BLOCKCHANGE

BLOCKCHAIN TECHNOLOGIES FOR SOCIAL CHANGE

CASE STUDY:

Addressing Voting Inefficiencies Resulting from Identity Challenges with Blockchain

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PROJECT DESCRIPTION

Problem Definition

Voting is the cornerstone of any democracy. Among the 35 OECD countries, however, the United States ranks 28th in voter turnout.[1] For the 2016 Presidential Election, voter turnout dipped to its lowest point in 20 years at just 55.7%.[2] Inefficiencies of the voting process – including barriers to registration, long lines at the voting booth, difficulties in establishing proof of identity and flawed counting – not only negatively affect people's voting experience (and negatively affect turnout); they may also harm people's ability to take part in the democratic process. After the passage of recent laws in some states tightening voter ID requirements, some of these inefficiencies have received considerable media attention; they illustrate not only the centrality of identity to the voting process (and any steps that would make that process more efficient) but also highlight asymmetries of access in the current voting system.

Inefficiencies within voting processes are not only present in large, public elections; they also exist at a state and local level, and within political parties. The use cases under examination here are no different. At previous conventions, the Massachusetts Democratic Party conducted all registration and voting on paper, which made processes slower, and the election prone to risks of tampering and physical damage, as well as difficult to audit. At Tufts University, like many other university campuses, voter turnout for student government elections has been historically low.[3] Low participation rates in elections can lead to officers being elected who are unrepresentative of what the majority on campus actually wants.

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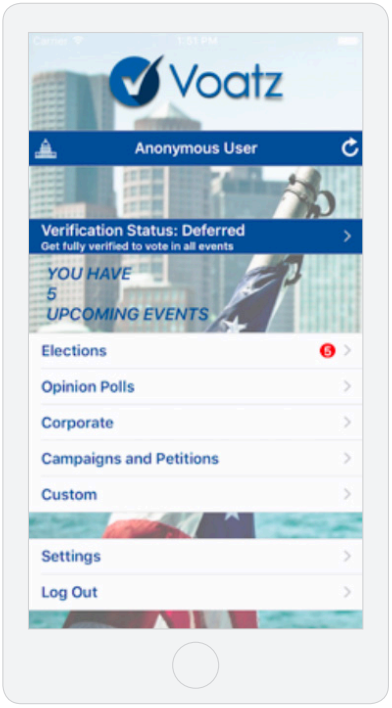
Blockchain Use

Voatz, a Boston-based voting startup, created a blockchain-based approach aimed at increasing the efficiency, transparency, and integrity of voting. Voatz's first two major use cases were the 2016 Massachusetts Democratic State Convention and the 2017 Tufts Community Union (TCU) Senate. In both cases, voters either downloaded the Voatz app onto their own mobile device or used tablets provided onsite by Voatz staff to register for an election and vote.



Voatz Platform

Voatz uses two private-permissioned blockchains built using HyperLedger, a collection of open source blockchain tools developed by Linux Foundation. The first is an "identity chain" and the second is the "voting chain." Based on a verified voter list created by election organizers, voters first need to confirm their identity and obtain an "identity token."[4] With identity tokens, voters can transact on the "voting chain." Each ballot choice acts as a recipient on the voting chain, and each "vote" is the transaction of a token going from the voter to a recipient, thus representing a vote cast for that option. All mobile devices and tablets anonymize users' identities before submitting votes. Once votes are cast, the transaction (vote) is immutable and securely stored on the blockchain ledger.

MA Democratic State Convention

According to a list provided by the MA Democratic Party, Voatz created a QR code for each delegate, which was printed on their badges at the MA Democratic Senate Convention. Each delegate was responsible for verifying their identity using photo identification through the Voatz app prior to voting.

Optional, ballot-specific identity features were also tested, such as photo comparison and verification. After voters scanned their QR code and cast their vote on one device, they would also take a picture of themselves on the device. When voters moved to a different voting station or device for another vote, they would take another picture of themselves to compare with the first picture taken.

