The State of Voting in the USA: Problems, Potential Solutions, and Risks – Can Technology help Defend Democracy?

Part I of the Global Blockchain Business Council's 'Open Source Ideas': State of Global Voting Systems, Technology, and Government

Introduction

Congratulations! You have decided to vote for the first time. But before you can cast your ballot, a lot of pieces need to come together. To start, you need to give yourself enough time to register because only 21 states allow for same day registration (SDR)[i] and some states (including Ohio, Pennsylvania, and South Carolina) require registration at least 30 days before an election.[ii] Next, you'll have to determine *how* to register. As of this writing, 13 states (including Michigan, New Jersey, North Carolina, and Texas) still do not allow online voter registration.[iii] As you are filling out the paperwork, you will be asked if you are already registered to vote in any other states. Assuming you moved away from the state where you first got your driver's license, this might be a difficult question: did you check the box asking you if you would like to register way back when?

Once you have completed and submitted your registration, you wait. Depending on your state, you may be able to check a government website to see if your registration was successful; but in many states you can only confirm your status by calling or visiting an election office.

Finally, you wake up on Election Day, excited to participate in the democratic process for the first time. You head to your polling place before work, hoping to beat the crowd. But there is already a line. You decide to come back after work so as not to arrive late and draw the ire of your not-very-understanding boss.

Throughout the day you check social media and are bombarded by reports of long lines at polls across the country. But you are not easily dissuaded (as this process has shown) and you travel back to your polling place after work to find the line just as you left it. You wait and finally get to

cast your vote, which is stored on the voting machine to be tallied and delivered to a central location.

As polls across the country start to close, election results start trickling in; races are called in favor of one candidate or another. Then your state is called with only 1% of precincts reporting – you know your vote *technically* matters, but it doesn't feel that way.

At times, the very structure of the U.S. voting system can seem designed to dissuade you from casting your ballot. The process is so archaic and disconnected that even the most modest reforms could have a significant impact. When examining the existing system - from registration to casting a vote - it is easy to see how a potential voter can become a discouraged non-voter or how a one-time voter can become a never-again voter.

Looking to more agile countries that have leveraged new technologies to improve the process shows the massive opportunity for improvement in the U.S. For the purposes of this report, we will examine the voting process in three distinct stages:

(1) identity and voter registration;

(2) casting votes; and

(3) verification, accuracy, and security.

I. Identity and Voter Registration

Voter registration and roll management processes vary significantly from state to state and have not been significantly altered since the passage of the National Voter Registration Act of 1993 (NVRA). NVRA requires states to offer voter registration at motor vehicle agencies and by mail-in application. A 2014 study found that about 24 million voter registrations in the U.S. are "no longer valid or are significantly inaccurate," more than 1.8 million deceased individuals are still listed as voters, and about 2.75 million individuals are registered in more than one state.[iv]

In response to inaccurate voter rolls, some states have adopted controversial voter purge laws. Notably, in 2017, Georgia removed over 500,000 voters from its rolls, 107,000 of which were "purged because they had decided not to vote in previous elections and they failed to respond to mailed notices from the state."[v] In June 2018, the U.S. Supreme Court upheld Ohio's "use-it-or-lose-it" voting law, which gives the state power to remove from its voter rolls anyone who does not respond to a mailed address confirmation form (which may or may not be received/seen by the individual) and does not vote for four years[vi]. Using data from the federal Election Assistance

Commission (EAC), the Brennan Center found that at least 17 million voters were purged between 2016 and 2018 and that purge rates were significantly higher in jurisdictions with a history of voting discrimination (as identified in the Voting Rights Act).[vii]

Estonia

To date, states have not properly leveraged technological advances to improve voter registration and roll management; blockchain technology[viii] could be part of the solutions to both issues. Blockchain-based digital identities have already been deployed in places like Estonia, which has revolutionized its governance with digital solutions secured on the KSI Blockchain.[ix] In Estonia, citizens are provided an ID-card with a chip that grants digital access to all government e-services, and can be used for voting and digital signatures, as a health insurance card, and to check medical records and submit tax claims, among other uses.[x] Citizens may also obtain a special mobile SIM card to use their mobile phone as a secure digital ID. Estonia's i-Voting system is secured on the blockchain and leverages the country's digital ID system to save voters an estimated 11,000 working days each election.[xi] Estonia's e-governance and digital ID system has contributed to the country becoming the 18th-least corrupt nation[xii] and growing its GDP per capita from US$4,070 in 2000 to $22,927 in 2018.[xiii] Estonia is a small, largely homogeneous country and is thus not a perfect template for the United States, though it is not the only country innovating in the area of digital identity.

