DELIVERING DEMOCRACY: THE HISTORY AND DEPLOYMENT OF ELECTRONIC VOTING MACHINES IN INDIA AND THE UNITED STATES

by

PATRICK JONES

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Student: Patrick Jones

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This dissertation has been accepted and approved in partial fulfillment of the requirements for the Doctor of Philosophy degree in the School of Journalism and Communication by:

Biswarup Sen	Chairperson
Gretchen Soderlund	Core Member
Janet Wasko	Core Member
Arafaat Valiani	Core Member
Colin Koopman	Institutional Representative

and

Andrew Karduna	Interim Vice Provost for Graduate Studies

Original approval signatures are on file with the University of Oregon Division of Graduate Studies.

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DISSERTATION ABSTRACT

Patrick Jones

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My dissertation explores how the introduction of electronic voting technologies (EVTs) has reshaped electoral democracy in India and the United States. Through archival research, patent analysis, interviews, and discourse analysis, I examine how EVT's technical features, public policy debates, and media discourse configure controversies around the use of electoral technologies and how those controversies both reify and challenge existing democratic norms. I argue that EVTs are a digital interface between the voting public and the government. As such, they transform one's vote from a discrete act of civic participation into a source of political information that communicates much more than electoral preferences. As information, our votes are integrated into data-driven campaign strategies, disinformation and misinformation projects, and media debates about electoral integrity and democratic culture. In the contemporary political moment, the project has important implications for policymakers, activists, and an interdisciplinary and global set of scholars concerned with voter suppression, the security of elections, and democratic legitimacy. The project also has much to offer political communications scholars concerned with the relationships among technology, citizenship, and civic engagement.

Chapter 1 elaborates how the Election Commission of India has used electronic voting machines and other electoral technologies to create a relationship with the voter that is not structured by partisan affiliation. Chapter 2 uses EVMs to explore the relationship between electoral administration, electoral controversy, and voter perception. In Chapter 3, I provide a genealogical analysis of contemporary debates about the use of voting technologies by tracking how the secret ballot and mechanical lever voting machines reorganized the act of voting in the United States in the late 19th century. The fourth and final chapter analyzes the discourse on electoral reform after the 2000 US presidential election and argues that this literature created, consolidated, and institutionalized a science of election administration for the first time in US history. I then examine how this literature configures the voter as a user of voting technology and customer for electoral services.

CURRICULUM VITAE

NAME OF AUTHOR: Patrick Jones

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

University of Oregon, Eugene
University of Puget Sound, Tacoma

DEGREES AWARDED:

Doctor of Communication and Media Studies, 2021, University of Oregon
Master of Arts, International Studies, 2011, University of Oregon
Bachelor of Arts, Philosophy, 2005, University of Puget Sound

AREAS OF SPECIAL INTEREST:

Global Media and Technology
Political Communication

PROFESSIONAL EXPERIENCE:

Program Assistant and Social Media Coordinator, New Media and Culture Certificate, Graduate School, University of Oregon

Graduate Employee, School of Journalism and Communication, University of Oregon

GRANTS, AWARDS, AND HONORS:

Dissertation Research Fellowship, University of Oregon Graduate School and the University of Oregon School of Journalism and Communication, 2017

Lokey Scholarship, School of Journalism and Communication, University of Oregon, 2016

Anderson Family Fellowship in Media Ethics, School of Journalism and Communication, University of Oregon, 2015

PUBLICATIONS:

Koopman, Colin, Bonnie Sheehey, Patrick Jones, Laura Smithers, Sarah Hamid, and Claire Pickard (Critical Genealogies Collaboratory). 2018. "Standard Forms of Power: Biopower and sovereign power in the technology of the U.S. birth certificate, 1903-1935." *Constellations*: *An International Journal of Critical and Democratic Theory, 25*(2): 1-16.

Valencia, Ricardo and Patrick Jones. 2018. "Networks of Radical Dissent: The structural conditions of public relations strategies and tactics and the Committee in Solidarity with the People of El Salvador (CISPES)." *Journal of Public Relations Inquiry, 7*(3): 199-223.

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CHAPTER I: INTRODUCTION

The 21st century has seen persistent and increasing controversy over the use of voting technologies in the world's two largest democracies, the United States and India. In the 2020 US presidential election, Iran, China, and Russia spread dis- and mis-information in an attempt to affect the election's outcome (National Intelligence Council 2021). This followed Russia's unprecedented attack on the 2016 election, which included not just dis- and mis- information campaigns, but the attempted infiltration of election systems including voter registration databases in all 50 states (Perlroth et al. 2017).[1] However, election controversies in the United States have not been limited to foreign interference in electoral processes. Since 2000, the US has consistently experienced electoral controversies from hanging chads (Saltman 2006) to malfunctioning and poorly maintained voting machines (Alvarez and Hall 2008) to the spurious claims of former President Trump that 4 million people illegally voted in the 2016 presidential election (Kessler 2016) and the onslaught of baseless and dangerous claims made by Trump and his allies in the 2020 election.

In India, the years since Narendra Modi's election as Prime Minister in 2014 have seen the Election Commission of India (ECI) and their electronic voting machines come under increased scrutiny. Civil society actors and opposition political parties have attacked the ECI's assertions that EVMs are tamper-proof, discovered that the technical specs of the machine are different than the ECI has publicly claimed, and demanded that EVM source code be made available for public scrutiny. They have also pointed to flaws in the chain of custody for EVMs and criticized the secrecy surrounding EVM design

[1] Russia's efforts at electoral subterfuge have not been limited to the United States. Since 2014, Russia has attacked elections in Sweden, Spain, Germany, the UK, France, Italy, and the Netherlands (Tennis 2020).

(Citizen's Commission on Elections 2021a, 2021b). While EVM controversies date back to at least the 2009 general elections, they have taken on a more heated, high-stakes tone in the Modi era, with some accusing the government and the ECI of collusion (Agarwal 2021; Scroll Staff 2019; Wire Staff 2021).

As these examples make clear, voting technologies have acted as flashpoints in electoral controversies in each country, igniting fierce debates about electoral integrity, democratic legitimacy, and election reform. In the U.S., Trump's rhetorical assault on mail-in ballots, electronic voting technologies, and illegal voters culminated in a mob of far-right insurrectionists attacking the Capitol on January 6 during the certification of President Biden's victory. This act of violence has raised urgent questions about how to repair the damage done by Trump's assault on the integrity of US elections and the stability of American democracy. In India, EVM controversies cannot be isolated from other criticisms of the ECI focused on their handling of the pandemic, their deferential treatment of Modi and the BJP during campaign periods, and their unwillingness to engage in productive dialogue with reformers. In the case of EVMs and related controversies over electoral technologies, the ECI has vehemently denied that EVMs are in anyway technologically vulnerable (despite increased evidence that they are), flat out refused calls for transparency regarding source code or other features of the design process, has begun the process of linking voter registration data with the Indian Government's Aadhaar Identification system (spurring more worry about the ECI's compromised autonomy in the age of Modi), and unilaterally began exploring replacing EVMs with a blockchain alternative (Citizen's Commission on Elections 2021a, 2021b; PTI 2021; Sribhashyam 2017).

Given the scope and scale of voting technology controversies, one would expect sustained engagement from scholars studying the intersection of technology, democratic processes, and political engagement. However, while political communications scholars have developed a robust literature on data-driven political campaigns (Baldwin-Philippi 2015; Hersh 2015; Kreiss 2016), the role that mis- and dis- information play in shaping political engagement (Bennett and Livingston 2018; Freelon and Wells 2020), and the changing composition of the political information space in which contemporary elections occur (Bennett and Segerberg 2012; Chadwick 2013), they have not extended their analyses to voting technologies and the nuts and bolts of the electoral process. Similarly, though scholars in science and technology studies (STS) have developed cutting edge techniques to study the dynamics of political controversies on digital platforms (see Marres 2017 for overview), they have paid sparingly little attention to elections and their attendant controversies.[2] With a handful of exceptions, voting technology has also been a footnote in most historical analyses of electoral processes, voting rights, and electoral cultures in both India and the United States.[3]

One reason for this neglect might be that elections end, and their controversies fade from memory. Call the problem, "electoral obsolescence." Electoral controversies surrounding voting technologies invariably stir high stakes debates about democratic legitimacy, electoral integrity, and voter confidence and often energize urgent pushes for electoral reform. However, these efforts almost always dissipate rapidly in the months following an election as elected governments settle into temporary positions of power and

[2] For exceptions see Miller 2004, 2015 and the special issue of the *Social Studies of Science* from June 2001 (vol. 31, no. 3)

[3] For the US exception see Saltman 2006. For India, see the sporadic mentions of EVMs in Banerjee 2014).

other issues take political precedence. The farther away you move from elections, the more reform efforts become confined to legislatures and debates among a gaggle of policy wonks, journalists, think tanks, and election officials. In other words, elections end, press attention fades, and people lose interest until a new election cycle.

This process points to another reason for the lack of critical attention to voting technology. Elections perform two incredibly important functions in any democratic society—they allow voters to have a voice in who governs them and they allow for the stable, orderly, and peaceful transition of power. As such, we hope they are mundane affairs with few hiccups and outcomes that everyone can easily agree upon. When electoral controversy erupts and the electoral black box opens, it raises very serious questions about democratic legitimacy and electoral integrity—issues such as these, real or imagined, as we saw in the United States this year, can lead to doubt, vitriol, and violence. The desire to close the black box is intense. Electoral controversy must be contained, the system has to hold. Therefore, elections must be processes that begin and end every few years. Their products, electoral outcomes, must be discrete and voters must have some degree of trust in the process. As election controversy recedes from popular memory, the banal details of reforming electoral processes, voting technologies, and registration systems becomes the purview of the dedicated gaggle mentioned in the previous paragraph.

In this dissertation, I argue that media studies and STS scholars need to pay attention to voting technology and electoral processes. New ways of conceptualizing voting technologies, elections, the vote, and how they are connected to a broader political information space are urgent given persistent controversy and the ever-shortening

window between elections. Political scientists often speak of the permanent campaign. It is time we speak of something akin to "permanent elections."

This dissertation begins this work by developing an analysis of voting technologies that emphasizes their role in mediating various electoral processes and experiences and reconceptualizing elections as sociotechnical systems that produce much more than electoral outcomes. In STS, a sociotechnical approach focuses on how heterogenous social and material actors work together to produce, reproduce, consolidate, and sustain systems, networks, orders, and institutions (Latour 2005; Latour 1991; Law 1991). The sociotechnical perspective makes visible the heterogenous set of actors involved in elections. These relationships include journalists, social media platforms, lawyers, pens, polling locations, voting technologies, poll workers, election officials, security procedures and chains of custody, pundits, partisan news networks, voters, voting instructions, electoral laws and regulations, judges, and many others. Together, these actors work together to perform the complex choreography out of which elections and their attendant controversies emerge. The sociotechnical approach also attunes one to the fact that products of elections are not simply discrete, tangible electoral outcomes, but nebulous concepts such as democratic legitimacy, electoral integrity, voter experience, stability, and voter confidence that are iteratively reproduced with each new electoral cycle. Within this sociotechnical framework, I pay special attention to the ways that electronic voting technologies function in the electoral process.

I argue that voting technologies perform three vital functions in elections. First, they are the primary mechanism connecting a voter and their ballot to the production of electoral outcomes. Second, they play a predominant role in organizing the polling

facilities in which voters cast their ballots. Third, they translate votes into electoral counts and enable those counts to be aggregated into totals. As mediators, organizers, and aggregators, voting technologies do much more than simply produce vote counts. They also connect the mechanical aspects of electoral processes to the expressive aspects that give it meaning. As mediators, they don't just allow someone to cast a ballot; they allow a voter to perform one of the most fundamental acts of political communication, casting a ballot. As organizers, they don't just play a crucial role in configuring polling booths; they have an intimate effect on a voter's experience of a quintessential democratic space. As aggregators, they do not simply produce electoral outcomes, they transform individual votes into the essential abstraction of electoral democracy, the will of the people. An appreciation of a voting technology's expressive capacities leads me to argue that we should consider them a type of media technology. I develop this argument more fully later in this introduction and in the conclusion.

Each chapter in this dissertation is informed by an understanding of elections as sociotechnical systems and voting technologies as media technologies. A sociotechnical perspective anchors an analysis of the dynamics of EVM controversies in India (Chapter 2), and motivates a genealogical inquiry into the roots of contemporary debates about voting technology and electoral reform in the United States (Chapter 3). An understanding of electronic voting machines as media technologies helps elaborate how the EVM has enabled the Election Commission of India to cultivate a unique relationship with the voter (Chapter 1). It also shapes my inquiry into how US public policy discourse operationalizes a figure of the voter as a user of voting technology and a customer for electoral services (Chapter 4). The remainder of this introduction proceeds as follows: I

briefly describe the Indian and American electoral systems. I then elaborate in more detail the analytical framework briefly introduced above by situating the study within three different election literatures: elections and electoral integrity, elections as ritual, and an STS perspective. After reviewing these literatures, I flesh out the argument that electronic voting technologies are media technologies. The chapter concludes with a note on method and a plan of dissertation.

Indian and US Elections: A comparative perspective

Elections in the United States and India are administered quite differently. In India, elections are run by a national body called the Election Commission of India. In the United States, they are administered by local officials according to a cross-cutting set of municipal, county, state, and federal rules. Elections are holidays in India and have a festive atmosphere. The campaign period before an election is prescribed by law. In the United States, people rush to vote before and after work or on their lunch break. Politicians routinely block any attempt to make voting a holiday or simply move it to a weekend because they want to keep turnout low. Elections in India are run by a central body that was deliberately designed during constitutional debates just after independence. The US constitution says virtually nothing about elections, vesting almost all power over their superintendence to states. In this section I briefly outline these differences in more detail before showing how they shape the design and deployment of actual voting technologies.[4]

The size and scope of Indian elections is overwhelming. India's electorate is approaching 1 billion. In the 2019 general election, more than 600 million people voted,

[4] For an exhaustive overview of the Indian system, see Devi and Mendiratta 2017. For the U.S, see Hale and Brown 2020; Hale et al. 2015.

making it the largest election in world history. It broke the previous record held by the 2014 Indian general election (Bhattacharya 2019). Indian elections take place across a diverse rural and urban geography that includes scattered island chains, remote jungles, some of the most densely populated cities in the world, and isolated mountain communities. The Indian electorate also speaks more than 100 languages, many with multiple dialects. Together, these factors make Indian elections the largest and most complex, non-martial feat of civil engineering in the world. To accomplish this task, Indian elections have to be highly organized affairs organized around a stringent set of administrative rules and logistical procedures and a single voting technology—the EVM. All of which are overseen by the Election Commission of India, a constitutionally, mandated independent body. In addition to dealing with the sheer size and complexity of Indian elections, the Election Commission has also designed election procedures to ensure that each Indian voter has roughly the same experience at the polls. This uniform experience lends the election additional layers of cohesion and stability (Banerjee 2014; Devi and Mendiratta 2017).

US elections are the exact opposite. US electoral infrastructure is deeply distributed and decentralized. Election laws and processes vary from state to state, county to county, and in some cases municipality to municipality. In effect, the United States has at least 50 different electoral systems. However, given county and municipal variation that number is likely in the thousands. This means that voters in the same state, county, and city might experience election day very differently. US elections also employ a variety of voting technologies including mail-in ballots, direct recording electronic

(DRE) voting machines, and optical scan voting technologies. Electronic technologies are designed and manufactured by commercial vendors (Hale et al. 2015).

A small cadre of vendors controls 88 percent of the market: Election Systems & Software, Dominion Voting Systems, and Hart Intercivic (Caulfield et al. 2021). While an exhaustive discussion of the voting technology industry in the United States is outside the scope of both this section and this dissertation, I want to note a few of its features and issues. First the market is small. A comprehensive study by Hitt et al. (2016) concluded that the size of the market was roughly $350 million annually (calculated over a ten-year period). Second, the market is almost completely unregulated at the state and federal level. While there are voluntary guidelines at the federal level and states have their own standards for vendor certification, the small number of vendors, the local scope of procurement (often election officials in municipal offices are buying voting technologies), and lack of funding for electoral technologies make certification relatively easy, giving the three companies mentioned previously even more control over the market (Fessler and Kauffman 2019; Norden et al. 2019; Wilkie 2019). Third, the big three companies, particularly Election Systems & Software, ruthlessly control the market by behaving like patent trolls, suing cities and states over ambiguities in their RFPs for new voting technologies and suing new voting machine companies out of the market for violating their intellectual property (Huseman 2019). Finally, the industry has aggressively lobbied against any kind of federal regulations regarding election security, fearing that it might increase costs and decrease profits. This lobbying has mostly been directed at Republican lawmakers including Mitch McConnell (Goodkind 2019; Shaw 2019). While I indirectly discuss why the US has a privatized voting technology industry

in chapter 3, I wanted to provide a brief, and obviously motivated, overview of the market here because it deserves more attention in future research (for industry-oriented overviews see Caulfield et al. 2021).

The decentralized nature of US elections makes it hard to judge their performance. Some commentators have argued that the fragmented nature of the US electoral system makes elections more secure—there are no Death Star sized weak points that a malicious actor could target to destroy the whole system. On the other hand, the fractured structure of US elections leads to serious administrative problems at the local, state, and federal level including poorly trained and paid poll workers, the inconsistent application of registration procedures and voter ID laws, uneven voter education campaigns, and badly maintained election equipment. These problems can compromise a voter's experience at the poll or their ability to access the franchise at all. (Tran 2019).

This again is the exact opposite of the case in India. The ECI's highly organized approach to election administration makes it fairly easy to assess the performance of India's electoral processes. Data on registration, turnout, and outcomes from different states are quickly aggregated and shared with the public. The ECI has uniform procedures for election administration that are laid out in numerous manuals, working papers, and other publications. Information about how EVMs are secured is also readily available and the ECI regularly does public demonstrations of the machine (ECI 2018). In short, Indian election data and information about its electoral process and EVMs is readily available. However, the ECI's complete control over the electoral process could be seen as problematic, especially in an era where the organization has become increasingly unwilling to entertain criticism or partner with civil society actors.

Before moving on to a discussion of academic literature on elections, I want to compare the EVM to one particular voting technology used in the United, the infamous butterfly ballot used in Palm Beach County during the 2000 Presidential election. The example vividly illustrates how the differences between each country's electoral system become embodied, so to speak, in their voting technologies. While voting technologies are made by private vendors in the United States, paper ballots are often designed by local officials. In the case of the butterfly ballot, Theresa Lepore, the local election supervisor, was in charge of the design. The ballot splayed over two pages, listed presidential tickets on both sides of the page. Running between the two pages was a narrow strip with tiny, perforated bubbles roughly aligned with each ticket. These were the infamous chads that needed to be punched out in order to cast a ballot. She chose the design because listing all the tickets on one side of the ballot would have forced her to use a smaller font, and she worried that elderly voters would not be able to read it.

The issue with the butterfly ballot was that the layout confused voters. This confusion is evocatively captured in the 2008 film *Recount*. The movie begins with an elderly woman perseverating over the butterfly ballot. As the woman stares down at the ballot the bubbles next to the Gore-Lieberman ticket, the second pair on the left side of the page, and the Buchanan-Foster ticket, the first ticket on the right side of the page, blur into one. Around her, elderly voters all stare intently at their ballots, seemingly consternated by the same problem.

On the other hand, EVMs have a simple, standardized interface which can feature up to 16 selections on a single ballot unit (15 candidates and a none of the above button).[5]

[5] The technical features of EVMs are discussed in chapter 2 on EVM controversies.

Names of candidates are listed next to a party's symbol. This symbolic interface was designed to help illiterate voters cast their ballot (ECI 2018). The EVM's design was the outcome of twenty years of coordinated efforts by the Election Commission of India, two Indian companies, Bharat Electronics Limited and the Electronics Corporation of India Limited, and a technical experts committee composed of Indian academics (Devi and Mendiratta 2017). The EVMs made by the two companies are identical and are used in every state and national election throughout the country.

In Florida, the butterfly ballot's design was spearheaded by one well-intentioned, underpaid person trying their best to help voters (Saltman 2006). The EVM emerged out India's need for a light weight, portable, battery-powered electronic voting technology to stop ballot stuffing, curb the cost of Indian elections, and enfranchise illiterate and other underrepresented voters (Devi and Mendiratta 2017). The butterfly ballot used punch card technology first developed in the late 19th century (Saltman 2006). The EVM has become a symbol of pride in India, "the leitmotif" of the world's largest democratic exercise (Ford 2014). The butterfly ballot was a manifestation of the US election system's decentralization, localization, and lack of standards. The EVM is emblematic of the ECI's highly controlled, managerial approach to election management.

Electoral Integrity

Over the last three decades, a wide swathe of scholarship and white paper research has embraced electoral integrity as an organizing concept for studying elections. These researchers have argued that electoral integrity influences public perceptions of the electoral process, fosters political legitimacy, and encourages civic participation and activism. The concept has spurred growth in election monitoring by international actors,

focused attention on the importance of elections in emerging democracies, and organized a multifaceted approach to studying elections (Elkit and Svensson 1997; Garnett 2019; James 2019, 2020, James et al. 2019; Norris, 2013, 2014; Norris et al. 2014). As a concept, electoral integrity departs from the traditional focus of election studies on how electoral systems affect voter turnout, who wins elections, and the nature of the party system (James 2020). While the concept's importance is obvious, defining it is a bit more slippery. Pippa Norris (2014), for example, argues that the term has increasingly become a catch-all concept encompassing a wide range of values, indicators, and indices for judging the integrity of elections. Frank and Coma (2017) argue further that the literature has often evaluated electoral integrity either positively, in terms of adherence to democratic ideals, or negatively, focusing on electoral malpractices and institutional corruption.

Elkit and Stevenson (1997) provide an example of the former in their outline of an approach to assessing electoral integrity in terms of their freeness and fairness. They define the freeness of an election as a freedom from coercion and tie fairness to the impartiality by which the rules of the game are applied. They go on to divide the election process into three temporal phases: before polling, the day of polling, and after polling. They then develop a checklist for election monitors to assess the freedom and fairness of elections during each of these periods. Before polling, one might assess freedom in terms of assembly, speech, and the absence of obstacles to stand for election. After the election, one might evaluate fairness in terms of how quick election results are announced and how legal complaints are dealt with by the courts.

On the other hand, scholars such as Andreas Schedler (2002) and Sarah Birch (2011) have defined electoral integrity negatively. For example, Schedler (2002) argues that political actors can sample from a "menu of manipulation" to influence an election. He contends that there are several different moments in the "chain of democratic choice" where political actors can transgress democratic norms and try to manipulate electoral results. For example, political actors could control the formation of political preferences through the outright repression of civil liberties or through control of media access. They also could control the aggregation of preferences through electoral fraud and the creation of unfair election procedures. In *Electoral Malpractice*, Sarah Birch (2011) outlines five effects of electoral malpractice on the quality of democracy: "reducing the objective quality of representation," subjective confidence in the electoral process and regime legitimacy, fostering more corruption, indirect costs of electoral malpractice, and creating the potential for violence. Her framework then places empirical assessments of electoral malpractice in conversation with democratic theory, emphasizing the importance of transparency, inclusivity, openness, and impartiality.

Birch, Schedler, and Elkit and Svennson are all interested in the practical application of their work in actual electoral processes. How can we develop evaluative indicators for electoral integrity? How can we connect these with both the theoretical ideals of democratic theory and the political, social, and cultural realities of specific electoral contexts? All of these authors also emphasize the importance of the "electoral cycle" approach to studying elections. This approach recognizes that all phases of the electoral process influence perceptions of electoral integrity.

In her 2014 book *Why Electoral Integrity Matters*, Pippa Norris helps synthesize these various approaches to understanding electoral integrity by appealing to global norms and conventions. She grounds her concept of electoral integrity in the "agreed upon international conventions and universal standards about elections reflecting global norms applying to all countries worldwide throughout the electoral cycle, including during the pre-electoral period, the campaign on polling day, and its aftermath" (21). Through her reading of a variety of international treaties and covenants, she identifies a set of international standards for holding free and fair elections such as the right to a secret ballot, universal suffrage, transparency, and the holding of periodic, fair elections. This scholarship is complemented by Norris' work with the Election Integrity Project (EIP). The EIP's *Perceptions of Electoral Integrity* report represents the most sophisticated study of electoral integrity worldwide. The most recent report released in 2019 surveyed 3,861 election experts and covered 337 elections in 166 countries. The survey covered 49 indicators of various aspects of the electoral cycle from cybersecurity and the performance of election management bodies to the fairness of media coverage and availability of various voting technologies.

The EIP's work has motivated research on electoral integrity that takes an increasingly complex view of elections and what elections actually do. In his recent book on comparative election management, EIP Deputy Director Toby James (2020) argues that electoral governance should be understood as the power to make rules and any analysis of electoral governance should embrace the "broader set of power relationships and actors involved in deciding how elections are organised. The power relations involved in electoral governance cover all aspects of the electoral cycle – from designing

an electoral system, electoral justice or polling station design" (6). This broader framework allows James to examine how electoral governance affects the diverse products of democratic elections including an election's fidelity to democratic values and norms, electoral outcomes, and the electorate's confidence in those electoral outcomes. It also allows him to assess the degree of transparency around how electoral outcomes are produced, how elections and political parties are funded, and the role peaceful electoral processes play in stabilizing democracy in both fragile states and established democracies.

Together, Toby James and Hollie Anne Garnett, the other Director of the Electoral Integrity Project, (2020) have examined how digital technologies have impacted how we conceptualize and measure electoral integrity. In their view, elections, in all phases, are inescapably digital. This reality has sped up communications processes, created new data flows, and led to a commodification of electoral data. No longer is voter registration information housed in a poorly lit basement. Now it exists in a world where it can be hacked, sold, and used by campaigns to influence voters. Similarly, the public's demand for the speedy and efficient reporting of electoral outcomes has become insatiable. For example, think about the way former President Trump preyed on the time it took to count mail-in ballots to fuel his baseless assertions of electoral fraud. Crucially, digital technology has also expanded the number of actors involved in the electoral process. Garnett and James point to the emerging roles of voting technology vendors, social media companies, and other non-traditional media outlets as new variables in assessing electoral integrity. They define electoral integrity according to a set of democratic norms that includes opportunities for deliberation, equality of participation,

and professionalism and transparency. They insist that we need to evaluate the performance of digital technologies according to these three norms. However, they also argue that electoral integrity is not a discrete product of electoral processes, but rather is produced and reproduced with each election cycle. This reality challenges scholars and policymakers to be nimble and flexible in their measurements and policy responses.

Within the literature on electoral integrity, much attention has been paid to the effects of digital technologies on the electoral process. This research generally lumps voting machines together with electronic registration systems and electronic vote tabulation software in its discussion of electoral technologies. Some scholars argue that electoral technologies benefit the electoral process by facilitating increased voter participation, introducing transparency into the electoral process, and making election management more efficient. Voting technologies can also reduce the number of spoiled ballots in an election, help enfranchise voters with disabilities as well as illiterate voters, fight fraud, simplify registration procedures and fix inaccuracies in registration systems, provide faster electoral results, and lower the costs of holding an election (For an overview of this literature see Haque and Carroll 2020).

However, an equally robust literature has challenged these supposed benefits. For example, Cheeseman et al. (2018) argue that use of electoral technologies actually leads to less transparent elections in three interrelated ways. First, electoral technologies are often black-boxed, meaning the public is not privy to how the hardware and software in these various technologies function. This lack of access gives elite technologists a problematic amount of control over electoral processes. Second, this lack of transparency about the design and functionality of electoral technologies creates opportunities for

fraud that is virtually untraceable. Finally, elite control of electoral technologies and the possibility of fraud creates public distrust in electoral results. Other literature critiquing the role of voting technologies has focused on the role of international actors in implementing these systems in emerging democracies with very little input from anybody other than government actors, the possibility that the use of digital technology might undermine the secrecy of the ballot, and the fact that a focus on technology obscures the social and political contexts (and the problems associated with those contexts) in which elections occur (Barkan 2013; Cheeseman and Klaas 2018; Evrensel 2010; Yard 2010).

Whether understood positively or negatively, this literature understands voting technology instrumentally either in terms of the usability and accessibility of various electoral technologies or the security of electoral technology systems. In terms of voting machines, the usability and access literature examine the effects of ballot formatting and interface design on voter participation. The securities literature investigates the benefits and drawbacks of particular voting systems (see Alvarez and Hall 2008 for an overview). Both perspectives see voting machines primarily as a technology for producing electoral outcomes. These outcomes include both a voter's communication of preferences through the casting of a ballot and the aggregation of those ballots via electronic tabulation. This understanding of voting technology is embedded in the concept of electoral integrity outlined above. Situating voting technology in this framework allows it to gain an additional layer of communicative capacity to the simple casting of ballots— the ability to communicate public confidence in the electoral process. Together, an understanding of voting machines as communicating both electoral outcomes and voter confidence implicates voting technologies in the production of democratic legitimacy—a nebulous

concept in the electoral integrity literature, difficult to define according to discrete indices.

Elections as Ritual

In his book, *Celebrating Democracy*: *The Mass-Mediated Ritual of Election Day*, Mark Brewin (2008) defines ritual as a "set of public, communally performed, and rule-governed acts, set apart in time and space from the mundane or every day, which effect a change in reality through the symbolic rather than physical means" (7). Following this definition, he argues that elections are rituals because they create a liminal and symbolic space for the "Emphatic construction of the categories by which we understand politics" (9). Frank O'Gorman (1992) argues, following a similar definition of ritual that elections initiate a special time that enacts an "idealized social and political order" that is dialectically opposed to the real world (82). Filomeno Aguilar Jr., (2005), in his analysis of Philippine elections, argues that elections are moments when the ideal and the everyday (the sacred and the profane in his language) are inverted and societal hierarchies, are upended. However, importantly, for Aguilar, this inversion affirms the current social order. Elections are also unique moments in which a voters' individual voices are aggregated together to form a collective voice. Or as Stephen Coleman puts it, "voting is a means of aggregating voices so that they possess a collective social meaning. Another way of putting this is to see voting as a process of social embodiment (2012, 12)." For Coleman, this act of transmutation makes voting a social practice saturated by both instrumental and affective signification. Elections are in some sense mystical moments when the collective act of voting conjures the demos.

As such, elections are crucial spaces in which democratic values, identities, and norms are performed, contested, and celebrated. Coleman (2012), for example, sees elections as spaces where certain democratic practices are either affirmed or disavowed. And Graham Orr sees them as rituals that perform both "republican unity and democratic difference" (2015, 21). Jon Lawrence (2011) similarly argues that elections are important rituals for the performance of social and culture mores, identity politics, and the boundaries between everyday public life and the role of the citizen. An election in these formulations is a social and political drama that allows democracy to reproduce itself, while also providing a unique space wherein the implicit value of democratic governance can be questioned. Though the core ritualistic functions of elections are common to most democratic systems, every electoral system differs in terms of customs, atmosphere, and social performance.

Mukulika Banerjee (2007, 2011, 2014) has examined how Indian elections represent a social levelling in which traditional social hierarchies and rules are inverted and politicians are forced to grovel for votes from their constituents. In this sense, despite the realities of social inequality, poverty, and poor governance, elections "provide a glimpse of a transcendent reality of fairness and prosperity for all that can be imagined for the future, but is yet to be realised in the present" (2014, 19). Banerjee further argues that the ritualistic qualities of Indian elections are marked by the special nature of Indian electoral time. When the Election Commission of India declares that there will be an election, special rules go into effect that allow the ECI to discipline political parties.

So quite literally, elections occur in a special temporality in which the normal structures of governance are suspended. Within this special temporality, Banerjee

elaborates how a carnivalesque quality takes over as people display party colors, attend public talks, and welcome politicians into the intimate realities of their daily lives. Election day has a festive atmosphere. People dress in their best clothes and mill about the polling station to talk and socialize. After they vote, individual voters proudly display their ink-stained fingers to friends and family. In her interviews with rural Indian voters, she has found that the vote has immense symbolic value in "expressing people's self-respect and self- worth, and instrumental power, in helping to ward off potential attacks by the state upon that self-worth" (2007, 1561). This symbolic value sacralizes the vote, imbuing the electoral ritual with more meaning.

This description of the Indian electoral ritual might sound odd to American ears. The festive, communal quality of Indian elections feels deeply opposed to the isolated, depersonalized, automated feel of American elections. In "Voting Alone: The Decline of Bodily Mass Communication and Public Sensationalism in Presidential Elections," Carolyn Marvin and Peter Simonson (2004) examine how progressive reformers in the early 20th century dismantled the electoral culture surrounding American elections in the late 19th century. In post-bellum America, elections were riotous affairs that demanded the participation of large crowds. These crowds charged elections with populist drama. It also enabled a form of political communication in which individuals voiced their opinions in uncontrolled political encounters. This form of communication was tied to the needs of specific communities and populations.

Simonson and Marvin argue that progressive reformers saw this combative mass of bodies as a political problem, one that could be solved by the textualization of American political communication. This textualization thoroughly privatized the

American election ritual. The kind of political communication that took place at the mass gatherings and marching regimens of the late 19th century gave way to political information mediated through the radio and newspaper after World War One. This type of information appealed to a rational, literate, educated, dispassionate, and isolated voter. The secret ballot, an innovation that emerged at the tail end of the 19th century, made voting a lonely, deeply private act. Together, these reforms alienated voters from their social and political environments. No longer would voters be inundated by the realities of their community as they approached the ballot-box; instead, they could vote solely in their own private interests. Similarly, political candidates and their campaigns were taken over by advertising and public relations professionals. Long speeches in front of crowds of dissenting, invective spewing constituencies were replaced by witty slogans and mechanically produced campaign materials. The candidate disappeared from the daily lives of voters. Together, for Simonson and Marvin, all three of these changes disappeared the bodies of individual voters and candidates from the electoral ritual in favor of a more distant, elite controlled, textually mediated electoral process.

The electoral ritual in the United States is now a passive one, mediated through cable television and social media. In this ritual, the act of voting is diluted of its symbolic value and affective power. Stephen Coleman diagnoses a similar problem in the UK in his 2012 book, *How Voters Feel*. In this book, he interrogates a paradox often encountered by those studying voting: while an individual vote is aggregated with others to form a collective decision, the individual voter personally receives very little in exchange for their vote. That is, if a vote has very little instrumental value outside of broad and abstract policy positions, why do people vote? However, people do vote,

suggesting that voting has an expressive as opposed to instrumental value. Coleman provides a good overview of the expressive value of voting: "Rather than seeking to realise a tangible objective, such as the rule of a particular party or higher expenditure on certain services, expressive voters act with a view to asserting their own political identity or uniting with a community of imagined others who share their values" (71). Coleman spends most of the book examining the dissonance between the instrumental and expressive values of voting among actual voters.

Banerjee (2014) also focuses on the expressive value of voting in India. She finds that voting has at least four expressive dimensions for Indian voters. First, it creates a feeling of citizenship, providing a mode for expressing the voter's identity as an Indian. Second, it is a fundamental, precious, and deeply valued right among the Indian electorate. Third, there is a sense of gratitude toward the Election Commission that compels people to vote. And finally, the belief that every vote is important. This last point complicates Coleman's distinction between the instrumental and affective facets of voting. While the belief that every vote counts has a clear instrumental quality (my vote could decide an election and therefore how my interests are represented at local, state, and national levels), it is also loaded with affective sentiment—my vote is meaningful for the construction of democracy.

The ritual literature's focus on the expressive value of voting points to how this research understands the role of voting technology in the electoral process. Voting technology, as the media through which our votes are cast, plays a powerful role in our experience of democracy. Graham Orr (2015), for example, analyzes how new voting technologies can infuse the act of voting with fear and mistrust for some voters. Paperless

voting technologies make electoral outcomes profoundly intangible, "as if we were compressing a nation's political mood into a mere bottle of vapour" (107). This intangibility can cause more suspicion and anxiety around the act of voting (if there is no tangible receipt, how do I know my vote counted). Orr also speculates on how remote voting technologies like Internet or SMS voting might impact the meaning of the vote, arguing that if voting can occur from any place at any time, then the solemnity of the act, its expressive value, might be further diluted. While Orr does not specifically come out against new voting technologies, there is an implicit skepticism in his analysis—if voting technologies further undermine the expressive meaning of voting and the communal qualities of the election ritual, then we need to include these losses in our evaluations of new voting technologies.

Monnoyer-Smith (2006) provides a different view from Orr, arguing that that rather than see new technologies as a threat to the electoral ritual, we should analyze voting technology and voting as "total social phenomena" embedded in a particular culture and existing set of electoral rituals. This analytical orientation leads him to a) examine how new voting technologies materialize new voting practices and b) elaborate the changing notions of citizenship that emerge from these new practices. Monnoyer-Smith's discussion points us to a provocation that animates Stephen Coleman's book: "the political obsession of modernity has been the making of voters" (2012, 2).

The ritual view's analysis of elections and voting further complicates our understanding of what exactly a vote communicates. If the electoral integrity literature sees voting as both tangibly communicating electoral preferences and more abstract qualities such as democratic legitimacy, the ritual view provides a blueprint for making

the abstract more material. Qualities such as democratic legitimacy make voting meaningful for people. Further, the ritual literature provides elections and voting a meaning not connected to an electoral outcome and in doing so demonstrates how deeply embedded in a particular electoral culture our experience as voters is. Next, we turn to literature from STS that in some sense brings together the ritual literature's ability to make democratic norms, values, and identities tangible products of election processes and the electoral integrity literature's focus on the administrative, legal, logistical, and technical aspects of elections.