Tufts Community Union Senate Election

All undergraduate students were eligible to vote in the TCU Senate Election. A list of students was provided by the Tufts Registrar, and Voatz created a unique QR code for each student, which was emailed to them prior to the start of the election. Students verified their identities on a smartphone or tablet with their Tufts student ID card prior to or on the day of the election.

The verified identities were hashed and stored on a blockchain, and voters received "identity tokens," which were used to cast their ballot in the election(s). Voters do not interact with their identity tokens; rather, the tokens exist on Voatz's backend and allow voters to cast ballots during elections.[5]

In both cases, voters were able to verify their identities, scan their QR code, cast and view their votes, and view election results via the Voatz app on a smartphone or tablet device. To cast votes, users simply type their login details, select the voting event in which they would like to participate, and then choose the option for their ballot choice.

Voters do not interact with blockchain-specific functions such as wallet addresses, tokens, or long private keys. Instead, a 6-digit pin set by the voter or biometric verification acts as each voter's private key.

The Voatz platform also includes an admin interface for election officials to view ballots, add voters, and/or publish results.

Blockchain Value Proposition

In both use cases, Voatz sought to take steps toward establishing new methods for mitigating many of the challenges present in the current voting system – e.g., designated voting times, dates, and locations; paper-based identity registration and verification. Addressing these issues – no easy feat – could serve to modernize the voting process, increase efficiency, and lower the cost requirements surrounding elections.

Additionally, Voatz is premised on the idea that if voters use blockchain-based protocols for identity creation and management, they will be able to see and trust that their votes are accurately recorded. Similarly, election organizers can trust that voters are who they say they are.[6]

While relatively small in scale, the initial state party and university use cases signal some potential value along those lines. At the MA Democratic State Convention, Voatz facilitated delegate check-in and registration as well as committee voting for over 2000 participants. The use of Voatz in the TCU Senate elections led to a 100% increase in voter participation.

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PROJECT ANALYSIS

Risks and Challenges

The right to vote is one of the most critical ways individuals can affect government, and thus, should not be taken lightly. Election results have the ability to change the future of a community or country. Considering the delicacy of electoral events and democracy, blockchain-based voting solutions must operate with extreme care and caution in such environments.

The Voatz team takes steps to protect users against risks associated with voting, such as identity fraud, improper recording of votes, voting machine failure, and destruction or invalidation of ballots. However, critics of the technology, such as Professor Audrey Malagon often point to GENESIS block issues in arguing against blockchain-enabled voting:

> *"...the problem is that blockchain technology in voting does nothing to make sure that correct information gets put on the list in the first place. If a vote is distorted before it's recorded, bad information gets on all the lists, and blockchain actually keeps bad information secure. While this may not be obvious to the person voting, you can bet the hackers are aware of these vulnerabilities."*[7]

While Voatz creates a tamper-proof ledger for voting results that is virtually impossible to hack, mobile and blockchain-based voting creates other opportunities for interference. Instead of altering the final vote count (which is recorded on the blockchain ledger), hackers may target other, more vulnerable points of the election, such as the Voatz app interface, the code of each vote prior to encryption, or third-party biometric verification systems. By interfering with these other systems prior to vote encryption, hackers can ensure incorrect information gets recorded onto the blockchain, which may then be extremely hard to identify and correct.

While overall a success in two different projects and with different user-groups, Voatz still faced some challenges and introduced potential risks to the electoral process. These include:

- ***Trust and understanding of blockchain-based voting by election officials and users.*** In both cases, Voatz was the only option for delegates and students to vote. Thus, the decision was already made by election officials to trust the technology. In other voting events, voters may have the option of blockchain-based voting or traditional voting methods. Voatz will need to continue to make the case to election officials and voters alike regarding why their technology is preferable.