Switzerland

In 2018, the Swiss Canton of Schaffhausen and digital identity firm Procivis successfully completed a pilot phase of its eID+ electronic identity solution and began to roll it out for the entire canton. Shauffhausen's eID+ allows citizens to create an electronic identification on their mobile phones that is then validated by a government registration office. This government-verified and blockchain-secured digital ID allows citizens to easily verify their personal information for a range of government services. As of this writing, eID+ has enabled e-Authentication, which allows users to "engage in trusted interactions with third parties," e-Signature, and e-Document, which allows citizens to review, sign, and submit official government documents, all from their mobile device. Procivis and the Schaffhausen government are also moving to add e-License (to digitally store licenses and permits), e-Company (to simplify the founding of companies), e-KYC (to improve know-your-customer processes), and e-Health (to provide direct access to health platforms). They are also currently developing e-Data, which will allow citizens to control and monetize their

personal data. These solutions, whether revolutionizing or streamlining government processes, are made possible by Schaffhausen's robust and secure blockchain-based digital ID solution.[xiv]

Sierra Leone

This summer, nonprofit organization Kiva and the government of Sierra Leone announced that they will be building a national blockchain-based digital ID solution using biometric data that was previously collected by the government. According to President Julius Maada Bio, this project "guarantees that Sierra Leoneans are not excluded from… the global digital economy," by utilizing digital ID to allow citizens to build and prove credit history.[xv] While the project was developed with financial inclusion rather than voting in mind, it shows that digital ID can be attractive to governments, NGOs, and companies for a variety of reasons.[xvi]

ID2020 Alliance

Companies and organizations, including Microsoft, Accenture, and the Rockefeller Foundation, created the ID2020 Alliance to provide digital identities to refugees around the world. The Alliance believes that effective digital ID is crucial for at-risk populations and notes that it is nearly impossible to access government services or vote without a recognized form of ID.[xvii] Most recently, the Alliance announced that it is partnering with the City of Austin, TX to develop MyPass, a blockchain-powered digital ID solution for people experiencing homelessness.[xviii]

Digital Identity in the United States

The introduction of a robust digital ID system for U.S. citizens would make registering to vote easier for the average citizen. Further, keeping voter rolls on a blockchain could potentially allow voters to use their own private key (essentially a very secure password) to confirm they are registered and ensure their information is correct. Tying registration to a private key would also reduce or eliminate issues surrounding voters with the same name, as "minority voters are more likely to share names than white voters, potentially exposing them to a greater risk of being purged."[xix] Some innovative jurisdictions like Schaffhausen and Estonia have implemented blockchain-based digital ID and begun building on it; meanwhile, projects like those in Austin, TX are crucial for identifying problems, improving solutions, and ultimately convincing some skeptics that digital ID is worth the implementation cost.

However, many questions remain open and in development regarding the type of digital identity from country to country. Is self-sovereign digital identity with government-based verification the

ideal model? Who should act as the verification nodes in a blockchain-based identity network? How can any system scale? Who will develop common taxonomy and/or standards language? And do we need a global solution or country-specific solutions?

II. Voting

It is a well-known fact that the U.S. has lower voter turnout than most other developed democratic countries; in 2016 just 55.7% of the voting-age population voted, compared to 77.92% in South Korea and 62.12% in Canada.[xx] Perhaps most shocking, the Department of Defense estimates that only 7% of the 3 million eligible overseas voters voted in 2016.[xxi]

In-Person Voting

While national average voting times declined from 14 minutes in 2008 to 8 minutes in 2016, there remain extreme outlier districts with significantly longer wait times. For example, in 2008 the average wait time in South Carolina was 62 minutes and in 2012 the average wait time in Florida was 45 minutes.[xxii] In 2016, some voters in Maricopa County, Arizona (home of Phoenix) waited over 5 hours to vote – the average wait time was over 2 hours.[xxiii] According to *The Arizona Republic,* most counties had an average of 2,500 eligible voters per polling place; Maricopa County had about 21,000 eligible voters per polling place.[xxiv] Most recently, non-partisan advocacy organization Common Cause Georgia stated the average wait time in 2018 in the Atlanta metro area was an astonishing three hours because of "locations not opening on time, broken voting machines, and issues with the state's exact match rules."[xxv] While there is a dearth of research in this area, studies by the Brennan Center[xxvi] and Dartmouth[xxvii] found statistically significant positive correlations between precinct proportion of minority voters and wait time.