Elections as Sociotechnical Systems

In June 2001, a special issue of the journal, the *Social Studies of Science*, brought high-profile STS scholars including Susan Leigh Star, Sheila Jasanoff, Michael Lynch, Harry Collins, and others together to examine the 2000 US election controversy. In his introduction to the issue, aptly named "Pandora's Ballot Box: Comments on the 2000 US Presidential Election," Michael Lynch draws out why the controversy should be of interest to STS Scholars: "The media coverage and court cases drew attention to local contingencies associated with the politico-techniques of voting and vote-counting. These contingencies tend to remain hidden when the system of humans and machines seems to function well enough and election results are trusted" (2001, 417). Or has Sheila Jasnaoff more bluntly put it: "...the breakdown involved that most basic of political technologies: the machinery of democratic representation" (2001, 463). The journal's authors, in a series of short pieces, go on to explore a diverse array of topics including why the controversy was quickly forgotten by the public and media (Jasanoff), how the media reported the statistical aspects of the controversy (Lewenstein), the relationship between

electoral legitimacy and controversy (Agre), and mechanical objectivity and public decision-making in American political culture (Carson 2001; Clark 2001).

While the journal's articles tackle a wide range of issues, they do establish some core themes that echo in subsequent STS-oriented work on elections. The first is a focus on the sociotechnical dynamics of electoral controversies. The second is an appreciation of the epistemological dimensions of electoral processes. Elections, in this view, provide a special arena in which to interrogate how democratic knowledge, order, and authority are generated through a specific set of practices. Finally, the STS perspective holds that special attention needs to be paid to the roles that voting technology and other electoral materials play in shaping electoral processes and controversies. The rest of this section examines how this approach is deployed in Clark Miller's work on US elections and Kimberley Coles examination of elections in postwar Bosnia-Herzegovina.

In his article, "Interrogating the Civic Epistemology of American Democracy," Clark Miller investigates how the US electoral system managed the instability brought on by the 2000 US presidential election. For Miller, a variety of questions constituted the controversy: Was there a clear winner arrived at through an objective, accurate vote tally? Did voting machines malfunction? Were illegal votes cast? Were people disenfranchised? In the wake of the election, most of these questions could not be answered with any satisfaction. How then did the US electoral system contain and resolve a serious attack on its credibility?

Miller argues that the controversy revealed that "the voting system…is neither hierarchical nor bureaucratic. Its pieces are much more loosely tied together, consisting of elements of county, state, and federal governments, the courts, the media, and

individual households" (2004, 503). It is this distributed network of actors, working across political, geographic and social scales, that worked to contain the instabilities brought on by the controversy. The decentralized nature of the US electoral system kept the Florida controversy from infecting electoral outcomes in other states, while local election workers, media outlets, and other government actors across the country worked hard to ensure that electoral outcomes were not called into question in their precincts. Media commentators, similarly, focused on Florida in their coverage and did not allow the controversy to spill over into other states. County courts in Florida settled many disputes about vote counts and voting technologies and of course, the Supreme Court stepped in to formally end the election. Together all of these actors worked to contain the electoral controversy and translate the election's outcome from a matter of concern into a matter of fact. That is, they translated the uncertainty of the electoral outcome into a result the public, albeit warily, accepted as an attestable electoral fact.

In "Knowledge and Democracy: The Epistemics of Self-Governance," Clark (2015) extended this analysis to argue that elections are an important component of the civic epistemology of democracy. He defines civic epistemology as "the social and institutional structures and processes through which politically relevant knowledge gets made, validated, synthesized, circulated, applied and given meaning" (200). Civic epistemologies generate public knowledge through agreed upon standards for evidentiary practices, modes of expertise, statistical techniques, styles of reasoning, surveillance systems, and many other factors. Elections play a crucial role in democratic societies by producing electoral outcomes that the public agrees are valid. This agreement tacitly extends to the processes through which those outcomes are produced including vote

counting and audit procedures, the use of particular voting technologies, and registration systems. Clark further argues that epistemologically, elections are the "foundational institution in the public imagination of democracy" (203).

Following the work of Yaron Ezrahi (1990, 2012), Clark sees the democratic imagination as "the socio-epistemological ground" that holds together democratic societies. Collective beliefs about where power resides, how authority is transferred, and values such as equality, self-governance, and accountability enable certain kinds of knowledge making practices and processes. Civic epistemologies are both produced by and in tension with the democratic imaginary. Questions about electoral outcomes, for example, clash with our belief that voting should be fair, equal, and free of coercion. In the article, Clark reviews recent legal precedent in which the ideal of voter equality has come into tension with the belief that states should have absolute control over their electoral processes. Following Clark's schema, voting technology controversies are particularly problematic because not only do they create doubt about the electoral outcome, but also, on an individual basis, they make us doubt that our vote has been counted at all. Controversies involving voting technologies are made even more dangerous because they are fueled, validly or not, by the anecdotal experiences of voters, meaning they are not easily settled by existing standards for closure in the courts or media.

Clark's work is instructive for us on several accounts. First, it highlights that elections inevitably involve a heterogenous network of distributed actors consonantly working toward a particular goal: the production of a credible electoral outcome. Second, it elaborates the complex epistemological function that elections perform in democratic

society. Finally, he demonstrates the complexity of connecting the abstract democratic ideals that theoretically ground elections to the mundane, messy realities of actual electoral processes.

In her work on postwar elections in Bosnia-Herzegovina, Kimberley Coles (2004, 2007) has thoroughly examined how the international community leverages certain technologies and techniques to cultivate trust in the electoral process. Coles conceptualizes elections as laboratories for producing "democratic reality, democratic facts, and democratic norms" (2004, 555). In this framework, technologies like ballots boxes, invisible ink, voting registers, and voter databases, embedded in a highly rationalized set of bureaucratic procedures and administrative mechanisms, were designed to encourage voters to cast their ballot, trust the results, and participate in the next election. However, crucially for Coles, the trust generated through rigid, technocratic electoral processes "is a form of antipolitics, as it limits the possibilities of debate and confrontation through its use and normalization of technical procedures" (2004, 574).

In this view, the international community's implementation of rigorous electoral rules, standards, and procedures and deployment of electoral technologies were designed not simply to encourage participation and trust in the electoral process, but also to position elections as nonpolitical and technocratic instruments for producing electoral outcomes. Coles see this process of depoliticization and technocratic and bureaucratic rationalization as deeply problematic for two reasons. First, it obscures the practices through which elections are made, disconnecting elections from their mundane complexities, and orients attention toward their normative and idealistic dimensions. This

reorientation works to reify democracy's "exalted place in the political imagination" (2004, 574). Second, this process legitimates democratic authority and naturalizes democracy as a form of governance. In doing so, it forecloses space to critique specific models of democratic authority and democracy as a form of governance more generally.

Coles and Clark share many of the same concerns. First, elections are messy affairs involving myriad human and non-human actors. Second, they legitimate democracy as a form of good governance. They also potentiate or hinder the realization of certain democratic values and ideals and authorize political authority. Finally, they both see voting technologies embedded in particular sociotechnical ensembles as doing much more than just producing vote counts.

For Coles and Clark, voting machines play a key role in mediating the electoral process in a variety of ways. First, these technologies format the actual act of voting. In doing so, they organize polling day processes, pre-polling logistics, and post-election counts and audits. John Carson captures this mode of mediation well in his piece, "Opening the Democracy Box," from the special issue of the *Social Studies of Science* discussed above. Carson argues that the 2000 election controversy turned on the fact that a "technology that was supposed to remain invisible—the voting punch card with its soon-to-be notorious perforated chads—became visible, and a transparency that was supposed to be produced—the connection between voter and vote—was instead rendered opaque" (2001, 425). As debates raged about determining voter intent and the accuracy of counts, it became clear just how much work voting technology does in organizing the electoral process.

Secondly, voting technologies mediate the relationship between the voter, their vote, and electoral outcomes. In doing so, they are deeply entangled with the production of democratic authority, legitimacy, and continuity. Voting technologies in this sense are among what Kristina Asdal (2008) calls the "little tools of democracy." According to Asdal, these tools are capable of mediating between "mundane epistemic and administrative tools…and authority and objectivity" (16). By making the organizing and mediating capacities of voting technologies visible, Coles and Clark provide a blueprint for problematizing voting technology as a little tool of electoral democracy. This problematization complicates any account that positions voting technologies as simply transmission devices designed to translate votes into electoral outcomes. It also politicizes voting technologies and electoral processes, opening a path for a critical analysis of the kinds of work voting technologies and elections do in democratic societies.

Voting technologies as Media Technologies

Elections are organized around the act of voting. As such, they are fundamentally oriented around an act of political communication. This leads Martha Kropf, in her 2016 book, *Institutions and the Right to Vote in America*, to argue that elections should be considered vast communication systems. These systems are composed of poll workers, polling booths, election laws, and many other actors. The purpose of the system is to accurately and reliably translate a person's vote into an electoral outcome. Crucially, this outcome must also be perceived by the voter to be legitimate. Even if one's preferred candidate loses, a person must recognize the result of an election as binding. Kropf's conceptualization of elections as communication systems resonates with the preceding

review of the literature on elections and electoral integrity, elections as rituals, and STS approaches to elections. In each of these literatures, we saw that elections do much more than just produce electoral outcomes. They are epistemological spaces in which democratic values and ideals are negotiated, democratic authority and democracy as a form of governance are legitimated, voter's expressively experience democratic values and norms, and the demos is conjured through the aggregation of singular interests into a collective will.

This dissertation builds on these insights to argue that not only should elections be considered communication systems, but that voting technologies should be considered media technologies. As media technologies, voting machines mediate both the instrumental and expressive aspects of the vote. First, voting machines mediate the relationship between a voter's electoral preference and an electoral outcome. However, crucially, voting technologies do not merely transmit one's vote, they transform it into an aggregate, something more than it was on its own. As media technologies, voting machines then close the distance between an individual act of voting and representational democracy as a form of governance. Moreover, in translating one's preferences into electoral outcomes, voting machines transform votes into information that is integrated into data-driven campaign strategies, mis- and dis- information projects, and media debates about electoral integrity and democratic culture.

Voting technologies also mediate the vote as an expressive form of communication. For example, voting machines can determine whether a person is able to exercise one of their fundamental rights—the right to vote. In this way, voting technologies are deeply connected to the performance of citizenship. Ideally, voting

technologies produce outcomes that the polity sees as legitimate. Taken together then, voting technologies have the capacity to mediate the relationship between democratic rights, values, and ideals, citizenship, and the production of democratic legitimacy and authority. In a similar vein, voting technologies profoundly shape a voter's democratic experience. Do you have to go to the polls to vote? Do you vote by paper or touch screen? Is your vote counted electronically or by hand? Are there long waits at your polling booth? Is voting easy and convenient or a difficult chore? Does your voting technology make you question the quality of your democracy? Voting technologies play an important role in answering these questions.

Recognizing the communicative capacities of voting machines muddies the line between the instrumental and expressive aspects of casting a ballot. It shows that the communication of electoral preferences, the production of electoral outcomes, the integrity of electoral processes, the production of democratic legitimacy and authority, the realization of democratic rights such as equality and inclusion, the experience of democratic norms and values in an election, and the performance of the electoral ritual are deeply entangled. Voting machines make these tangles visible. In this sense, they are a critical technological interface between a citizen, their elected representatives, and the values and ideals we hope structure democratic society. Moving forward, this conceptualization of voting machines as media technologies motivates each chapter's bespoke inquiry into elections and voting technology.

Methodology

This dissertation's methodological approach is deeply informed by work in science and technology studies (STS). There are three features of STS that are

particularly relevant to my methodological approach. First, STS work often begins with what scholars such as Bruno Latour (2005) and John Law (2009) call opening a black box. Black-boxing occurs when a technological object or other material artifact is taken for granted as a matter of fact. Opening a black box denaturalizes this matter of fact, transforming it into a matter of concern and allows a researcher to see the multiplicitous and heterogenous set of actors, relationships, and controversies out of which the object emerged. Importantly, the object is not simply reducible to these relationships, actors, and controversies. Instead, STS methodology allows one to identify the generative tension between the forces out of which stuff like scientific facts and technological artifacts are produced and the agency of an object once it is black-boxed. One classic illustration of a black-boxed object is the lab report. A lab report is the articulation of a complex reality, but paradoxically, through this articulation, it obscures and reduces that reality. STS restores that complexity by tracing the relations that worked together to produce the lab report, while maintaining the stance that the lab report has relational force in and of itself (Latour 2005).

The second feature of STS relevant to this dissertation's methodological approach comes Actor-Network Theory (ANT). ANT argues that researchers should analyze the relationships between human and non-human actors using the same analytics as we would to interrogate relationships among human actors. ANT calls this its principle of symmetry and it grounds its relational approach to empirical methodology. In ANT, there are two basic types of actors: mediators and intermediaries. Intermediaries are passive vessels merely relaying the actions of another actant, while mediators transform or translate their interaction with other actants into something else. In other words, for

intermediaries input dictates output, but for mediators, you cannot predict the output based on the input. Mediation in ANT is part and parcel of the principle of symmetry – nonhumans are mediators too and one needs to pay attention to what they are doing just as you would a human mediator (Law 2009).

The third feature of STS formative to my methodology also comes from the ANT tradition. ANT theorist, Bruno Latour, calls ANT a sociology of association (2005). In doing so, he counterposes ANT to what he calls the sociology of the social. The sociology of the social posits the social as either a force compelling people to do things or as a context that structures their behavior. ANT rejects this picture of the social. For ANT, the social is something to be specified through inquiry. It is in this sense then that ANT is interested in fabrication and construction. The social is something fabricated or constructed through inquiry and this makes the social something that is tenuous and contingent (but also material and real) rather than monolithic or naturalized. The social is something that is either overtly invoked by actants in the process of research or it is something that the researcher applies to their description of a particular network or sociotechnical system (fully knowing that the social cannot be theorized beyond this specific description) (Latour 2005). The social never explains; it only is explained.

The STS-oriented approach sketched here underpins each chapter's analysis of voting machines. I see voting machines as black boxes that can be opened to reveal the heterogenous set of actors, relationships, controversies, and discursive and technical schema out which voting machines emerge to format the act of voting and configure the electoral process. Furthermore, voting machines are not simply input-output devices. They are mediators engaged in a complex relationality with many other actors involved

in the electoral process. When a voter casts their ballot using a particular voting technology, their vote becomes entangled with this complex set of relationships. Finally, the chapters in this dissertation do not attempt to paint a monolithic portrait of Democracy with a capital "D" or explain why people vote, the role of voting machines in electoral processes, or electoral controversies using normative conceptions of democracy. Alternatively, it deals with the technical features of various voting technologies, the fluctuating dynamics of voting machine controversies, and the discourses around electoral reform and voting technology in India and the United States in effort to better understand the kinds of things that elections produce.

Before moving on to a discussion of each chapter's data and analytic, it is important to note that in addition to STS, this dissertation is informed by Foucauldian genealogy. While the genealogical method is more fully described in chapter 3, I want to say a brief word about how it informs the broad methodological orientation of this dissertation. Genealogy is a critical historiographic method and mode of critique for conducting inquiry into the conditions of possibility for present problems. The engine of genealogical inquiry is problematization. Problematization takes a contemporary problem and opens it up to critical analysis, revealing its complexity and contingency. In doing so it opens space to ask questions about how a multiplicity of issues and concerns congealed and emerged as contemporary, monolithic problem (Koopman 2013).

Problematization grounds this dissertation's basic approach to asking questions about voting technologies. Rather than engage with debates about the security, usability, or accessibility of voting technology, I ask how have the US and Indian voting systems come to understand electoral problems as solvable through the use of voting

technologies. Problematizing voting technologies in this way allows me to historically analyze how voting machines have emerged as a solution to electoral issues and how this has impacted who we are as voters, how electoral controversies play out, and how electoral institutions interface with voters.

Data and Analytics

Each chapter of this dissertation mobilizes its own distinct methodological framework. Chapters 1 and 2 are focused on India and weave together insights from my field work there including informal and formal interviews with Election Commission officials, journalists, researchers at think tanks, academics, and civil society actors with extensive analysis of media sources, Election Commission publications, secondary literature, and election data from the Lokniti network, a program run by the Centre for the Study of Developing Societies (CSDS). Though I do not reference or quote from the interviews I conducted in India in either Chapters 1 or 2, my conversations there along with archival research at the National Library of India and first-hand observations of the State Assembly Elections in Uttar Pradesh inform how I track the history of electronic voting machines in India and my understanding of the dynamics of EVM controversies.

Chapters 3 and 4, focused on the United States, are based on analysis of both contemporary and historical documents. Chapter 3's principal primary documents are 280 patents for voting machines filed between 1865-1910. I obtained these patents using Google Patents. I searched for "secret ballot," "ballot box," "ballot-boxes," and "voting machines." The choice of search terms was based on secondary reading on both the history of voting technology in the United States (see Saltman 2006 for an overview). Chapter 4 treats the 11 reports and 148 working papers produced by the Cal Tech/MIT

Voting Technology Project (VTP) as primary documents. The Cal Tech/MIT Voting Technology Project began in 2000 in response to the controversy following the Bush/Gore presidential election. In the chapter, I argue that the VTP is representative of the massive amount of social scientific and policy-oriented research on electoral reform and voting technology that followed Bush/Gore. Several of the VTP's founding members have gone on to play leading roles in the discussion of public policy and electoral reform over the last 20 years. Additionally, the project has spun off several other major election-oriented resources and research projects including an Election Management Toolkit, developed at the request of President Obama's Presidential Commission on Election Administration, the Health Elections Project, the MIT Election Data and Science Lab, and the 2020 Monitoring the Election Project.

In each chapter, analysis of primary sources is deliberately entangled with secondary literature on the topics. That is, I do not necessarily draw sharp lines between primary document analysis and secondary literature. Instead, I let each chapter's analytical approach dictate how I treat distinctions between the two types of documents. The analytical approaches for each chapter are STS relational methodology (chapter 1)[6], STS-oriented controversy analysis (chapter 2),[7] genealogical inquiry (chapter 3),[8] and discursive analysis using Ian Hacking's concept of making up people (chapter 4).[9] The decision to treat primary and secondary documents in this fashion is anchored in STS

[6] See Latour 1999, 2005; Law 1991, 2009, 2017; Mitchell 2002.

[7] See Asdal 2014; Marres and Moats 2015; Marres 2020; Pinch and Bijker 1987

[8] For genealogy see Foucault 1977; Koopman 2013; Monea and Packer 2016. For patents see Bowker 1992; Jaffre et al. 1993; Popp 2002, 2005; Verspagen 2007.

[9] Hacking 1986, 1995, 1999, 2007.

literature that sees methods not as a set of rules and standards for uncovering or describing realty, but as generative mechanisms for producing realities through the complex interaction of researcher, theory, and empirical material. As such, the application of particular methods and modes of data collection and treatment of specific kinds of documents are specified through empirical inquiry.[10]

Plan of Dissertation

In this dissertation, I use an understanding of elections as sociotechnical systems and voting machines as media technologies to historically situate the use of different voting technologies in India and the United States and analyze their contemporary roles in electoral controversies and debates about electoral reform. Chapters 1 and 2 of this dissertation focus on India, while Chapters 3 and 4 focus on the United States. In chapter 1, I track how the Election Commission of India (ECI) has used electronic voting machines and other electoral technologies to develop a relationship with the voter outside partisan interference by political party actors. I argue that the ECI has leveraged EVMs to rationalize the use of digital technologies including an electronic photo ID project and computerized registration, develop an intimate relationship with the Indian voter, reinforce their identity as the people's primary defender of electoral democracy, and discipline political parties. Chapter 2 focuses on contemporary EVM controversies in India. I examine the dynamics of EVM controversies using Election Commission documents, media discourse, and materials written by the anti-EVM movement. Through this analysis, I show that EVM controversies are inherently unresolvable, generative of

[10] For overview of STS methodology see Law 2004; Marres 2012, 2017; Mol et al. 2002; Prior 2003; Shankar et al. 2017.

technological innovation, and emphasize tensions between two paradoxically entangled democratic ideals, secrecy and transparency.

In Chapter 3, I provide a genealogical analysis of contemporary debates about the use of voting technologies in the United States. Examining patents for mechanical lever voting machines and other secret ballot-related electoral technologies, I track how these technologies reorganized the act of voting in the United States in the late 19th century. I argue this reorganization isolated the act of voting from other aspects of the electoral process, stabilizing it against the changes created by the suffrage and civil rights movements throughout the 20th century. It is this isolated act of voting that was exposed during the 2000 presidential election. Chapter 4 tracks the avalanche of public policy literature that emerged following Bush/Gore. I argue that this literature created, consolidated, and institutionalized a science of election administration for the first time in US history. By analyzing the documents produced by one of the most prolific sources of this new election science, the Cal Tech/MIT Voting Technology Project, I elaborate how this literature understood who the voter American was/is. Specifically, I outline two figures of the voter that emerge from the VTP's corpus, the user-voter and the customer-voter. In the conclusion, I flesh out how each chapter's analysis contributes to an understanding of elections as sociotechnical systems and voting machines at media technologies. I also discuss avenues for future research.

CHAPTER II: THE HISTORY OF ELECTRONIC VOTING MACHINES IN INDIA

Indian elections present an important and understudied case for global policymakers and scholars interested in voting technology for three primary reasons. First, India is by far the world's largest democracy with a complex rural and urban geography and multilingual electorate. The fact that it has with at least relative success used electronic voting machines (EVMs) compulsorily since 2004 should draw attention from the global community. Second, the Election Commission of India (ECI) has complete control over Indian elections. Since India's first elections in 1951-52, the ECI has approached election management with an emphasis on administrative rationality, iterative improvement, and system efficiency, optimization, and standardization.[11] The ECI is also a constitutionally mandated independent body, meaning it exists outside the control of the sitting government. This gives the ECI at the very least theoretical autonomy over its form and function. While the ECI is not unique among other electoral management bodies (EMBs), it is one of the most powerful and globally influential EMBs, disseminating its techniques for electoral administration around the world and selling electronic voting technologies on an increasingly competitive global market. Third, and flowing out the ECI's managerial approach to election administration, the implementation of various electoral technologies including EVMs and photo ID cards has been deliberate, phased, and systematic, providing unique insights into how the EMB in the largest and most complex democracy in the world has aggressively technologized its

[11] While it is obvious that the ECI has not always met these goals, the point is that even in constitutional debates, specific attention was paid to designing an electoral system and EMB built on global best practices.

elections over the last twenty years. These factors work together to make India an ideal case for studying how electoral technologies shape electoral processes.

In the next two chapters, I focus on the history of electronic voting in India and contemporary controversies surrounding the use of EVMs. This chapter examines how the ECI has used electronic voting machines and other electoral technologies to remake the Indian electoral process and cultivate new relationships with Indian voters. The next chapter analyzes controversies surrounding the use of electronic voting machines to investigate how electronic voting machines mediate the relationship between the ECI, the anti-EVM movement, and electoral reform.

Introduction

Between April 11 and May 19, 2019, India held its nineteenth general election. 67.1 percent of India's approximately 900 million registered voters cast a ballot. The election fielded some 8000 candidates from 2,292 registered political parties. Election officials traveled 35 kilometers to record the vote of the only resident of the Gir National Forest in Gujarat and set up the world's highest polling station, 15,256 feet above sea level in Tashigang, Himachal Pradesh. Engineering elections in the world's largest democracy required 11 million election personnel, 1.035 million polling booths, 3.96 million electronic voting machines, and for the first time 1.7 million Voter Verified Paper Audit Trail machines, which produce a paper record of a person's vote (Bhattacharya 2019).

In 2014, the Election Commission of India (ECI) declared EVMs "the leitmotif of the world's largest democratic exercise." The ECI integrated EVMs into Indian elections between 1998-2004. Since 2004, EVMs have been used in all state and national elections

in India. This process involved trials in India's rural and urban constituencies spanning an array of geographical climates while also mobilizing a complex voter education program, training part-time poll officials and political party members, working with the media to educate the public, developing an administrative infrastructure that could track EVMs, and ironing out logistics for how to store, move, and secure them during a live election process. At the same time, the ECI was rolling out EVMs, it also embarked on an aggressive technologization of all facets of the Indian election process including the computerization of the electoral rolls (which would significantly expand the electorate), delivering electronic photo identity cards (EPIC) to the voters, developing networked communications between the Election Commission in Delhi and the state, district, and constituency level election offices and polling booths, creating a website and implementing a massive surveillance architecture designed to ensure that elections are free and fair (for an overview of these processes see Devi and Mendiratta 2017).

The history of EVMs dates back to just after the end of the Emergency in 1977. In June 1975, Prime Minister Indira Gandhi declared a State of Emergency in India which allowed her to rule by decree, imprison her political opponents, suspend civil liberties, censor the press, and infringe on civil liberties. When the Emergency ended, the Election Commission held elections and the Janata Alliance replaced Gandhi's Congress Party. Emerging from this period untainted by the corruption that had infected other public institutions during the Emergency, the Election Commission asserted itself as a powerful institution in Indian political life (Singh 2012). EVMs along with assorted other technologies including the Model Code of Conduct, indelible ink, symbolic ballot interfaces, Voter ID Cards, and computerized rolls played a pivotal role in the ECI's

resurgence, transforming how they relate to voters, political parties, and the government of India (Gilmartin 2009; McMillan 2012). This chapter uses the history of EVMs as an analytical lens for tracking how these various technologies reconfigured these relationships. It argues that these technologies helped create a non-partisan channel between the ECI and the voter and established political parties as the ECI's primary political adversaries in ensuring free and fair elections in India.

The chapter proceeds as follows. I begin with a brief overview of the Election of Commission of India. I then discuss the roles played by the Model Code of Conduct, EVMs, symbolic ballot interfaces, and indelible ink during what Ujjwal Singh (2012) has called the ECI's first period of electoral activism, lasting roughly from 1977-1988. It then discusses the history of EVMs during what Singh terms the ECI's second period of electoral activism between 1988-1998. The chapter then turns to a detailed analysis of the rollout of EVMs as well as two other electoral technologies: computerized electoral rolls and Voter ID cards. It concludes by surveying critiques of the ECI and its conception of citizenship.

The ECI and their Electoral Technologies

Articles 324-29 of the Indian Constitution establishes the ECI as an autonomous body that can stand above everyday politics to ensure elections are free and fair. Scholars such as Alistair McMillan (2012), Ujjwal Kumar Singh (2004), and David Gilmartin and Robert Moog (2012) have argued that the ECI was created to address two pressing problems, which confronted India at independence and continue to confront India today—the threat of an overly powerful bureaucracy attempting to take control of the democratic process and a divisive local politics premised on regionalism, caste, and

religion. Moog and Gilmartin assert that “The Election Commission (EC) was conceptualized, from the beginning, as standing ‘‘apart’’ from the government and ‘‘above’’ everyday politics—and its significance lay in the constitutional effort to link the process of elections to the idea of the ‘nation’” (2012, 137). Positioned at the procedural heart of India's democracy, the ECI has carved out an institutional space that allows it to regulate the partisanship of the political process through a variety of statutory measures, residual powers, and regulative mechanisms, while also seeking to control how voters and political parties participate in the democratic process (Gilmartin 2009; Singh 2012; Singh and Roy 2018, 2019).

Perhaps the most important source of the ECI’s authority is the power to schedule elections.[12] The scheduling of an election initiates a special period of electoral time in which the ECI’s regulatory authority is absolute, supervening the government, the courts, and the police. During electoral time, the ECI can control campaign content, preventing the use of sectarian, cast, or religious-based rhetoric to inflame voters, dictate how close party workers can be to polling locations, and monitor the minutiae of election day using a variety of technologies. Moreover, the ECI's regulations have the force of law allowing

[12] Determining when an election is officially scheduled has been a matter of some debate. The major driver of the debate is that once the Model Code of Conduct goes into effect, sitting governments are no longer allowed to implement new public works projects as these could act as a way of bribing the voter to vote for the incumbent. The ECI has held that election time begins when it announces an election. However, political parties and both central and state government officials have argued that election time should commence when the President or governor makes a formal notification announcing the election. Their argument rests on the idea that the ECI's proclamation is not statutorily binding. However, the courts have generally supported the ECI's right to decide when election time officially begins (and the Model Code of Conduct goes into effect). In a landmark judgment from the Punjab-Haryana High Court in 1997, the court asserted "On the eve of an election, political parties or candidates may come forward with tempting offers to the electorate to win their favour. If such a course is allowed to be resorted to by the parties or the candidates contesting the elections, it will certainly undermine the purity of elections" (quoted in Singh 2012, 164). The government threatened to appeal this decision to the Supreme Court, but the ECI suggested dialogue would be a better course of action and together the government and the ECI worked out a compromise that there would be no longer than three weeks between the ECI's announcement of an election and the formal notification (Singh 2012).

them to seize alcohol, illicit money, and other materials used to bribe voters. Once scheduled, the ECI enacts a complex set of administrative and logistical procedures including drafting and training government employees to serve as poll workers, initiating voter education processes, distributing EVMs, and surveilling campaign content. The ECI's role as party disciplinarian creates a sometimes tense relationship between political parties and the ECI (Ahuja and Ostermann 2018; Gilmartin and Moog 2012; Singh 2012; Singh and Roy 2019.

Indian election scholars have called the ECI the gatekeeper of Indian elections and the custodian of electoral rights (Banerjee 2014; Ahuja and Chibber 2012). In this role, they are capable of creating an electoral process that produces "the levelling effect that election campaigns have on the powerful when, in a period of role-reversal, however temporary, politicians have to beg for votes and get their spotless clothes soiled in the heat and dust of the campaign battle" (Banerjee 2014, 37). Banerjee argues that this inversion of power, where constituents are allowed to hold their representatives accountable, transforms Indian elections into a carnivalesque, sacred expression of democracy. The ECI's role as ringmaster of the electoral process brings them into close contact with voters. Whereas many governmental institutions may exist as bureaucratic abstractions or quotidian nightmares for many Indians, the Election Commission has a concrete relationship with the voter that is premised on the ECI's ability to ensure the right to vote free of interference and intimidation and provide credible and fast counts. Positioned between political parties and voters, the ECI has to be both disciplinarian and advocate. This role has made the ECI controversial in Indian political life. In both roles, the ECI deploys a variety of technologies to mediate their relationships with voters and

political parties. The next section discusses four of these technologies: The Model Code of Conduct (MCC), EVMs, symbolic ballot interfaces, and indelible ink.

Electoral Technologies and the first period of electoral activism (1977-1988)

The Model Code of Conduct (MCC) was first designed and implemented by state election authorities in Kerala in 1960. The MCC elaborates a set of rules that set limits on how political parties are allowed to conduct campaigns and empowers the ECI to discipline political parties that do not follow the rules. The MCC contains a long list of rules that sanction party behavior including provisions against using communal, caste, or religious rhetoric during campaigns, canvassing within 100 meters of a polling station, and campaigning 48 hours before an election. Importantly, the code is not law (Singh 2012). The ECI does not prosecute parties that fail to adhere to the code but threatens serious consequences such as de-recognition that allow the ECI to immediately and publicly curtail party behavior (even though the code is voluntarily agreed to by political parties). While there have been some moves to make the MCC law, the ECI has often waffled on whether it wants statutory authority over political parties. The main drawback to transforming the MCC into law is that it would hinder the ECI's ability to quickly sanction party behavior, meaning that by the time the case was heard, the election would be over. The legality of the ECI's actions is often decided in court cases following elections (and the Supreme Court has been generally considered a strong ally of the ECI expanding its power, especially with regard to the MCC) (Sridharan and Vaishnav 2018).

The ECI framed a national version of the MCC in 1968, circulated a revised version in 1972, and officially distributed the document to political parties in 1974. During this period, though parties acceded to the code, the ECI had difficulty

implementing it.[13] The end of the Emergency and the 1977 General election, however, created an opportunity for the ECI to more forcefully implement the MCC. Gandhi's authoritarian rule during the Emergency eroded the public's faith in governmental institutions, most notably the courts. However, the ECI's institutional mandate to ensure free and fair elections gave it credibility amongst the voting public (Singh 2012). To illustrate this point, we can look to Myron Weiner's observation during the 1977 election that next to partisan political posters urging voters to support Indira Gandhi were ECI posters telling the voter to "vote without fear—your vote is important" (Weiner 1978, quoted in Singh 2012, 155). Singh further asserts that these posters had an "anti-government ring," reinforcing the ECI's constitutional independence from other governmental institutions (Singh 2012, 155),.

The ECI capitalized on its public image and fears surrounding resurgent authoritarianism to update the MCC. With the blessing of all the political parties, the ECI expanded its power to discipline political parties as well the party in power. Specifically, it forbids the party in power from using governmental machinery and resources to campaign for particular candidates and limited the government's ability to initiate schemes just before an election. It also suspended the sitting administration's ability to transfer employees to different districts just before an election. Alongside the ECI's efforts to assert more stringent control over how political parties participate in the electoral process, it also began developing EVMs, an innovation targeted more at the voter than at political parties.

[13] Though it should be noted that in 1974, the ECI created bureaucratic infrastructure at the state level to supervise the enforcement of the code. The ECI also became more prominent as the Congress system broke down and more parties entered the electoral fray (Singh 2012).

In 1977, the ECI approached the Electronics Corporation of India (ECIL) about producing an electronic voting machine. The idea behind the machine was that it would "make the voting procedure simpler, quicker, and more efficient…and that no vote recorded by any elector would go to waste…" (Devi and Mendiratta 2017, 628-629). Additionally, the overall cost of elections would be greatly reduced as ballot paper and ink were quite expensive. The machines would also help curb booth capturing—a practice where a political party would pay people to take over polling booths at gunpoint and manually stuff the ballot box. ECIL developed a prototype by 1979, which was demonstrated for political parties on August 6, 1980. In January 1981, Bharat Electronics Limited (BEL) approached the ECI, saying that they had independently developed an electronic voting machine and successfully tested it in union elections. Between 1981-1982, engineers from BEL and ECIL and officials from the ECI negotiated a standardized design for the EVM (Devi and Mendiratta 2017; ECI 2018b).

In 1982, the ECI tested EVMs in 50 out of 84 polling stations of the Parur assembly constituency in Kerala. After the election, one of the contesting candidates, Shri AC Jose, filed a petition that the use of EVMs was unconstitutional, as the Conduct of Election Rules (CER) and the Representation of the People Act only allowed for the use of ballot boxes and ballot papers in Indian elections. While the case turned on whether the language in both the CER and RPA was general enough to include EVMs as a media for the ballot, the case was primarily about the power of the Election Commission and whether the ECI could unilaterally decide to change electoral procedures without any kind of legislative precedent. The Supreme Court, overturning an earlier ruling, found that the ECI had indeed overstepped its bounds when

it used EVMs without the requisite change in the law. The court argued that while the ECI had residual powers to enact new policies and procedures, they could not enact policies and procedures that contravened established law (A.C. Jose 1984; Devi and Mendiratta 2017).

The court refused to comment on the quality of EVM technology. Instead, they simply listed some of their benefits and some of the concerns raised about their use in Indian elections. While EVMs seemed to enable efficient and fast elections, the Court noted concerns that EVMs might be susceptible to certain forms of voter fraud such as impersonation and multiple voting (A.C. Jose 1984). Interestingly, when the use of EVMs would again be challenged fifteen years later, the courts, ruling in favor of the ECI, would specifically commend the Commission's ability to innovate solutions to the problems noted in the A.C. Jose decision. Rather than focus on the technology itself, the decision instead made it clear that in order to use EVMs, there would have to be changes to the Conduct of Election Rules (CER) and the Representation of the People Act (RPA). Once the changes were made, the ECI would not only be free to deploy EVMs, but also enact new policies and procedures related to their use. In effect, this initial challenge to the use of EVMs created a clear legal path to implement EVMs and significantly narrowed the ground on which the use of EVMs could be challenged. Once the election laws were changed, the constitutionality of the ECI's decision to use EVMs would be settled.

After the decision, the ECI, BEL, and ECIL continued to improve upon the design of EVMs with the help of the National Institute for Design. Though there is little information available about the evolving design of EVMs between 1983-1989, according to the Foundation for Advanced Management of Elections, the ECI finalized the “design and model of existing electronic voting machines in May,

1989" (Fame 2018). During the same period, the ECI also lobbied for the RPA to be amended. In December 1988, the law was changed, EVMs were declared legal, and the ECI ordered 150,000 machines (75,000 from each company) (Devi and Mendiratta 2017).