- ***Pre-registration and voting-related inefficiencies.*** Long lines and wait times at polling stations are major drawbacks of the current voting system for which Voatz claims to be a solution. However, although Voatz allowed voters to pre-register/verify their identities, most people did not, which created delays and long queues on the day of the event.
- ***Necessity of onsite presence.*** Voatz staff were onsite at both voting events to encourage voting and assist with any issues, but this is neither a sustainable nor a scalable solution. For future projects, Voatz must train election staff prior to the event and/or create a troubleshooting process for the day of the election.
- ***Developing an effective strategy to address the risk of collusion.*** The current system requires election organizers to choose four nodes that comprise the consensus protocol. The Voatz team acknowledges that, while highly impractical and improbable, collusion is possible amongst the nodes. With higher-stake elections, one can imagine a situation where nodes will have incentives to collude and/or hackers to attack the system to alter election results or retrieve personal information.
- ***Countervailing winds regarding technology and voting.*** In contrast to Voatz's blockchain-based voting solution (and other tech-based voting solutions), there is a large and vocal constituency advocating for voting reform that moves away from technology and back to traditional pen and paper-based ballots. To this group, which notably includes the computer scientist Barbara Simons,[8] voting is a unique sanctity that must be protected and resistant to tampering - and the only method invulnerable to hacking is paper.

Next Steps and Opportunities for Scaling

Both of Voatz's initial projects demonstrate the potential of blockchain-based voting to be deployed in the near future. To build on these early proofs of concept, the Voatz team is plotting out a number of next steps:

- ***Uniformed and Overseas Citizens Absentee Voting in West Virginia:*** Just after the time of this writing, Voatz provided a secure military mobile voting application for West Virginia's May 8th Primary Election available to all eligible Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA) voters in Harrison County and Monongalia County.[9] This pilot project is the biggest opportunity for Voatz, and blockchain-based voting in the United States, to date. Some of the challenges Voatz may have faced during the election include: lack of technical support for overseas voters, integration of blockchain-based voting and traditional voting, and more sophisticated hackers and collusion as the election stakes increase. With those challenges in mind, Voatz's official partnership with the State of West Virginia provided an opportunity to liaise with government officials in better designing and implementing its solution while addressing challenges. Lessons learned from research into the West Virginia pilot will provide additional insight into how effective and secure Voatz can be in more contentious election contexts.[10]
- ***Moving from Transactional to Foundation ID:*** While voting is an important step in electoral processes and democracy, it is far from the only opportunity the Voatz team sees for blockchain-based solutions. By creating robust and authenticated digital IDs on the platform, Voatz envisions a future where users' Voatz IDs could offer more foundational IDs, like a passport or driver's license. Many of the long-term goals of the system, however, will only be realized if the Voatz network expands to cover a range of private and public voting events, building the type of user base necessary for such aims.
- ***Increasing Safety and Security of the Voting Process:*** The Voatz team also states they are exploring ways blockchain can manage the chain of custody of voting machines as well as make auditing and voter registration processes safer and cheaper.

With the plethora of blockchain-based voting solutions, it is perhaps only a matter of time before one makes major headlines with an implementation in a larger-scale, higher-profile election. Within this space, Voatz is well positioned, although risks and challenges will definitely need to be confronted as the scope and scrutiny of Voatz implementations continue to grow. The West Virginia pilot will be a definitive opportunity for Voatz to showcase its technology as well as engage government officials. It could provide key insight into the opportunities, feasibility, and risks of scaling blockchain-enabled voting beyond more limited pilot projects.

ENDNOTES

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3 "Editorial: Use of Voatz is a step in the right direction." Tufts Daily, September 28, 2017. https://tuftsdaily.com/opinion/editorial/2017/09/28/editorial-use-voatz-step-right-direction/

4 Interview with Nimit S. Sawhney, Co-Founder and CEO, and Jesse Andrews, Business Development, Voatz, March 28, 2018.

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