Democracy Decentralised:

Voting, Governance & Transparency

dGen

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Democracy Decentralised:
Voting, Governance & Transparency

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Written and researched by Evelyne Buzziol and Maggie Clarendon

dGen is a not-for-profit think tank based in Berlin, Germany. We focus on how blockchain technology can contribute to a decentralized future in Europe and what this might mean for people, society, private entities, and the public sector over the coming decades.

We're working with a team of researchers exploring how decentralisation will shape our future. Our insight reports focus on specific topics and industries to drive ideas for adoption in Europe. To find out more, please visit us at dgen.org.

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Foreword

When I grew up, the world seemed to be in a transition from analog to digital. Y2K was real and teachers hardly knew what hit them when information would be sourced from websites instead of books. We'd increasingly use the internet to communicate with one another and the first smartphones saw the light of day. By the time I turned 18, my first experience in participating in democracy felt surprisingly analog; despite a decreasing involvement in the democratic process, and eroding trust in our institutions, surprisingly little had changed since our grandparents cast a paper ballot two generations ago.

2020 has proven to be a catalyst for change, forcing us to (sometimes hastily) adopt novel technologies to handle new situations. Throughout the world, however, we're seeing that people who have embraced technology and experimentation are the most successful in this transition.

With all the technological progress we've made over the past 30 years, and while facing a public health crisis challenging our status quo, it's time to have a conversation about the future of voting and governance. After all, global connectivity has demonstrated its ability to democratise markets and access to opportunities, so why not rethink how we execute democracy itself?

Between theoretical ideas, like quadratic voting popularised by Eric Posner and Glen Weyl in Radical Markets, and practical experiments with technology, like DLT for immutability and transparency, there are interesting new opportunities to let people participate in the democratic process.

This might not solve all the problems we're facing right now, but new ideas with great user experience do have the potential to make the democratic process more inclusive for all of us.

Jake Stott & Nick Dijkstra

Founding Board, dGen

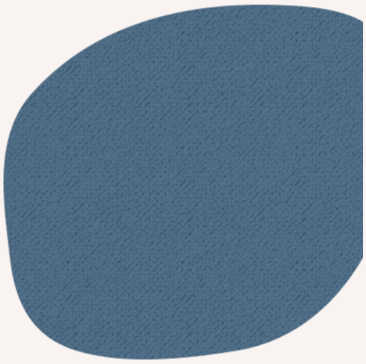
Executive Summary

While the internet revolutionised many aspects of our daily lives, one fundamental element left behind are our democratic systems.

While the internet revolutionised many aspects of our daily lives, one fundamental element left behind are our democratic systems. Although it is widely recognised that current governance and voting systems are prone to fraud and lack of transparency, global governments remain reluctant and hesitate to modernise. While technology is far from the only solution, it poses several necessary interventions. Current unresolved issues democracies are related to:

- Reliance on Political Parties
- Homogenisation of Opinion
- Trust
- Rule of the Majority
- Low Voter Turnout

In addition, when democratic voting systems do not follow necessary requirements to protect the validity of votes, it can be difficult for citizens to hold governments accountable.



Once again, the Covid-19 pandemic exposed major weaknesses in our political systems. Postponing the US presidential election was proposed,[1] and the legitimacy of this election is still under attack with a substantial percentage of mail-in ballots expected to be thrown out.[51] Belarus' presidential elections reappointed Lukashenko as president despite widespread protests and accusations of vote rigging.[12]

European Democracies

While Europe is widely viewed as a stronghold of democracy, the situation is not much better. There are varying levels of direct representation, with most modern democracies combining republics and democracies. While some systems stand out among others - like the Swiss one[8] - many others fail to account for low voter trust and declining voter turnout. This leaves power centralised in the hands of a few elected officials, who may not represent the full population.