Ujjwal Kumar Singh (2012) identifies the time following the Emergency as the ECI's first period of electoral activism. The ECI's newfound authority, based on the reputation it gained running the 1977 elections, allowed it to aggressively reform India's electoral process. The Model Code of Conduct positioned political parties as the ECI's primary antagonist in holding free and fair elections. This relationship persists today. Former CEC S.Y. Quraishi (2011-2012), for example, points to the fact that though the political parties played a critical role in developing the MCC, they are also the ones constantly trying to weaken it through changes in the law. Perhaps a bit tongue-in-cheek, he asserted at a 2011 conference on Electoral Reforms that the MCC was the "greatest" contribution made by political parties to the democratic process (Quoted in Singh 2012). While Quraishi is diplomatic in his discussion of the role that political parties play in the Indian electoral process, former CEC T.S. Krishnamurthy (2004-2005) in his 2008 book *The Miracle of Democracy*, clearly sees political parties as a necessary evil, entitling his chapter on political parties, "Political Parties: The Weakest Link." But no CEC has been quite as vitriolic in his hatred of political parties as James Lyngdoh (2001-2004) who called politicians a "cancer…for which there was no cure at the moment" (PTI 2003).

If the MCC is a technology used to control political parties, the EVM was designed to enhance the ECI's relationship with the Indian voter. The small, battery-powered units would allow the ECI to enfranchise voters in geographically isolated

areas, ensure the secrecy of the ballot in constituencies where poor voters could be socially pressured based on caste, class, or religion, control the distribution of polling places and the allocation of electoral resources, and stop booth capture, a practice which seriously undermined electoral integrity. Perhaps most importantly, it created a relationship with the voter that was not mediated through political parties. That is, the EVM helped the ECI engage the voter through a non-partisan channel, the ballot.

EVMs and the MCC are not the only technologies the ECI developed to interact with the voter and control political parties. Two others, symbolic ballot interfaces, which have been used since India's first General Election in 1952, and indelible ink, which was first used in the 1962 General Election, have played a crucial role in shaping how political parties engage the voter and how the voter participates in electoral democracy. Indian ballots feature symbols for each political party. This system was implemented as a way to enfranchise illiterate voters. The symbols used to represent political parties on Indian ballots, however, have to be registered with the Election Commission. Without a registered symbol, a party cannot appear on the ballot. Once approved, these symbols play a powerful role in branding a particular political party. The Congress' hand or the BJP's lotus are immediately recognizable to any Indian voter and communicate a party's platform and key values. Symbols, therefore, have immense representational and technical value to political parties. Symbol registration is one of the main ways that the ECI controls political parties. The ECI approves party symbols, deregisters political parties that haven't contested recent elections making their symbol available to other actors, and provides symbols for independent political parties. The ECI also wields de-recognition and the loss of an electoral symbol as a weapon to enforce the MCC. While the ECI has never

derecognized a political party, the threat has forced political parties to accept the ECI's punishments for violating the MCC (Chopra 1989; ECI 2001a, 2001b; Gilmartin and Moog 2012; Katju 2006; Kumar 2009; McMillan 2012).

Perhaps the most iconic feature of Indian elections is the myriad photos of voters showing their index fingers marked with blue or black ink. Indelible ink, produced by Indian company Mysore Paints and Varnishes, does not simply communicate that one voted but demonstrates one's substantive participation in the ritual of democracy (Choudhary 2019). Banerjee (2014) argues, for example, that polling queues, EVMs, and indelible ink play a crucial role in enacting Indian democracy. Regardless of whom you vote for, every Indian voter gets the mark. The importance of the ink, which is now exported to some 30 countries, indicates that one's vote communicates something excessive of a mere preference. It is also an expressive form of communication, one that marks the symbolic "inversion of power from the hands of the politicians back to the hands of the voters" (Singer and Hauser 1986, 947).

EVMs and the ECI's 2nd period of electoral activism (1990-1998)

Ujwaal Singh (2012) argues that the ECI's second period of electoral activism begins in the early 1990s. This period was marked by major changes in India's political and economic climate including increased reservations for Other Backward Classes (OBCs), the liberalization of the Indian economy, increased communal tension, the assassination of Rajiv Gandhi, and the destruction of the Babri Mosque. Yogendra Yadav argues that this period marked the beginning of what he calls India's third electoral system. In this system, state politics became as important if not more important than national politics: the BJP rose to prominence (and the Congress party's influence declined), regional parties forced national parties to build cross-cutting alliances and

coalitional governments, and electoral volatility came to be a very noticeable feature of Indian electoral life (Yadav 1999).

Singh associates the ECI's second period of electoral activism with T.N. Seshan's tenure (1990-1996) as Chief Election Commissioner. Seshan's elevation of the MCC, aggressive pursuit of electoral reforms, authoritarian flare, and antagonism to sitting governments and political parties became emblematic of the ECI's reputation as a fierce defender of India's electoral process and a non-partisan ally of the Indian voter.[14] David Gilmartin (2009) argues that Seshan attempted to foster an "electoral morality that transcended everyday politics" (252). At the end of Seshan's contentious time in office, his work seemed to have paid off. In 1996, a survey sponsored by the Indian Council of Social Science Research and *India Today* and administered by the Centre for the Study of Developing Societies found that the ECI was the most trusted governmental body in India, just ahead of the Supreme Court (De Souza 1998).

During Seshan's tenure, two crucial things happened that would set the table for the use of EVMs later in the decade. First, the machines gained a technical seal of approval from a committee of experts. In February 1990, the Government of India convened the Goswami Committee on Electoral Reforms, which organized the Technical Experts Committee (TEC) to inspect the machines. The report laid out three qualifying conditions for the deployment of EVMs: their acceptability to the Election Commission, a stable and secure design, and high manufacturing quality and reliability. Notably, the report only briefly addresses the first and third criteria,

[14] Whether the ECI created conditions for the emergence of new parties and initiated the decline of major parties is a point of contention. While some continue to see the ECI as enabling a more robust, competitive electoral process (Banerjee 2014), others (Chatterjee 2006) have seen its expanding power as creating conditions for the resurgence of large, established parties that have the economic resources and logistical infrastructure to cope with the ECI's changes to election rules and procedures.

mentioning that the EVM's suitability to the ECI's needs is self-evident given the fact that the Election Commission was the body recommending their use and that an inspection of the machines revealed them to be of high quality. With regards to the second condition, the commission found that the "system is tamper-proof in the intended environment" and provided a preliminary set of logistical guidelines that might prevent malicious actors from accessing the machines: (1) That the cable connecting the ballot unit (BU) to the control unit (CU) always be publicly visible, (2) after polling, the BU and cable are physically inspected for any damage, (3) that ECI officials formally record that nothing has been inserted between the cable and its connections with the BU or CU, and (4) that a rigorous program of preventive maintenance is observed (TEC 1990).

The TEP's report plays a pivotal role in the history of EVMs. First, it gave the ECI a rhetorical tool to argue with those concerned that about EVM security. Second, it raised the burden of proof in future court challenges to the use of EVMs because an independent government committee had officially sanctioned the soundness of the machine's design and the logistical security provided by the ECI's chain of custody. Finally, the existence of the TEP provided a blueprint for future EVM innovation. The Technical Expert Committee is reconvened whenever new versions of EVMs are being designed. The TEP plays a mediating role between the ECI and the two Indian companies that make them Bharat Electronics Limited (BEL) and the Electronics Corporation of Indian Limited (ECIL). The TEP communicates the ECI's desires to BEL and ECIL, while also vetting their designs for the ECI (TEC 2007).

Secondly, under Seshan, additional changes in the law that were required for

the rollout of EVMs were made. On March 24, 1992, a new chapter was inserted into the Conduct of Election rules, 1961, detailing the procedures for using EVMs in a live election including preparation instructions, voting instructions, and the process for dealing with any complaints by voters (ECI 2000; ECI 2018b). Another obstacle to the use of EVMs was the dramatic increase in the number of candidates contesting elections which made use of the machines unfeasible. In 1996, the Election Commission successfully lobbied for a new law increasing the security deposits potential candidates were required to pay in order to get on the ballot.[15] This change led to a decrease in contesting candidates and made use of the machines possible. Despite an inability to develop consensus around the use of EVMs by political parties,[16] the new changes in election law and the TEC's support for EVMs at the national level worked together to lay the groundwork for the implementation of EVMs in the late 90s. These factors coupled with the ECI's reputation with the public and external pressure from the government led to the ECI's unilateral decision to begin testing EVMs in 1998 (Devi and Mendiratta 2017; ECI 2000, 2001; *Hindustan Times* 1998a, 1998b,1999).

Electoral Technology, 1998-2004

In 1998, the Office of the Comptroller and Auditor General performed an audit on the ECI and demanded that it make use of the machines it had ordered in 1988-1989 (Devi and Mendiratta 2017; *Hindustan Times* 1998b). In response, the ECI decided to use

[15] The number of candidates has once again increased over the last decade, forcing the ECI to innovate the machine to handle a greater number of candidates per election.

[16] The attitude of political parties towards the use of EVMs during this time is incredibly unclear. There seems to be little consensus on the issue about the degree of distrust expressed by political parties, but since multiple authors and my conversations with former EC officials indicate that there was some resistance, I have chosen to include it as a factor in the decision-making process.

electronic voting machines in six constituencies in Delhi and 5 constituencies each in Assembly elections in Rajasthan and Madhya Pradesh (*Hindustan Times* 1998a). According to Dr. M.S. Gill, the then-Chief Election Commissioner, the use of EVMs was experimental and designed simply to raise awareness of EVMs. Alongside EVMs, the ECI implemented four other electoral technologies: the computerization of electoral rolls, the creation of a website, the issuing of voter ID cards, and the creation of a networked infrastructure connecting the ECI with its regional offices (ECI 2000; *Hindustan Times* 1999). While the computerization of electoral rolls and the use of voter ID cards were often correlated (with the former taking priority over the latter), EVMs were positioned as a separate issue, with the benefits of EVMs such as ensuring that there would be no spoiled ballots, guaranteeing fast counts, simplifying the voting process, and the environmental benefits of not using paper ballots, seemingly self-evident both in the English-language press and Election Commission documents (Devi and Mendiratta 2017; ECI 2000, 2001; Gill 1997).

The commission's rhetoric around the "experimental use of EVMs" rapidly changed. In June of 1999, EVMs were used in all constituencies during the Goa assembly elections (*Hindustan Times* 1999). After the elections, CEC M.S. Gill said the ECI was considering "using EVMs extensively" in the major state elections later in 1999. Just two months later, during an interview with *The Hindu*, as the ECI prepared to run polls in five major states including Andhra Pradesh, Jammu and Kashmir, Bihar, Madhya Pradesh, and Uttar Pradesh (Anand 1999), Gill, in response to a question about whether he was hopeful that the ECI would eventually use EVMs in all general elections, said:

> Not hopeful. I am certain. If we can do 46, we can do 543 even today. In Andhra Pradesh, all parties requested us to cover the whole electronically. But we didn't

> have the machines. We are only putting to use old machines which were rotting away. We have to simply buy more machines from the much-maligned Indian public sector. And we will do it and it is cheap (Reddy 1999).

After 1999, the use of EVMs was systematically expanded and the machines seemed to perform well.

Between 1999 and 2000, according to the ECI, of the 101,245 machines used, only 12 developed technical defects, less than .001 percent. These 12 mechanical failures included battery failures, buzzer failures (a buzzer sounds when a vote is cast), and memory failures. In 2001, the Government of India, following a proposal by the ECI, agreed to purchase 138,000 new EVMs from BEL and ECIL (ECI 2000). The ECI continued to use EVMs on a trial basis in various elections until 2004 when all 543 parliamentary constituencies used EVMs.

Voter ID cards and the computerization of electoral roles were comparatively much more difficult, complicated projects than scaling up EVMs, but the processes for introducing them were strikingly similar to the EVM rollout. In India, unlike the United States, the Election Commission goes door to door registering voters. This process involves coordinating a variety of election officials, the appointment of Booth Level Operators (BLOs), producing media materials, and involving political parties and other non-governmental actors. The decision to computerize the rolls was made at a 1997 meeting of Chief Electoral Officers (ECI 2000, 2001).[17] The challenge of

[17] The practice of appointing BLOs began in 2006 (PIB 2014). BLOs are local people employed by the Election Commission who help update the role and distribute voter ID cards. The EC describes the BLO as "just like a friend, philosopher and guide of the local people in matters relating to the roll" (ECI 2011: 1). The appointment of BLOs (who usually cover 1 to 2 polling stations) created a grassroots connection between the local community and the ECI, deepening the sense of civic duty among everyday people. BLOs can be "electricity bill readers," "Postman," "health workers, or "teachers amongst other professions (ECI 2011: 2). Interestingly, the ECI recently proposed a plan to cut the number of BLOs (960,000) by 25 percent over the next three years by replacing BLOs with a variety of citizen-centric mobile applications. The proposed change would save the ECI 1.71 billion dollars annually. This shift away from in-person

computerization was not simply the logistical difficulties presented by India's massive electorate (some 620 million in 2000) and having to deal with registering voters in multiple languages, but in creating an IT infrastructure capable of building an accessible and searchable database of this material (ECI 2000, 2001). As the ECI put it: "there was no precedent or experience in taking up a nation-wide standard for standard Information Technology (IT) solution for the management of data of such vast numbers and in multiple scripts in the Indian languages" (2000, 256). To develop a database capable of centralizing all voter registration information, the ECI coordinated with another Indian company, the Haryana Electronics Corporation (HEC). Working with IT professionals, political parties, and district and state election officers, HEC and the ECI developed a database responsive to India's diverse electoral context and capable of "sharing data across geographic, administrative, and linguistic boundaries" (ECI 2000, 256). At the same time, the ECI also standardized the physical forms and printouts needed to register voters, syncing them with the information categories in the database, and created automated processes to eliminate dead registrations.

The initial effort to computerize the electoral rolls began in 1997 and ended in 1998. The next effort occurred in spring 1999 with the ECI mounting a special campaign to encourage voters to register and enroll in the Electronic Photo Identity Card (EPIC) program. Modeled on a nationwide campaign for mass immunization, the ECI mounted a massive publicity effort encouraging voters to register and enroll. After 1999, the continued push to computerize the rolls allowed the ECI to implement monitoring and data security measures, created new avenues for the ECI to access and categorize voter

registration represents the ECI's recent embrace of a customer service mode for engaging the voter (ECI 2018b; EMD 2016).

information, and encourage state electoral officers to try and implement similar technologies for local elections. Electoral registration information was made available to voters, political parties, and election officials in the form of CDs (ECI 2000).

According to the ECI, the factors needed to successfully implement the program were similar to those of EVMs including developing rigorous standards, articulating clear goals, assigning explicit roles to various positions within the electoral infrastructure, providing a training program for state agents, ensuring that state CEO's were IT savvy, creating and refining prototype technologies, iterative and responsive testing, and setting up extensive security and monitoring procedures. The successful rollout of EVMs and the quick computerization of rolls both relied on the ECI's administrative efficiency and flexibility. If the EVM was designed to eliminate invalid votes and limit the efficacy of booth capturing and other forms of muscle power, the decision to computerize India's electoral rolls was motivated both by a desire to curb electoral fraud and expand the electorate. However, for this goal to be met, the computerized rolls needed to be coordinated with the Electronic Photo Identity Cards project (EPIC) (ECI 2000).

The ECI's desire to design and distribute Voter IDs dates back to 1978 and a pilot program initiated by then CEC S.L. Shakder. However, this initial project stalled and did not reemerge until the tenure of T.N Seshan, who began to push the project once again, clashing with political parties over his desire to rapidly introduce the cards and make them a compulsory part of the electoral process (Devi and Mendiratta 2017; Kumar 2009). The issuing of voter I-cards was ramped up during the computerization of the electoral rolls. However, issuing the cards was even more complicated than the computerization of the electoral rolls. First, unlike the door-to-door registration efforts

mounted by the ECI, the EPIC program required voters to come to a center and have their photos taken (a process in which some voters were unwilling to engage). Without nearly universal coverage, the ECI couldn't make the cards compulsory and risk disenfranchising voters (Kumar 2009; Special Correspondent 2003). This forced the ECI to continue accepting a variety of ID cards including passports, driver's licenses, student ID cards, employee identity cards, income tax ID, and ration cards among others.[18] There were also difficulties with the distribution of cards including the delivery of error-riddled cards such as voters receiving cards with the wrong picture and incorrect information and misspellings inconsistencies and irregularities in the rolls such as voters that possessed voter ID cards but were not included in the rolls and possible mischief by political parties printing out fraudulent voter ID cards to allow for multiple voting (*The Hindu* 2003, *2004*; Pandey 2004). Reporting the percentage of voters covered by the EPIC program was part and parcel of media coverage related to the ECI's technologization of elections and was often coupled with a discussion of EVMs, the computerization of rolls, and the promotion of voter awareness campaigns. Interestingly, the ECI also positioned that card as the signature Indian identity card. [19] As early as 1999, M.S. Gill proposed replacing

[18] There 18 identity documents accepted by the ECI in the early 2000s: "passport, driver's license, service identity cards, bank/kissan/post office passbooks, ration cards issued prior to January 1, 2002, SC/ST/OBC certificates, student I-cards, property documents, arms license, conductor license, pension documents, ex-servicemen's widow/dependant certificate, railway/bus passes, handicap certificate, freedom fighter I-cards, I-cards issued to advocates, certificate of residence issued by Village Administrative Officers" (Roy 2012, 184). Today, the ECI accepts 12 forms of voting ID including Passport, Driving License, Service ID card (w/photo), bank or post office passbook (w/photo), the Register General of India Smart card (provide under the National population register (NPR) scheme), a Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) job card, A ministry of Labour Health Insurance Card, a pension document (w/photo), a photo voter slip, a parliamentary, legislative assembly, or legislative council ID card, and an Aadhaar card (*The Hindu* 2019).

[19] In Proceedings of the Conference of Chief Electoral officers from 1990, a discussion of photo ID cards was the second topic covered (just after EVMs). Later in a longer section from the proceedings, the CEOs discussed the topic at length, expressing reservations about making the card compulsory, clarifying what information should be included on the card, outlining potential trial locations, and detailing the cost of the

ration cards with Voter I-cards and applying the cards to “anything and everything” including property registration and the issuing of passports. Positioning the I-card as a central identity document in India, or “citizenship card” as Gill referred to it in 2000 was accompanied by voter awareness campaigns, which took place alongside the phased rollout of EVMs. Voter curiosity about EVMs clearly assisted in the success of the EPIC program (*The Hindu* 2000).

In *The Miracle of Democracy*, T.S. Krishnamurthy, the CEC who oversaw the 2004 election, details the technological sea change that occurred during the 2004 General Election. After a lengthy discussion of EVMs, in which he credits them as playing a crucial role in encouraging voter registration, he notes that

> The use of the electronic medium was not confined to voting machines. It extended to high-tech campaigns by political parties using mobile phones, and sophisticated and subtle advertising in the electronic media. The elections also witnessed computerised voting rolls, computerised political analysis by parties, psephologists, and the media, electronic photo identity cards for the first time on a large scale, and correspondence through emails (2008, 118).

The election is also considered the first “live election” featuring live 24-hour campaign coverage, live political debate, and ubiquitous opinions polls. The televised nature of the election led some commentators to conclude that “these elections were contested on TV rather on the ground” (CFAR 2006, 3). Contributing to this live coverage were the fast counts enabled by the use of electronic voting machines and the

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card and the company that would make them. Importantly, at two different times, the CEO's "multi-purpose" vision for the cards is clear: "Chief Election Commissioner explained that they are not going to make the cards compulsory. Already people are apathetic towards elections. They were all thinking aloud how to remove the impersonation and other connected ills in the electoral system and also how the electoral card can be linked to other purposes like right to work, bank loans, ect" (1990, 26). Then again at the end of the discussion, after the CEO of Maharashtra expressed concern that since local and assembly electoral rolls were different, ID cards issued at the assembly level might not apply to local elections. In response, the CEC "explained that was the reason why the multi-purpose concept has been brought in so that the card will be used only for different types of elections but also for various other purposes like driving licenses, agricultural loans, ect" (27).

ability of the ECI to quickly post detailed data concerning election results to their website. According to Krishnamurthy, the ECI website received nearly 14 million hits during the election. Closing his account with a variety of letters written to him by everyday citizens and international scholars and politicos, Krishnamurthy includes a lengthy quote by incoming President, A.P.J. Abdul Khan:

> …I would like to congratulate the Election Commission of India for smoothly conducting the 14th Lok Sabha elections using electronic voting machines in all the booths for the first time. The first general election of this millennium reflects the firm conviction of our people in the democratic process of change. These elections have demonstrated the vibrancy of our democracy (121).

In a lecture given in 2003, M.S. Gill captured the dizzying period of technological change during his tenure as CEC from 1995-2001. Enumerating 13 crucial changes made between 1996-2001, he first mentions the widespread distribution of Voter I-cards. Next, he discusses the introduction of EVMs. Third on the list is the computerization of the electoral rolls and fourth is the transformation of the ECI into a networked institution with digital links to state election offices and a publicly accessible website. Fifth is the standardization of the amount of time political parties received on state-owned television and radio networks (a change which would eventually lead to standards for private stations as well) (Gill 2003).

The computerization of electoral rolls, Voter I-cards, and EVMs are all voter-centric technologies. Their highly organized rollout sought to incorporate voters at every phase, using voter awareness and education campaigns to familiarize voters with the new technologies. Political parties were for the most part absent from these technological changes. Instead, the ECI as an independent institution, worked with Indian companies and the media to promote the use of their technologies, inserting themselves between the

voter and political parties. The importance of electoral technologies in cultivating a relationship between the voter and the ECI is best captured in the ECI's slogan, introduced in 2002, that asserted: "New Ways for the New Century; an electronic identification in your hand and electronic voting machine in the booth."

Voter Education, Electoral Technologies, and the ECI

The surgical rollout of EVMs was accompanied by an aggressive voter education campaign focused on public demonstrations and the production of pamphlets, posters, and other print materials that familiarized voters with EVMs, voter ID cards, and computerized registration. Public demonstrations in rural and urban areas allowed voters to use EVMs. These demonstrations were accompanied by a massive media blitz on Doordarshan and All India Radio, the creation of voter helplines, and the production of various media detailing how to use EVMs (Chief Electoral Officer, Gujarat 2012; ECI 2000). The ECI produced three films for election staff, political parties, and the public and encouraged State CEOs to produce content geared for their particular state. The films for voters were put on CD, dubbed into local languages, and distributed to the public (ECI 2000). These promotional efforts were coupled with a systematic training regimen in which master trainers from BEL and ECIL trained election staff at the national level who in turned trained staff in state election offices who in turn trained poll staff. This training chain created pockets of EVM expertise along the entire administrative chain of Indian elections, enhancing both the ability of local officials to handle problems and the ECI to promote EVMs as a success at the national level (ECI 2000).

As discussed earlier, EVMs were developed with the voter in mind. The EVM was a technology designed to increase voter participation and make Indian elections more

secure. However, the relationship between the ECI and voter was relatively abstract and symbolic. Voters trusted the ECI to manage the electoral process and the ECI used electoral technologies such as EVMs, indelible ink, and the MCC to make it easier for people to vote. EVM awareness campaigns marked a turning point in the ECI's engagement with voters, opening a communication channel that allowed the ECI to interact directly with voters. A report by the Chief Election Commissioner of Gujarat (2012) put it starkly: before EVMs, the ECI's "engagement with voters was borderline nonexistent" (8). EVM awareness campaigns and the related programs designed to register voters, deliver voter ID cards, and increase turnout would provide a blueprint for the ECI's engagement with voters from 2004 onward. In 2009, the ECI formalized its approach to voter education and outreach with the launch of the Systematic Voter's Education and Electoral Participation (SVEEP) program. SVEEP was designed to address stagnating turnout in Indian elections (which as of 2004 had historically hovered between 55-60 percent). Initiatives have focused on filling in gaps in voter registration and civic education projects designed to encourage voter turnout (ECI 2014; SVEEP 2018).

Working at the national, state, and local level, SVEEP utilizes systematic survey-oriented research methods to identify low-turnout polling stations, engage groups prone to low turnout, and develop targeted media strategies. The program seeks to enfranchise voters traditionally excluded from or marginalized by India's electoral process such as migrant laborers, women, and other under-documented communities. The programs are also designed to target youth, particularly disaffected urban youth, and children. Media campaigns are tailored to target specific groups of voters such as using social media

campaigns to engage urban youth and interpersonal communication to reach rural women. These campaigns promote voter awareness in the form of EVM trainings and demonstrations, voter facilitation call centers, and helplines that inform voters of registration information, poll locations, and SMS access to registration and polling information. Electoral education is also integrated into curricula activities such as essay contests, debates, and poster making and "edutainment" activities including the distribution of "democracy kits" for school kids and tailor-made media such as pop songs celebrating elections, video games, and community television. SVEEP also played a key role in establishing National Voter's Day, a holiday celebrating electoral democracy. These campaigns are augmented by assistance from a wide variety of actors including the Government of India, Civil Society Organizations, International actors, the media, and corporations (ECI 2014).

Statistically, the SVEEP program is undeniably successful. Even if it is difficult to definitively connect changes in statistical indicators to specific SVEEP programs, all key voting statistics targeted by the program went up between the 2009 and 2014 general election—the electorate grew from 717 million to 814 million, the number of votes cast went up from 417.2 million to 554.1 million, turnout among women increased from 55.8 percent to 65.6 percent (decreasing the gender gap from 4.42 to 1.55), and the overall turnout increased from 58.19 percent to 66.14 percent (SVEEP 2014).

SVEEP's mission statement reads "'I have the power.' This realisation of the importance of the power of the fundamental right to vote and the difference it could make to their lives and the nation makes the voter the central actor, the real hero in the democratic process" (2014, 3). Positioning the voter as the "hero" of democracy divorces

them from party affiliation and the lived realities of their electoral choices such as the failure of elected politicians to fulfill their campaign promises. In 2016, for example, the ECI published a promotional book entitled *101 Human Stories from Indian Elections*: *Belief in the Ballot*. The volume is littered with vignettes that simultaneously demonstrate the ECI's commitment to "the last voter" and their mission to leave "no voter left behind." From difficult to reach polling places to innovative and committed election workers and stories from voters of various communities that include women, children, migrants, the poor, and voters with disabilities, who all passionately recognize the importance of voting, the book ceaselessly confirms the relationship between the voter, electoral infrastructure, and the ECI. From these relationships, an idealized picture of democracy emerges—one in which the experience of democracy is mediated by the ECI's coterie of electoral technologies.

The book's story "What does an EVM look like" is a particularly telling example. A short vignette, consisting of only a couple of paragraphs, details the story of the Shompen Tribe's first encounter with EVMs. Inhabitants of the Andaman and Nicobar Islands, there are purportedly only 211 members of the tribe, 2 of whom seemingly voted for the first time in the 2014 General Election due to both the diligent efforts of the ECI and out of sheer curiosity about EVMs. All at once, the ECI's commitment to the voter, the administrative capabilities of the ECI, and the technological wonder of Indian elections coalesce around the figure of the voter, who emerges in these pages, as the hero of India's democratic ritual. Divorced from the political realities that their electoral choice helped shape, the vote is rendered an expressive rather than instrumental form of communication, which both legitimates electoral democracy and the ECI's role as its

custodian.

Less spectacularly, the ECI's introduction of a public grievance system also demonstrates the link between technology, the ECI, political parties, and the voter. The system, initially developed by a District Magistrate in Uttar Pradesh named Raj Shekhar, was demonstrated for the Election Commission in January of 2011. Within six months, a team of EC engineers had scaled the system up for national use. Called the Citizen Service Portal, the 2012 UP Assembly elections saw nearly 20,000 complaints (Quraishi 2014). Former CEC SY Quraishi provides a thorough description of the system:

> A Good Grievance management system provides insights into the shortcomings of the system and presents an opportunity for improvement and conducting free and fair elections depends greatly on prompt action on all complaints. Thus, the commission receives a slew of complaints related to violations of the Model Code, misuse of money power, paid news, distribution of money, liquor, and other things during an election. Immediate and strict action on all these is essential to maintain the credibility of the election process to ensure a level playing field. These complaints are received at all levels including that of returning officer, the District Election officer, other field officers, observers, and even the commission. It is necessary that people send their complaints easily and even anonymously, if they desire. It is also essential that a perfect record of all complaints and that complainants are informed about any action taken by the commission (Quraishi 2014, 176).

The quote demonstrates the way the introduction of technology creates associated administrative procedures and the way those procedures reorder relations between commission officials, electoral problems/abuses, and the voter. In addition to the online grievance system, voters can still file grievances in person and via telephone. These grievances, however, are immediately registered online, allowing them to be addressed via the online grievance management system.[20] While the process is ostensibly designed

[20] The ECI's recently published (2018a) ICT vision document proposes upgrading the current web-based Public Grievance Management System (PGRMS) to the Unified Public Grievance Redressal Management System (UPGRMS). This system will enhance the current systems by further coordinating national and

to provide the voter a way of voicing grievances, it also creates a feedback loop between the voter and the Election Commission. This loop excludes political parties, allowing the Election Commission to directly address voter problems.

The grievance system is an example of the ECI's move toward an e-governance based model for providing electoral services. The centerpieces of this strategy are three systems that allow voters and election officials to manage electoral rolls: the National Voters Service Portal (NVSP), the ERO-Net, and Unified National Photo Electronic Rolls (UNPER). The NVSP is designed to help citizens engaged voter-centric services more easily. Voters can use the NVSP to register to vote, change their voter registration, find details about their polling location, access voter education materials, and obtain contact information for local officials. ERO-Net allows Electoral Roll Officers (EROs) to process online registration applications quickly and ensure that national and state electoral rolls are unified. ERO-Net coupled with UNPER ensures that accurate and comprehensive electoral rolls are constantly maintained. Together, these three systems allow voters to engage the ECI as customers looking for solutions to their voting problems. This customer-service model represents the endgame of the technologization process that began in the late 1970s—to develop a relationship with the voter outside the partisanship of the political process.

Conclusion: Democracy, the Voter and The Election Commission

Scholars have critiqued the model of citizenship cultivated by the ECI and the emphasis it places on representative democracy (for an extensive discussion of citizenship politics in India, see Gopal 2013). In "Democratic Dogmas and Disquiets,"

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local grievance systems and allowing the voter to access the system by phone, SMS, email, and webchat. These upgrades hopefully will result in the "improved satisfaction of electors and citizens" (2018a, 28).

Niraja Gopal Jayal (2006) worries that an overemphasis on representative democracy, best exemplified by an attention to electoral politics, papers over the substantive challenges that Indian democracy faces such as extreme social and economic inequality. While elections may offer symbolic moments of political equality and accountability, the failure of state, local, and national governments to actually help people casts serious doubt on the quality of Indian democracy. Partha Chatterjee (2006) in an editorial for *The Telegraph* argues that the expanded power of the Election Commission and its rigid control over the electoral process and political spaces, especially its ability to police the content and timing of campaigns, threatens to replace politics with bureaucracy. The ECI's expanding authority over all facets of electoral governance means that "The act of voting must become the private act of private citizens" and conceals the ECI"s "desire is to rid the space of citizenship of all the noise, smell and gaudiness of a publicly mobilized plebeian culture that is now being seen as both an impediment to, and an embarrassment for, an India seeking to become a world power" (Chatterjee 2006). In effect, the ECI's sanitized, non-partisan relationship with the voter threatens to evacuate the electoral process of political dissent. These fears have been enhanced over the last couple of years by EVM scandals, discussed in the next chapter, controversy about the ECI's cybersecurity procedures for securing voter data and their relationship with the controversial identity card, Aadhar, and serious concerns about the ECI's impartiality under Modhi.

Anupama Roy (2012) and Niraja Gopal Jayal (2013) have also expressed concern about the ECI's role in connecting the right to vote with Indian citizenship. Anupama Roy (2012) has argued that since voting is a constitutional right in India, the preparation of the

electoral rolls forces the Election Commission to "identify 'legitimate' votes and sift out citizens from non-citizens" (170). Investing the Commission with the "superintendence, direction, and control" of elections, the Constitution nationalized election registration. According to Roy, one of the primary reasons for this was that given the diversity of India's population, a national body was necessary for protecting minority rights from exclusionary policies implemented at the state and federal levels. Roy goes on to argue that the 1984 *Inderijit Barua and Others v. Election Commission of India*[21] decision, in which the Supreme Court tasked the Election Commission with making the confirmation of citizenship part and parcel of revising the electoral rolls, significantly expanded the Election Commission's role in deciding citizenship status. This new role was accentuated by the ECI's decision to computerize the electoral rolls and expand the EPIC program. In 2002, the Supreme Court confirmed the ECI's ability to require either a valid voter ID card or one of 18 other identity documents in order to vote. The court-supported power of the ECI to determine citizenship status and the various efforts of the commission to technologize the electoral process made "Inclusion of one's name in the voter list…a marker of citizenship, and…Photo voter-ID-cards…the most ubiquitous proof of identity of Indian citizens" (Roy 2012, 185). The ECI's uneven record of protecting minority rights has led to controversy and highlighted the complex role that the organization plays in mediating between the rights of voters, the demands of the government, and the pressures of political parties.

These critiques highlight the tension between the ECI's role as a voter-centric organization ensuring that India's elections are free and fair and its institutional identity

[21] AIR 1984 SC 1911, 1984 (2) SCALE 441 (1985)

as a regulatory bureaucracy that's constitutionally mandated independence from the rest of the Indian government may be questionable. They also confirm that the ECI has been effective in cultivating a unique if problematic bond with the voter. The existence of this bond is confirmed by Banerjee's (2014) comprehensive ethnographic research on *Why India Votes*. She finds that elections create a fleeting moment of equality facilitated by the secret ballot that suspends communal tensions, caste hierarchy, gender inequality, and wealth disparity. In this view, the polling booth becomes "a microcosm of political equality that elections created" (134). This visceral experience of political equality accounts for the ECI's emergence "as one of the most important, open and secular institutions that can mediate between the citizens and the state" (2013, 183). This act of mediation connects and immediately places in tension what Yogendra Yadav (1999) sees as two aspects of representative democracy in India. On the one hand, you have elections as mechanically connecting the electorate both to the field of candidates and the institutions of liberal governance. On the other, elections, through their outcomes, transform the relationship from voter and candidate to one of constituent and representative. At this stage, the ability of the representative to adequately serve their constituents becomes the focus rather than the institutions and mechanisms that make democratic elections possible. Yadav suggests that one of the paradoxes of Indian democracy is that while the first mode of formal representation, election mechanics, has improved, and perhaps connected the individual voter to state institutions in new ways, the ability of candidates to actually represent their constituencies' interests has radically declined, creating extreme electoral turnover. This notion is confirmed by Banerjee's repeated findings that voters do not seem to see the vote as a way of advancing their own

interests but rather as a way of holding authority responsible for their failures.

While much scholarship on the Election Commission of India has focused on the need for electoral reforms such as intra-party democracy, financial oversight, and the decriminalization of Indian politics or on the ECI's efforts to discipline and control political parties (through the model code of conduct for example), scant attention has been paid to its focused and ongoing efforts to technologize the electoral process. This chapter, focused on the implementation of EVMs and other electoral technologies, highlights the ways in which the creation of a technical infrastructure reconfigured the ECI's relationship with the voter. It is clear that these new modes of engagement are deeply entangled with recent assessments of why Indians vote despite the failure of elected representatives to fulfill campaign promises and the persistent social inequality in Indian society. However, it would be a mistake to assume that the only way to assess the success or failure of the ECI's efforts to technologize Indian elections is in terms of turnout numbers and political outcomes. Through EVMs, computerized rolls, voter ID cards, and other ICT projects, the ECI has created a relationship with the voter that is not structured by partisan affiliation, voter choice, or the abstract norms and ideals of democratic theory. Instead, those norms, a person's choice, and their political ideology are articulated through a relationship built on process, procedure, and consistency. People's trust in the electoral process then is configured in complex moments of mediation in which electoral democracy becomes a technology that's primary media is the vote.

While the initial rollout of EVMs between 1999-2004 was fairly smooth, consistent controversy over their use has erupted after every election since 2009. These

controversies call into question the machine's functionality and security and the integrity of the ECI and the companies that make EVMs. These controversies reveal another layer of mediation that EVMs are responsible for in the Indian electoral process: the relationship between the ECI, electoral reform, and the anti-EVM movement.

CHAPTER III: EVMS AND THE SOCIOTECHNICAL DYNAMICS OF INDIAN ELECTION CONTROVERSIES

Massive controversy followed the General Elections of 2009 in India. Anti-EVM advocates claimed that EVM's technical vulnerabilities threatened the election's integrity. This outcry led to lawsuits, demonstration hacks involving both domestic and international actors, and the publication of edited volumes and articles. Some also began to call for a return to paper ballots. However, a subset of the anti-EVM movement, recognizing the utility of EVMs in India's complex and massive electoral process, argued that the problem was not with EVMs, but with their limited auditability. For these critics, the solution was the addition of the Voter Verified Paper Audit Trail (VVPAT).

For example, GVL Narasimha Rao, author of the scathing anti-EVM manifesto, *Democracy at Risk! Can we trust our Electronic Voting Machines*, argued that a VVPAT would allow for recounts in the case of malfunction or legal challenge and that the new technology would ultimately increase a voter's confidence that their vote was counted correctly. Ajay Jagga, a lawyer, called into question the legality of EVMs, asserting that the Information and Technology Act of 2000 required all electronic transactions to provide a paper receipt and that EVMs were not exempt from these rules (Sharma 2010). The call for VVPAT technology was echoed by foreign experts as well. Dr. David Dill, a professor of computer science at Stanford, wrote to then Chief Electoral Commissioner, Navin Chawla, that "It is time to recognize the reality that there is no basis for public trust in paperless electronic voting equipment" (Dill 2010). As a result of this unrest, Subramanian Swamy, a former politician turned political activist, filed public interest litigation (PIL) in 2009 demanding that VVPATs be used in all Indian elections. While

initially dismissed by the Delhi High Court, the Supreme Court eventually ruled in favor of Swamy and required the ECI to make VVPATs mandatory in all Indian elections in 2013.