Overseas Voting

Overseas voting is even more unreliable, with the DoD's Federal Voting Assistance Program (FVAP) estimating that if obstacles to overseas voting were removed, the voting rate would increase from 6.9% to 37.5%. FVAP also found that "in countries with the highest estimated voting obstacles, those who receive their ballot electronically are approximately 50% more likely to have a vote recorded in administrative records than those receiving a ballot by mail."[xxviii] Electronic submission of ballots is critical to engaging overseas voters in the democratic process.

Voting in the USA

There are reforms that could be implemented to boost voter turnout (e.g. compulsory voting, automatic registration, making Election Day a national holiday, etc.), but in recent years there has been increasing advocacy for blockchain-based mobile voting. Notably, a top Democratic candidate for president (as of this writing) believes that "Americans should be able to vote via their mobile device, with verification done via blockchain. This could significantly increase participation in all elections, whether local, state or federal."[xxix]

In the U.S., blockchain voting pilots have been tested in multiple jurisdictions, most notably West Virginia. In a 2018 pilot project, individuals covered by the Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA)[xxx] were able to cast ballots using their mobile phones, each "ballot submitted was encrypted and stored on a geographically distributed and redundant network of blockchain servers managed by the two largest cloud infrastructure providers."[xxxi] Of the 183 eligible UOCAVA voters, 144 submitted ballots, for a voter turnout rate of 78.6%. This is a remarkable improvement over the DOD's estimated 7% voter turnout for overseas voters. It is important to note that the FBI is currently conducting an investigation into an attempted hack of the platform during this election, though the U.S. Attorney for the Southern District of WV has stated that "there was no intrusion and the integrity of votes and the election system was not compromised."[xxxii] Jurisdictions have not been dissuaded by the hack attempt, as Jackson and Umatilla Counties in Oregon announced in October 2019 that they are moving forward with pilot projects.[xxxiii]

Russia

Russia has experimented with online voting for years, most recently offering about 450,000 citizens of Moscow the opportunity to cast blockchain-secured online ballots in the 2018 Moscow City Duma election. On its website, the Moscow city government claims that its "electronic elections guarantee complete anonymity and observance of ballot secrecy. The voter identity can not be connected with the ballot he/she made."[xxxiv] However, shortly after the government released the code on GitHub, a French researcher found a critical encryption flaw that could be cracked "in a matter of minutes with easily available resources."[xxxv] After the flaw was published, the government corrected the issue and promised to pay its highest bug bounty, about US$15,000. Next, a Harvard researcher identified another vulnerability that "can be used for counting the number of votes cast for a candidate."[xxxvi] Finally, after the votes were tallied, a Russian researcher found that there were significant statistical abnormalities between the online

and offline votes; for example, one candidate supported by the ruling party received 47.1% of electronic votes and only 28.1% of paper ballots.[xxxvii] Russian journalists found that in "all three districts that used online voting, voters who chose pro-regime candidates submitted their ballots in the morning… at noticeably higher rates than voters who chose independent candidates."[xxxviii]

As demonstrated by the projects in West Virginia and Russia, it is crucial that online voting projects are conducted in a thoughtful and cautious manner; developers, government officials, and citizens should be aware that the use of blockchain technology does not necessarily make a voting system secure.

Blockchain Voting

Furthermore, while the prospect of mobile voting secured on the blockchain is exciting, many election security experts have cautioned against its broader implementation. Generally, they believe that while blockchain is secure, transmitting votes over the internet comes with inherent risks that have yet to be appropriately addressed.[xxxix] The U.S. Vote Foundation wrote an extensive report on internet voting with input from "experts in election integrity, election administration, high-assurance engineering, and cryptography."[xl] This report states that "public elections conducted over the internet must be end-to-end verifiable (E2E-VIV)… No internet voting system of any kind should be deployed for public election before end-to-end verifiable in-person voting systems have been widely deployed and experience has been gained from their use."[xli] And further, it "is currently unclear whether it is possible to construct an E2E-VIV system" that is sufficiently secure, usable, and transparent.