Estonia i-Voting System

Democracies and our outdated voting systems need to be rethought. Political power must be more decentralised, leading to more direct democracies and greater inclusion. Online

voting initiatives have been in various stages of development for decades, trying to achieve this. However, especially with i-Voting systems, or online voting, governments face different security, privacy, and hacking concerns.

Among all these attempts, one country has excelled, launching the longest running national online voting system - Estonia. The i-Voting system was first applied for local elections by the end of 2005, and now the country has reached a proportion of 1/3 of citizens voting via the internet. The i-Voting system relies on three servers, following the double envelope scheme used on postal voting. Further, voters authenticate in the portal with a digital ID and a digital signature PIN, and have 7 days to cast their vote - a measure implemented to avoid vote coercion. While Estonia's online voting has not experienced specific or serious threats to the i-Voting platform, some studies argue that there is still a problem with 'trust in central servers' to be solved.[26] The Estonian i-Voting system brings with it some valuable benefits, including substantial cuts to election costs. The EU Commission recognised it as a workable solution to follow in developing other European online voting systems.[29] However, a positive experience of one country does not ensure the success of the model, if implemented in another environment.

Blockchain-based Initiatives for Voting

Blockchain-based proposals are still underdeveloped for national elections, but offer interesting alternatives to address major transparency, security, and accessibility issues. However, it comes with major pros and cons.

Namely, blockchain-based proposals offer solutions beyond merely vote collection, to address deeper governance issues.

Namely, blockchain-based proposals offer solutions beyond merely vote collection, to address deeper governance issues. Decentralised Autonomous Organisations (DAO), first applied on the Ethereum blockchain, are drawing increasing interest thanks to their automated and non-hierarchical structure. While not yet used in public governance, there are several potential use cases, such as managing government contracting, or improving the voting process and mitigating partisan politics for legislative houses. Although expectations are high, this technology still has limitations, namely:

- Data integrity
- Data confidentiality
- Rule integrity.

Another potential solution offered by modern technologies and blockchain is quadratic voting. This system gives multiple votes so that voters can give more weight to issues they care about more. However, quadratic weighting means that second, third, and more votes count for less than the first vote. In other words, additional votes will not be enough to outweigh the vote of the basic population. Although this option still has problems with the transparency of blockchain, once solved, it might mitigate the problem of low voter turnout among young citizens. It may reduce feelings of powerlessness in the political system and convince Millennials and GenZ that their votes count.

Technical and Social Considerations for Online Voting

Implementing an online voting system is a difficult upgrade, but, at this point, also indispensable. Research is well on the way to finding workable solutions. However, there are still a few aspects that need to be discussed.

- Cost of i-Voting
- Voter Turnout
- Verifiability, Trustability, and Security of Platforms

In addition, as i-Voting also aims to increase voting access, some social factors that can undermine accessibility of specific social groups must be taken into account. In this report we try to cover major risks of the i-Voting system when it comes to minorities and immigrants, and people who do not have access to the internet or suitable digital devices.

Conclusion

To make sure that democracies continue to represent the interests of their whole constituency, especially younger generations, change must happen sooner rather than later.

To make sure that democracies continue to represent the interests of their whole constituency, especially younger generations, change must happen sooner rather than later. We look forward to improved technologies to enable these systems, although recognise that they are far from the only solution. Based on this, we recommend and expect:

1. The EU Parliament should trial quadratic voting in the next 5-10 years.
2. DAOs will begin to be used by multinational civil societies and smaller, digitally robust villages.
3. Voter turnout will be bolstered by greater transparency