While the ECI vehemently protested that there was anything wrong with EVMs, they quietly began a dialogue with political parties and other civil society actors. Responding to a meeting with political parties on October 4th, 2010, the ECI convened its technical experts committee (TEC). This group began holding meetings with the two companies that make EVMs, Bharat Electronics Limited (BEL) and the Electronics Corporation of India Limited (ECIL). In 2011, The TEC approved the companies' initial design. After conducting field trials, the companies' refined their design and after another round of meetings with the TEC, the ECI began a new round of testing (Rao 2011). In early 2013, the ECI requested that the government amend the election laws to allow for the use of VVPATs (Special Correspondent 2016). By the time the Supreme Court sided in favor of Dr. Swamy, the ECI had already designed and tested a VVPAT system (ECI 2018a; EMD 2016).[22]

On the surface, the story of the VVPAT seems like a case study in good electoral governance. In response to public concerns about the legitimacy of the 2009 election, the ECI engaged in responsive dialogue with aggrieved actors and proactively designed new technology to address their concerns. However, this narrative fails to adequately capture the scope of the controversy. Another version of the story would detail how a group of civil society actors, journalists, international hackers, and partisan political actors

[22] Dr. Subramanian Swamy versus Election Commission of India, CIVIL APPEAL NO.9093 OF 2013 (Supreme Court of India. October 8, 2013).

attacked the credibility of EVMs, the ECI's chain of custody for them, and the design process. These attacks raised the stakes of the controversy and put pressure on the ECI to reveal details about EVM source code, technical specs, and the manufacturing process. Far from the ECI's somewhat amicable engagement with those calling for the VVPAT, the ECI engaged these requests with diffidence, insisting that EVMs were tamper-proof and that the secrecy surrounding their source code and design specifics was necessary to ensure that they remained so. In this story, the ECI was compelled to innovate not because it was a responsive institution but because sustained pressure from multiple agitators forced some positive response.

It is tempting to end the story of the EVM controversy with the VVPAT. In theory, this innovation should have brought some closure to the controversy surrounding the use of EVMs. In reality, it did not, as new accusations about EVM vulnerabilities emerged during both the 2017 state assembly elections and the 2019 general elections. These controversies were further stoked by VVPAT malfunctions, particularly in 2019 when the device was first used throughout India.

The persistent controversy around EVMs is interesting for a variety of reasons. First, they emphasize the EVM as a thoroughly sociotechnical object. The EVM is not merely a computerized means of casting a ballot. Rather, it is a piece of hardware ensconced in multiple chains of custody. The processes underlying the machine's design, manufacture, and distribution depend on the interaction between logistical and administrative processes, human actors, and the machine itself. When EVMs become an object of controversy, it is the machine's technical affordances as they are ensconced in and mediate these processes that are called into question. Second, the controversy seems

unresolvable. Despite the introduction of the VVPAT and other technical changes to EVMs, critics continue to demand more transparency about the EVM design process and source code, attack the ECI's chain of custody for EVMs, and increasingly question the credibility of the ECI itself. Third, anti-EVM discourse remains remarkably stable despite changes in the composition of the anti-EVM movement. The initial wave of anti-EVM activism was led by the BJP and civil society organizations. Narasimha Rao, the EVM critic mentioned above, is now a member of the BJP's central committee and a current representative to the Rajya Sabha for Uttar Pradesh. He is now a fan of EVMs. Instead, parties like Congress, the Aam Aadmi Party (AAP), and the Bahujan Samaj Party (BSP) now lead the charge against EVMs, largely for the same reasons that the BJP did in 2009. Finally, it is difficult to gauge the ramifications of the controversy for the perceived integrity of India's elections.

While there is a lot of coverage around EVM controversies in the press, the issue seems to matter little to the public at large. Respondents to a 2019 post-election poll by the Lokniti Network and the Center for the Study of Developing Societies (CSDS) were asked whether they trusted electronic voting machines and 77.8 percent of people said they had a lot or some trust in them. Only 13.5 percent reported not having much or any trust in the machines. These percentages line up with other qualitative studies of EVMs that suggest the public has a high degree of confidence in them (Banerjee 2014; Debnath et al. 2017). The same poll mentioned earlier also asked people if the respondents trusted the Election Commission to conduct elections fairly. 77.8 percent of respondents had some or a lot of trust in the ECI's fairness in conducting elections. Only 11.6 percent of respondents had little or no confidence. In a similar survey done by the Lokniti-CSDS in

2009, they asked respondents the same question. 59.7 percent said they had a great deal or some trust in the Election Commission. 17 percent had little or no trust in the ECI. Despite nearly a decade of consistent controversy surrounding the use of EVMs, trust in the ECI has actually grown.

How can we understand the persistence of the EVM controversy given how little traction it has amongst the Indian electorate? What are the substantive issues that animate the EVM controversy such that it resists closure through technological solutions? I address these questions by examining the social, technical, and rhetorical dynamics of EVM controversies. Through this examination, I map the EVM controversy and make visible the ways EVMs are problematized by a variety of actors to create and sustain controversy and generate innovations to the electoral process. Through this analysis, I show how EVMs as technical artifacts enmeshed in a specific sociotechnical and political context become sites in which trust and transparency are performed and contested as democratic norms and values.

The chapter proceeds as follows. I begin by situating my case study on the EVM controversy within the STS literature on controversy analysis. I then provide an overview of how EVMs work and how the ECI positions them as tamper-proof based on their technical features. Next, I outline the chain of custody for EVMs. Together, the ECI argues that the chain of custody and the technical aspects of EVMs ensure the integrity of India's elections. I then review how the anti-EVM movement has problematized both the chain of custody and the technical design of EVMs and how the ECI has responded to these attacks. The chapter concludes by reflecting on the role trust and transparency play in sustaining the EVM controversy.

Controversy Analysis in STS

Studying scientific controversies has been a core feature of STS work since the field's inception in the 1970s and 1980s. Controversies are important to STS research because they lay bare the constitutive relationships between science/technology, knowledge, and society. A social constructivist stance on knowledge claims allowed STS researchers to appreciate the interaction between the epistemic content of a particular knowledge claim and its sociopolitical dimensions. (Jasanoff 2012; Martin and Richards 1995; Pinch and Leuenberger 2006). Or as Noortje Marres and David Moats (2015) put it, researchers should always be studying both "the knowledge content and the political position taking, the epistemic configuration, and the power constellation" (3). This core insight has motivated several different avenues for pursuing controversy analysis. In this section, I review two classic approaches in some detail: The Social Construction of Technology (SCOT) approach and the Actor Network Theory (ANT) method. I then detail how STS scholars approach studying controversy in a digital environment.

The SCOT approach is formulated in Pinch and Bijker's classic essay, "The Social Construction of Facts and Artifacts: Or how the Sociology of Science and Sociology of Technology might Benefit Each Other." In this essay Pinch and Bijker outline four methodological imperatives for studying controversy: the principle of symmetry, interpretative flexibility, problematization/the identification of relevant social groups, and closure and stabilization. The principle of symmetry asserts that we need to study technological failures using the same analytical frameworks as technological successes. Symmetry disrupts teleological accounts of technological progress and innovation. In their study of the bicycle, for example, they elaborate on the myriad styles

of bikes competing for commercial dominance in the late nineteenth century. They then outline the controversies surrounding different bicycle designs. In doing so, they show how the bicycle was problematized by different social groups. These problematizations are an example of interpretative flexibility—different social groups had different ideas about what constituted the best design for a bicycle-based on their own specific set of issues. Pinch and Bijker uncover a host of problematizations in their study of bicycles. Mapping how these actors attached different meanings to different kinds of bicycles allows one to see the nebulous, complex set of relationships out of which a standard design for the bicycle emerged. Crucially, this design is not the best. It is simply the one that was capable of addressing as many of the problems presented by different social groups as possible. This is what Pinch and Bijker call closure and stabilization. Closure and stabilization occur through two primary mechanisms. Rhetorical closure occurs when a relevant social group sees its problem as being solved. A variety of tactics can be used to facilitate this kind of closure including advertising. The second mechanism is the redefinition of a particular social group's problem. In the case of the bicycle, Bijker and Pinch show how the use of an air tire, originally advanced as a mechanism to reduce vibration while riding, ultimately appealed to bicycle racers who were only convinced to use the air tire when it proved faster than other alternatives. Crucially, closure and stabilization are not permanent, and controversy can reopen around a seemingly settled technological object. SCOT’s approach to controversy analysis then is multifaceted, nonlinear, and focused on showing that technological innovation is not the result of some natural progress, but rather is the outcome of the struggle by relevant social groups to define a technical design (Pinch and Bijker 1987).

Controversy analysis was fundamental to the development of Actor Network Theory. While sympathetic with SCOT, ANT differs in its approach to controversy analysis in two important ways. First, it argues that "we should treat controversies as "empirical occasions"—events that render legible and "researchable" relations between a whole variety of heterogeneous actors from science, society, politics, industry, and so on…"(Marres and Moats 2015, 3). In other words, ANT asks researchers to avoid mapping conceptual and theoretical assumptions onto the controversy before studying it. Rather, the controversy itself should generate conceptual and theoretical resources as you study it. For example, in the case, electronic voting machines, it is tempting to start one's analysis by laying out a set of democratic values and then imputing an interest in satisfying these values onto the various actors involved. ANT asks us rather to let our analysis of the controversy produce conceptual categories like democratic values. Secondly, ANT asserts that human and non-human actors should be treated symmetrically in addition to success and failure. That is, we have to recognize the active and non-instrumental role that non-human actors play in shaping a particular controversy (Pinch and Leuenberg 2006; Marres 2015; Marres 2020; For classic examples of ANT see Callon 1984; Latour 1992; Mol 2002). ANT's approach to controversy analysis then is not only multifaceted and nonlinear but also expands the universe of actors that we need to pay attention to in our analysis and forces researchers to be radically agnostic about what they will find when they start to study a controversy

In the 1990s and 2000s, STS researchers engaged in controversy analysis had to confront the role that media and digital technologies, especially the Internet, play in mediating controversy. Controversies in science and technology left the lab and sprawled

across an expanding set of actors, institutions, and settings. In this context, myriad actors including civil society organizations, governments, scientists, technologists, the media, and private companies play a crucial role in the articulation of public issues (Marres and Moats 2015). Controversy over these kinds of issues radically altered the role expertise had played in traditional controversy analysis. In these kinds of controversies, scientific expertise is not always recognized by non-experts and the avenues for questioning scientific expertise multiply. The radical redistribution of expertise through multiple actors also has implications for the kinds of technical artifacts that play a role in shaping the outcomes of particular controversies (Callon et al. 2001; Barry 2012). In her analysis of debates about climate change, Sarah Whatmore (2009) emphasizes the role of, among other things, predictive modeling, risk analysis, and cost-benefit analysis.

The emergence of digital media and technology has also emphasized the constitutive role these technologies play in mediating public controversies. Noortje Marres and David Moats (2015), for example, suggest a new principle of symmetry for studying mediated controversy. In this formulation, we should not distinguish between media content and its underlying dynamics. In much the same way as controversy analysis originally theorized all knowledge claims as having sociopolitical dimensions, all media content is marked by media-technological dynamics. Finally, the digitally mediated milieu has highlighted several potential challenges for scholars in science and technology studies (and media and technology studies). First, studying digital controversies can require the use of computational techniques and proprietary digital technologies. We need to pay attention to how these techniques and technologies preformat research, making certain lines of inquiry possible and obscuring others.

Second, digital methods actively intervene in their environments of study, changing them (Marres 2015, 2020; Marres and Weltevrede 2013). Third, increasingly, companies have used controversy as a way to spur innovation. In her analysis of Dieselgate, for example, Marres (2020) shows how VW used the scandal as a way to generate sustainable innovation. She emphasizes that controversy researchers must be concerned about the instrumentalization of controversy by companies to spur innovation.

This brief overview of controversy analysis was meant to provide a basic analytical framework for what follows. My analysis makes visible the rhetorical, social, and technical dynamics that sustain the controversy over EVMs. It reveals how various actors problematize EVMs and pays special attention to the techniques and devices that mediate the controversy. In doing so, it reorients an analysis of the controversy away from whether or not EVMs are in fact vulnerable to tampering and towards the tensions and torsions that animate the debate. In the end, I argue that underlying these tensions and torsions is a fundamental debate about the role of transparency and trust in the electoral process. While the EVM controversy is generative of technical innovation and public debate about democratic norms, trust and transparency facilitate a dynamic that helps the controversy resist closure.

EVMs as Technical Objects

Costing about 200 US dollars, the EVM is a standalone machine that consists of a ballot unit (BU) unit, a control unit (CU), and a 5-meter cable that connects them. It has a simple, embedded design, is non-networked, and the CUs do not have any kind of radio frequency receiver or data decoder. Until at least 2013, EVMs used one-time programmable (OTP) software. OTP software cannot be altered once it is burned onto a microcontroller. EVMs are also designed to only accept 1 vote every

12 seconds (or 5 votes in a minute) and can record a maxim of 3,840 votes at a time. Each time a vote is cast, the EVM beeps and a red LED light glows next to the chosen name. Votes are recorded on the control unit, which can store the results of a particular election for up to ten years (ECI 2018a). EVMs have a roughly 15-year shelf-life.[23]

There are now three generations of EVMs. M1 EVMs were manufactured until 2006. These EVMs received some upgrades in 1999 and 2001 including a shift from magnesium batteries to 6-volt alkaline batteries. The last M1 EVM was used in the 2014 general election. M2 EVMs were produced after 2006. They feature four primary upgrades: dynamic coding between the CU and BU, EMI/EMC compliance, a real-time clock, and timestamping of key presses. Dynamic coding means that when a vote is cast and communicated to the CU, the key presses are encrypted. This ensures against any data corruption that might result from tampering with the connecting cable. The real-time clock and timestamping of key presses both allow for increased auditability of election results. EMI/EMC compliance protects against interference created by wireless signal injection. As of 2014, M2 EVMs also feature a NOTA (none of the above) option as one of the 16 options on a BU (ECI 2016a, 2018a; EMD 2016).

The third and most recent generation of EVMs was designed in 2013. These EVMs feature several major changes including the introduction of a voter-verified paper audit trail, tamper detection, self-diagnostics, increased candidate capacity, and battery life predication. While M1 EVMs and the initial crop of M2 EVMs could

[23] This is not a hard estimate. The real shelf-life of EVMs is difficult to calculate because the machines are not used regularly, and different machines are used at different intervals. This makes it hard to calculate the rate at which the machine's hardware and software will degrade. For more information see the TEP's report on Evaluating Usability of EVMs 1989-1990 Production Batch (2006).

only handle races consisting of 64 candidates (with the ability to link up to four BUs to one CU), M3 EVMs can hook up to 24 BUs to one CU (allowing for races to feature up to 384 candidates). M3 EVMs also feature enhanced protections to guard against tampering and hacking. The tamper detection mechanism renders a machine inoperable the moment it is opened, and self-diagnostics allow the machine to authenticate its hardware and software (ECI 2018a). Any detected change renders the machine inoperable. The M3s feature battery life predication, which allows technicians to monitor battery degradation. Finally, they feature a voter verified paper audit trail (VVPAT). The VVPAT is an independent system that will print out a receipt of each vote. The voter views the slip through a transparent window to verify that their vote was counted correctly. The receipt will dangle in the window for seven seconds and then drop into a lockbox (ECI 2018a). The addition of VVPAT technology is the first major change in EVM design since 1989.

EVMs were designed to cater to India's electoral conditions (Goswami and Sen 2011; Prasad et al. 2010). They are portable, lightweight, and battery-operated meaning they can reach voters across India's diverse rural and urban geography. Their symbolic interface is user-friendly and capable of handling the linguistic diversity of India's electorate. They are also cost-effective and environmentally friendly. Various features such as the symbolic interface were implemented to enfranchise illiterate voters. Innovations that have increased battery life have allowed the EVM to reach more of the electorate (ECI 2018a; EMD 2016). While EVM controversies focus on their security features, it is crucial to note that the EVM was not only designed to be secure but that it also plays a central role in facilitating the electoral exercise. This is important because as we saw in the last chapter, the ECI operationalizes EVMs to build a relationship with the

voter, and part of this relationship is based on increasing enfranchisement through the use of EVMs.

The ECI positions the EVM's simple-embedded design as its greatest security feature, with the ECI often likening the EVM to a giant calculator rather than a computer. In this formulation, the use of OTP software has traditionally formed the technical backbone of the ECI's claims that EVMs are tamperproof. Since OTP software cannot be altered once it is burned onto a microcontroller, this prevents malicious attackers from hacking the machines in the wild (read during an actual election). The use of OTP software, however, is just one aspect of EVMs that makes them more secure than other voting technologies. Indian EVMs do not use a standard operating system making them less susceptible to certain kinds of attacks. New features of M3 EVMs such as self-diagnostics, tamper detection, the VVPAT, dynamic coding, and timestamps also help guard against external attacks such as firmware corruption, machine state hacks, and cloning (ECI 2018a; PIB 2014).

While the ECI certainly positions the EVM as a secure technology on its technical merits, it also argues that EVMs can only be called tamper-proof when they are secured by what the ECI terms electoral conditions—the EVMs specific design coupled with its rigorous chain of custody. The only way to prove that an EVM can be tampered with is to do it under these conditions.

Chain of Custody

The ECI has designed a dense administrative infrastructure to ensure that EVMs are not tampered with before or after an election process. These processes mix moments of randomization (in terms of poll allocation), public testing (in the form of mock polls),

and surveillance and security to ensure that EVMs are not tampered with during an election.

When an election is scheduled, the initial testing of EVMs is called the first-level check (FLC). The FLC occurs in the presence of political party representatives and election officials under strict security including CCTV surveillance. The FLC is done before the EVMs are sent to specific assembly constituencies within a particular district. At the FLC, the EVMs are given a complete physical check by engineers from BEL and ECIL. A mock poll of 1000 votes is then conducted on five percent of the total EVMs, which are selected at random by representatives from political parties. The poll is conducted by those same representatives and observed by the District Election Officer (DEO) and central observers sent by the ECI. A report including both the sequence of votes as well as totals is then prepared and shared with political party representatives. Photocopies of these records are also given to the political parties. After the mock poll is conducted, the control unit of each EVM is sealed with a pink paper seal[24] that is signed and dated by the engineers and political party representatives. All EVMs are then moved to a strong room monitored by multiple layers of security including surveillance cameras (ECI 2000, 2016a; 2018a; EMD 2016).

The next step in the chain of custody is assigning EVMs to specific assembly constituencies (AC). The DEO in the presence of both political party officials and electoral observers randomly selects EVMs to be sent to each AC using the

[24] The EVM sealing procedure is exceptionally elaborate, with tags being applied every time an EVM is used. The paper tags used in the seals are always signed and dated by political party representatives and sealed with wax. While the measure is often maligned by anti-EVMers as simple and archaic, cutting the tags and then replacing them would require access to the special paper they are printed on, the ability to replicate the signatures of those who signed the wax, and the reproduction of the wax ceil (ECI 2018a).

randomization tools afforded by EVM tracking software.[25] At the AC level, the candidate lists are attached to EVM balloting units. Candidate lists are arranged by party designation with national parties appearing first, state parties appearing second, and independent candidates appearing third. Within each party designation, candidates are listed alphabetically. This way of organizing the candidate lists ensures that each AC has a unique list and that the sequencing of candidates cannot be known beforehand. Another mock poll of five percent of the allocated EVMs is then conducted by the returning officer (RO) and other election personnel under the observation of political party representatives/candidates, who select the machines at random. This process is recorded for transparency. After the mock poll, the balloting unit is sealed with a pink paper seal. The RO then uses the randomization function of the EVM tracking software to send EVMs to particular polling places. At this time, party observers write down the serial numbers of the EVMs assigned to particular polling locations (ECI 2015, 2018a; EMD 2016).

On polling day, the Presiding Officer (PO) conducts another mock poll in the presence of each party's designated polling agents, polling officials, and in some cases micro-observers detailed by the ECI to certain polling stations. Before each mock poll, the PO allows polling agents to confirm that the serial numbers on the EVMs match their records. For the mock poll, the EVM is set up for actual poll conditions, meaning that the control unit is placed on the PO's table and the ballot unit is placed in a voting compartment. The CUs are then connected to the BU via the connecting cable. Polling

[25] EVMs are tracked using an electronic tracking system (ETS) that uses a centralized database to keep a detailed record of an EVM's chain of custody, ID number, and status as well as detailed information about the warehouses where an EVM is stored. The ETS also can generate "conflict reports" on particular EVMs (ECI 2015).

agents then randomly vote 50 times. The results are shared with polling agents and polling officials. If confirmed, the parts of the CU and BU not needed for polling are sealed and the polling agents sign the seals with their name and the name of the candidate they represent. Regular polling then begins.[26] At the end of polling, the PO hits the close button on the CU, which prevents additional votes from being cast and seals the CU and BU in their locked carrying cases. The seals are once again signed by the polling agent. At the beginning and end of polling, the PO notes the time, displayed on the CU, that the poll started and finished. After polling is finished, the machines are transported to a secure facility to await counting. Political party representatives are allowed to follow the machines from the polling location to the strong room. The counting process involves collecting all the control units for specific polling locations, verifying that the seals on each CU match the records of each party's polling agents, and pressing the result button, which then displays the vote totals for each machine. Totals are then manually aggregated (ECI 2016a, 2018a; EMD 2016).

Randomization and mock polling form the backbone of EVM security. Until the first randomization, no one can predict the specific assembly constituency where a particular EVM will be sent. Until they reach that AC, the nomination sequence is unknown and until the second randomization, the polling station where a particular EVM is going is also unknown. On top of this, a third moment of randomization occurs in terms of election personnel. Polling personnel are drafted by the ECI from a variety of public sector jobs. However, polling personnel do not work in their home constituency or district. Instead, they are randomly assigned polling locations, often in other states.

[26] In the case of a malfunctioning BU or CU, the entire EVM is replaced, and another mock poll is conducted.

Randomization is combined with mock polling at multiple points in the process, creating transparency and furthering encouraging trust that EVMs are in working order (ECI 2018a). These interweaving uncertainties theoretically make hacking EVMs intensely complicated. Randomization and mock polls are coupled with rigorous security procedures, which makes access even more difficult. This security layer includes physical security mechanisms and administrative obstacles such as heavily guarded storage rooms, elaborate locking procedures, and constant surveillance by election officials and party officials.

Just like the process of preparing EVMs for polling, guidelines for storage and surveillance are equally detailed. During pre-polling, EVMs are kept in a strong room using a double lock system to which only the returning officers and the district election officers have keys. After polling, candidates are allowed to put their own locks on the strong room doors. The machines are stored with the CU on top and the BU on bottom with copies of the paperwork filed by the Presiding Officer at the close of polling resting on top of each CU. The EVMs are organized sequentially and spaced out so their serial numbers are visible. The facility is protected by three layers of security with state police forces guarding the outer areas and the innermost layer under the watch of the central police forces (ECI 2018a). All entrances to storage rooms are kept under constant surveillance. Political party representatives are allowed to keep constant vigil at the storage locations where they can monitor via CCTV the entrances to each strong room. There is also a live control center set up next to the strong room, monitoring it 24 hours a day. Logs are kept of all visitors to the strong room and only officially sanctioned vehicles are allowed on the site where they are being stored. When strong rooms are

opened, representatives of contesting political parties as well as poll officials are present. EVMs are moved under armed guard. During polling, CCTV, media presence, polling numbers, webcasting, and micro-observers provide an added layer of surveillance protecting EVMs from tampering or other types of interference. Webcasting, for example, allows round-the-clock observation of polling stations by Election Commission officials and the use of SMS and email allows real-time response to polling problems (ECI 2018a; EMD 2016).

After counting ends, all EVMs are kept in the possession of the district election officer for 45 days until the petition period for challenging an election result is over. After this date, the ECI is free to redistribute EVMs wherever they want. During non-polling periods, EVMs are kept in a secure warehouse with a single entrance (all windows are sealed with concrete and are monitored by armed guards). A double lock system is employed to protect against unauthorized access (two people are nominated to hold the keys by the District Election Officer). EVMs are tracked using the master stock register, which is a function of the EVM tracking software, and an annual stock is taken to physically verify the location of EVMs (ECI 2018a).

Together, the technical features of EVMs, the randomization of EVM assignment, mock polling, administrative infrastructure, and elaborate security procedures constitute the ECI's chain of custody. The complex choreography of the chain produces moments of uncertainty, transparency, and public performance designed to create trust that EVMs are not being tampered with. When an EVM is ensconced in this chain of custody, the ECI holds that it is tamper-proof. This formula creates a specific set of criteria that the Anti-EVM movement must meet to prove that an EVM can be hacked: an EVM must be

accessed during a live election or a simulation of the conditions under which a live election occurs, the EVM must then be tampered with, and the EVM must then be used to count votes in a live election or the simulation of a live election. This rubric makes the bar for proving tampering incredibly high. In the sections that follow, we will explore how the anti-EVM movement critiques the design process for EVMs, the machines themselves, and the chain custody.

EVM Design and the Apocalyptic Politics of Security through Obscurity

The manufacture of EVMs is coordinated between the two companies that make EVMs, Bharat Electronics Limited (BEL) and the Electronics Corporation of India (ECIL), the ECI, at least one foreign company called NXP[27], and a Technical Experts Committee (TEC). BEL designs the source code for EVMs, compiles it and sends it to NXP.[28] NXP then burns the source code onto microcontrollers, which are shipped back to India where the two companies build the actual EVM (Nayak 2019). The EVM design process is organized around an approach called security through obscurity (STO). This approach dictates that EVM hardware and software are not made available to experts for testing. In the case of EVMs, STO also means that some crucial design details are kept from most of the actors involved in the process including the ECI such as access to EVM source code. The ECI has asserted that security through obscurity is the only way to

[27] Outside of NXP, it is unclear who else makes microcontrollers for EVMs. Two other companies, Microchip U.S.A and Renesas (a Japanese company) have been rumored to make microcontrollers for EVMs. Recently, both BEL and ECIL have claimed that they will cease using foreign manufactures and begin making the microcontrollers in-house. Foreign participation in the EVM manufacturing process has formed an important part of anti-EVM discourse. Given, how opaque the design process is, I include the anti-EVM movements' critiques of foreign participation even though this might have already stopped (or will stop soon).

[28] Again, it is unclear who makes ECIL's microcontrollers.

ensure that EVM source code cannot be tampered with in the wild or used to make fake machines (Shetty 2018; Vora 2010).

BEL and ECIL are state-owned public service undertakings, meaning the government owns at least 50 percent of each company. BEL falls under the auspices of the Ministry of Defense, while ECIL is part of the Department of Atomic Energy. As PSUs, both companies stress the indigenous development of India's electronics industry with a particular focus on military technologies, e-governance, and digital infrastructure (Kapur and Mehta 2007). In promotional material for the ECI, each company's roots in national defense and atomic energy are used to legitimate them as trustworthy custodians of India's electoral process. Likewise, the TEC, which is composed of Indian professors who teach or have taught at prestigious Indian Institutes of Technology (IITs), is used in promotional material to reinforce the notion that EVM's are a distinctly Indian invention and that top Indian scientists are making sure they are tamperproof.[29] BEL, ECIL, and the TEC will occasionally speak publicly about EVMs to support the ECI's position that EVMs are indeed tamper-proof, but rarely if ever do they offer any technical details about the component parts of EVMs.

Anti-EVM critics have problematized the lack of transparency in the design process in three ways. The first is to attack the security through obscurity approach (STO) generally. STO has been widely criticized by the computer science community because it hides flaws and inhibits innovation (Massey 2004). Submitting technology to public scrutiny allows technology to evolve and ethical or white-hat hacking has become

[29] The current TEP consists of Professor Rajat Moona, director of ITT Bhilai, Emeritus Professor at IIT Bombay, DK Sharma, and Emeritus Professor at IIT Delhi, DT Shahni.

a tool driving innovation in many facets of the tech community (Caldwell 2011; Maurushat 2019; Olushola 2018). In the case of the ECI, the refusal to allow independent experts to test EVM hardware and software creates suspicion about both the functionality of EVMs and the intentions of the ECI. Second, the involvement of foreign companies in the EVM design process creates a potentially apocalyptic scenario where Indian elections are hijacked by international actors. Finally, the use of OTP software within an STO framework means that partisan actors at ECIL or BEL could be rigging the code (Rao 2010; Swamy and Kalyanaraman 2010).

In *Democracy at Risk*: *Can we trust our electronic voting machines*, GVL Narasimha Rao explains the technical-political implications of foreign actors being able to access EVM source code: "These chips are then delivered to BEL and ECIL through their local vendors as 'masked' microchips (in the case of ECIL) or 'One Time Programmable-Read Only Memory (OTP-ROM) microchips (in the case of BEL)" (2010, 11). Masked chips permanently write the software onto the microcontroller. For Rao, this process carries serious security implications. First, it means that Indian firms are sharing highly classified code with foreign companies—code that fundamentally shapes the practice of democracy in India. Second, masking the chips means that the microcontroller cannot undergo black box testing, where one can confirm the identity of the software running on a particular microcontroller by examining its source code.[30] Without black box testing, if the software is tampered with by a foreign company, then there is virtually no way for either BEL, ECIL, or the ECI to tell once they get the chips are returned. From that point on, the two companies can only perform white box functionality tests

[30] It is important to note that this problem is not addressed by the VVPAT. The VVPAT is essentially a redundant "white box" testing procedure in that it cannot confirm the integrity of the source code.

(Prasad et al. 2010; Rao 2010).

For Rao, this introduces a doomsday scenario into the Indian electoral process: foreign governments could tamper with EVM software to rig Indian elections. This kind of apocalyptic rhetoric fuels the conspiratorial logic implicit in many EVM critiques—the production chain is suspect and therefore EVMs are also suspect. Rao sums this up well, arguing "Involving foreign companies willy-nilly involves the services of many others. This includes local (India-based) vendors/ distributors of foreign companies and other intermediaries like courier or custom clearing agents in sending the source code to them and in receiving and delivering the microcontrollers to the EVM manufacturers after they are fused" (Rao 2010, 139). In other words, ambiguities in the design process, the use of OTP software, and the participation of foreign manufacturers mean that EVMs may have always already been tampered with.

Omesh Saigal, a former member of the Indian Administrative Service and an important anti-EVM advocate, also locates his catastrophic critique of EVMs in the design process and the STO approach. However, he does not see the real threat coming from foreign actors, but rather BEL and ECIL, who have complete control over EVM source code. In 2011, he exhaustively detailed how each step of the manufacturing process carries a serious risk of manipulation and displays a complete lack of transparency. For Saigal, the primary issue is that the ECI has no real oversight over the design or implementation of the software that EVMs use. ECIL and BEL design the software, convert the source code, and send it to foreign chip manufacturers where it is fused to the microcontrollers. The fused chips are sent back, now as masked chips, to

ECIL and BEL to be fixed onto the circuit board.[31] Saigal argues that at any stage in this process code could be altered, a Trojan could be introduced, or chips could be swapped for malicious ones. Furthermore, BEL and ECIL do not disclose key facts about the machines manufacturing specs to either the ECI or the TEC such as the printed circuit board's (PCB) serial numbers, any kind of manufacturer's ID, or the details of the devices used to solder the memory and microcontroller onto the PCB. Without oversight of this process, Saigal argues that the ECI has outsourced EVM security to two companies with various political and commercial interests and rendered all subsequent safeguards provided by the chain of custody useless (Saigal 2009).

For true transparency, public scrutiny of the production process through black box testing of EVM software is absolutely necessary. In Saigal's view, the threat of EVM manipulation comes from the handful of software engineers in charge of designing source code and manufacturing the finished machines. Echoing Saigal, Rao argues that these engineers, or the "three idiots" as he refers to them, could effectively sell Indian elections to the highest bidder.[32] Both Rao and Saigal reduce the design process to the human actors that compose it, allowing them to assert that institutional corruption is not necessary for EVM tampering to occur—all it takes is one bad apple so to speak. To trust such a process is the same as trusting a "stranger behind a curtain" (Prasad et al. 2010).[33]

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[31] Saigal suggests also that BEL and ECIL outsource the manufacturing and design of the EVM's component parts (such as circuit boards). This claim has been disputed by both the ECI and the two companies.

[32] Both Rao and Saigal cite anecdotal evidence of this kind of tampering already occurring, referring to stories that they have been told by politicians. Prasad maintains that state party officials have approached him about tampering with the machines as well.

[33] This line is taken from Prasad, Gongripp, and Halderman's presentation at the Voting Technology Workshop/Workshop on Trustworthy Elections in 2010. The panel included two ECI representatives, namely Dr. Alok Shukla, then Deputy Election Commissioner, and Professor P.V. Indiresan, the ECI's

Attacks on the EVM design process emphasize the degree to which EVM controversies are about trust. For the ECI, contracting out the production process to two well-regarded Indian PSUs should instill confidence that the process of securing EVMs is protected by Indian hands. Furthermore, the security through obscurity approach and the use of OTP software makes it incredibly difficult for malevolent actors to attack machines on or around polling day. For Saigal, Rao, and other anti-EVM critics, the STO approach requires not only trusting institutions like the ECI, the TEC, BEL, and ECIL, and foreign governments but also all the people who work for them. Without transparency, this level of trust is untenable. In this formulation, the use of OTP software is transformed from a security feature to a security threat as it prevents black box testing for source code verification. Isolating trust as the core problematic of the controversy over the design of EVMs highlights the role perception and possibility play when it comes to thinking about electoral integrity and EVM controversies. Saigal and Rao are not saying that elections have been or are actively being rigged. They are asserting that it could easily happen. The perception that the design process is flawed and the rhetorical possibilities it opens up translate electoral security from something secured through a set of social and technical relationship into an object of mediated controversy.

Over the years, critiques of the EVM design process have been more muted

primary spokesperson for EVM technology and IT luminary. The panel resulted in a letter signed by 28 American academics urging the ECI to adopt its suggestions for making EVMs more secure. The anecdote in its entirety is: "Imagine going to the polls and being given a ballot. After filling it out, you are shown a brand new "Electronic" Voting Machine that consists of a large box with a curtain. There is a man behind the curtain, and when you approach, he snatches your ballot. He then shreds it into pieces and tells you you have voted. When the polls close and counting time comes, the man behind the curtain hands over a piece of paper on which he has kept an honest count...or so he claims. Electronic voting machines are no more trustworthy than a stranger behind a curtain. We will show you several ways that they could cheat" (Prasad, Gongripp, and Halderman 2010).

than attempts to physically hack EVMs or critique their chain of custody. This changed in 2019 when Venkatesh Nayak, a Human Rights Activist, filed a right to information request (RTI) asking the two companies that make Indian EVMs, Bharat Electronics Limited (BEL) and the Electronics Corporation of India (ECIL) to reveal what model of microcontrollers are used in Indian EVMs. While ECIL refused to respond, BEL revealed that their microcontrollers are manufactured by the American Company, NXP. The model of this microcontroller is MK61FX512VMD12, and it comes with multiple types of memory including SRAM, EEPROM, and Flash (Nayak 2019). Microcontrollers with flash memory cannot be called OTP. The ECI has claimed that the change in software was necessitated by the introduction of the VVPAT.

There are two main takeaways from the recent revelations. First, they feed the critiques of STO reviewed in this section as a major change to EVM software was not disclosed to the public. Moreover, and perhaps more problematically, it is unclear whether the ECI knew that there had been a change in the software used to run EVMs. If the VVPAT necessitated the change, then it occurred as early as 2013. However, the ECI continued to claim that EVMs used OTP software well after that date (they only really stopped because of the RTI revelation). Second, the ECI will no longer be able to lean on the use of OTP software as a key feature of what makes EVMs tamperproof. It is unclear what the trajectory of this new controversy will be, particularly in the period between general elections. However, it does refocus attention away from critiques of EVMs from their use in actual elections to the design process.

Tampering with EVMs

As noted at the outset of the chapter, the first major wave of EVM controversies erupted after the 2009 general election. This period of unrest subsided when the Supreme Court ruled in 2013 that the ECI would be required to use VVPATs in future Indian elections. The second moment of controversy came after the 2017 state assembly elections and continues today. This period has coincided with the introduction of the VVPAT and M3 EVMs. Despite changes in EVM technology and the coterie of actors aligned against the use of the EVMs, the contours of their critique have remained remarkably constant: it is absolutely possible to tamper with EVMs given access to them. G.V.L. Narasimha Rao provides a good overview of the anti-EVM position:

> The design of India's EVMs relies entirely on the physical security of the machines and the integrity of election insiders. This seems to negate many of the security benefits of using electronic voting in the first place. The technology's promise was that attacks on the ballot box and dishonesty in the counting process would be more difficult. Yet we find that such attacks remain possible, while being potentially more difficult to detect (Prasad et al. 2010, 20).