Currently, blockchain-based voting presents the greatest opportunity for overseas voters, many of whom already use return ballots electronically. Given the significant technological challenges associated with creating a blockchain-secured mobile voting system, more pilot projects and innovations will be necessary before the technology can be deployed on a wider scale. Blockchain-based voting projects must be conducted carefully and should generate paper backups and undergo rigorous post-election risk-limiting audits, which can determine whether votes were counted correctly.[xlii]

III. Verification/Accuracy

The patchwork of voting systems around the U.S. means that vote count and certification systems also differ. Generally, the process goes as follows: (1) wait for polls to close; (2) shut down voting machines and download votes; (3) deliver the votes by phone, modem, or hand; (4) count

overseas, absentee, and provisional ballots; and (5) certify the votes.[xliii] This entire process can take weeks; elections are usually decided by the time the oversees, absentee, and provisional ballots are counted. There have also been shocking reports, most recently in Texas[xliv] and Mississippi[xlv], of voting machines changing votes.

There is room for innovation in these arenas and blockchain technology presents a promising solution. If votes were verified as a matter of record on a blockchain, voters would be able to confirm that their vote was included in the official result. Relevant state, federal, and local authorities could be included as trusted nodes on the network, granting them the ability to audit vote tallies and spot irregularities in real time. It would also be possible to count and include overseas and absentee ballots on Election Day, rather than tallying them days after.

Conclusion

The promise of an effective, digital, blockchain-backed voting system is not some far away dream – it's already being used in various countries around the globe. Let's take a moment to imagine what that might look like in the U.S.

You've decided to vote for the first time. You wake up on Election Day and log in to your state's voting portal using your private key. Here you link your government-issued digital ID to register to vote or update your information. You fill out your ballot and securely cast your vote, all before leaving for work.

While it will be a long time before this full vision becomes a reality, there remains plenty of opportunity for technology-minded states to take incremental steps to dramatically improve the U.S. voting process. Voter registration, roll management, voting itself, and verification of votes are all processes that are ripe for improvements. It is encouraging to see forward-thinking jurisdictions thoughtfully leverage blockchain to overhaul government systems and voting systems due for a revamp. Further, the slow and measured progression of bold voting reforms like the National Popular Vote Interstate Compact suggests there is an appetite for overhauling election systems.

Countries like Estonia and Georgia have shown that governments can use blockchain for the betterment of all citizens. Perhaps it is time for the U.S. to lead a transformation of traditional voting systems with the aim of increasing access, expanding engagement, and improving the health of its democracy.

All American citizens should be certain that their vote counts, and blockchain technology, along with other technologies, can be used to restore faith in democratic processes and the government as a whole. Today, there are too many inaccuracies, acts of voter suppression, questions of fraud, and inefficiencies surrounding the single most important function of a democratic government.

It's time for the voting process in the U.S. to be reexamined and reformed to create a secure, equitable, and trustworthy system.

At the GBBC, we see this report as the first step in a multi-level discourse in which we would like to engage the global community. While this report focuses on the U.S. voting system, many countries would benefit from voting reforms and we welcome global perspectives. Please let us know what you think and send us suggestions for Part II and beyond:

Email: voting@gbbcouncil.org

Twitter: @GBBCouncil

LinkedIn: Global Blockchain Business Council

An electronic version of this report is available at GBBCouncil.org

Here are some of our initial recommendations for further discussion:

1. **Robust digital identity for the U.S.: what next?**
2. **Blockchain-based pilot projects implementation, data security and risk mitigation: how does this work in the real world? Do we need to generate paper backups and undergo risk-limiting audits? What are the major risks, pros, and cons of blockchain-based online voting?**
3. **Overseas voting: how do we improve the electronic process and increase voter participation?**
4. **Legal and regulatory considerations: what laws need to change? Local, federal?**

Co-Authors: Riyad Carey, GBBC; Mercina Tillemann-Dick, GBBC; Sandra Ro, GBBC

Contributors: Dr. Tomicah Tillemann, Blockchain Trust Accelerator (New America)

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