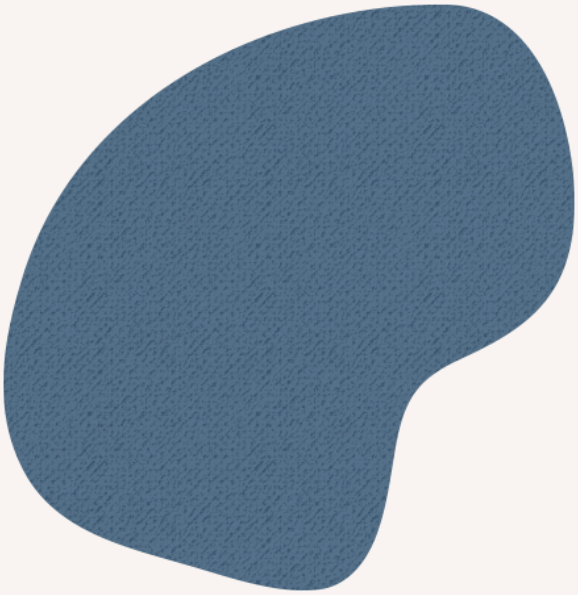
and more reactive democracies.

4. Online voting will be an option in five to seven countries by the 2029 EU elections.

5. Online voting will increase the number of referendums and special elections.

Technology is not be the only solution to decentralise power back to citizens, but it presents many potential solutions, and is one that we continue to look to.

Our democracies have stagnated for too long. While transfers of power and security are concerns that should not be taken lightly, the issues inherent in our current systems are too great to ignore. Technology is not be the only solution to decentralise power back to citizens, but it presents many potential solutions, and is one that we continue to look to.



1

Introduction

Introduction

Democracies developed well before mass digitisation. While the internet has radically improved access to information, in many ways, voting and governance remain relics of a time when communication took months.

While elections routinely make the news, it is rarely for positive reasons. The accusations of fraud, protests, and general controversy surrounding elections in recent years seem to have pulled back the veil, revealing our democracies to be a practice in trust that is simply not holding up.

The US is perhaps the most notable of this in 2020, with President Trump threatening to postpone the election due to coronavirus.[1] Hong Kong actually delivered on this, citing the pandemic to postpone elections in the midst of massive citizen unrest.[2]

While Trump may be unsuccessful in stopping the election all together, his threats to the US Postal Service caused more stir, as people realised without the post, many would not have a socially distanced means to vote.[3]

Large-Scale Issues

Currently, there is a lack of transparency in voting globally and continual issues with accessing a secure means to vote.

However, this also revealed that voting systems are out of date, and not just in the US. These problems are largely two-fold. The first is in how votes are actually collected and communicated to the voting public. Currently, there is a lack of transparency in voting globally and continual issues with accessing a secure means to vote. In-person elections are inconvenient, and can contribute to low voter turnout, while mail-in and online voting systems have both proven difficult to secure and susceptible to more voter error.

The second issue largely relates to political systems, which can face many problems in how they are structured. For instance, many systems are designed to privilege political parties, even over issues. While the US has fallen into the trap of a two party system, locking all other political affiliations out of the political system, Germany has the opposite issue.

German federal elections are for both candidates and political parties. To ensure that the makeup of the Bundestag, or parliament, stays proportional to the vote, "overhang" seats are added based on votes for political parties. In 2018, the number of political parties and seats that earned votes became

a clear issue, with Germany holding the spot for the largest democratic chamber in the world, with 709 lawmakers.[4]

With elections approaching in 2021, the number of current seats and expected seats to result from the elections became a pressing issue. First, the Bundestag is already prohibitively expensive, pulling funds from actual government functions - estimated at over €1bn this year.[4] Additionally, the difficulty of reaching decisions with such a large group continued to drive the need to find a solution. In August, a compromise was finally reached to limit further growth of this house,[6] but it was not easy, as any changes could shift the balance of power.

The setup of voting systems make it nigh impossible for the average citizen to observe the election and ensure integrity of the vote.

European democracy has deeper issues, even though Europe is often held up as a bastion of democracy. Belarus is one of the latest countries to face a major voting scandal. Incumbent President Lukashenko retained power, despite massive protests and calls of voting fraud. The election audit system left out notable organisations, but in general, the setup of the system makes it nigh impossible for the average citizen to observe the election and ensure integrity of the vote.