In other words, the fact that machine security is partially dependent on human actors undermines the rationale for using machines in the first place—to eliminate human error and subterfuge. It also transforms the EVMs' simple embedded design into a liability. EVM critics question whether EVMs are tamper-proof using two basic strategies: demonstration hacks and questioning the integrity of the ECI's chain of custody.

Demonstration Hacks

The most famous demonstration hack of an EVM was carried out in April 2010 by Hari Prasad, who was managing director of Net India and Technical Director of Citizens for Verifiability, Transparency, and Accountability in Elections. He was joined by Dr. Alex Halderman, a professor of computer science and engineering at the University of Michigan and a world-renowned expert on voting technology, and Rop

Gonggrijp, a Dutch Hacker and well-known anti-evoting activist. Together, they posted a YouTube video where they hacked a real EVM (a second-generation M2 manufactured by ECIL in 2003—the EVM's serial number was clearly showing in the clip). In the video, multiple hacks are performed in mere minutes, offering vivid proof that EVMs are not technically tamperproof.

The hack led to the paper "A Security Analysis of India's Electronic Voting Machines" (2010). In the paper, multiple modes of manipulating an EVM are demonstrated including dishonest displays, switched microcontrollers, and machine-state tampering such as attaching additional hardware so that an EVM can communicate with another device. Since Prasad's hack, there have been several other demonstration hacks. For example, during a special session of the Delhi Legislative Assembly in 2017, AAP legislator, Saurabh Bhardwaj, tampered with an EVM replica by switching out its motherboard (Thakur 2017). While demonstration hacks do show that an EVM can be tampered with, they do not offer proof that any specific election was manipulated. Instead, as was the case with attacks on the design process, they depend on a politics of possibility. All it takes to prove that EVMs are being tampered with is to prove that they can be. This politics of possibility is reinforced by the provocative nature of the demonstrations themselves and their circulation on social media.

Prasad's video set in motion an investigation into how he came into possession of a stolen EVM. The ECI filed criminal charges and Prasad was briefly arrested, drawing widespread criticism from technologists, journalists, civil society actors, political party figures, and international activists. Due to this pressure, the ECI disassociated itself from the arrest and Prasad was released. Prasad and his team went on to present their findings

at international conferences and in 2010, merely two months after his arrest, the Electronic Frontier Foundation awarded him their Pioneer Award.

The Prasad episode highlights the important role of foreign actors in EVM controversies. An American academic and a European activist played a prominent role in the video and the global attention the incident created was used to buoy the anti-EVM movement. Numerous anti-EVM actors leverage the fact that countries such as Germany and Denmark do not use electronic voting machines and that the United States has been scaling back the use of direct recording electronic voting machines (DRE) (Swamy and Kalyanaraman 2010). Demonstration hacks are often accompanied by rhetorical attacks on the ECI's chain of custody. These attacks take the form of Twitter accusations, newspaper articles, books, and court filings and emphasize how much trust in human actors is required to believe that Indian EVMs are not being manipulated.

Chain of Custody

One of the most extensive critiques of the ECI's chain of custody is offered by Narasimha Rao in his aforementioned 2010 book. His attacks on the chain of custody transform the ECI's tamperproof electoral conditions into a rickety contraption, always already falling apart. Pre-poll EVMs are stored at the district level in warehouses scattered across a rural-urban geography. Rao asserts that the conditions at these warehouses are suspect as are the people tasked with guarding them. The lax storage procedures are anecdotally confirmed by the EVM theft that allowed Hari Prasad and his team to get their hands on a real EVM (2010). According to Rao and others, the ECI's chain of custody also relies on inept, poorly trained people at nearly every level. He suggests that the ECI's EVM training procedures are deficient leading to serious issues on

polling day such as failures to conduct mock polls. Training problems coupled with a lack of transparency in counting procedures (polling agents are not allowed inside counting centers) render the ECI's entire chain of custody suspect because it relies on humans, any one of whom could make a crucial error or consciously manipulate the election process.

EVM tracking software also provides little protection against EVM tampering in Rao's view. Pre-poll tracking of EVMs and the annual master stock register only ensure that the EVMs that are supposed to be there are there. It doesn't check if they have already been tampered with. This vulnerability reverberates down the chain of custody. Randomization does little to prevent EVM tampering if it occurs at the district level. If EVMs are tampered with at the district level, randomizing the Assembly Constituency that they are sent to will do nothing. Moreover, it incentivizes political parties to try and mass manipulate elections. In this scenario, keeping the candidate lists secret until just before the election is also meaningless because the machines *have* already been tampered with (Rao 2010). Moreover, The ECI's vaunted First Level Check (FLC) does not protect against tampering because it only tests that the machine is functioning correctly at that moment.

Together, demonstration hacks and rhetorical attacks on the EVM chain of custody undermine the integrity of the ECI's electoral conditions. This rhetorical formula allows anti-EVM critics to portray the fundamental problem with EVMs and the ECI as one of trust. For example, in 2017, representatives from 16 political parties wrote a letter to the Election Commission of India (ECI) asserting that EVMs were eroding the public's faith in democracy: "The trust deficit amongst political parties in the electronic devices is

too deep-seated and pervasive. It has shattered the faith of the people in the fairness of the electoral process. Democracy is all about trust…" (*TOI* 2017). Or as Mayawati, head of Bahujan Samaj Party (BSP), asserted after the BJP's surprising landslide victory in Uttar Pradesh in the 2017 Legislative Assembly elections: "People's trust in EVM voting is broken. The BJP has tampered with the EVMs in Uttar Pradesh. I have written to the Election Commission in this regard, people no more have faith in EVM machines. It's an attack on democracy" (Bhatia 2017). Quotes like these illustrate how the anti-EVM movement uses the controversy to raise the stakes of the EVM debate. Innovations such as the VVPAT and tamper-detection cannot be judged successful unless they inspire more trust in the political process. For the anti-EVM movement, this trust cannot be mechanically secured through a rigorous chain of custody or an EVM's technical affordances. Instead, it is entangled with the politics of possibility discussed earlier. If it is possible to tamper with EVMs and the chain of custody is suspect, then you cannot trust EVMs or the integrity of India's electoral process. Technical innovation therefore cannot create more trust because there is no transparency when it comes to the innovations themselves.

ECI Responses

The ECI deploys a mix of rhetorical techniques and institutional strategies to defend itself and EVMs. First and foremost, the ECI fiercely and persistently reasserts the integrity of the electoral conditions. To do this, they dispute, investigate, and either debunk or handle lapses in the chain of custody during actual elections. For example, in 2017, a story circulated that EVMs used in a state election in Madhya Pradesh were biased toward the BJP. During an impromptu demonstration of how an EVM and

VVPAT work, Madhya Pradesh Chief Electoral Officer Saleena Singh voted for one party (it is unclear who), but the VVPAT displayed the name of one of the BJP's winning candidates in earlier elections in Uttar Pradesh, Satyadev Pachauri. This led one of the reporters to joke that the machines were biased toward the BJP and Singh to jokingly say that any reporter who published that would be reported to the police. A video of the exchange went viral and controversy followed. The ECI investigated and found that the incident occurred because the machine had not been reset after the last election. The failure to reset the machine occurred because it was not being used in an actual election, meaning the EVM used in the impromptu and informal demonstration performed by Singh, was not protected by the chain of custody. Therefore, it did not count as a real EVM (Bhatnagar 2017; Dey 2017).

The rhetorical strategy here was first to assert the absolute integrity of the machine and second to reassert that the incident did not occur under actual electoral conditions.[34] In other cases, the ECI simply denies opposition claims. For example, during the 2019 general election in Chandauli in Uttar Pradesh, protests broke out when additional EVMs were brought to an EVM storage area. Opposition parties claimed that EVMs were being swapped for ones favoring the BJP. In response, the ECI simply asserted that unused EVMs from another AC were being brought there for storage (HT Correspondent 2019).

With the chain of custody intact, the ECI sees the access to EVMs that the hacks performed by Prasad and others require as impossible. Under this logic, the ECI argues

[34] An investigation by Abishek Dey of Scroll India revealed how the entire incident was the result of bad reporting at the local level and poor gatekeeping by national news outlets. However, despite the debunking, the story persisted as part of the litany of examples of EVM tampering regularly cited by the anti-EVM movement (2017).

that the stolen or replica EVMs used in demonstration hacks are *not* actual EVMs because they are no longer under the jurisdiction of the ECI's chain of custody. Any modifications to EVMs that change their hardware or software transform them into new machines designed to produce fraudulent electoral results. If EVM critics deploy a logic in which vulnerabilities in the chain of custody create possibilities to physically access EVMs and tamper with their hardware or software, the ECI's defense reasserts the stringent criteria outlined earlier to prove EVM manipulation, placing the burden of proof on political parties and other actors who believe that EVMs are being manipulated. More importantly, they reorient attention to the identity of the machine. Under electoral conditions, EVMs are a safe, secure, and beneficial technology enabling hundreds of millions of voters to participate in the electoral process. Outside those conditions, they are transformed into vulnerable, easily manipulated machines, meaning they are no longer EVMs.

Second, the ECI attacks specific arguments offered by anti-EVM advocates. For example, it regularly cites the expertise of BEL, ECIL, and the TEC in defending the security of the EVMs' simple embedded design. In doing so, it positions the anti-EVM movement's reliance on foreign experts against the prowess of Indian engineers, allowing the ECI to argue that the anti-EVM movement lacks patriotism and is the victim of a colonial mentality. CEC SY Quraishi, for example, argued in a 2010 interview that

> We should realise that in India, we follow the Supreme Court of India, not the Supreme Court of Germany. Also, we need to shed the colonial mindset—that if something hasn't worked in countries of Europe, it will not work for us either. Our machines have been designed differently, they have stood the test of time and judicial scrutiny (Quraishi, quoted in Mishra 2010).

This last quote highlights how embedded Nehruvian attitudes toward science and technology are in ECI's philosophy of election management. Nehru saw a programmatic approach to scientific inquiry as a primary instrument for creating large-scale social change and severing colonial and imperial dependencies. As such, he also stressed the importance of local, indigenous Indian control over scientific research and technological innovation (Arnold 2011). In performing the Nehruvian ideal, the ECI paints the anti-EVM movement, as anti-progress, anti-modern, and ultimately anti-Indian.

The ECI also points to the general benefits of EVMs— they have dramatically lowered the cost of elections, made them eco-friendly by cutting down on paper costs, eliminated invalid ballots, allowed for fast counts, and have enabled greater participation in the democratic process because of their simple design and user-friendly interface. These benefits greatly outweigh the anti-EVM movements trumped-up concerns over possible manipulation. They have also argued that EVMs are simply a necessity given the size of India's electorate and the geographical and demographic complexity of India's electoral map (ECI 2018a; EMD 2016).

The final tactic deployed by the Election Commission has been to challenge national and state political parties to hackathons. At these events, each political party is given four hours to tamper with a certain number of EVMs used in recent state elections. They are then allowed to simulate the first-level check to ensure that the EVMs are in working order. The event takes place under simulated electoral conditions, meaning the EVMs are stored in strong rooms and sealed with the appropriate tags and political parties are not given physical access to the machines (Shaikh 2017).

One of the most recent hackathons occurred on June 3, 2017. The event consisted of two different challenges. The first tasked political parties with manipulating an EVM post-poll that had been closed for counting. In this scenario, political parties were allowed to employ two techniques: using a sequence of keypresses to alter the count and using some external device to communicate with the BU/CU. The second challenge asked political parties to tamper with an EVM pre-poll. In the scenario, the political candidates were allowed to use the same two techniques as before. The only political parties that agreed to participate in the hackathon were the Nationalist Party Congress (NCP) and the Communist Party of India (Marxist) (CPM). Each party backed out of the challenge at the last minute. The NCP claimed that last-second changes in the guidelines prevented them from participating in the challenge. The CPM said they never were planning to try and hack an EVM and instead received a demonstration of the EVM and VVPAT by the ECI technical team (Express News Service 2017; Ramachandran 2017).

The two main parties instigating the EVM controversy in 2017, the Aam Aadmi Party (AAP) and the Bahujan Samaj Party (BSP), refused to take part in the contest because of the ECI's stringent guidelines. Ankit Lal, a member of the AAP's Innovation and IT team, provides a good overview of why his party and the BSP refused to participate in the ECI's hackathon. First, he took issue with the fact that independent IT experts were not allowed to take part in the challenge, only members of political parties. Second, he asserted that the 4-hour window was simply too short to do any serious black box testing (through key combination) let alone hacking of EVMs. Third, foreign experts were not allowed to take part in the challenge. Fourth, the ECI refused to reveal the communications protocol (handshake mechanism) between the CU and BU. Without

prior access to these protocols, participants would need a lot of time and access to particular equipment to uncover them on their own (Lal 2017).

The row over the ECI's proposed hackathon demonstrates the tension between anti-EVM critics' politics of possibility and the ECI's vaunted electoral conditions. The anti-EVM coalition sees the ECI's unwillingness to grant them access to the machines as proof that either the ECI knows something is wrong or that they are involved in electoral manipulation on behalf of the BJP. For the ECI, possibility proves nothing. Political parties essentially want unfettered access to EVMs to alter their components and essentially create a new machine.[35]

The controversy over the hackathon also demonstrates stark differences in how each side thinks about the relationship between technology and electoral reform. For the ECI, new technologies are to be tested systematically and scaled up slowly to ensure that the technology works well in India's electoral environment. This culture of iterative testing allows for mistakes and setbacks; whereas, the anti-EVM movement's concerns are usually fueled by anecdotal accounts of problems during an actual election and a post-election urgency to autopsy what went wrong for a losing candidate. In this view, setbacks and mistakes, such as higher than normal malfunction rates for VVPAT devices in the 2019 election or possible lapses in the chain of custody, are unacceptable and create space for suspicion.

These attitudes highlight two important features of EVM debates. First, they are unresolvable. There will always be suspicion about any kind of voting technology, paper, electronic, or otherwise. As the case of the VVPAT discussed in the introduction shows,

[35] The ECI will not even concede that EVMs can be hacked, arguing that hacking requires that a device be connected to a network and since EVMs are not networked, the term hacking is inappropriate (ECI 2018a).

this innovation has not led to less controversy around EVMs, but more. Introducing a second piece of hardware created more mechanical errors and controversies over the mandatory auditing of paper slips, in no way quelling the suspicions of the anti-EVM movement. Second, they highlight the complex role that trust plays in these kinds of controversies. Both sides tend to emphasize that the stakes of the EVM controversy are the legitimacy of India's democratic process. Within these debates, it is the people who are consistently invoked.

For political parties, their ability to represent and express the "will of the people" gives them their political authority. It is therefore not political parties who are suspicious of EVMs, but the public they are authorized to speak for. This type of argument has allowed the anti-EVM movement to position the ECI as a bureaucratic organization, whose loyalty is to the government and not the people. For example, Lal, in the piece quoted above, excoriates the ECI, saying "We want to do actual tampering with the machines—for that to be done you need to, first of all, come up with an actual set of guidelines framed by technical people whose aim is to improve the existing EVM system, and not those drafted by some bureaucrats whose only aim is to maintain the status quo" (Lal 2017). Similarly, in a 2010 op-ed for the *Economic Times*, author Sruthijith KK, speaking about the Hari Prasad episode and the swell of anti-EVM sentiment following the 2009 elections asserts "The year-long saga is a telling clash of cultures, with a bureaucratic sense of entitlement, infallibility, and suspicions of the outsider on one side, and spirit of enquiry and skepticism kindled by scientific knowledge on the other" (2010). The ECI, on the other hand, counters this kind of rhetoric by pulling on its reputation as a constitutionally mandated institution operating independently of the

government with a history of serving the Indian people. At the same time, it paints the anti-EVM movement as a cadre of political losers and fringe activists.

Conclusion: Trust, Transparency, and EVMs

The EVM controversy is nebulous, involving a shifting set of actors including civil society organizations, partisan political officials, journalists, international actors, EVM manufacturers, academics, and the Election Commission. The constellation of the movement shifts with each new iteration of controversy, but the anti-EVM discourse remains relatively stable. The controversy has resisted closure through technological improvements such as the M3's new security features and the VVPAT. Despite these innovations, the anti-EVM movement conjures the possibility of manipulation in an effort to discredit EVMs and the ECI, while the ECI uses its institutional stature, managerial rigor, and the technical features of EVMs to place the burden of proof on the anti-EVM movement. The analysis in this chapter reveals that the rhetorical space between the anti-EVM movement's politics of possibility and the sociotechnical assurances of the ECI is one of the primary reasons that EVM controversies cannot reach closure. Embedded in this space are issues of trust and transparency that act as the engine of the EVM controversy.

Debates about EVMs are not about actual electoral outcomes or the public's perception of Indian elections. Instead, they turn on how public trust is proxied by both the ECI and the anti-EVM movement. This trust/distrust framework is the core problematization animating EVM controversies. With each election, there will be malfunctions, anecdotal accounts of tampering, and concern about the opaqueness of the EVM design process, fueling suspicion about the integrity of both EVMs and the ECI.

The ECI will approach these problems as merely part of the electoral process that needs to be addressed through iterative innovation and reform. In this formula, trust/distrust can be managed but not sated, stabilized but not settled.

The other core problematization animating EVM controversies is a fight over transparency. The anti-EVM movement argues that without transparency in the design process, EVMS can never be secure. The ECI, on the other hand, contends that this kind of transparency puts EVMs at risk of manipulation. In their view, a certain amount of secrecy is necessary. Instead, the ECI mobilizes transparency in the form of mock polling and ceaseless surveillance and security throughout the chain of custody. The anti-EVM movement might call this white box transparency—a meaningless transparency because the black box of EVMs remains closed to public scrutiny. The paradoxical stances of each side, transparency will make EVMs more or less secure, ensures that controversies around EVMs will continue as long as the ECI refuses to open the design process to the public.

The final important point to note is that the rhetoric of EVM controversies is mediated through a dense network of human and nonhuman actors including right to information requests, demonstration hacks, YouTube clips, Twitter commentary, CCTV cameras, electoral officials, political party representatives, police, and of course EVMs. In the controversy, EVMs take on a paradoxical role. They are the technical object at the heart of India's electoral exercise, allowing votes to be cast and counted. Under the protection of electoral conditions, they are a secure technology that should be a source of national pride. Outside those conditions, they are transformed into a vulnerable technology that threatens the integrity of the electoral process. In short, an attention to the

role of EVMs in the EVM controversy shows that they do much more than produce electoral outcomes. Following EVMs through their controversies allows us to see how democratic norms like transparency and a commitment to public trust are debated, produced, and reproduced in actual electoral processes.

CHAPTER IV: MECHANIZED SECRECY: A GENEALOGY OF DEMOCRATIC SPACES IN THE UNITED STATES

The United States provides an ideal contrast to India's highly organized electoral system. In the previous chapters, we saw how a centrally regulated election system mediates relationships between voters, voting technology, election officials, various institutions, and the media. Indeed, the ECI's control over every aspect of Indian electoral processes underpins its ability to not only deploy EVMs and other voting technology but also structures its relationship with the electorate, political parties, and the sitting government. Vesting control over election administration in a single national organization also shapes the dynamics of EVM controversies, trajectories of innovation, and critiques of the Election Commission of India and EVMs. In the next two chapters, we will see how the United States' decentralized system invests voting technologies with different capacities as mediators, organizers, and aggregators, and track how those capacities inform the historical development of voting technology, debates about electoral reform, and an emerging science of election administration in the United States.

As the world's second-largest electoral democracy, the US electoral system is deeply decentralized, containing *sui generis* electoral processes at the state, county, and in many cases, municipal levels. Electoral laws differ at these levels as well. While Indian voting machines are made by two companies that are partially owned by the government, voting technologies in the United States are manufactured by private companies. The market is controlled by three companies—Election Systems & Software, Dominion Voting Systems, and Hart Intercivic. Together, these three companies control 88 percent of the voting technology market in the United States (Caulfield et al. 2021). In

India, one organization, the Election Commission, ultimately makes decisions about the implementation of new voting technologies and other electoral reforms. In the United States, these debates are hyper-partisan, occurring at every level of governance, with final decisions often being made by local election workers.

In the next two chapters, I delve into both the history of and contemporary debates about voting technology in the United States to examine the various ways that voting machines have shaped both how we vote and who we are as voters. In this chapter, I dig into the discursive foundations of contemporary debates about electoral reform in the United States. Analyzing 280 patents for voting technology from the late 19th century, I show how the secret ballot and mechanical lever voting technologies forced a reconceptualization of the act of voting, severing it from the larger electoral context. In the next chapter, I argue that the avalanche of policy-oriented electoral reform literature produced after Bush/Gore led to the creation of a science of election administration in the United States. I then use Ian Hacking's concept of making up people to elaborate on the figure of the voter that emerges from this literature.

Introduction

The publication of a top-secret National Security Report detailing Russian interference in the 2016 US presidential election detailed a systemic multi-prong assault on the technological architecture of the US electoral system. Fake news and phishing attacks on voter registration systems revealed serious issues with the regulation of political campaigns and pre-electoral processes. Russian actions also highlighted potential challenges created by the highly decentralized nature of the US election system, the pronounced role that third-party election vendors play in outfitting states often at the

precinct or county level with voting machines and associated electoral technologies, the lack of regulation for the voting technology industry, and the dearth of funds provided to precincts and counties to maintain those machines or employ their own full time IT specialists (Cole et al. 2017).

In the wake of the attacks, academics, policymakers, politicians, and journalists, acknowledged their severity. Kenneth Greers, an ambassador to NATO's Cybercenter, asserted "we were all kind of hoping that the election hacking was at the cognitive level: propaganda, doxing, influence operations. But this is proof that they were actually closer to the tactical, technical level… They were closer to the guts, to the operating system of our democracy, than we knew (Greenberg 2017)." President Obama signaled the importance of a new approach to securitizing US elections by having the DHS designate US elections as critical infrastructure (Williams 2017). However, the US response to the crisis was complicated by a president who was both being investigated for colluding with the Russians to interfere with the election while also falsely claiming that illegal votes by undocumented people had swung the popular vote to Clinton (Kessler 2016). Reform efforts were further stymied by the deep antipathy that state electoral authorities have toward any type of federal intervention in electoral processes (Capitol News Bureau 2017; NASS 2017).

Russian interference is not the first, second, third, or fourth time that controversy has erupted around electoral technologies in the 21st century. The Bush v. Gore decision and the passage of the Help America Vote Act (HAVA) energized a serious push for electoral reforms, particularly in terms of upgrading every state's voting technology. However, the voluntary nature of HAVA and state distrust of federal involvement in

electoral processes slowed reform efforts (Kropf and Kimball 2013; Saltman 2006). In others, such as California and Ohio, voting machines malfunctioned, were sourced from companies with overt partisan ties, were not upgraded properly, or were poorly designed for use by voters. These kinds of instances slowed, stopped, and reversed states' adoption of new, fully electronic voting technologies, created a push for voter verified paper audit trails, and stirred debate about the overall safety of electronic voting technologies (Alvarez and Hall 2010; Herrnson et al. 2008; Jones and Simons 2012; Kropf and Kimball 2013; Stewart III 2013).

Electoral reform priorities in the post-Bush/Gore era were articulated through a hyper-partisan lens. Republicans seized on the vulnerabilities of electoral technologies to argue for stricter security measures such as voter ID laws and increased registration requirements. Democrats, on the other hand, were deeply concerned with how various voting technologies could potentially both enfranchise and disenfranchise voters through their interface design and functionality (Kropf and Kimball 2013; Tran 2019). Quickly, a simple slug line emerged that encapsulated the partisan debate about electoral reform: access vs. integrity. Interestingly, both sides of the debate agreed that reform efforts should focus on voting and associated electoral technologies. That is, the solutions to America's electoral issues required technological innovation.

Since that time, the access vs. integrity debate has played a central role in debates about electoral reform. This played out in the 2020 election in disturbing detail as Trump has launched a massive disinformation campaign to undermine the integrity of mail-in ballots, arguing that they create opportunities for voter intimidation, bribery, and intimidation. Given that Trump's claims are demonstrably false and deeply problematic,

it is perhaps ironic that mail-in ballots might present a better defense against the kinds of cyberattacks policymakers feared were coming following the 2016 election (Roberts 2017; Victor 2020; Weiser 2020).

One consequence of the access vs. integrity debate is that it reorients attention away from parts of the electoral process desperately in need of reform such as an inability to recruit and adequately train poll workers and the bizarre, unregulated terrain of the electoral technology industry and redirects it towards the intimate aspects of the voting process — user experience and machine design, the technical aspects of machine security, and voter outreach, awareness, and education. In other words, the access vs. integrity debates focuses attention on the relationship between the voter and the machine, isolating the act of voting from the larger electoral ecosystem in which that vote occurs. The Bush v. Gore Decision provides an instructive illustration of this point.

In his analysis of Bush v. Gore, Paul M. Schwartz identifies two conflicting epistemological attitudes toward the role of technology in the US electoral process (Schwartz 2002). The first, evidenced by Justices Rehnquist, Scalia, and Thomas' concurring opinion, is an inclination toward "technological reification and human fallibility" in which "voting technology is generally precise and fair, and humans bring with them the threat of inaccuracy and partisan passion" (628). Rehnquist et al., for example, held that it was an unreasonable expectation to hold a machine responsible for failing to tabulate miscast votes. In their view, given that Florida voters were informed about how to properly cast a vote, it was their responsibility to cast it correctly. If a voter miscasts their vote either due to error or a misunderstanding of how a particular voting technology works, they have effectively surrendered the right for their vote to be counted

(Schwartz 2002).

The epistemological orientation expressed by the dissenters in Bush v. Gore (and the Florida Supreme Court) was of "technological subsidiarity and fallibility" in which machines are "ancillary to human decision-making and the fulfillment of human goals" (2002, 649). Put differently, machines should be designed with human usability in mind—if a voter fails to cast a vote properly then the machine is, at the very least, partially responsible. The latter epistemology guided the steps taken in the Help America Vote Act passed in 2002. HAVA mandated that states upgrade their voting technologies to provide "for error correction by voters, manual auditing, accessibility, alternative languages, and federal error-rate standards" (Coleman and Fischer 2001, 2). Post-HAVA, voting technologies need to be user-friendly, encouraging voter participation, and secure, inspiring confidence in electoral outcomes.

While Schwartz sees these epistemological attitudes as counterposed, they both reflect a deeply held belief in the power of technology to stabilize the act of voting. In one case, voting technologies are corrupted by human fallibility and in the other, technologies need to be upgraded to improve their security and functionality (or in a more strident variant, these technologies need to be replaced altogether by paper-based alternatives for both security and usability reasons). The solutions following from both ends are symmetrical. In the former, voters need to do a better job of educating themselves on how to vote. In the latter, the voter is configured as a user, and voting machines need better interfaces and security provisions. Either way, the solution to the problem requires new voting technologies.

Schwartz's in-depth account challenges both epistemological attitudes through an

in-depth examination of what happened in Florida. Different precincts, gerrymandered to create race and class-based voting enclaves, had different budgets, different electoral machinery, and different electoral technologies. Miscast votes were not merely about a failure to educate voters (or of voters' failure to educate themselves) or the use of proper technologies, but systemic issues related to many factors including class and race-based disenfranchisement (Saltman 2006). The Supreme Court decision in Bush v. Gore ignored these factors, focusing on the relationship between voter and machine, effectively severing the act of voting from the larger environment in which it occurs. The access vs. integrity framework that emerged in response to Bush v. Gore both depended on and reified this excision, isolating the human-voting technology interaction from other phases of the electoral process including voter ID laws and voter registration.

This chapter problematizes the access vs. integrity debate, inquiring into the conditions that have enabled the act of voting to become so disconnected from other aspects of the electoral process. To perform this inquiry, I use a genealogical approach. Genealogy, deployed here in a Foucauldian vein, tracks the conditions of possibility for the emergence of a contemporary problem (Koopman 2013; Monea and Packer 2016). In this case, I am seeking to excavate the "constitutive and regulative relations" that have severed the act of voting from the larger electoral environment (Koopman 2013, 18). Another important feature of genealogy is that it does not search for origins and causal mechanisms, but instead for points of emergence and descent (Foucault 1977; Koopman 2013; Monea and Packer 2016). I have chosen the emergence of the secret or Australian Ballot and mechanical voting machines in the late 19th century as the period in which to begin my investigation. While legislative efforts and social movements have doggedly

pursued the right to vote, the secret ballot and mechanical lever voting machines represent the last set of technological innovations that required a significant reconceptualization of both the act of voting and the space in which it occurs.[36] I interrogate this moment along two intersecting lines. First, how did the secret ballot and the techniques it entailed change the act of voting? Second, how did the secret ballot and mechanical lever voting technologies stabilize the act of voting within America's raucous, incoherent, and deeply decentralized electoral process?

Genealogy also grounds my rather unconventional use of primary and secondary sources. Most of the paper focuses on the patents for voting technologies written between 1865-1910.[37] My analysis of these patents is not interested in whether a particular patent was commercially successful or not. It is also not interested in the economic motivations for patenting these machines. Instead, it is sympathetic with accounts that use patents to investigate knowledge diffusion, patent citational networks, and measure the amount of innovation in a particular field (Jaffre et al. 1993; Popp 2002, 2005; Verspagen 2007). In this chapter, patents present a space of civic discourse that describes how inventors were creating technical solutions to problems such as voter intimidation, bribery, and ballot stuffing. I entangle this analysis with both primary and secondary literature on the secret ballot and mechanical voting machines to investigate the haphazard ways that these technical schema interface with social and political context. By analyzing how secrecy becomes embedded in the technical apparatuses through which we vote, I track how the

[36] In this paper, the names will be used interchangeably. While not every secret ballot meets the full criteria of the Australian system, the distinctions do not matter for this analysis.

[37] For this paper, I analyzed 280 patents. I used Google patents and used the search terms "Voting Machine," "Ballot Box," and "Secret Ballot."

secret ballot produces a rubric for solving electoral problems that isolates the act of voting, sanctifies the secret ballot, naturalizes the use of voting machines made by private vendors, and renders the profound instability of the American electoral process excessive of the performance of the franchise.

Secret Ballot as Technology

In their introduction to the *Hidden History of the Secret Ballot*, Romain Bertrand, Jean-Louis Briquet, and Peter Pels define the ballot as "something that wavers between a material substance, an organised system of secret voting and a quantified measure of votes cast" (Bertrand et al. 2007, 8). The ballot is a physical technology, one that mediates a person's vote and a particular electoral outcome. It is also a technology in a more robust sense in that it rationalizes and choreographs a set of social and technical relationships which come to constitute the act of voting. Bertrand et al. go on to argue that it is the oscillation between ballot as a tool and ballot as a sociotechnical artefact that gives it power as a form of material culture. In their view, this allows the ballot to "subjectivate" people in two senses. First, it constrains and disciplines people to behave as "docile citizen-voters." Second, it provides resources through which subjects can act back against those in power (Bertrand et al. 2007; for more on civic epistemology see Miller 2004).

The notion that the secret ballot mobilizes a set of techniques through which a mode of subjectivity is enacted conforms with most literature on the secret ballot that sees it as playing an important role in the rise of the figure of the information-seeking, rational voter in the late nineteenth and early twentieth centuries. Schudson, for example, sees the secret ballot as a new "performance of individualism oriented to the nation, not a

performance of community directed to the locale" (173). The secret ballot severed the pluralistic, party-loyal, fraternal relationship that had existed between voter and party in the mid-19th century. This new format was a "citizenship by virtue of informed competence" (Schudson 1998, 173).[38] This citizen was autonomous and self-interested with no social pressure to vote in the interests of their fellow citizens. Instead, the well-informed, coldly calculating voter rationally weighed how particular electoral outcomes would benefit them directly. For Schudson, the emergence of the secret ballot and the "Good Citizen" fundamentally transforms voting from a social act to a civic one.

This transformation sacralized the relationship between a voter and their ballot and made the Australian ballot a foundational component of electoral democracy. Richter, for example, sees the secret ballot and accompanying reforms (in a variety of countries including the United States) as crucial to both the expansion of democracy globally during the twentieth century and the emergence of universal suffrage as an accepted democratic norm in the global community Richter 2016). Crook and Crook (2011) see the secret ballot as providing connective tissue for the globalization of democracy in the 18th, 19th, and 20th centuries. In the 21st century, without the secret ballot, a democratic government is not considered legitimate.[39]

Literature on the global history of the secret ballot is wide-ranging, examining the fierce debates in mid-19th century England about the morality of the Australian ballot, the gradual adoption of the secret ballot in Europe and the United States, the colonial

[38] Schudson goes on to analyze whether the informed citizen ever really existed and several other scholars writing about digital democracy have wondered if the normative constraints offered by the figure have undermined our ability to understand contemporary political events such as the election of Trump and the rise of democratically elected, populist authoritarian rulers in other countries. For more see Kreiss 2018.

[39] The Universal Declaration of Human Rights includes ballot secrecy as a constitutive part of the right to vote. See article 21.3.

diffusion of European ideas about the secret ballot and voting, and the adoption of the secret ballot in both colonized and formerly colonized countries.[40] In the case of India, for example, Gilmartin (2011) examines the relationship between the secret ballot, British colonialism, the development of the Indian electoral system, and ideas about popular sovereignty in India's political culture. His work shows the complex ways that India appropriated European ideas about the ballot into its nascent electoral structure following independence. Recall, for example, the footnote at the beginning of chapter 1 that the benefits and weaknesses of the US and Britain's electoral systems were explicitly outlined in India's Constituent Assembly debates about the function and form of Indian elections. Importantly, in these debates, the secret ballot's central role in guaranteeing universal suffrage is never questioned—voting in secret is the only way that people can freely exercise their fundamental democratic right. While global scholarship on the secret ballot elaborates the historical context in which it emerged in particular countries, its problematic diffusion as a colonial ideology and emergence as a global norm, and the haphazard ways it has been incorporated into a variety of electoral systems, it never engages the secret ballot as a technology that fundamentally alters the actual act of voting. That is, how electoral democracy is composed through the sociotechnical mechanics of the secret ballot including polling place reorganization, mechanical voting technologies, and new administrative and logistical procedures.

In the case of the United States, this chapter argues that the pervasiveness of the secret ballot and the romanticized figure of the citizen voter has obscured the historical-

[40] For case studies, see Bertrand et al. 2007; Crowley 2007; Newman 2003; Teorell et al. 2017; Willis and El Battahani 2010. For India, see Gilmartin 2012; Jaffrelrot 2007. For diffusion see Blaut 1993; Crook and Crook 2007, 2011; Gilmartin 2012; Markoff 1999. For a quixotic, deeply problematic, and bizarre Euro- and American-centric view of diffusion see Seymour and Frary 1918.

technological conditions from which they emerged. Crowley reminds us, for example, that the secret ballot was used to disenfranchise voters as it presupposed a literate and educated voter, one who could deliberate over a complex and lengthy set of political decisions (Crowley 2007).[41] These characteristics link the figure of the citizen voter to suffrage debates from the late 19th century in which mugwumps (and later progressives), racists, nativists, and the wealthy would use literacy and education as techniques for disenfranchising black, Chinese, and working-class voters as well as immigrants, women, and the poor (Keyssar 2000; Reynolds 1988; Wang 1997) Crowley's reminder forces us to both reconceive the secret ballot as a technology in the sense described earlier, and resist the urge to focus on who the voter it interpolated was. Instead, he provides a jumping-off point for considering the role the secret ballot as a technology played in reformatting the act of voting.

Who Shall Make the Voter? Fraud in the Gilded Age

In 1869, Senator James Dixon of Connecticut, in congressional debates over the 15th amendment, famously declared that "the question is not what shall be the qualifications of the voter, but who shall create, establish, and prescribe those qualifications; not who shall be the voter, but who shall make the voter" (Dixon 1869, 705). Dixon's comment strikes at the heart of suffrage debates that raged across the United States in the second half of the 19th century. Who would control suffrage? And by extension, who would control not just the definition of the right to vote, but the actual exercise of the franchise? Congress passed the 15th amendment on February 26, 1869. On March 30, 1870, after being ratified by ¾ of the states, the amendment became law.

[41] Crowley, "Uses and Abuses of the Secret Ballot." The length of the ballot resulted in reform efforts to shorten it. For more on the short ballot, see Beard 1909.

The 15th amendment protects against disenfranchisement based on "race, color, or previous condition of servitude." To enforce the 15th amendment, congress passed 5 election enforcement acts between 1870-1872. These amendments radically federalized US elections for the first time in US history (Ewald 2009; Keyssar 2000; Wang 1997). Though all but one provision of these acts would be repealed by 1893, the acts effectively nationalized reconstruction, taking aim at machine politics and partisan bickering in the north as well as racialized disenfranchisement in the south.