Across Europe, these issues are pulling back the charade holding democracies together and revealing that updated, more transparent, and better designed systems are necessary.

Time for an Update

As citizens now have access to information nearly instantaneously, they have the chance to be informed on voting issues like never before. It may be time to address the possibility that this offers for less representative governments, and more direct democracies.

These efforts offer much greater transparency, and potentially more reactive and direct democracies - the kind that the internet should have heralded.

Many of these conversations are already underway in different communities surrounding blockchain technology, especially with the rise of Decentralised Autonomous Organisations (DAOs). These efforts offer much greater transparency, and potentially more reactive and direct democracies - the kind that the internet should have heralded. While they may not be the perfect solution for national government elections, they provide interesting possibilities that should be included in discussions, and a potential model for how to update our governance systems.

2

European Democracies

European Democracies

Democracy is traced back to ancient Greece,[6] with the term coined in the 5th century BCE. It refers to a system of government that relies on the people who are governed to collaborate on their own ruling. However, there are several iterations of this, with varying levels of direct representation.

The majority of the population is able to vote for a representative who then carries out the direct act of ruling.

Most modern democracies are some combination of republics and democracies - with the majority of the population able to vote for a representative who then carries out the direct act of ruling. These representatives take the form of presidents, prime ministers, parliaments, and sometimes judiciary figures.

The European Union (EU) has a vested interest in democracy, with the 'stability of institutions guaranteeing democracy' listed as the first criteria for nations seeking to join.[7] Even with this, 12 monarchies remain in Europe, with six of them current members of the EU. However, each of these monarchies has a heavy reliance on parliament, and either has legal stipulations that make the monarch a figurehead or convention that does the same.

Therefore, there are four main classification of government in Europe are:

- Presidential republics
- Semi-presidential republics
- Parliamentary republics
- Parliamentary constitutional monarchies.

Under all of these systems, eligible voters - generally composed of citizens 18 or older, with some stipulations - elect the head, or heads of state, which can be a president or a president and a prime minister, as well as parliamentary representatives. These elected officials make most governance decisions, although referendums are also used to get direct opinions from the voting electorate.

Over half of all global referendums have been held in Switzerland.

Switzerland has a particularly interesting democratic system, as representational democracy and direct democracy run in tandem.[8] All-in-all, this means that there are far more referendums. Over half of all global referendums have been held in Switzerland.[8] This grants voters the ability to voice their own opinion on matters, rather than trusting a representative or having to compromise on certain issues to vote a

representative who will reflect their views on other topics. Referendums must be held on all constitutional matters and major international treaties, although voters also have the right to challenge laws passed by the Federal Assembly.[8] Online voting was offered in 10 out of 26 Swiss cantons until the beginning of 2019 to make this system easier to participate in, although the online voting systems were pulled to be made more secure for 2020.[9]

While other European nations also rely on referendums for certain matters, their democracies are far more representative, centralising actual legislative power into the hands of a few elected officials.

Further, while the majority of Europe's nations fall into one of the aforementioned categories technically, in practice, some countries have ceded enough power, either officially or unofficially, to the president that they may not be classified as a true democracy. Belarus is one such example.

Democratic Failings

While the 1994 constitution characterised Belarus as a 'democratic, social state', revisions to the constitution in 1996 gave the president far greater reach,[10] and have led to calls that this is no longer a democracy. The 2020 elections, which sparked widespread protests, both within and outside of Belarus' borders, reveal general dissent with the state of the government.

'[I]nternational election observers can't be present across the entire country', so even in nations where all credible observers have been invited, full transparency of elections can remain uncertain.

- Florian Marcus, Digitisation Expert & Keynote Speaker, e-Estonia

Overall, there is a fundamental transparency issue, in which the public must trust that first of all the government will accurately count and report the outcome of elections, and second, uphold the promises made during elections to meet the demands of the public. At present, Belarus relies on a method for securing the integrity of their vote that is very similar to most other democracies - allowing political parties, international organisations, and more to observe the election.[11] While this year, certain organisations were not invited to observe the election, notably the OSCE's Office for Democratic Institutions and Human Rights,[12] there are other obvious flaws with this system. As Florian Marcus, Digitisation Expert & Keynote Speaker for e-Estonia noted, 'international election observers can't be present across the entire country', so even in nations where all credible observers have been invited, full transparency of elections can remain uncertain.

While Belarus is extreme in the oversight taken, the rest of Europe could be improved.

Issues with Representational Governance

Even with widely accepted election integrity, representational democracies require voters to cede power to their elected officials. This creates several issues, including:

Reliance on political parties

In order to create political alliances, communicate views, connect decision-making between legislative bodies, and hold politicians accountable, democracies rely heavily on political parties.[13] However, as mentioned previously, voting for parties as well as candidates in the German Bundestag has actually degraded the function of that legislative body.[5] Further, it can be disproportionately difficult for new political parties or unaffiliated candidates to break into political scenes, due to laws, incumbent wealth, and visibility to the voting public.[14]

Homogenisation of Opinion

Voting for candidates or parties often requires voters to compromise on certain issues, risking the erasure of certain opinions if they do not find a candidate that can adequately represent their views.

Trust

One study found that only 6-9% of eligible voters trusted politicians to tell the truth.

Representation requires a great deal of trust that election promises will be carried out. While some of these promises are blocked by legislative systems, voters must trust that candidates will not make promises that they can keep and will put their efforts into keeping election promises. While studies continue to find that the majority of candidates do deliver on the many promises, one study found that only 6-9% of eligible voters trusted politicians to tell the truth.[15] It may be time to decentralise direct voting power back to citizens, rather than forcing them to continue to rely mostly on elected officials they don't trust.

Rule of the Majority

Modern democracies function on the premise of one person, one vote, but this model has been widely criticised for decades as discounting the interests of minorities, and can lead to issues such as the systematic transfer of resources away from minority groups.[16] The criteria to join the EU also includes 'respect for and protection of minorities',[7] which may indicate a need to explore voting models outside of the current system. Solutions to this issue often rely on complicated mathematical systems,

Decentralising the power in democracies from representational figures, even partially, can serve to improve our governance systems.

which makes technological solutions particularly well suited.[16] Decentralising the power in democracies from representational figures, even partially, can serve to improve our governance systems, and could even revive interest from voters, if they feel that their opinions are better reflected.

Low Voter Turnout

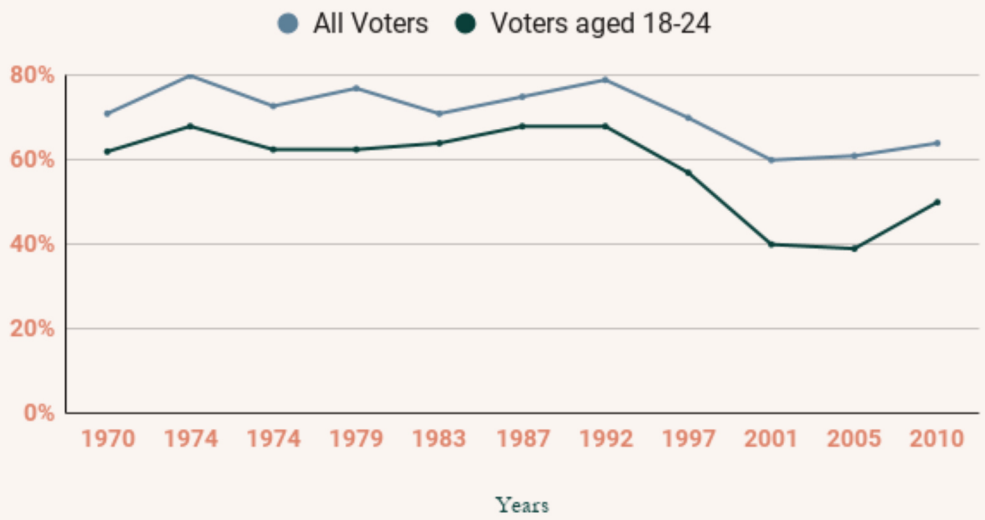
Voter apathy and low voter turnout are growing problems, and cause for significant concern, as without the vote of the majority of the electorate, a governance system cannot be representative.