Post-war America voted in much the same way as Ante-Bellum America. From the colonial period through independence and the first half of the 19th century, states transitioned from voice voting to paper-based balloting. In practice, a mix of techniques was used. Kentucky, for example, did not abandon oral voting altogether until 1891. However, the dominant method was the party ballot. This form of the ballot was printed by political parties and distributed before an election. It allowed parties to monitor who was voting for them and encouraged bribery, intimidation, and in some cases violence. As early as 1831, Maine enacted laws specifying ballot color and design—ballots had to be printed on white paper with ballot ink. Many states would follow suit both before and after the Civil War (Bensel 2004; Ewald 2009; Saltman 2006). However, while these measures were theoretically designed to deter fraud and create a limited form of secrecy, in practice, they did neither. Parties printed ballots using different shades of white and various paperweights allowing their tickets to be easily identified by fellow voters, partisan poll officials, and party intimidators. The party ballot coupled with the rise of machine politics in the 1870s and 1880s led to numerous accounts of endemic election fraud. It was in this context then that the 15th amendment was passed—the extension of

suffrage was entangled with the geographically dispersed politics of reconstruction (discussed later in relation to secret ballot reforms), the use of party ballots and the power of machine politics, and the perception of widespread electoral fraud (Ewald 2009; Keyssar 2000).

In America's larger cities such as San Francisco, Pittsburgh, Cleveland, Philadelphia, Chicago, and New York powerful political machines deployed a diverse set of tactics to ensure electoral control over a city. These techniques included vote buying, ballot stuffing, the use of false-bottom ballot boxes, padding registration rolls, violence, bribery, and intimidation (Erie 1988; Ethington 2001; Golway 2014 Lepore 2008; Reynolds 1993; Ruppenthal 1906; Scott 1969; Steffens 1904; Woodruff 1901). For example, Steffens (1904) describes how every aspect of Philadelphia's electoral process in the late nineteenth century involved fraud from padding electoral registers with the names of pets and dead people to repeating and floating (in which the same people crisscrossed the city voting over and over again). He concludes his invective by quoting a Philadelphia machine member's address to a crowd of followers at Independence Hall in the late 19th century: "'These men, the father's of American liberty, voted here once. And...they vote here yet'" (Steffens 1904, 200-1).

Machines also created new voters through the mass naturalization of recent immigrants and the colonization of electoral districts on the eve of big elections. Fredman (1968), for example, notes that in New York, 41,112 aliens were naturalized in 1868—84 in January, 26,226 in October, and 24 in December. In addition to outright electoral fraud, machines priced opponents out of elections by charging exorbitant fees to print ballot papers. Ivins asserts that in 1880s New York, to run an entire ticket including

aldermen, assemblymen, congressional candidates, judicial candidates, mayoral candidates, sheriff and other county offices, comptroller, judgeships, and the DA cost a party 211,000 dollars in assessments. He estimates the total cost of running an election in New York to be 693,000 dollars including the printing of ballots, renting of rooms for floaters and other colonizers, and the indirect bribery of officials (Ivins 1887).

Corruption took place on a statewide level as well. One of the most famous incidents of state-level corruption was the block of five incident in Indiana, where a Republican campaign official's instructions to "Divide Floaters into blocks of 5 and put a trusted man with the necessary funds in charge of these five and make him responsible that none get away and all vote for our ticket" became public, creating fervor for reform (Quoted in Argersinger 1993, 110). Tactics such as these also affected the public at large. John Reynolds found that perhaps almost ⅓ of the electorate in New Jersey sold their votes during the Gilded Age and notes a particular incident in 1890 when 55 election officials were convicted of perpetrating election fraud in 16 different precincts in Jersey City (1980, 1988, 1993).

Obviously, electoral fraud (or rumors thereof) also affected national politics. In the 1888 presidential election, Democrat Grover Cleveland lost the election to Republican Benjamin Harrison. Cleveland lost New York (which swung the election in Harrison's favor) by 12,787 votes. Meanwhile, David B. Hill (the head of New York's Democratic machine) won the governorship by 17,740 votes. The partisan dissonance between these electoral outcomes led many to accuse Hill of "knifing" Cleveland (Fredman 1968). Knifing was a technique in which ward captains would alter party ballots to confuse voters. Ballots in the 19th century were incredibly long and, in many

cases, names could be switched or omitted without the voter knowing. Knifing was consonant with the increased use of fusion tickets during this period. Fusion occurred when different political parties would cooperate on a single ticket (Argersinger 1980).

While some scholars have debated the actual extent of electoral fraud during the Gilded Age, its rhetorical scope in the popular press was incredibly large. Peter Argersinger has argued that we have to define and evaluate corruption within the contexts in which it occurs. Techniques such as vote-buying, ballot-stuffing, intimidation, outright violence, repeating or floating, colonizing, count-rigging, and indirect bribery were ideally suited to a 19th-century political environment that was both highly partisan and highly competitive (1980). In addition, increased urbanization eroded the familiarity that seemed to secure elections in rural areas and smaller towns in the first half of the nineteenth century (Fredman 1968). Newspapers during this time also had direct political affiliations and reported the news according to partisan perspectives (Schudson 1998). Together these factors created an environment that incentivized fraud.

For our purposes, it is important to specify that within this milieu the party-produced paper ballot was a major technical condition enabling these various forms of fraud.[42] Intimidation, vote-buying, and even violence at the polls were only effective because party poll watchers could verify from a distance for whom a particular person voted. A lack of ballot standards enabled the use of "tissue ballots" or "pudding ballots," a form of fraud where thinner ballots were folded inside of thicker ones (Argersinger 1993; Ewald 2009). Repeating and floating depended both on lax registration laws and the ability for parties to mass-produce ballots. "Knifing" and ballot pasting were also

[42] For evocative examples see *Daily Evening Bulletin* 1880; *Frank Leslie's Illustrated Newspaper* 1876.

premised on the availability of the party-produced ballot paper. In this context, the vote was a form of communication cast within a complex political culture in which populist machines mobilized poor, often immigrant voters, to control city politics. The figure of the voter that this system configured was clientelist, partisan, and occasionally opportunistic. The party-produced ballot paper then was not epiphenomenal to the partisan politics of the late 19th century, but rather played a crucial role in sustaining those politics by organizing the act of voting itself. Recognizing the party-produced paper ballot as a technology that formatted the act of voting allows us to see how the secret ballot would have seemed an ideal solution to some of these problems as it requires the state to design and produce ballot papers, limiting parties' abilities to verify for whom someone voted.

Ballot Boxes and the Party-Produced Ballot: Stamps, Registers, and Bells

As mentioned earlier, while some states made ballot laws to control the color, weight, and length of ballot papers, these laws were largely ineffective (and sometimes repealed) given party control over the electoral process (Harris 1934). Given the weak institutions governing US elections and the local character of these processes, it is perhaps not surprising that during this era, we see an explosion of patents for ballot boxes designed to deal with electoral fraud. Patents from just after the Civil War up through the mid-1870s have various features that will eventually become part of the standard design of ballot-boxes: a secure slot for depositing votes that can be open, shut, and locked, a registering mechanism for counting votes, a way of stamping the votes with a distinctive mark, and an alarm that notes when a vote has been cast. The first fully integrated "stamp, register, and bell" style machine was patented in 1877 by Jacob Fricker Jr. and

Adolph Seinecke of Ohio. This ballot box was constructed to allow for "three-fold security against the casting of fraudulent votes" (1877, 1). Ballots were to be deposited in a secure slot; an official would then turn a crank, which passed the ballots through a stamping mechanism, which would effectively mark or "cancel" the ballot; the depositing of the ballot coincided with a gong or bell, which gave public notice that a vote had been cast; and the depositing of a ballot would also turn a registering wheel (1877).

Improvements and innovations to the "stamp, register, and bell" style machine show a nuanced approach to solving electoral problems from an emerging class of inventors. Glass bottoms gave a modicum of transparency to the process (Brooks 1875; Ringo and Pettibone 1884). Gongs would be activated both when a vote was cast and when it was counted to signal the beginning and end of the voting process (Davis 1874; Morris 1878; Bacon 1881). Registering mechanisms would create faster counts and count redundancy (Savage 1873; Powell 1879; Bodge 1886). Stamping mechanisms would imprint the ballot with serialized numbers, ward and precinct numbers, gibberish, or full sentences. Machines were designed that would enable stamps to be set internally on the day of voting to prevent actors from printing their own versions of ballots (Bacon 1882; Howell 1884; Woods 1888). Others had time locks and internal clocks for ensuring the accuracy and security of counts (Crowe and Hester 1880; Lindenborn 1881). Some proposed doing away with ballots and using ball-based voting machines instead. These machines, which would periodically be patented until at least the 1890s, allowed the user to place their hand into a sealed compartment and deposit a ball for the candidate of their choice. These machines effectively made voting secret (Outcault 1868; Nicolls 1877; Welch 1880). Patents from this period display both a grip on the problems that boxes

were meant to solve and the possibilities that more mechanized forms of voting could provide for secure voting and ballot secrecy. James Buck's 1880 patent for a "recording ballot-box" provides a succinct summary of the technological affordances offered by the new ballot-boxes:

> The object of my invention is to indicate accurately and instantly the result of an election; to prevent the possibility of rifling the box of its ballots or of stuffing it with fraudulent ones; to promote the convenience of the public by determining the result of the election immediately upon closing the polls; to curtail the expenses of elections by dispensing with the services of vast numbers of men and the necessity of counting the votes; to reduce those sources of error and doubt which are in separable from the old form of ballot-box and which occasion a great majority of contested elections, and to protect the voter more fully against the dominating influence of designing men, as well as his privilege of secret voting (1880, 1).

Particularly important within the designs of these voting machines is an attention to the need for voters to trust the count and a recognition that redundant registering mechanisms and public registers were a crucial part of creating this trust. Richard S. Conover's 1880 patent for a "Register for Counting Votes" is a good example of how this trust is incorporated into the design of a ballot box. In this machine, a voter approaches with a ballot and places it into a compartment; a crank is turned which activates a register and rotates the compartment towards the election official. The ballot is then taken from the compartment by an election official who deposits it in a ballot box. Conover sees this redundancy as necessary because this "whole arrangement is based upon the principle that the people are their own protectors against fraud, and the votes are hereby counted under the eye of all the voters, instead of being entrusted to a few men in a room by themselves" (1880, 2). While trust in the process is invested in the people's ability to identify potential fraud, it is also part of the machine's design.

The notion of a publicly verified count confirmed by a register also shows how

the new ballot-boxes forced the standardization of electoral procedures and the design of polling places through their technical requirements. This procedural uniformity will play a crucial role in establishing other kinds of reforms that would become part of the secret ballot. First, there is an order to voting, a mechanized slowness. A voter approaches; they cast their ballot in one of several ways; the ballot moves through a set of mechanical processes; and a gong, bell, or other alarm is sounded. The register which counts the vote is visible to the public and has to be certified at the end of voting by local officials. In this schema, voting becomes a somber, formalized act. It is an act that requires an orderly environment that can be easily controlled, meaning polling could no longer take place in barrooms or other uncontrolled spaces where violence could occur. Procedural reforms, oriented around these early ballot-boxes, sought to reorganize the environment in which voting occurs, making it safer for the average person to cast their ballot securely and confidently.

Suffrage and the Secret Ballot

By the mid to late 1880s, ballot boxes of the party-ballot era had standardized around the design specs elaborated above. William Munroe and Timothy Sullivan's 1885 patent for a "stamp, register, and bell" machine demonstrates this standardization: their invention is "related more specifically to that class of ballot-boxes which are provided with means for preventing fraud in voting…" (1). Munroe and Sullivan do not specify what forms of fraud their box is designed to fight, indicating that a) the necessity of reform is self-evident and b) that there is a community of people interested in designing ballot-boxes to expedite those reforms. Patents for boxes also begin to reference the shortcoming of earlier designs. For example, Munroe and Sullivan's box is designed to

accept ballot papers of varying thicknesses, a feature not previously available. Alongside the creation of boxes designed for the party ballot era, patents begin to be filed for ballot boxes that enable the secrecy of the ballot either through the voting procedure that the box prescribes or through the use of paperless ballots.

James Buck's patent, quoted above, is the first to mention ballot secrecy explicitly in the context of a paper ballot. However, secrecy was an implicit feature of the ball-based machines described earlier. Patents for those machines date back to 1868. In 1878, Alexander Roney patented an "Improvement in Registering Ballot-Boxes." This machine is the first to describe a paperless, mechanical lever-style voting machine. These early paperless machines show the intimate connection between the secret ballot and the development of mechanical voting technologies (Roney 1878). Roney's technology sought to "avoid the trouble and waste of time caused by counting the votes, to prevent intimidation, to guard against fraud, to save the cost of elections, and to guarantee satisfaction to the candidates and preserve the purity of the franchise" (1878, 1). Anthony Beranek's patent for a "Voting Apparatus" not only trades paper ballots for levers but also provides the first elaboration of a fully automatic polling booth— providing a mechanism for connecting the setting and resetting of the voting machine to the opening and closing of the entrance and exit doors of the voting booth (1881). Ballot secrecy and related technologies were also designed to prevent the ignorant voter from being swindled out of their vote. Roney, for example, asserts that his machine will protect the "purity of the franchise," meaning that it would ensure that every voter could cast their ballot free from intimidation (Roney 1978). Protecting the "purity of the franchise" would take on new meanings when used by secret ballot reformers.

The reform movement for the secret ballot emerged in the early 1880s and was primarily advocated by mugwumps, educated, wealthy Republicans committed to civil reform and pragmatic public policy. Fredman argues that mugwumps believed that "the common man was a fundamentally honest but thwarted elector, who could be stirred up and persuaded by speech and earnest tract to share their belief in the existence and evil of corruption and to demand honest and limited government" (1968, 100-101). Prominent mugwumps across the country such as Henry George, who had first advocated for the secret ballot in an editorial in 1871, Allen Thorndike Rice, editor of the *North American Review*, Richard Henry Dana III, and E.L. Godkin, took up the cause of "purifying the ballot" ostensibly as a solution to the corrupting influence of money in politics (Beckert 2002; Fredman 1968; Keyssar 2000).

Throughout the decade, labor leaders and trade union activists as well as some of the machines would also come out in support of the ballot (Fredman 1968). According to Evans, arguments for the ballot focused on putting an end to bribery, preventing coercion and intimidation at the polls, and stopping the assessments that were being levied on potential candidates (1917). Outside of eliminating specific forms of corruption, the ballot would also "soften the influence of political contests and create order and decency at the polls" and "raise the tone of political life by teaching that a vote was a privilege and not an article of merchandise" giving "the voter a sense of responsibility" (1917, 23-4). While mugwumps may have needed the common man's support in order to initiate reform, "purifying the ballot" also presented an opportunity to disenfranchise those same voters.

In the late 1870s and 1880s debates about universal male suffrage were deeply

embedded in regional political contexts. Early versions of the 15th amendment, such as the one developed by Senator Henry Wilson of Massachusetts, actively conferred suffrage on the disenfranchised, radically wrested control of the electoral process from the states, and included not only language that would make it illegal to disenfranchise based on race or skin color, but also ethnicity or nativity, property requirements, literacy tests, or other educational standards. (Keyssar 2000). This stronger version of the 15th amendment met serious resistance from Republicans and Democrats for a variety of reasons, which crisscrossed the continent. Republicans on the west coast wanted to retain the right to disenfranchise based on ethnicity in order to control the influx of Chinese and Japanese laborers (who outnumbered African Americans on the west coast 10-1 after the civil war). Southern Democrats obviously wanted to restrict suffrage based on race and northern Republicans in Massachusetts and New York wanted to retain educational and literacy requirements as well as in at least one case (Rhode Island) maintain property qualifications in order to weaken the machines and disenfranchise immigrants. Similarly, while some Republicans favored federal intervention in southern electoral processes, they also wanted to thwart federal interference in electoral processes in northern, mid-western, and western states, where they held power. During the 1870s and 1880s, there were attempts by a new class of corporate urban elites to repeal universal male suffrage in New York, California, Texas, and Illinois. However, all of these attempts failed (Beckert 2002; Ewald 2009; Fredman 1968; Keyssar 2000; Wang 1997).

It is in this context that the secret ballot, which assumes both a certain level of education and some amount of literacy, emerged as a tool of disenfranchisement in both the South and the North. Keyssar notes that the secret ballot along with “poll taxes,

cumulative poll taxes, literacy tests, ...lengthy residency requirements, elaborate registration systems, confusing multiple voting-box arrangements, and eventually, Democratic primaries restricted to white voting," were used as techniques for disenfranchising black voters in the South (Keyssar 2000, 11). For northern elites, the secret ballot represented a workaround for explicit disenfranchisement. Rather than pass legislation that restricts suffrage, reformers framed secret ballot reforms as a way to end machine politics, stop electoral fraud, and rationalize government administration at the municipal, state, and federal levels. Under the auspices of reform though, the secret ballot also was seen as a way of covertly sneaking suffrage qualifications into the act of voting itself (Beckert 2002; Keyssar 2000).

Regardless of the new ballot's effects on enfranchisement, the fact that so many disparate groups supported it meant its institutionalization was rapid and relatively uncontroversial. Though the first attempts to make the secret ballot law were defeated in Michigan in 1885 and 1887, states rapidly passed laws legalizing the Australian ballot by the late 1880s. Louisville was the first city to pass municipal legislation requiring the secret ballot in February 1888. Later that year, Massachusetts would become the first state to require the Australian ballot. Between 1888-1896, 39 of 45 states adopted some form of the ballot. By 1893, all northern states had initiated some sort of reform (Crowley 2007; Saltman 2006; Ware 2000). By 1933, all states except South Carolina and Georgia had adopted some form of the secret ballot. While states would continue to experiment with various kinds of ballot designs throughout the twentieth century, no state ever dropped the Australian ballot after it had been legally adopted (Crowley 2000; Harris 1934; Saltman 2006; Ware 2000). The rapid spread of the secret ballot was

accompanied by an explosion of patents for both ballot boxes and mechanical voting machines. For our purposes, we will focus on voting machines in this section, as the ballot boxes patented during this era do not differ much from the ones designed in the 1870s and early 1880s (Kutscher 1889).

Mechanized Secrecy: Mechanical Voting, 1889-1910

On November 19th, 1889, Jacob H. Meyers filed patents for a "Voting Machine" (Myers 1889a, 1889b). These machines were push-key, lever-based, and connected to an automatic voting booth. When a voter pushed a key, it would lock, preventing them from voting for more than one candidate. When a person left the booth, the door closing reset the machine for the next voter. While improvements were made to the guts of the machine including the interlocking mechanisms and the use of different ballot indicating devices, this basic design would be foundational for most lever-based voting machines (McElroy 1909; Sjober 1904).

Myers' machine laid the groundwork for the problems that mechanical voting machines could potentially solve. He writes that

> his present invention relates to voting or balloting machines, and has for its objects to provide one by the employment of which an honest vote can be had and counted without liability of voters being intimidated, the balloting being secret, or their voting more than once for the same candidate or different candidates for the same office, and as the votes are counted as fast as the voter indicates a preference, and the total number cast for each candidate can be ascertained rapidly and accurately at the close of polls (Myers 1889a, 1).

Myers' statement indicates two fundamental things about the design of voting machines. First, the machines were developed to stop fraud. Importantly, the machines were designed to prevent both external forces from intimidating voters as well as to stop mischievous voters from ballot stuffing. Rapid counts hindered the ability of election

officials to rig the count after voting ended. The Myers machine does not trust the voter or the election official and has been designed to keep both from potentially falsifying the results of an election. Second, the development of the automatic voting booth made secrecy a function of the machine itself. Improvements to voting booths would allow them to be disconnected from specific machines and folded for storage and transport (Elsner 1890; Gardner 1891; Van Dorn 1892). Inventors would also experiment with floor-based sensors for setting and resetting the machine, substitute turnstiles and curtains for doors, and outfit entrances and exits with alarms and other signaling devices (Mourot 1894; Davis 1895; Darnell 1896). All of these innovations further embedded secrecy into the design of the machine.

The other basic type of voting machine is most closely associated with John McTammany, who would go on to file many patents for different versions of roughly the same machine. His 1892 patent for a "Pneumatic Registering Ballot-Box" is a good example of what a McTammany machine entailed. These devices used punch-card technology to create a perforated, mechanical ballot that was fed into the machine via a tally sheet. The machine also included an automatic register. By creating a physical record of the ballot in addition to the mechanical one recorded on the registering device, McTammany's machine effectively created the first mechanically auditable voting technology. Finally, he also came up with an ingenious way of verifying that a ballot had been cast correctly. The ballot would pass through a machine that would blow air through the perforations, activating audible sensors. If a person had not voted or voted more than once, the machine would catch it.

Though McTammany's designs would never prove commercially successful, his

patents are important for two reasons. First, his designs are a precursor to the punchcard voting technologies that would emerge in the 1960s (and were still being used in Florida in 2000). Second, McTammany's prolific number of patents demonstrated an awareness that there was an emerging market for voting machines. He specifically references this market in the above patent when he declines to patent his registering device because there is already an existing market for them. Through the 1890s and 1900s, McTammany's patents began to contain congenial, market-oriented language. While most patents contain some reference to a) the purpose of the machine and b) its relationships to other existing machines, McTammany always oriented his descriptions to the specific problems that his voting machines would address in a clear effort to beat his competitors (McTammany 1897; McTammany 1910; McTammany 1914;). By the 1900s, it was assumed that private actors would make and supply voting machines for elections.

Between Myer's 1889 patent and 1900, 160 patents were filed related to mechanical voting machines, ballot boxes, and voting booths. During this time, new demands were made on mechanical voting machines. They needed to allow for both straight and split-ticket voting as well as two different ballot designs, the party column and the office group (Davis 1894; Bancroft 1897).[43] They needed to let voters cast irregular or write-in ballots mechanically as well as allow for cumulative voting (more than one candidate per office) and referenda voting (Honiss 1896; Lambert and Aronson 1896b; Ocumpaugh 1912). They had to allow for class voting, which prevented certain

[43] Office group ballots arrange candidates according to the offices they are running for as opposed to party column ballots, which arrange candidates by party rather than office. Office Group ballots were seen as a method to encourage split-ticket voting and erode the power of political parties.

groups such as women from voting for certain offices (Lambert and Aronson 1896a). Machines had to be simple enough for both ignorant and "voters of ordinary intelligence" to operate as well as provide options for blind and illiterate voters (Cummings 1897; Gilbert 1895; Sumter 1893). New designs allowed registers to be partially visible to the voter so they could confirm that their ballot was counted (Boma 1899). A handful of electrical machines were also patented (Stitzer 1895).

By 1896, basic elements of a mechanical lever voting machine had been roughly standardized. Arthur Bolfing's 1896 patent is a paradigmatic example. The machine was simple, provided for straight and split-ticket voting, multiple or cumulative voting (where the law allowed for it), absolute secrecy (afforded by an automatic voting booth), and an automatic count. Bolfing, when referencing the machine's affordances for ballot secrecy, twice asserts that the machine ensures the purity of the electoral process. This reference to purity represents an important moment where the secret ballot and therefore the act of voting had clearly become isolated from the social and political context in which the vote occurred. Here, the purity of the electoral process is defined in terms of an individual voter's ability to cast their ballot in secret, free of intimidation. This purity is ensured by the machine's design, which is fundamentally oriented around the secret ballot. The secret ballot solves problems like fraud and voter intimidation, provides fast counts, allows for different kinds of balloting, and provides a means for communicating a voter's own political choices. Technologically, the voting machine and the secret ballot ensure that a vote will be counted as cast. By the early 20th century, the act of voting had been idealized in the design and function of voting machines. This point is captured in the advertising material for Henry Neibur's voting machine: "That his machine during an

election is always in charge and control of the Board of Election Officers—the voter not having any access or control over it, but voting as now by an Australian ballot" (*Report of the Commission* 1925, 16).

In 1898, the federal government passed a law allowing for the use of voting machines in states where they had been legalized. Voting companies also emerged in the late 1890s, including the Empire Voting Machine Company (whose first patent was assigned in 1896), the McTammany Ballot Company, the Standard Voting Machine Company, and the U.S. Voting Machine Company (VMC). In 1900, Standard and VMC merged to form the U.S. Standard Voting Machine company. In 1914, after absorbing several smaller companies, U.S. standard would change its name to the Automatic Registering Corporation. It would again change its name in 1925 to the Automatic Voting Machine Corporation (Jones 2009; Saltman 2006). By the 1910s, this company had effectively monopolized the US voting machine market (this monopoly would last until the 1930s when the Shoup Voting Machine Company began to seriously compete). The emergence of voting machine companies during the late 19th and early 20th century institutionalized the role that outside companies continue to play in providing technologies for the electoral process.

While voting machines would not overtake paper balloting in popularity until the second half of the twentieth century, they clearly were an established part of electoral life by 1930. In 1928, advertising material for the Automatic VMC asserted that 1 in 6 voters would use their machines in the presidential election (Saltman 2006). While states were still deciding on the use of voting machines, it is clear that by the 1920s, the voting machine designed had stabilized. T. David Zuckerman, in his 1925 report to the Political

Research Bureau of the Republican County Committee of New York, argued that the period of experimentation with voting machines was now over as they had clearly demonstrated their advantages over the "failure of the 'human elemen" (15). In his seminal 1934 book, *Election Administration in the United States*, Joseph Harris asserts that "the conduct of elections in the precincts has undergone no substantial change since the introduction of the Australian ballot" (5). Harris goes on to identify eight areas in need of electoral reform: the creation of a centralized and integrated electoral organization, the creation of administrative protocols in the form of "rules, regulations, instructions, and inspections" for governing electoral processes rather than statutes, flexible organizational procedures to limit the cost of elections, the depoliticization of electoral machinery, creation of larger precincts, the simplification of procedures, methods, and record-keeping, the use of the Office Group ballot, and the simplification of absentee voting procedures (1934, 10). Of these eight, only one, the use of Office Group Ballots, concerns electoral technologies. The rest of Harris' recommendations primarily target the radical decentralization of US electoral processes. Harris goes on to devote two chapters of his book to voting technologies, one on voting machines and one on ballots. In these chapters, Harris clearly sees these technologies as one of the few stable features of the US electoral process.

In 46-years (1888-1934), one aspect (and only one) of American elections had stabilized —the idea that the act of voting should be organized around the secret ballot. While the secret ballot presented many advantages including fraud prevention, fast counts, and auditability, above all, it effectively cut voters off from political parties and other community relationships, creating an intimate relationship between the voter and

their ballot. Technologies such as lever-based voting machines further mechanized secrecy, enhancing the experience of the voter and stopping fraud. This technologization of the act of voting thoroughly isolated it from debates about electoral reform during the 20th century. Whether advocating for women's suffrage or African American voting rights, fighting against racialized gerrymandering, or pushing for campaign finance reform, the sanctity of the secret ballot is rarely ever questioned.

The stability of this arrangement would not be challenged until 2000 when the controversy over the Bush/Gore election and the passage of HAVA drew attention to the voting technologies used in Florida. However, sixteen years after HAVA and now reeling from the evidence of foreign interference in the 2016 presidential election, nothing much has really changed. Regardless of the technology you use to vote, absentee ballots in Oregon, Direct Recording Equipment with audit trails in California, or paper ballots in New York, our votes are still cast in secrecy and counted automatically. While HAVA was directed primarily at the usability of voting technologies, contemporary reform efforts have tended to focus on those machines' security vulnerabilities. However, even this renewed interest in voting technology has only reified how isolated the act of voting is from the environment in which it is cast. We do not focus our energies on securing the chains of custody for voting machines and certain kinds of paper balloting, funding for maintenance and upgrades, creating national standards and best practices for voting technology companies, or unifying the way we vote (the United States effectively has 50 different electoral systems and many more than that if you try to account for variance at the county and municipal levels). Ultimately, the starring role that voting technologies have played in every election of the 21st century has only intensified our

attention on the act of voting itself, obscuring the social, political, and technical contexts in which it is cast.

Conclusion

The introduction of the secret ballot fundamentally altered the entire process behind casting a vote. It necessitated the creation of a state bureaucracy for printing and disseminating ballots.[44] In doing so, it wrested control over the electoral process from political parties. It reorganized the polling station by making voting a somber and individual act. This meant the introduction of not just new ballot boxes and voting machines but also the creation of booths where a voter's privacy could be guaranteed (Evans 1917; Fredman 1968). It reformatted how the vote functioned as a form of political communication as well. In the era preceding the secret ballot, electoral outcomes were expressions of a party's power to mobilize voters — a purely social act that was meant to confirm a previous agreement. The Australian ballot recast the vote as the communication of an individual's preference, collectively articulating the "will of the people" (Crook and Crook 2011; Ewald 2009: Schudson 1998; Ware 2000).

As a technology, the secret ballot and mechanical voting machines rationalized and disciplined the act of voting. In doing so, they narrowed and inoculated the voting environment, isolating it from the "noise and irrationality of political conflict" (Barry 2001, 7). Following Clare Birchall's work on the logic of political secrecy and its function within regimes of transparency, the secret ballot is fundamentally a technology

[44] This new federal bureaucracy did not easily map onto the existing infrastructure of US elections, creating discretionary space between state electoral officers and local election officials. Some see this space as creating distance between electoral laws and statutes and their administrative implementation. For more see Alec Ewald, *The Way We Vote: The Local Dimension of American Suffrage* (2009).; Joseph Harris, *Election Administration in the United States* (1934).

that manages visibility (2011). By making the act of voting profoundly intimate, it creates both certainty and uncertainty at the heart of the voting process—I know I voted free from intimidation, but was my vote actually counted? This uncertainty is stabilized by both the rationalization and disciplining of the environment in which the vote is cast and the introduction of technologies to ensure that secrecy is protected, and counts can be confirmed and audited without identifying individual voters. This new act of voting configured through the secret ballot thoroughly cuts it off from the rest of the electoral process. In the next chapter, I show how this isolation became incorporated into electoral reform discourse after Bush/Gore.

CHAPTER V: CONFIGURING THE VOTER: THE SCIENCE OF ELECTION ADMINISTRATION IN THE UNITED STATES

On January 6, 2021, a motley, loosely organized, violent mob of white nationalists, including the Proud Boys, Oath Keepers, the Boogaloo movement, the Three Percenters, and supporters of the QAnon conspiracy theory, attacked the US Capitol in an attempt to stop the certification of Joe Biden's electoral victory. Incited by Trump's false assertions that the election was rigged and the administration's overtly racist, xenophobic rhetoric, the mob ransacked congressional offices, forced the house into recess, took control of the Senate Chamber, and killed a police officer. The violence, a sad but fitting epitaph for the Trump era, rocked the United States. For the first time in US history, a violent group of insurrectionists actively attempted to stop the peaceful transition of power. The acting president was fully complicit in this attempted coup.

In the months preceding the election and the months that followed it, Trump and an array of his supporters sowed seeds of doubt about the integrity of the US electoral system. Before the election, Trump and his ilk attacked, without proof, mail-in ballots, asserting that they were susceptible to manipulation. After the election, Trump, again without proof, asserted that in addition to mail-in ballots, electronic voting technologies, particularly those made by Dominion and Smartmatic, were also vulnerable to fraud. Trump's refusal to concede the election, dogged legal challenges, and apocalyptic rhetoric stoked a conservative media environment hungry for sensational, affective-laden reasons to not accept Biden's victory. From the *Epoch Times* and the *Gateway Pundit* to stopthesteal and the QAnon web community, wild theories about election rigging targeted the technologies we use to vote. While all claims of fraud were baseless, the fact that

voting technology lay at the heart of Trump's assertions is telling. Trump used the voter's intimate relationship with their voting technology and their anecdotal experiences at the polls to create doubt and suspicion. These doubts and suspicions became the seeds of more abstract conjectures about the integrity of the electoral process as a whole.

It would be easy to allow the violence at the Capitol and Trump's unprecedented attempt to steal the presidency to be the only legacy of the 2020 election. But there is another equally important story to tell. 159,633,396 voters cast ballots in the election. This represents the largest electoral turnout in the history of the United States by more than 23 million votes (136 million people voted in the 2016 election). The turnout rate was 66.7 percent, an approximate increase of 7 points from 2016, 8 points from 2012, 5 points from 2008, 6 points from 2004, and 9 points from 2000. You have to go back 120 years to the election of 1900 to find a higher turnout (Desilver 2021). The turnout in the 2020 election is even more remarkable because it occurred during the pandemic.

While many have argued that the uptick in participation was the result of the deeply polarized and vitriolic nature of the election, it is important to note that in response to the pandemic, many states made it easier to vote by changing election laws to expand no-excuse absentee balloting, dropping witness requirements for absentee balloting, suspending ID requirements, and automating vote by mail.[45] According to Pew, 46 percent of voters cast absentee ballots in 2020 and only 27 percent voted in person on polling day (27 percent also voted in person before polling day). In the same study, Pew found that 94 percent of voters found it very or somewhat easy to cast their ballot (Pew

[45] For a complete list of state-by-state changes, visit https://ballotpedia.org/Changes_to_election_dates,_procedures,_and_administration_in_response_to_the_coronavirus_(COVID-19)_pandemic,_2020

Research Center 2020). Facing a global pandemic and unprecedented pre-election attacks by a sitting president, the US electoral system enabled more of its electorate to vote than ever before. Election officials were able to think quickly and adapt their systems to the challenging electoral environment. Many voters were able to successfully engage a new election day normal.

Interestingly, voting technology played a role in both rhetorically motivating insurrectionist violence and in facilitating the election's historic turnout. The situation in 2020 is very different from the one in 2000. In the wake of Bush/Gore, the electorate, the media, the courts, and elected officials all had to be educated about the mysterious world of voting technology. Last year, the electorate's familiarity with voting technology both enabled greater participation in the electoral process and fueled wild accusations of electoral fraud. How did we get to this point? How did the US electorate become familiar enough with their voting technology and election administration to both adapt to pandemic-related changes and mount serious attacks on election infrastructure and voting machines? How was this newly knowledgeable voter made? How were they configured through existing electoral processes?

To address these questions, this chapter turns to the avalanche of policy-oriented literature on voting technology and electoral reform that emerged after the 2000 US presidential election. This multidisciplinary scholarship from computer science, management, political science, sociology, economics, and other fields has systematically analyzed how environmental factors, technology, and administrative processes affect how a voter experiences an election. Does ballot design impact whether a voter correctly casts their ballot? Do electronic voting technologies inspire confidence in voters? How do we

make machines more accessible for voters with disabilities? Do interactions with poll workers affect voter confidence? And how do we make voters confident in the security of various voting technologies? In response to these types of questions, this literature has developed new measures to assess how many votes are lost on election day by different voting technologies, developed environmental and systems-oriented frameworks for understanding electoral processes, and designed encrypted voting technologies that balance the necessity for ballot secrecy with a voter's desire to know that their vote was correctly counted (VTP 2012).

While the scope and precision of this literature are remarkable, perhaps the most surprising thing about it is that before 2000, it did not exist. That is before the 2000 election, there was almost no engagement with election administration by the academy in the United States. Following the 2000 election, influential reports released by the MIT/Cal Tech Voting Technology Project (VTP) (July 2001), the National Commission on Election Reform (August 2001), and the Commission on Federal Election Reform (September 2005) all remarked on the lack of research, funding, and interest in electoral reform before 2000. In their 2012 report, *Voting*: *What Has Changed, What Hasn't*, *& What Needs Improvement*, the VTP dedicated an entire section to the continued need to build an academically informed science of election administration.[46] How could it be that before 2000 there was virtually no scholarly engagement with election administration?

As I detailed in the last chapter, the emergence of the secret ballot and mechanical lever voting machines formatted the act of voting in the early 20th century. Women's

[46] For more on the VTP's own reflections on the science of election administration see Alvarez 2004 (VTP Working Paper 29); Alvarez et al. 2010 (VTP Working Paper 100); Cal Tech/MIT Voting Technology Project 2016 (VTP Report 9); Stewart III 2009c (VTP Working Paper 71); Stewart III 2017 (VTP Working Paper 131).

suffrage, the Civil Rights movement, and the emergence of computer-based voting technologies in the 1960s and 1970s did not substantively alter this arrangement. One of the side effects of this stabilization was that the nuts and bolts of election administration were neglected by academics. For example, in his seminal book *Southern Politics*, V.O. Keye (1949) asserted that "over most of the United States, the conduct of elections is the most neglected and primitive branch of our public administration…" (443). Roy Saltman (2006) similarly points out in his *The History and Politics of Voting Technology*: *In Quest of Integrity and Public Confidence*, that since the late 1930s, the field of election administration has "struggled…and floundered…" to professionalize due to the absence of academic interest (126).

The pre-2000 neglect of election administration as an object of social scientific inquiry or field for professional development in the academy places the flood of literature published after Bush/Gore in a new perspective. Over the last twenty years, a science of election administration replete with professional degree programs, dedicated think tanks, and collaborative relationships with state election officials has emerged. This new knowledge of elections has reformed electoral processes, developed new pools of expertise, and reconceptualized both the voter and the act of voting. In this chapter, I examine this new science of election administration to identify its modes of classification, mechanisms of problematization, and social and technical infrastructures. Through this analysis, I excavate two figures of the voter configured through an intersection of these classifications, problems, and sociotechnical relationships.

As mentioned earlier, there is now a vast amount of research on election administration by academics from multiple universities and many departments. To

narrow my discursive universe, I have chosen to focus on the corpus of reports and working papers produced by the Cal Tech/MIT Voting Technology Project (VTP) since 2001. The VTP provides a representative and longitudinal account of how policymakers, academics, computer scientists, and election professionals have understood the evolving issues facing electoral processes, technologies, and participation in the United States since 2000. Since its inception, it has been a consistent leader in the emerging field of election administration, with its principal investigators creating new centers for studying elections, consulting globally on election technology reform, advising President Obama's Presidential Commission on Election Administration, and developing new ways to measure the health of American elections. As of June 9, 2021, the project has produced 11 reports and 148 working papers examining various aspects of the electoral process. The last working paper was published in November of 2020. These reports and papers have been the basis of numerous peer-reviewed, book-length, and policy-oriented publications.