Cause for low turnout is difficult to trace, but is widely attributed to:

- Disillusionment or feelings of powerlessness[15 17]
- Lack of interest[18]
- Lack of knowledge
- Barriers to voting.[15]

Low voter turnout, although a problem across all demographics, affects Millennial and GenZ voters,[18] Figure 1.

Figure 1: Election Turnout Since the 1970s



Source: [56]

Multiple studies have found that this can be linked to all of the issues above. In particular, these generations are less likely to feel that elected officials care about them and their concerns, with only 16% answering positively to one survey.[18] At what point will the continued trend of dropping youth voter turnout make our democracies unviable? As the next generation, the decentralised generation, approaches voting age in the next decade, we need to address these issues, and rework our democracies to serve the populations they govern and are supposed to represent.

In their current iterations, while often still functional, democracies have many issues. According to Drs. Hans Koning, Chair of DigitByte Foundation & PhD Researcher:

> 'Our societies, cultures and dynamics have changed dramatically, our democracy hasn't'.

'Our societies, cultures and dynamics have changed dramatically, our democracy hasn't'.

- Drs. Hans Koning, Chair, DigiByte Foundation & PhD Researcher

That being said, updating governance is never an easy task, and should not be undertaken without extreme caution. While the internet may not be the only solution, the improved ease of voting or different models presented by different factions, such as the blockchain community, are areas that deserve continued research. As Drs. Koning continued, it is 'important to realise that blockchain is a tool, a facilitator, and at best, a catalyst, but not a solution for securing or promoting democracy'.

3

Online Voting

Online Voting

Continued security, privacy, and hacking concerns have thwarted many of these initiatives, especially i-Voting initiatives.

Online voting initiatives have been in various stages of development for decades. However, continued security, privacy, and hacking concerns have thwarted many of these initiatives, especially i-Voting initiatives. i-Voting reference voting from an internet browser, versus e-Voting, which merely relies on an electronic machine in polling stations.[19]

For strong election integrity, there are many conditions that must be met, for both online and off-line voting.

Requirements for Democratic Voting

- **Integration** – Ensuring that the system of collecting and counting the vote is integrated and either equal or equitable, depending on if representation is based on population or the same regardless, for the entire region.

- **Security** – Ensuring that the entire system is secure, from individual ballots to the collection and counting of all ballots, to make sure that votes are counted as they are cast.

- **Transparency** – Making the voting collection, counting, and reporting process clear and auditable. Ideally any voter should be able to audit the system, but at present international organisations are generally relied upon to provide complete oversight and assurance that the system is operating without fraud.[20]

- **Privacy** – The right to a private vote is important to ensure that voters can, first, vote as they wish without potential repercussions, and second, to protect against voter coercion.[21]

- **Registration** – Voter registration is an important means of ensuring that only those who are eligible to vote (normally citizens over 18 years old, although mental disabilities and past incarceration also widely disbar otherwise eligible voters) have access to their vote, but vote only once.[22]

- **Accessibility** – Ensuring that eligible voters can access the polls is an important step to a fair and free election.[22]

Any online voting platform will have to contend with all requirements for a free and fair election, but should also strive to improve upon the issues that have plagued democracies for centuries. As a Tusk Strategies representative put it:

'Today's election infrastructure is outdated and vulnerable. We need a better alternative'.