In this chapter, I argue that the VTP initially prioritized three areas for potential voting technology reforms: the electoral environment, the voting machine interface, and the security of voting machines. In each of these three areas, reform efforts focused on the relationship between the voter, the voting machine, and the voting environment. The figure of the voter that emerges from this analysis is not the rational, information-seeking citizen that is often held up as the democratic ideal. Nor are they the affective, uninformed dolt that threatens our democracy. Instead, what emerges is a complex voter — a savvy user that demands clean digital interfaces, a customer who is both always right and deeply shaped by systemic inequalities, and a suspicious skeptic who requires

independent verification that their vote was counted correctly. Specifically, I elaborate on two figures of the voter that emerge from the project's topical foci: the user-voter and the customer-voter. I also develop a figure of the suspicious user-voter as a sub-classification of the user-voter. I contend that these figures working together can help illuminate how voters in the 2020 election could both simultaneously accept new voting arrangements and be coerced by baseless claims of election fraud.

The rest of the chapter proceeds as follows. I provide an overview of the literature on voting/citizenship by media studies scholars and then briefly elaborate on Ian Hacking's concept of making up people to ground my methodological approach to analyzing the VTP corpus. I then use the VTP's initial report, *Voting: What Is, What Could Be*, to outline the set of problems, measures, and technological foci that motivated the project's initial research agenda. I then elaborate on the figure of the user-voter that is configured through the project's work on interface and ballot design and voting technology security and the customer-voter who emerges from the VTP's research on the electoral environment. I conclude by connecting this analysis to the paradoxical legacies of the 2020 presidential election.

Media, Technology, and the Citizen Voter

In *How Voters Feel*, Stephen Coleman begins his ethnographic study of English elections with the bold statement that "the political obsession of modernity has been the making of voters" (2012, 2). But what does it mean to make a voter? How are they assembled? Out of what stuff? Who makes the voter and to what end? These questions are not new, nor are they purely academic. Recall from last chapter Senator James Dixon's famous assertion during debates about the 15th amendment that "the question is

not what shall be the qualifications of the voter, but who shall create, establish, and prescribe those qualifications; not who shall be the voter, but who shall make the voter" (1869). Dixon's answer to the above questions is clear—the voter is made through laws that guarantee suffrage. However, following the 15th amendment, people of color, women, and other marginalized communities continued to be systematically disenfranchised despite legal protections. They were disenfranchised by literacy tests, implicit and explicit educational requirements, registration procedures, and other administrative measures. Clearly, the making of voters is not purely a legislative exercise. Over the last three decades, communications scholars have studied how conceptions of citizenship and voting have emerged from particular constellations of technology, media, and sociopolitical context.

Michael Schudson (1998), for example, argues that the ideal of the informed citizen, which emerged in the early 20th century, altered how individuals related to their communities, their nation, and their ballot. The informed citizen was not swayed by party loyalty or any other communal affections. Detached from the social and political pressures of their own communities, this citizen could connect their interests to more abstract policy orientations. This act of abstraction allowed citizens to engage politics as rational, calculating individuals, capable of drawing connections between their everyday lives and those of society at large. In this milieu, voting became a deeply private act—a sacred performance of citizenship and a ruthless method for pursuing one's own interests.

The emergence and codification of the informed citizen model depended on media technologies. In the 19th century, people received their political information in taverns, political party meetings, public celebrations, and face-to-face interactions with

politicians. Television, radio, and print allowed citizens to consume information as individuals. Political engagement no longer required social connection (in fact, a social connection could cloud one's judgment and lead to irrational decision-making). Ideally, voters then went to the polling station armed only with opinions they had formed on their own, without pressure from party flunkies, bosses, or community elites.

Schudson argues that the rights-based political movements of the 1960s and 70s expanded the realm of the political creating a new model of the rights-based citizen. People no longer consumed political information in the comfortable apolitical space of their living room. Homes, offices, and schools became the terrain of the political. At the same time, cable television, the Internet, and mobile technology exponentially enlarged the political information space. Writing in the late 1990s, Schudson saw yet another new model of citizenship emerging—one that contained elements of both the rights-based and informed models. These citizens cannot possibly consume all the relevant political information swirling around them. Instead, they monitor the political information environment, selectively deciding which issues they will engage. Schudson does not specifically discuss how this monitorial citizen votes. However, one could surmise that for the monitorial citizen, voting is not the vaunted act of citizenship that it is for the informed citizen. Instead, voting is one of many forms of political engagement that may or may not be appropriate depending on context.

I have discussed Schudson's work on citizenship at length for two reasons. First, it does not focus exclusively on the law as the realm where citizens are made. Instead, he brings the law into conversation with the social, mediated, and technical practices that shaped different cultures of citizenship in the United States. That is, citizens are made

through a heterogeneous mixture of practices. Second, it has had a deep influence on political communications scholarship in the 21st century. While the informed citizen model continues to haunt popular polemics about the death of democracy in the age of disinformation, new technologies and computer-based techniques such as data-driven campaigns and voter microtargeting have allowed communications scholars to develop new figures of the citizen-voter that both complement and challenge the monitorial model.

In *New Media Campaigns and the Managed Citizen*, Philip Howard (2006), for example, examines the emergence of what he calls the hypermedia campaign, which is an "agile political organization defined by its capacity for innovatively adopting digital technologies for political purposes and its capacity for innovatively adapting its organizational structure to conform to new communicative practices" (2006). Hypermedia campaigns use new technologies to target voters as private citizens. Weaponizing an emerging market for political information and the rapidly growing industry of political consultants and strategists, these campaigns can target the granular interests of potential voters. This process has further alienated the already isolated informed citizen. Sloughing off the need to imagine a connection between personal interest and broader social and political concerns, hypermedia campaigns specifically target individual interests, moving "democratic conduct…to the private spheres of screens, key strokes, and highly personalized news services" and incentivize political participation by offering "relief from private wrongs" (190).

The hypermedia campaign creates what Howard calls thin citizenship. Social media, personalized news services, and mobile technologies prioritize opinion over

information, outrage over deliberation, the simple over the complex, and the immediate over the past. Individuals are not actively engaged in a process of deliberation; instead, quick polls and overly simplified political choices create a reactive citizen—one that "can respond quickly to political urges and need not spend significant amounts of time contemplating political matters" (185).

Howard argues that the problem of thin citizenship is further exacerbated by the existence of our data shadows. These shadows produce the information that political consultants and strategists use to model voter needs, values, habits, and personalities. Hypermedia campaigns' interactions with voters occur therefore through the mediation of their data shadow. Importantly, a data shadow does not have a 1:1 resemblance with its real-life counterpart, making its influence on political beliefs and actions somewhat opaque. Moreover, as we have seen over the last two presidential cycles, hypermedia campaigns have not just used political information to market candidates and issues, but they have also used data to disenfranchise voters and discourage participation in political processes (Vandewalker 2020).

Written in 2006, Howard's influential account paints a grim portrait of the digital citizen-voter. Unlike Schudson's monitorial citizen overwhelmed by a deluge of information, Howard's citizen has been transformed into a political consumer whose interests are managed by political party actors using increasingly invasive and sophisticated data-driven surveillance techniques. While acknowledging the new mechanisms of control afforded to political actors through new media technologies, some political communications scholars have challenged the passivity of Howard's managed

citizen, instead, examining how people are actively engaging with the creation and circulation of campaign content.

In *Using Technology, Building Democracy*: *Digital Campaigning and the Construction of Citizenship*, Jessica Baldwin-Philippi (2015) argues that two modes of campaign communication, microsites and fact-checking sites, are producing a new model of skeptical citizenship. Microsites, essentially political hit sites, and partisan fact-checking sites are designed to reveal hidden information about one's political opponent. Microsites often do this through eye-catching graphics that demonstrate inconsistencies between a candidate's public statements and their voting record. Fact-checking sites supposedly illuminate who the opposing candidate really is.

Baldwin-Philippi's account is important for two reasons. First, rather than focusing on the environment in which political information is accessed and consumed, she examines the interpretative position in which campaign content places its audience. This framework allows her to engage the voter as an active participant in the formation of their political interests. Second, microsites and fact-checking sites use revelatory rather than informative frames to engage voters. Revelatory frames imply the existence of other hidden information, misinformation, and disinformation. In this environment, citizens need to be active and critical consumers of content, capable of navigating an increasingly detailed and nuanced web of information.

Philippi published her book in 2015, but the research was based on the 2010 mid-terms. Since that time, the information space cultivated by microsites and fact-check sites has expanded to include social media, messaging apps, and discussion sites. These spaces encourage citizens to actively engage in the political process. However, as we well know,

our current political information environment is dominated by mis- and disinformation and many voters have not become the well-trained skeptics for which Baldwin-Philippi hoped. Instead, the flashy hit piece aesthetics of microsites and revelatory nature of fact-check sites have been absorbed into a highly fractured information space where the lines between being informed and being indoctrinated are blurred.

Baldwin-Philippi's skeptical citizen exists in a networked information environment in which political content proliferates via multiple channels, connecting diverse communities to myriad political issues. While her focus is on how political campaigns engage voters through mediated content, other authors have focused on how networked media have further expanded the realm of the political, creating new modes of political participation in the process. For example, W. Lance Bennett (2007, 2008) has written about the rise of what he calls actualizing citizenship among youth cultures in the United States. In this view, campaign techniques that granularly target individuals increasingly exclude huge swathes of the population, primarily young people, leading "politics and government" to seem "distant, irrelevant, and inauthentic to many citizens, particularly younger demographics" (2008, 13). This environment incentivizes individuals to embrace personalized forms of political engagement such as volunteering, issue-based donation, and ethical consumerism rather than traditional forms of political participation such as voting or petitioning. Bennett contrasts this model with what he calls the Dutiful Citizen model, which is more commonly adhered to by older generations. This model requires a strong sense of civic duty grounded in an obligation to participate in formal political processes. Voting is the central democratic act and political mobilization occurs through top-down organizing efforts of political parties and civil

society organizations. The primary source of public information is traditional mass media and the government.

In the spaces of actualizing citizenship, political action is coordinated through peer networks cultivated on social media and other interactive technologies (Bennett 2007, 2008). In later work, Bennett and Segerberg (2012) would call this horizontally organized mode of political action, connective action, contrasting it with the classical notions of hierarchically organized collective action. Connective action redistributes authority and expertise from traditional sources such as the mass media and political parties to networked sources of information. This redistribution fosters distrust of traditional sources of authority, especially mainstream media and government actors.

Bennett's model is sympathetic with dominant ways of looking at identity in the era of social media and digital platforms (for an overview see Papacharissi 2018). Actualizing citizens are not passive or purely monitorial. Instead, they are engaged in an iterative and reflexive process of political engagement and active in decentralized networks of political participation that encompass everything from lifestyle choices to consumer habits and transnational political issues. They exist in an increasingly perilous political information space characterized by micro-targeted content and the proliferation of mis- and disinformation. We hope that these citizen-voters can adopt the skeptical attitude detailed by Baldwin-Philippi, but our experience shows us that often the inundated actualizing citizen does not live up to this ideal.

Each of these authors elaborates a figure of the citizen-voter, who engages politics based on the particular configuration of social, technical, and mediated relationships that compose their political information environment. Invariably, these relationships are

perpetually shifting as new technologies emerge. Interestingly, this work almost exclusively focuses on who the citizen-voter is before they cast their ballot (if indeed they reach the polls at all). The implicit supposition of this work then is that voters arrive at the polls as preformatted political entities. The actual act of voting is the culmination of months of political targeting, selective exposure, and information saturation. This chapter complicates this view by focusing on the relationship between voters, voting technologies, and the electoral environment. Who is the voter created by these relationships? To address this question, I turn to Ian Hacking's framework for making up people.

Making up the Voter

Ian Hacking has been developing a framework for understanding how the human sciences make up people since the 1980s.[47] My focus in this section is on elaborating, in as straightforward a way as possible, how the process works and how I will apply it to the VTP's corpus on electoral reform. In "Kinds of People: Moving Targets" (2007), Hacking provides a fairly concise overview of the process of making up people. The first aspect of this framework is classification. The second aspect is the individuals or groups of individuals that are classified. The third is the formal institutions which refine and disseminate classifications and produce the fourth aspect of the framework, knowledge about the people who are classified. This knowledge is further legitimated by experts, who use it in their practices.

Hacking provides a concise illustration of how these various aspects interact: "…the expert or professionals who generate or legitimate the knowledge…, judge its

[47] Hacking first advanced the notion of "Making up People" in the 1986 edited volume *Reconstructing Individualism*.

validity, and use it in their practice. They work within…institutions that guarantee their legitimacy, authenticity, and status as experts. They study, try to help, or advise on the control of the…people who are…classified of a given kind" (297). Hacking notes that this framework is necessarily broad as various elements of the model will be more or less important for analyzing different cases. In my analysis of the VTP literature, for example, I focus on knowledge, classifications, and expertise more than I do on individuals and institutions.

Hacking also identifies 10 engines of scientific discovery that work together to develop, proliferate, and refine classifications. My work mobilizes three of these engines in its analysis: counting, quantification, and correlation.[48] For a classification to take hold, we need to know how many people belong to the class and we need a quantitative rubric for classifying them. Correlation provides a way to measure relationships between exogenous factors and a specific category.

In addition to these engines, I have developed two more that I will use extensively in my analysis of the VTP: problematization and sociotechnical infrastructure. Problematization, in this framework, refers to the way that a discourse identifies and elaborates electoral problems and how these problems are connected to the experience of the voter. Sociotechnical infrastructure, in this context, broadly refers to the relationships between voters, technology, an electoral environment, election administrators, and administrative processes and how these relationships produce a voting experience that can be evaluated, problematized, and optimized. In my analysis of the VTP literature, I examine how methods of counting, quantification, and correlation are used to identify

[48] The 10 engines are count, quantify, create norms, correlate, medicalize, biologize, geneticize, normalize, bureaucratize, and reclaim our identity.

electoral problems and how these problematizations yield interventions into the sociotechnical infrastructure of election administration. From the intersection of these methods, problems, and sociotechnical interventions, I argue that a figure of the voter emerges.

Schematically, Hacking's framework appears to be rather top-down, suggesting that individuals of a particular class have very little control over their classification. This is not the case. In studies of autism (1995), child abuse (1999), and multiple personality disorder (1995), Hacking has examined what he calls the "the looping effects" of human kinds. New classifications can change a person's life, transforming their experience of the world and altering how they understand their past. For example, being diagnosed as autistic or having an experience categorized as abuse by an expert can change how you enter the world, how you know yourself, and how you interact with others. Looping occurs when the classified person interacts with their classification, challenging it and forcing experts and institutions to reconceptualize elements of the category (1995). In my analysis of the VTP corpus, I will not emphasize looping, but it is important to understand that looping is built into the VTP's DNA. Most of the group's core concepts and proposed solutions come out of surveys and experiments. These methodologies allow the individuals being studied to actively contribute to the refinement and redefinition of categories. The social scientific approach that grounds the VTP's methodology builds looping into the process.

Before moving on, I want to note one difference between voters and the kinds of people analyzed by Hacking. He tracks autism, child abuse, multiple personality disorder, and other kinds to their points of origin as socially meaningful, contemporary categories.

For example, he argues that child abuse, "as a way to describe and classify actions and behavior" emerged among a group of pediatricians in Denver, Colorado between 1960-1961 (1999, 133). The concept went public as "battered child syndrome" at the American Medical Association conference in 1961. For Hacking, before 1960-1961, there was no concept of child abuse as we know it today. One could not be a victim of child abuse or a child abuser before that time. He tracks, for example, how the modern concept of child abuse diverged from previous Victorian norms against cruelty to children. Chiefly, what is new about our modern conception of child abuse is that it emerged within medical discourse. He similarly argues that multiple personality as a form of personhood emerged in the 1980s. He asserts that "in 1955 this was not a way to be a person, people did not experience themselves in this way, they did not interact with their friends, their families, their employers, their counsellors in this way; but in 1985 this was a way to be a person, to experience oneself, to live in society" (2007, 299). For the most part, Hacking's kinds all share a similar clean point of emergence as psychological classifications. Voters are different.

The voter clearly existed as a popular, normative, and academic figure in the United States before the 2000 election. Pages and pages of academic writing, legal wrangling, and popular press have debated who the voter is. Without a doubt, there is a popular understanding of what it means to vote and what being a voter entails. And as evidenced by the earlier overview of the citizen-voter literature, there is extensive academic literature in media and communications studies on the topic. I am arguing that alongside these popular and academic conceptualizations there sits another, new figure of the voter that emerges after 2000 as an object of technical, policy-oriented, social

scientific discourse. This voter is configured through a specific set of problematizations, sociotechnical relationships, and methodological strategies and they are not reducible to the conceptualizations of the voter found in the media and other academic discourses. I am not arguing that this figure of the voter is more important than those models. Instead, I contend that this figure should not be neglected as we grapple with the paradoxical legacies of the 2020 election.

Cal/Tech MIT Voting Technology Project: What Is, What Could Be

The VTP came into being on December 15, 2000, just a month after the election and only three days after the Supreme Court's ruling that effectively ended the recount. The brainchild of David Baltimore, President of Cal Tech, and Charles Vest, President of MIT, the VTP was designed to bring a bipartisan, multidisciplinary group of academics together to assess the magnitude of the problems facing the US electoral process, identify their root causes, and design technological solutions to them.

In March of 2001, the VTP released its second working paper: "Residual Votes Attributable to Technology: An Assessment of the Reliability of Existing Voting Equipment." In this paper, the VTP developed a way to measure the number of votes lost in a particular race. This measurement, called the Residual Vote Rate, counts the number of under- and overvotes in a particular race and expresses that number as a percentage of the total turnout. The VTP used the residual vote rate to calculate that 4-6 million votes were lost in the 2000 election: 1.5-2 million because of voting technology, 1.5-3 million because of registration problems, and 1 million due to problems at polling places. They also used the measurement to show which voting technologies had the highest residual vote rates. That is, they were able to show which voting technologies lost the most votes.

Interestingly, punchcard technologies had a similar residual vote rate to direct recording electronic (DRE) voting machines. The residual vote rate represents the first and perhaps most powerful achievement of the VTP. By creating a way to quantify the number of lost votes and correlate those numbers with specific aspects of the electoral process, namely poll experience, registration, and voting technology, the VTP initiated a quantitative, social scientific, and technology-centric approach to studying elections that has dominated the discourse around electoral reform for over two decades (Ansolabehere and Cal Tech/MIT Voting Technology Project 2001).[49]

In the VTP's first major report, *Voting*: *What Is*, *What Could Be*, published in July 2001, they used the residual vote rate to identify problems with the electoral process. The report was written by a group of 10 scholars from electrical engineering, political science, media arts and sciences, computer science, economics, and management with the help of 50 graduate and undergraduate students. It had a significant impact on the voting technology provisions of the Help America Vote Act (HAVA) and set the agenda for future research on election administration.

Voting begins by elaborating two broad but related problem areas for US election administration. The first area focuses on recounts. Electoral recounts might seem like a straightforward way to audit an election. However, voting technology can complicate recounts in important ways. In Florida, the emphasis on chads neatly illustrates the issue. Manual recounts of punchcard ballots revealed hanging, dimpled, pregnant, and other types of chads. Essentially, these modifiers describe the degree to which a chad was

[49] For more on residual vote rates see Alvarez et al. 2011 (VTP Working Paper 105); Grigg 2008 (VTP Working Paper 38); Stewart III 2005 (VTP Working Paper 25); Stewart III 2009a (VTP Working Paper 81); Stewart III et al. 2019 (VTP Working Paper 133)

actually punched. Election officials were put in the position of determining what kinds of chads should be counted. Does a dimpled chad indicate voter intent? How about a hanging chad? In Florida, there were no standards for determining voter intent and recounts became highly partisan affairs. The lack of standards for determining intent was one of the primary reasons the Supreme Court stopped the recount.[50]

Based on their analysis of residual votes and recounts, the VTP argued that no voting technology should place the responsibility for determining voter intent on the subjective capacities of election officials. One clear path for reform became obvious based on this insight. Voting technologies with high residual vote rates and complicated auditing procedures needed to be replaced. Moreover, new voting technologies are needed that allow voters to cast their ballot easily and confidently. The layout of punchcard voting systems and the interface of many DRE voting technologies confused voters, leading to lost votes and voter frustration. Voting technology interfaces needed to be designed with their user in mind—this user might be in a hurry, lack political knowledge, have rudimentary computer skills, or have disabilities. A good voting technology should enable all of these users to cast their ballot easily and confidently.

The second problem area identified by the VTP was system failure. The group's early research had shown that millions of votes were lost in the 2000 election due to a variety of factors. Among these factors were long lines at polling places, voter education issues, registration problems, poor poll worker training, unclear chains of custody, poor polling place design, poor information sharing between local, state, and federal election officers, and inconsistent application of voter ID laws. All these problems resulted in lost

[50] For more on the legal dimensions of Bush v. Gore see Ackerman 2002.

votes. Each of these issues created new research paths investigating various aspects of the electoral system including poll worker interaction, voter education and instructions, and polling place design.[51]

This systems perspective allowed the VTP to develop a new description of what elections actually do. Elections are not merely mechanisms for producing outcomes. Instead, they offer a service to the voter that allows them to experience democracy through the casting of their ballot. If elections are administered poorly then the voter's experience will be negatively impacted. The voter in this model is no longer just an actor engaged in the performance of civic duty, but a customer who needs to be satisfied by their experience at the polls. Reform efforts should aim to optimize this experience through better ballot design, poll worker training, poll design, and voter education. This customer service model of electoral reform also emphasizes the importance of the data generated by voters throughout the electoral process from residual vote rates and registration errors to post-election surveys and public opinion polls.

The VTP's initial analysis of system failure and recount problems opened the door to novel methods of problematizing elections and created new paths to reform by connecting these problematizations to the sociotechnical environment in which elections take place. Ambiguities around voter intent led the VTP to begin research into ballot design and user interfaces. Systemic problems directed them to examine how different

[51] For more on problems related to various aspects of election administration see Alvarez 2019 (VTP Report 10); Alvarez et al. 2009 (VTP Working Paper 85); Alvarez and Hall 2008 (VTO Working Paper 65); Burden and Milyo 2013 (VTP Working Paper 111); Hall 2009c (VTP Working Paper 78); Hall and Alvarez 2003 (VTP Working Paper 10); Hall and Moore 2011; Selker 2004a (VTP Working Paper 19); Stewart III 2009d (VTP Working Paper 88) Stewart III and Shaw 2013 (VTP Working Paper 113)

aspects of the electoral process affected voter experience. The VTP took a similar approach when examining voting machine security.

While not included in the report's initial set of problematizations, the authors devote an entire section to security problems. It is important to note that the security of voting technologies was not really at issue following the 2000 election. However, the rapid adoption of DRE voting machines, the increased use of no-excuse absentee ballots, and nascent interest in Internet voting made security an important issue for the VTP. Also, as I discussed last chapter, while democrats focused on accessibility issues following the Bush/Gore debacle, Republicans fabricated security as an equally important issue.

In *What Is*, the VTP identified two basic types of fraud: voter manipulation and coercion and machine tampering. They used these two broad categories to identify five security threats that the use of electronic voting technologies introduces into the electoral environment. First, there is a loss of openness. Voting machines are back boxes. If they have been tampered with, poll watchers, election officials, and other voters cannot tell. Second, traditionally, the decentralized nature of the US electoral system has meant that there were many eyes on every aspect of an election. No single actor was in control, making systemic manipulation very difficult. Black-boxed voting technologies risk ceding control over voting technology to voting technology companies. Related to this point, major security risks are created when we ask voting machines to "do it all"—generate ballots, allow voters to cast ballots, and count ballots. This places most of the responsibility for election security on the machine itself (and the companies that build and maintain them). Fourth, many direct recording electronic voting machines, at the

time the report was written, lacked redundancy, meaning they did not provide an independent record of who voted for whom. This lack of auditability makes recounts using paperless DREs impossible, undermining electoral integrity and voter confidence. Fifth, private voting technology companies are not transparent or accountable to the public.

The VTP offers straightforward solutions to these problems. Machines should be simple, auditable, and open source. Auditability should take two forms. First, voters should be able to see some concrete evidence that their vote was cast as counted. Second, maintenance and event logs should be open to public scrutiny. Finally, election officials and poll workers should understand how their voting technologies work so that they can address issues that arise during polling.

While most of these solutions target machine tampering, the VTP also addresses concerns about voter manipulation and coercion in the report. First, they are wary of voting technologies that allow a person to cast their ballot from home. Absentee ballots and Internet voting introduce new vulnerabilities into an already complicated system. Second, when gaming out election security, one needs to conceptualize the voter as a threat that must be neutralized. Third, related to auditability, the voter needs to be confident that their vote was counted without compromising the secrecy of the vote. Each of these points led the VTP to develop encrypted voting technologies and modular approaches to electoral security.[52] Similarly, to the VTP's discussion of voter intent and user interface design, the voter that emerges from the report's analysis of potential security issues is also a user. This user, however, is tech-savvy and suspicious.

[52] For a discussion of modular system design, see Bruck et al. 2001 (VTP Working Paper 3)

The VTP's initial report offers much more in the way of recommendations than discussed here. However, each of the three problematizations outlined above, voting technology and user intent, system perspectives and customer service, and user security became primary research foci in the years to follow. In the next two sections, I delve into the VTP's research on user interface and ballot design, voting machine security, and electoral systems to elaborate in more detail the nascent figures of the user-voter and customer-voter discussed in *What Is*.

User-voter

In *What is*, the VTP identified poor user interface and ballot design as the biggest drivers of lost votes.[53] They found that DRE and punchcards had the highest residual vote rates. The report suggests that each of these voting technologies be replaced by optical scan voting technologies, which had a lower residual vote rate. However, it also recommends increased research into DRE user interfaces (UI). Their approach to UI design emphasizes the relationship between the voter, voting technology, and the process of casting a ballot. Rather than placing responsibility on either the voter or the machine, this relational approach invites nuanced ways to both problematize human interaction with voting machines and research solutions. Selker et al. (2005b) neatly state the opportunities afforded by UI research for DRE voting technologies: "the ability to accurately and repeatedly count votes, but also to provide a means of effectively making selecting easier, flagging or disallowing voting mistakes and empowering populations that were previously disenfranchised from the voting process" (3).

[53] For a discussion of ballot design issues, see Alvarez 2002 (VTP Working Paper 4); Alvarez et al. 2005 (VTP Working Paper 65); Sinclair 2005 (VTP Working Paper 33); Sinclair and Alvarez 2003 (VTP Working Paper 7).

Poor interface and ballot design can mislead voters into believing they have successfully cast their ballot. They can also create voter confusion and disenfranchise voters with disabilities. Interface problems include ballot layout and navigation, ordering effects, unclear voter instructions, font, size, brightness and formatting issues, and choice manipulation (Selker et al. 2005b). Creating solutions to these problems requires surveys, interviews, user experience experiments, and statistical analysis. The VTP's research on user interfaces led to the creation of bespoke voting systems designed to make voting easier, create confidence in the voting process, and enfranchise voters with disabilities.

In "Orienting Graphical User Interfaces Reduce Errors: The Low Error Voting Interface," Ted Selker et al. (2005a) develop a Low Error Voting Interface (LEVI). LEVI allows users to navigate elections using a tab-page system. Each race or referendum has its own tab and clicking on the tab brings up a page with the corresponding race/races. Selection simply requires clicking on the desired candidate. Your selection is automatically saved, and you can move to a different race by clicking on another tab. Once you have voted for a particular race, the tab becomes highlighted. Once a voter has finished casting their ballot, they click submit. If there has been an error such as the voter missed a race or overvoted, they are notified and asked to go back and finish/correct the ballot.

LEVI's design conceptualized voting as a task, the ballot as a platform, and the voter as a user. The interface design also stressed process over action. Paper ballots deploy an action-oriented interface that organizes the ballot race by race or put differently, vote by vote.[54] A process-oriented interface allows the user to navigate the

[54] For a discussion of improving the usability of mail-in ballots, see Selker and Blanchard 2020 (VTP Working Paper 141)

ballot as they see fit, enabling the user to move freely among different races in whatever order they wish. This type of interface simplifies formatting, affords smooth navigation, and provides real-time feedback, allowing the voter to focus on the task at hand. Theoretically, this engineered focus slows down a voter's decision-making, creating space for increased deliberation (2005a, 2005b).

Selker et al. quantitatively and qualitatively tested LEVI. In the qualitative testing, the LEVI team found that users engaged the ballot's form intuitively, rarely engaging the page-by-page navigational instructions. They also discovered that the smoother interface did not slow users down; instead, they moved quickly through the ballot, relying on the platform to inform them when they had committed an error. It is interesting to note that though LEVI's design was intended to create greater opportunities for deliberation, voters did not engage it in this way. As a user, the voter's interest in politics, overall education, or political inclinations did not determine how they engaged with the electoral process. Instead, voters used the system as they would any other platform, checking boxes quickly and relying on their intuitive knowledge of navigating webpages and other digital platforms (2005a).

This finding reminds us that the relationship between classifications, applications, and sociotechnical realities is complicated. LEVI's design was informed by a deliberative conception of the voter. This conception shaped how the researchers actually built LEVI. However, voters, though they responded positively to LEVI, did not conform to this deliberative expectation. The VTP did not see this as a problem. Their goal was to design a voting system that allowed users to easily cast a ballot by providing a simple interface, smooth navigation, and error recognition. Though informed by a deliberative model of

the voter, the output of the experiment decidedly departs from this expectation, creating a rather sharp distinction between normatively grounded models of voting and voter behavior and the user-voter configured through the VTP's research.

The voters who took part in the qualitative experience also identified some issues with LEVI and suggested improvements. First, they had trouble de-selecting a candidate. If a voter wished to change their voter, they had to click on their new choice and then click on their old choice, de-selecting it. Users expected the interface to work more like the radio buttons you find on webpages, where simply clicking a previous selection, de-selects it. The second suggestion was to provide iconographic representation next to each candidate/choice, either a party symbol or a picture of the candidate. While many states' election laws do not permit this kind of formatting, it is telling that the participants wanted another layer of informational context added to the ballot and that this layer of information would have further simplified choice selection (2005a).

The LEVI project is representative of the VTP's approach to user-interface design: Process-oriented, emphasizing user experience, informed by survey research and secondary literature, experimentally tested using quantitative and qualitative methods, and easily integrated into other voting systems. The user that emerges from the LEVI study is familiar with the basics of computers and platform navigation and desires simplicity in ballot formatting, selection mechanisms, and error recognition. They wish to make their decisions quickly and for the machine to tell them when they have made an

error. Systems like LEVI do not ask the voter to be educated or politically informed; instead, they try to optimize the experience of casting a ballot for the user-voter.[55]

Much of the VTP's research on user-interface design has focused on improving accessibility for voters with disabilities, especially those with auditory and visual impairments. Historically, voters with auditory or visual impairments had to have assistance voting, compromising the secrecy of their ballot. DRE voting technologies create opportunities to preserve secrecy while also improving usability. For example, with DREs, "Vision-impaired voters can use headphones and systems that provide verbal feedback. Mobility-impaired voters can use alternative input mechanisms to make their selections" (Forsythe 2005, 19).

The VTP's research in this vein has included audio-only voting interfaces, further refinements of the LEVI system designed to focus a voter's attention on choice selection such as page customization and lighting and magnification enhancements, Wii-remoted-based voting, and the development of polling place support tools (Selker 2004b; Selker et al. 2014).[56] Polling place support tools, for example, allow poll workers to digitally organize the polling area in order to maximize accessibility. Wii-remote-based voting uses a Nintendo WII controller's motion capture technology to enrich the voting experience for impaired users. The controllers afford multiple ways for the voter to interact with the ballot interface including "buttons, gestures, and vibrations" (Selker et al. 2014, 40).[57] Accessibility research also extended to auditing technology and voter

[55] For discussion of other voting systems see Carback et al. 2010a (VTP Working Paper 96), 2010b (VTP Working Paper 143); Librud 2004 (VTP Working Paper 17); Selker 2008 (VTP Working Paper 61); Selker et al. 2014 (VTP Working Paper 148).

[56] This 2014 report, entitled "Research in Accessible Voting Report," provides an overview of the project's research on this topic. It discusses research done throughout the history of the VTP.

security concerns with Selker (2004b) developing a Voter Verified Audio Transcript Trail (VVATT). This device allows a voter to hear their choices and selection.[58]

The user-voter configured through the VTP's UI and accessibility literature is a complex figure. They crave a simple, smooth voting process that alerts them to when they have made a mistake. They demand both absolute secrecy and ballot transparency. They exist on a spectrum of technological literacy, and they come to the poll with different needs and problems. The user-voter's relationship with voting machines and the electoral process is depoliticized, rationalized, and optimized. Any problems a user-voter has can be addressed through applied research that quantifies, counts, and defines the issues. Solutions can then be designed that target the sociotechnical relationships between a voter and their voting technology.

Selker's (2004b) research on the Voter Verified Audio Transcript Trail connects to another problem area where the voter is conceptualized as a user, voting technology security. Over the course of the last twenty years, the VTP has developed several new voting systems and technologies. Some of these have largely been theoretical and others have been built and tested in live elections.[59] One tension universal to all these systems is the desire to design a voting machine that can both maintain voter secrecy and give the voter 100 percent assurance that their vote has been counted correctly. Most voting systems in use today tend to value secrecy more than transparency when it comes to

[57] Wii-remote-based voting was developed by Ying-Chuan Liu and Minh Pham in an Accessible Voting course taught by co-taught by Ted Selker, co-designer of the LEVI system and several other voting systems for the VTP, at Carnegie Mellon University- Silicon Valley.

[58] For more on obstacles for voters with disabilities, see Schur 2013 (VTP Working Paper 2013).

[59] See Liburdi 2004 (VTP Working Paper 17) for an example of a theoretical system. See Carback 2010a (VTP Working Paper 96), 2010b (VTP Working Paper 143) for examples of systems tested in the field.

voting security. That is, preserving the secrecy of the vote is more important than being able to verify that a particular vote was counted as cast. Most election reformers and many voters see this as an untenable situation that requires attention—one should be able to both vote in absolute secrecy and verify that their ballot was counted correctly (Adida 2006).

One popular response to this problem has been the development of Voter Verified Paper Audit Trails (VVPATS). A VVPAT provides a tangible receipt that can be verified by the voter before being captured in a lockbox or other storage mechanism. While VVPATs might seem an ideal solution to the secrecy-transparency dilemma, they still have issues. The major problem is that they still ask voters to trust election officials to handle the receipts properly (Adida 2006). As detailed in chapter 3 on Indian voting controversies, one of the major ways election administrators secure voting technologies is by establishing a rigorous chain of custody—where voting machines are stored and how they are transported should be easily verifiable. VVPATs also utilize a chain of custody as a fundamental security feature. Once a voter confirms that their ballot has been cast correctly, the receipt is locked in a secure container. Theoretically, voters can track what happens to these containers after election day. As Ben Adida[60] (2006) notes in his doctoral dissertation, published as a VTP working paper, the VVPAT continues to ask the voter to place an untenable amount of trust in election officials. While adding a layer of redundancy, the VVPAT embraces a "trust-by-proxy" model that does not address the

[60] Adida is now Director of VotingWorks, a nonprofit voting technology company that is currently making inroads in the voting technology industry.

security-transparency dilemma. The only way to solve this dilemma is to provide voters their own mechanism for verifying that their vote has been properly counted.[61]

Adida's dissertation offers cryptographic voting as just such a solution. The cryptographic approach replaces the traditional chain of custody, trust-by-proxy model of security with a "mathematical proof of end-to-end behavior" (2006, 33). In general, a cryptographic voting system works as follows: the voter casts their ballot at a physical polling booth. At the time of posting, the voter is given some sort of key for decrypting their vote. The encrypted ballot is posted to a digital bulletin board where it is paired with the name of the voter who cast it. By visiting a website, a voter can enter their key, decrypt their ballot, and confirm that it has been counted correctly. In this system, tallying the votes requires multi-step decryption that ensures ballot secrecy is preserved. There are many variations of this general cryptographic system.[62] One called Scantegrity was implemented by the VTP in local elections in Takoma Park, Maryland in 2009 and 2011.[63]

Scantegrity offered voters a hybrid model of encrypted voting. Voters did not cast their ballots electronically. Instead, they used optical scan ballots, which were then collected and counted as usual using tallying machines (in other words, the vote count was not the result of decrypting votes via a digital bulletin board). Each ballot was given

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[61] For more on VVPAT see Cohen 2005 (VTP Working Paper 46); Selker and Goler 2004 (VTP Working Paper 16). For a somewhat kooky example focused on paper-based elections in corporate America see Blanchard et al. 2020 (VTP Working Paper 142).

[62] For more on cryptographic voting see Forsythe 2005 (VTP Working Paper 41); Park and Rivest 2016 (VTP Working Paper 128); Rivest and Madars 2016 (VTP Working Paper 144); Rivest and Rabin 2014 (VTP Working Paper 122).

[63] For a complete breakdown of the Scantegrity project, see Carback 2010a (VTP Working Paper 96), 2010b (VTP Working Paper 143); McBurnett 2014 (VTP Working Paper 126)

a unique serial number and when voters filled out their ballot, they used a special decoder pen that revealed a previously invisible confirmation code. After voting, they could visit a publicly accessible website and check that their ballot serial number and codes matched correctly, verifying that their vote had been counted correctly. The Scantegrity pilot was fairly successful with the machine working properly in both elections. However, many voters did not bother to check whether their ballot was counted correctly online. This finding echoes the literature on VVPATs, which has also shown that people rarely take the time to check a voting receipt (Cohen 2005; Selker and Goler 2004).

The cryptographic approach builds skepticism into the voting machine's relationship with the voter. The user-voter configured by a cryptographic voting system approaches their ballot already suspicious that their vote will not be counted probably. Much like the deliberative assumptions built into LEVI's design, real-world tests like Scantegrity show that users do not necessarily engage the voting process with suspicion. However, whereas the usefulness of LEVI's system is not undermined by voters not engaging its deliberative features, the fact that voters may not be interested in the self-auditing affordances created by cryptographic voting systems suggests that voters' security concerns may not be solvable using technology. It also points to two important differences between the user-voter configured in the VTP's UI literature and the one that emerges from the security literature.

First, UI research problematizes the act of casting a ballot from the point of interaction between a voter and a voting machine. In this model, the user-voter is not tasked with optimizing their own experience. Instead, UI sees human-technology problems as relational rather than fault-based. Security-oriented approaches place much

of the burden of auditability on the voters. VVPATs and cryptographic systems each require the voter to verify that their ballot has been counted as cast. The latter makes the user-voter a primary line of defense against election tampering. While audits of cryptographic elections can be performed by election administrators, the system's design is oriented toward user responsibility.

Second, UI research is grounded in an analysis of the real problems that voters encounter at the polls. The latter addresses a perceived or potential problem. This gap between perception/potential and actual usability highlights one of the basic tensions running throughout the VTP's security literature. Cryptographic and other security approaches are necessarily adversarial.[64] That is, they assume election systems are under imminent threat from corrupt voters, election officials, and voting technology manufacturers. This fundamentally adversarial orientation conditions two crucial assumptions foundational to the suspicious user-voter. First, if voting machines are under constant threat then voters should be paranoid that their vote is not being counted correctly. Second, the only way to ensure that elections are secure and voters are confident in their integrity is to provide a technological solution that provides the user with the ultimate ability to audit the election. The user-voter configured through these assumptions is not only responsible for ensuring an election's integrity but also needs to be tech-savvy and deeply committed to secure voting.

The suspicious user-voter that emerges from the security literature is premised on this adversarial security model. While public opinion polls do show that voters are concerned with voting technology security, it is unclear what security features these

[64] For more on this adversarial model see Adida 2006 (VTP 51); Blanchard et al. 2020 (VTP 142); Forsythe 2005 (VTP Working Paper 41); Park and Rivest 2016 (VTP 128) Shen 2013 (VTP 109).

concerns are explicitly connected to. For example, Atkeson (2011) finds that voters might be confident that their vote was counted correctly but believe that electoral outcomes at the state and federal level are compromised and vice versa. Furthermore, media exposure, partisanship, and winning and losing effects also affect whether a voter believes their vote was counted correctly.[65] In short, it is unclear whether there is a technological solution to the problem of voter confidence in voting machines. The user-voter made up by the security literature then is in some sense aspirational. That is, they are a fabricated figure for whom the voting process can be secured via technical solutions such as audit trails and cryptography.

Customer-Voter

In 2014 testimony before the U.S. Senate Committee on Rules and Administration, released as VTP WP 123, Charles Stewart argued that the United States needs a more data-driven approach to studying elections. He begins by showing that elections are already swamped with data. Precincts produce election returns and voting machines have extensive event logs. The U.S. Census Bureau publishes the Current Population Survey and the Voting and Registration Supplement, and the Election Assistance Commission produces the Election Administration and Vote Survey. All this data, Stewart argues, can be translated into useful, policy-oriented research.[66]

[65] For more on voter confidence Alvarez et al. 2020 (VTP Working Paper 139); Hall 2009a (VTP Working Paper 76); Llewellyn et al. 2009 (VTP Working Paper 79); Sances and Stewart III 2014 (VTP Working Paper 125); Stewart III 2009c (VTP Working Paper 71).

[66] For more election data and VTP methodology see Alvarez 2009 (VTP Working Paper 94); Alvarez et al. 2004 (VTP Working Paper 21); Alvarez et al. 2011 (VTP Working Paper 105); Grigg 2008 (VTP Working Paper 38); Stewart III 2009b (VTP Working Paper 88); Stewart III et al. 2019 (VTP Working Paper 133)

One of the ways Stewart III argues for the importance of a data-driven approach is by analogizing the data generated through electoral processes to transaction data generated by commercial businesses:

> Retailers know that transaction data can tell managers about the behavior of their customers; the best managers know how to turn this data into changes in customer service that improve the shopping experience. It is not a big stretch to think about voters as customers when they come to the polls, and thus to ask, how can transaction data help improve the convenience and security of voting (10)?

Voting transaction data such as the time a voter checks in to vote, the time they cast their ballot, and the time they submit their ballot could provide crucial insight into how long people are waiting to vote, whether it was easy to cast their ballot, and how well organized the polling place is. More importantly, Stewart III vividly elucidates some core elements of the VTP's customer service approach to evaluating elections: Voters are customers engaging in elections for the services they provide. Their experience at the polls will either be satisfactory or not. Electoral data can illuminate what elements of the electoral environment are dissatisfying voters (2014).

In *Voting*: *What is*, *What Could be*, the VTP provides another clear description of this customer service model of election administration: “The voter is the customer with certain requirements. Namely, the voter wants to cast his or her vote accurately, privately, with minimal wait, and with absolutely no hassles. The mission of the polling place should be to satisfy its customers, spending the minimal amount of resources needed to do so” (2001, 32). This explanation explicitly problematizes the relationship between the polling environment and the voter, focusing attention on each of the elements in that environment and the voter’s overall experience at the polls. In this section, we will look at how this customer service model conditions the VTP’s approach to evaluating the

overall performance of the electoral system, poll worker interaction, and wait times and lines

In his undergraduate thesis, published as VTP WP 42, Tom Posner (2006), applies LEAN management principles to assess the electoral process as a whole. The LEAN model was first proposed by Womack, Ross, and Dean (1990) in their famous study of management strategies in the international auto industry. The model emphasizes 6 elements: value, value stream, flow, pull, perfection, and waste. Put succinctly, LEAN asks organizations to identify the value they create for their customers; track the value stream through which that value is developed, designed, and produced; flow emphasizes the smooth acquisition of value by customers and pull asks an organization to adapt to their customer's fluctuating needs; finally, perfection is sought through continuous improvements to the system and the elimination of waste.

It is not possible in the space of this chapter to discuss Posner's approach in detail. Instead, I will focus on the first stage of the LEAN system, identifying value. He argues that on the surface the value produced by an election is votes. That is, "Each vote should be cast by a single eligible citizen and should result in a unit increment on the final ballot count" (2006, 16). However, he also asserts that this is too narrow a view of the value created by an electoral system. Taking the voting experience as a whole allows us to see how value is created at different stages. Other values include inclusion, accessibility, reliable counts, audits, the secrecy of the ballot and vote security, and a positive polling environment. Each of these values is connected to a specific quality of the electoral experience. For example, a "Positive Poll Environment" is created by "timely and

convenient voting" and "Accessibility" is generated through easy registration and voting procedures regardless of any impairments.

Posner's thesis provides a clear illustration of the customer service model at work. He has fully reconceptualized the entirety of the electoral process as essentially a commercial enterprise. In this model, the customer-voter is quite literally the "consumer of voting" (19). The LEAN system does not address the customer-voter as a political entity; instead, voting is a service offered to a consumer and the only way to ensure that the consumer comes back to the polls is to optimize their voting experience. Much like the user-voter, this customer-voter is deeply depoliticized. They approach the polls with different backgrounds and sensibilities, but electoral services should engage each person on their own terms, optimizing their experience and producing value at every phase of the electoral process. This depoliticized customer-voter and the industrial rationality of approaches like LEAN is challenged once we dig into the research on specific electoral issues.

One of the primary foci of the VTP's research on the election environment is the relationship between poll workers and voters. Interactions with poll workers have a significant impact on whether or not a voter is satisfied by their polling experience.[67] However, recruiting, training, and keeping poll workers is very difficult. Poll work is obviously irregular and therefore usually draws primarily the under- or unemployed or retirees. Some of these workers, particularly the retirees, will show up at each election, but in general poll workers are a temporary workforce. With each election, new workers

[67] For more on polls, poll workers, and voting technology see Burden and Milyo 2013 (VTP Working Paper 111); Hall 2009b (Cal Tech/MIT WP 77); Hall et al. 2009 (VTP Working Paper 104); Hall and Moore 2011 (VTP Working Paper 2009); Stewart III 2015 (VTP Working Paper 9).

have to be trained in changes to election laws, registration rules, the use of voting technologies, and election procedures (Hall et al. 2009). A lack of funding for training combined with the temporary nature of the workforce creates the potential for serious issues to arise at the polls.

Hall and Alvarez (2003) address some of these concerns by applying principal-agent theory, an approach developed in public administration, to issues of delegation and responsibility. The people in charge of temporary poll workers are called Local Election Officers (LEOs). These permanent employees are perennially underpaid and overwhelmed by the amount of work necessary to put on an election. One of the primary areas where they delegate election duties is to poll workers. This act of delegation takes control over the voting experience away from the LEO and places it in the hands of a poll worker, whose training may be subpar. Hall and Alvarez define the problem this presents in terms of a customer-service model of election administration: "The principal-agent model illustrates that ability of the LEO to control the quality of service that is provided to their customer—the voting public— is greatly limited by their inability to carefully select poll workers and to control the activities at poll sites" (2003, 22). This view emphasizes the transactional nature of the voting process. Elections are essentially a service industry and the item for sale is ballot casting. Poll workers and other election officials are there to make sure that you are satisfied with the process. Importantly, however, the funds to train poll workers, are constrained by how well-funded the precinct is. Addressing poll worker performance, therefore, is not just a matter of training.

It is also important to note that feedback from voters about their experiences at the polls can be flawed as they may blame poll workers for issues outside their control. In

VTP 111, a report prepared for President Obama's Presidential Commission on Election Administration (PCEA), Burden and Milyo (2013) argue that a voter evaluating poll staff is much like a restaurant customer trying to calculate a tip at the end of a meal, where it is unclear whether the customer can "determine the unique contributions of the wait staff amidst the 'noise' of other influences" (10). These other influences have a significant effect on a voter's satisfaction at the polls such as the number of poll workers present (more poll workers equal more positive evaluations) and wait times.

Long lines at polls are another significant area of research at the VTP. Stewart III and Ansolabehere (2013), in VTP WP 114, identify three main problems with addressing wait times at the polls: long lines are costly, there is not enough strategic research on how to reduce wait times, and long lines are not universal. This last point affects primarily people of color and rural voters. Each group waits longer than White voters and city-dwellers, respectively. To address these issues, the authors apply queuing theory, an approach primarily taught in business schools, to polling place administration. In one illustrative example, they use queuing theory to demonstrate that polling places involve not one but three queues. There is a check-in line, there are the voters actively casting ballots, and there are voters submitting ballots. A backup at any of these locations will cause a cascading set of delays in the others.[68]

In the piece's executive summary, the authors assert that queuing theory offers three tentative solutions to wait times: "reducing the number of in-person voters, increasing service points, and decreasing transaction times" (2). The language here is telling. Once again, there is an emphasis on the transactional quality of voting as it is

[68] For more on lines see Stewart III 2013 (VTP Working Paper 110).

embedded within a service environment. While the authors offer some provisional suggestions to reduce wait times such as decreased ballot length, easier to use electronic poll books, and better voter education campaigns, they caveat that implementing these reforms will require money. Many precincts are underfunded and cannot implement these reforms. These are the precincts with longer wait times. Wealthier districts can afford more voting machines, election personnel, and voting education materials and therefore are capable of providing better services to their customer-voters.[69]

This discussion highlights one of the more important insights generated by a customer-service-based approach to evaluating elections. While the VTP's customer-service approach is oriented towards rationalizing electoral procedures in order to optimize the experience of voting, it also points to the deep inequalities that shape electoral service provision in the United States. If elections are primarily designed to provide a service, then election officer's ability to provide that service is directly linked to the amount of funds they have. A customer-voter, who lives in an underfunded precinct, will therefore more than likely receive poor electoral services. Likewise, one who lives in a wealthy precinct will probably have access to more education and instructional services, well-trained poll workers, and better voting technology. In this way, the customer-service model emphasizes the way societal inequalities define the customer-voter in addition to poll-based sociotechnical relationships and data-driven problematizations of the electoral process.

The customer-service model produces a paradoxical customer-voter. On one hand, their experience at the polls can be optimized by data-driven research and the

[69] Stewart III has written extensively on wait times and lines at polling places for the VTP. For more, see Stewart III 2009c (VTP WP 71).

application of management techniques borrowed from business. These strategies can diagnose problems at the level of wait times, poll worker interaction, and voter education and instruction. However, they also cannot overcome the inequalities that pervade the electoral system, meaning the quality of service often has to do with funding. This does not mean that underfunded precincts cannot provide quality electoral services; it just means that they face an uphill battle in doing so. The customer-voter that emerges from the VTP's research on electoral systems oddly straddles two worlds: the quasi-ideal space of applied research and the complicated, problematic reality of electoral funding.

In some ways, the customer-voter and user-voter are quite similar. Neither figure approaches the poll as a political entity. The customer-voter comes to vote, expecting to receive good service at the polls—limited wait times, pleasant poll interactions with poll workers, an efficient and positive overall experience. The user-voter engages their voting technology intuitively, looking for a simple interface, smooth navigation, and feedback. Each of these figures is deeply compatible with each emerging from a problematization of the voting process that emphasizes how voters interact with different elements of the electoral process.

However, the customer-voter is configured quite differently than the user-voter in two important ways. First, while data-driven approaches and systematic evaluation of environmental factors have important insights for election officials and policymakers looking to reform the electoral process, the customer-voter's experience is clearly shaped by social, cultural, racial, and other inequalities. The user-voter may also be shaped by these inequalities, but the UI literature's focus on human-technology interaction prioritizes technological solutions to usability and accessibility issues. That is, the user-

voter's relationship with voting technology obscures the way systemic inequalities shape their electoral experience. Secondly, a well-designed voting machine can address a problem that the user-voter is having in real-time. Does the user-voter not understand that you need to vote for two candidates for a particular race? A well-designed machine lets the user-voter know. The customer-voter, on the other hand, is inflected by the entire experience of voting. Long wait times, poorly trained poll workers, and a disorganized polling booth cannot be addressed while a person is voting. That is, for the customer-voter, satisfaction or dissatisfaction with the voting experience is absolute.

Conclusion

The 2020 presidential election has left the United States reeling. Lies about widespread election fraud fueled insurrectionist violence. The pandemic forced massive changes to existing election laws. These changes helped facilitate historic turnout. How does one make sense of these paradoxical realities? How does one engage an electorate capable of both quickly adapting to new voting technologies and then questioning the integrity of those technologies?

There are many informational spaces one could turn to address these questions. In the first two decades of the 21st century, and the last five years in particular, many scholars, journalists, and policymakers have interrogated how the media, political parties, and activist organizations have shaped political engagement in the United States. Mainstream media channels and social media platforms certainly play an outsize role in informing voters about the electoral process and voting technology. Political parties, activist organizations, and private companies actively encourage participation in the electoral process through voter registration drives and get-out-the-vote campaigns. These

same groups also try and disenfranchise voters through legislative activism and misinformation. While these spaces certainly play an important role in educating voters and shaping US political culture more broadly, they are also removed from the actual experience of voting.

In this chapter, I have looked at a discourse largely neglected by critical media and technology scholars, the emerging science of election administration, to examine how electoral experience may shape who we are as voters. I argue that two distinct figures of the voter emerge from this new knowledge of election administration: the user-voter and customer-voter. Each of these figures has something to tell us about the paradoxes of the 2020 election.

The user-voter helps explain the adaptability of the US voter. Over the last twenty years, election administrators, social scientists, and policymakers have responded to public feedback about election technologies. Through experiments and surveys, they tested and implemented new voting technologies and replaced those technologies when they did not work. Before 2000, a voter had probably used one voting technology over the course of their entire life. In the twenty years since they have more than likely engaged multiple voting technologies. New technologies require flexibility. The user-voter is capable of embracing technological changes. They are also familiar with their voting technology. They have been asked to be sensitive to ballot and UI design. They are prepared and willing to identify issues and inconsistencies.

The customer-voter is uniquely attuned to the experience of voting. They have been trained to familiarize themselves with the idiosyncrasies of the electoral process. No-excuse absentee ballots, early voting, and a new election day normal do not phase the

customer-voter. However, they are also prepared to voice their dissatisfaction with their voting experience. That is, the customer-voter's anecdotal experience of the electoral process informs how they judge how the election works for everyone else. Customer-voters who have been primed to believe that absentee balloting and voting machines are rigged are more than ready to find confirmation of these beliefs in their actual experience at the polls.

These descriptions are meant to be broad and illustrative. I am not suggesting that the user-voter and customer-voter are dominant modes of subjectivity for the American voter. Instead, I hope they sensitize us to a reality often lost in the coverage of the 2020 US election: elections are sociotechnical affairs that do more than produce an electoral outcome. They create an electoral experience. A voter's engagement with the electoral process is not only shaped by politicians, pundits, and demagogues. It is also formatted by the technologies we use to vote and the social and technical relationships our interactions with those technologies are embedded in. Over the last twenty years, a new science of election administration has emerged that focuses specifically on how voting technology shapes our electoral experience. This literature has developed a deeply complex and nuanced account of American electoral processes. It has also produced a depoliticized, rationalized, experience-oriented, and expert-driven approach to electoral reform. The customer-voter and the user-voter have emerged from this approach to electoral reform. In turn, they have shaped how we experience elections, who we are as voters, and how we engage with electoral controversy.

CHAPTER VI: CONCLUSION

When I began this research in 2015-2016, voting machines were a rather mundane topic. Though far from perfect, the US election system was doing a perfectly mediocre job providing electoral services to a diminishing number of American voters. The voting technology controversies that had rocked the country in 2000 were a distant memory. Lacking critical attention from the media, political theorists, and media studies scholars, voting technology was primarily a topic for quantitative social scientists, engineers, and computer scientists interested in electoral reform and system design. On the other hand, the Election Commission of India, according to then-Secretary of State Hilary Clinton, was the world's gold standard.[70] While India's electronic voting machines (EVMs) occasionally became embroiled in controversy, they were often celebrated as a symbol of the ECI's pragmatic approach to election administration. Despite robust literature on the Election Commission of India and the history of election administration in India, however, there was little systematic engagement with electronic voting technologies. Obviously, over the last six years, the situation in both countries has changed dramatically.

Since the election of Narendra Modi, the autonomy of the Election Commission of India has increasingly been called into question. The 2019 general elections saw the inconsistent implementation of the Model Code of Conduct, violations of media policy, increasing use of dark money by the BJP, and myriad EVM controversies (Wire Staff

[70] Secretary of State Clinton made the remark at a talk entitled "India and the United States: A Vision for the 21st century" in Chennai on July 20, 2011. The comment was specifically directed the ECI's efforts to export their approach to election management to other countries: "India's election commission, widely viewed as the global gold standard for running elections is already sharing best practices with counterparts in other countries, including Egypt and Iraq." For the speech's full-text visit, http://2007-2017-blogs.state.gov/stories/2011/07/20/travel-diary-india-and-united-states-vision-21st-century.html

2021b). No longer limited to losing political parties, major think tanks and other civil society actors have called the ECI's integrity into question including the Forum for Electoral Integrity and the Association for Democratic Reforms. Recently, a group of retired judges and other government officials alongside academic researchers and computer scientists convened the Citizen's Commission on Elections. In 2021, they began releasing a series of reports collectively titled *An Inquiry in India's Election System*. The first volume focused on whether EVMs and VVPATs[71] are secure voting technologies and the second focused on the ECI's inability or unwillingness to control the corrosive role of money power in Indian elections, make the electoral rolls more inclusive, monitor social media and fake news, and fight the criminalization of Indian politics (Citizen's Commission on Elections 2021a, 2021b). Perhaps most problematically, the ECI has responded to these critiques with either silence or diffidence, creating concern about the institution's democratic character (Basu 2021). In 2020, the Swedish research institute, V-Dem, reclassified India from an electoral democracy to an electoral autocracy (Wire Staff 2021b).

The 2016 election of Donald Trump was marred in controversy. Congress investigated Russian mis- and disinformation campaigns and attempts to hack electoral infrastructure as well as possible collusion between the Trump Campaign and Russian officials. It also saw baseless accusations of voter fraud by President Trump (for a wonderful overview see Jamieson 2020). These controversies led President Obama, in one of his final acts as president, to classify the US electoral system as critical

[71] Much like previous reports detailing EVM vulnerabilities, this one invited commentary from a global group of academics including Dr. J. Alex Halderman, who was involved in the Hari Prasad affair discussed in Chapter 2, and Ron Rivest, a prominent member of the MIT/Cal Tech Voting Technology project.

infrastructure. In 2020, both before and after the election, Trump attacked US voting technology, asserting without proof that mail-in ballots and voting machines were being rigged against him.[72] These attacks culminated in a mob of far-right terrorists, incited by the president, violently assaulting the Capitol on January 6, 2021. In addition to the seditious attempts of the sitting president to undermine the electoral process, foreign actors including Iran, China, and Russia engaged in mis- and disinformation campaigns designed to affect electoral outcomes (National Intelligence Council 2021). The fallout of the 2020 election is ongoing. While Democrats have attempted to pass voting rights legislation at the federal level, Republicans in statehouses around the country have passed scorched earth legislation designed to disenfranchise those unlikely to vote for them. So far, these attacks have primarily targeted voter ID laws, early voting, and the use of absentee ballots.[73]

Voting technologies are no longer considered a mundane element of electoral administration. Instead, they have become social, technical, and rhetorical flashpoints in high-stakes debates about election integrity that simmer long after elections end. It is perhaps surprising then that there continues to be little engagement with voting technology by science and technology studies, political communications, or media studies scholarship. A limited amount of STS scholarship has studied electoral controversies, but it has never engaged the nuts and bolts of the electoral process itself.[74] While media

[72] For more on Trump's relationship with the media, see Boczkowski and Papacharissi 2018)

[73] For a rolling list of these efforts, visit https://www.brennancenter.org/our-work/research-reports/state-voting-bills-tracker-2021

[74] Most of the STS work on Elections was in the special issue of *Social Studies of Science* from June 2001 (vol. 31, no. 3). For additional work see Avgerou 2019 et al; Coles 2004, 2007; Miller 2004, 2015.

studies scholars have developed extensive literature on the role of digital technology in political campaigns, there has been virtually no engagement with the technologies that mediate the vote.[75] This dissertation has aimed to address this lacuna in two ways. First, it has elaborated a sociotechnical approach to studying elections capable of grappling with the complex dynamics of election administration and management, voter experience, and voting technology controversies. Second, it has argued that voting machines should be considered media technologies. In the remainder of this conclusion, I briefly outline these two contributions before offering a third, the idea of the permanent election, as a provocation for future research.

Elections as Sociotechnical Systems

Traditionally, elections have been understood as mechanisms for producing electoral outcomes. In this view, aspects of the electoral process should be optimized for maximum production.[76] Problems with polling agents, voter registration, and electronic poll books are defined in terms of how they affect the smooth production of outcomes. In this schema, voting machines are input-output devices—cast a ballot, count a vote, aggregate an outcome. Ideally, voting technologies provide for quick counts, limited audits, and the efficient reporting of results. Voters, in some sense, are incidental to this process. They produce the votes that need to be counted, but their overall experience at the polls is secondary to the process.

[75] For examples of this literature see Baldwin-Philippi 2015; Hersh 2015; Karpf 2016; Kreiss 2016.

[76] Though never fully articulated, this instrumental understanding of elections is embedded in much of the work on electoral integrity and election administration. For examples in the electoral integrity literature see Cheesman and Klaus 2018; Haque and Carrol 2020; Norris 2014. For election administration see Brown, Hale, and King 2020; Hale, Montjoy, and Brown 2015; Tran 2019.

Contrary to this view, I have approached elections as deeply sociotechnical processes designed to do more than produce electoral outcomes. In this model, poll workers, the voter, election officials, state and federal legislatures, the courts, voting technologies, administrative procedures, chains of custody, the companies that design and manufacture voting technologies, the ease of registering, voter education, and other factors work together in a complex choreography to compose an election. The products of the election are manifold and include a voter's experience at the polls, electoral outcomes, electoral integrity, democratic legitimacy, and public trust.

In chapter 2, for example, I examined the dynamics of electoral controversies in India, elaborating how various aspects of the electoral process including the chain of custody for EVMs and their design and manufacturing processes are problematized by the anti-EVM movement to create doubt about both the integrity of India's electoral process and the autonomy of the Election Commission of India. In chapter 3, I showed how the introduction of the secret ballot and mechanical lever voting machines in the late 19th century reformatted both the act of voting and the space in which it occurs. The reconfiguration severed the act of voting from the larger electoral context and this isolation conditioned the electoral reform discourse following Bush v. Gore when the black box of voting technology was opened for the first time in a century.

The sociotechnical approach has important implications for future election research. First, it creates a framework for understanding elections as bureaucratized and scientifically managed processes. In doing so, it focuses attention on the relationship between various aspects of electoral administration and the forms of expertise, types of knowledge, and methods of inquiry used to diagnose electoral problems and implement

solutions. This approach allows for rich, comparative problem-oriented analyses of electoral systems around the world and when coupled with the genealogical method deployed in chapter 3, provides critical resources for connecting the development of electoral technologies to the emergence and consolidation of electoral systems and the creation of electoral cultures. In doing so, it builds a bridge between policy-oriented, pragmatic, instrumental approaches to election studies and those that focus on the expressive, ritualistic, normative dimensions of electoral processes.

In particular, this sociotechnical approach opens space to study the global diffusion of various approaches to election management and the consolidation of expertise, norms, knowledge, techniques, and technologies in international institutions. In 2011, India opened the International Institute for Democracy & Election Management (IIDEM). This organization trains poll workers and election officials from countries around the world in the Election Commission of India's "scientific approach to election management."[77] In addition to the IIDEM, the ECI also sells voting technologies to other countries such as Nepal, Namibia, Kenya, and Bhutan. While the ECI's mode of exporting their electoral system mimics their highly organized approach to election management domestically, the dissemination of electoral knowledge in the United States reflects the hyper-decentralization and uncoordinated nature of our electoral system. US election experts, including those working with the VTP, have consulted on electoral processes in Latin America, Europe, and Asia, and American voting technology companies also sell their technology abroad. Additionally, President Obama's classification of US elections as critical infrastructure effectively made any attack on US

[77] http://iiidem.nic.in/about.html

election technology a sanctionable act. This decision impacts the way election management and tampering are debated in global institutions such as the UN. Together, India and the United States are playing a profound role in globalizing their sciences of election administration. The sociotechnical approach to election studies provides unique insights into how these styles clash and coalesce in international organizations such as the International Institute for Democracy and Electoral Assistance (IDEA) and the International Foundation for Electoral Systems (IFES) and country-specific contexts in which elections are either being initiated post-conflict or significantly revamped to fight corruption.

Voting Technologies as Media Technologies

In the introduction, I argued that voting machines are involved in at least three kinds of political communication. First, they have an instrumental function, translating electoral preferences into electoral outcomes. Second, they enable voters to experience the expressive dimensions of democracy, in doing so they play a key role in producing democratic values and norms (for an overview of the expressive vs. instrumental dichotomy see Coleman 2012). Finally, voting technologies allow these two types of communication to become entangled with one another, creating opportunities for voters to use their preferences and anecdotal experience at the polls to form opinions about the overall electoral process. In chapter 4, for example, I reviewed work by the VTP that showed that a voter's engagement with their voting technology can impact their beliefs about an election's overall integrity. A bad experience at the polls might make an individual voter suspicious that their vote and the votes of others were counted correctly or that the process was rigged. In Chapter 1, I argued that the Election Commission of

India leveraged the intimate connection between a voter and an EVM to create confidence in an election's outcomes and trust in an election's integrity. However, importantly, voting technologies do more than simply mediate the casting of ballots.

Voting machines also count votes and provide mechanisms for aggregating those counts into electoral results. Far from simply producing an electoral outcome, this act of aggregation performs electoral democracy's most mysterious and sacred abstraction, transforming the voices of individual voters into a collective political decision, romantically conjured as the will of the people. This act of abstraction is fraught with uncertainty. However, this uncertainty is necessary for electoral democracy to reproduce itself. As Ujjwal Singh has argued (2004), for people to buy into elections, their outcomes have to be uncertain. That is, if one knows how an election will turn out before they vote, there will be no reason for them to vote. The problem with uncertain outcomes is that inevitably people will be disappointed, and this disappointment can generate doubt about the integrity of the electoral process. To address these doubts, voting machines usually possess some form of auditability. As discussed in chapter 1, EVMs are now outfitted with a voter verified paper audit trail (VVPAT) that produces an anonymized receipt of one's vote. In the US, as outlined in chapter 3, in the 19th century, there were already mechanical lever voting machines and automatic ballot boxes with limited auditability. Aggregation and auditing add more complexity to voting technologies' communicative capacities. Aggregation links a voter's individual ballot to the generation of an electoral outcome. In doing so, it imbues the act of voting with the uncertainty that animates the electoral process, while also potentially undermining its legitimacy.

Auditing addresses these legitimacy concerns by adding a layer of transparency to the electoral process, but in doing so it potentially compromises ballot secrecy.

In chapter 3, I argued that throughout the late 19th century, the secret ballot was institutionalized in Europe and the United States as an essential feature of electoral democracy. Over the next century, the secret ballot diffused into new electoral systems around the world. I also asserted that the secret ballot sacralized the relationship between a voter and their ballot, effectively transforming electoral democracy into a secular religion with the act of voting as its primary sacrament (Bertrand et al. 2007; Crook and Crook 2011; Gilmartin 2012; Markoff 1999; Richter 2016). Since that time, ballot secrecy has often been prioritized over electoral transparency, creating discord between electoral reformers in India and the United States demanding increased auditability and public accountability and election officials concerned with compromising the secrecy of the ballot. As we saw in chapter 2, EVM controversies are animated by a tension between secrecy and transparency. While not discussed in that chapter, the controversy over another proposed innovation to EVMs, the totalizer, best illustrates how the tension between secrecy and transparency is mediated by voting technologies

As discussed earlier, during the counting phase of Indian elections, EVMs from multiple polling stations are brought to a single site for count aggregation. This process makes the counts from individual polling stations visible to political parties. Given the small size of Indian polling stations, this creates the potential for interested parties to reverse engineer granular data about a community's voting patterns. The ECI has argued that this process compromises secrecy and has proposed using a technology called a totalizer that allows multiple EVMs to be totaled at one time, to mask poll-level counts.

However, political parties argue that this data is integral to voter targeting and that publishing poll-level EVM results adds transparency to the electoral process (Choudhary 2018; ECI 2016; *Hindu* 2009; LCI 2015; Mahapatra 2017).

The debate over the totalizer illustrates two important ways that voting technologies mediate the tension between secrecy and transparency that often animates debates about electoral reform. First, the controversy connects abstract democratic values such as the sanctity of the secret ballot and electoral transparency to the mundane sociotechnical realities of running an election. Second, it shows how voting technology and voter interest are invoked in struggles over electoral authority and control. In the case of India, as discussed in chapter 1, the ECI has framed political parties as the enemy of smooth electoral processes and political parties have attacked the creeping authoritarianism of the ECI.

Conceptualizing voting machines as media technologies opens new paths for future research by media studies scholars. First, it provides a way of connecting the instrumental and expressive aspects of voting in unique ways. A voter's electoral preferences and the mechanical production of results are not distinct from their experience at the polls. Together these factors work to produce both electoral outcomes as well as more abstract categories such as legitimacy, integrity, and trust. At a time when electoral processes are under attack around the globe, this communicative approach to studying voting technology provides resources for analyzing how voter perception and electoral outcomes become entangled through the act of voting and the consequences of this entanglement for the peaceful transition of power and the generation of democratic legitimacy.

Second, recognizing that voting machines are media technologies allows one to redefine the vote as data, enabling its integration into a broader spectrum of political communication that encompasses media debates, policy analysis, microtargeting by political consultants and strategists, and mis- and disinformation campaigns by malicious actors. In particular, this perspective is important for scholars and journalists analyzing the expanded use of data-driven techniques by political campaigns. Controversies around the use of data in elections have risen in both the United States and India in recent years. In the U.S., the Cambridge Analytica scandal and Russian hacks of voter registration databases have shown different ways that ill-gotten data can be used to influence electoral processes. Since 2019, the Election Commission of India has proposed linking voter data from the electoral rolls with the Government of India's Aadhaar identification system. The ECI has claimed that marrying the electoral rolls with Aadhaar will make registration easier for voters and help eliminate bad information from the electoral rolls. Critics have claimed that joining the two data sources will undermine the ECI's autonomy, potentially transforming it into just another bureaucratic mouthpiece for the sitting government. Some have also warned that the union would give the BJP and Modi unfettered control over critical voter information. Retired Supreme Court Justice B.N. Srikrishna provocatively asserted, for example, that collapsing the two identification systems would create a Cambridge Analytica level scandal: "Instead of having a Cambridge Analytica you'll have a Delhi Analytica, Mumbai Analytica, a Calcutta Analytica…" (Quoted in Sircar 2019). Given the expanding influence of data in every facet of the electoral process from campaign strategy and voter modeling to using event logs and maintenance information to optimize the flow of voters through polling stations,

we must conceptualize votes not only as a medium for communicating electoral preferences but also as information with a long, multifaceted afterlife.

This final point also illustrates the final takeaway from this project for the study of elections and voting technology. The vote doesn't die at the ballot box and elections don't end on election day. Controversies around voting technology, the information generated by electoral processes, and efforts to reform election systems using data-driven methodologies all take place long after votes are counted, and results are certified.

Permanent Elections

In the late 1970s and early 1980s, political scientists and campaign managers began referring to the permanent campaign. At the time, the term referred to the expanding role of political consultants and strategists by politicians both before and after campaigns.[78] These professional political operatives created a political climate in which politicians were always running for office whether it was an election year or not. In their 2012 book, *The Permanent Campaign*, *New Media*, *New Politics*, media studies scholars Greg Elmer, Ganaele Langlois, and Fenwick McKelvey updated the term for the data-driven campaigns of the 21st century. In this milieu, hyper-partisan issues proliferate on social media forcing politicians to constantly campaign on increasingly niche platforms rather than govern in the interest of the public good. Following this train of thought, perhaps we need to speak of the permanent election.

This idea might initially sound counter intuitive. Elections are, at their conceptual core, designed to be discrete mechanisms for the orderly transition of power. The idea of a permanent election is anathema to this concept of elections. Persistent controversy,

[78] See Blumenthal 1980 for an early definition of the term.

continual debate, and unending reforms undermine, at least theoretically, democratic legitimacy. If the people do not agree that an election was fair, how can there be an orderly transition of power? Theoretically, for democracy to be a stable system of governance, elections need to end.

Despite these high stakes, election systems have proven quite capable of surviving seemingly existential threats. For example, the United States' disorganized, underfunded, hyper-decentralized electoral system both adapted to facilitate record turnout during a pandemic and withstood rhetorical and physical attacks on its integrity in 2020. Perhaps election systems are more resilient than we realize. Or perhaps the U.S. got lucky. Regardless, the permanent election perspective does not hope that electoral systems are resilient enough to withstand serious controversy nor does it pray for luck. Instead, it recognizes that a) elections rarely end on election day, b) elections are composed of social and technical relationships that can be problematized by a variety of actors for various reasons, and c) reforming electoral processes is a political imperative outside election years.

The permanent elections approach also recognizes that democratic categories such as public trust and confidence, legitimacy, and electoral integrity are the iterative and fleeting products of people's experiences at the polls, media coverage, electoral outcomes, and many other factors. The permanent elections perspective provides resources and tools for analyzing the mundane social and technical processes through which these categories are produced and reproduced, allowing for delicate and deliberate intervention. This approach to election studies is counterposed to the push for reform that

often occurs after a controversial election, which is often framed in terms of a nearly apocalyptic urgency.

Finally, the permanent election resonates with the data-driven, media-saturated notion of the permanent campaign. Elections produce endless amounts of data for use by political consultants, strategists, operatives, candidates, and parties. Administrative choices, logistical infrastructure, and voting technology are continual fodder for debate on social media and partisan platforms. In short, elections are not walled off from the rest of the political world. They do not simply happen, produce outcomes, and then fade from view. They are unending sources of controversy and data that drive political processes long after they end.

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