- Tusk Strategies

> 'Today's election infrastructure is outdated and vulnerable. We need a better alternative. Technology solutions, like blockchain, when paired with an auditable paper trail, can help people vote more securely than the status quo'.

However, while many nations have struggled to launch online voting systems, with several launching, only to later recall them, Estonia has possibly the longest running national online voting system.

Estonia i-Voting Use Case

Estonia introduced an internet voting (i-Voting) option for local elections as early as 2005. Nowadays, the system has been extended at the national level. In 2019, '46.7% of all votes were cast online' according to Florian Marcus, Digitisation Expert & Keynote Speaker for e-Estonia, for the European Parliament election. While Estonia has by far the widest user base for their i-Voting system, Estonian's enjoy the possibility to vote via two different modes: on paper in polling stations or remotely over the internet.

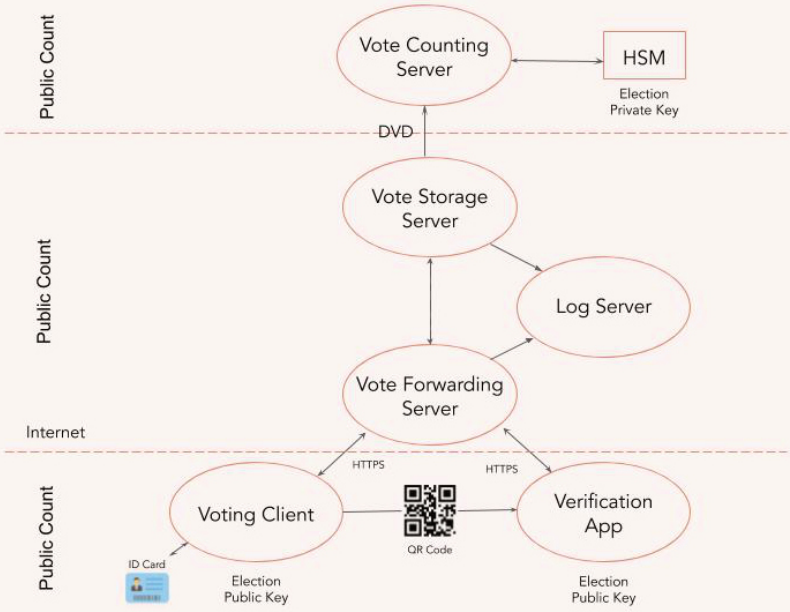
Now, Estonia has reached a proportion of 2/3 of citizens voting on paper and 1/3 of them voting via the internet - the optimum level according to Dr. Vinkel.

The i-Voting method was piloted first in Tallinn, and then implemented for local elections by the end of 2005. Although only around 2% of votes were cast electronically, it was generally considered a success.[23] During 15 years of operation, it has undergone extensive testing and improvements. Now, Estonia has reached a proportion of 2/3 of citizens voting on paper and 1/3 of them voting via the internet - the optimum level according to Dr. Vinkel and a proof that people have gained confidence in using e-IDs.[24]

For security, the Estonian i-Voting system relies on three servers. The Vote Forwarding Server, which authenticates i-voters and distributes ballots, the Vote Storing Server, which stores i-Votes while they are anonymised, and the Vote Counting Server, which is always offline and responsible for tabulating votes,[23] Figure 2.[57] As cybersecurity expert, Liisa Past, explained in a 2019 conference, this was designed to '[mimic] the double envelope scheme used on postal voting'.[24] From the voter side, Estonia's e-ID cards have made this a fairly simple process. Marcus explained this process as:

> 'First, authenticate yourself with your digital ID; second, click on the candidate you want to vote for; third, enter your digital signature PIN to confirm your choice. That's it. So it really takes around 20 seconds to cast your vote online'.

Figure 3: e-Estonia's i-Voting Architecture



Source: [57]

Particularly, 'the need to trust the central servers' was noted as a risk that remains to be solved in Estonia's i-Voting.

In the case of Estonia, specific or serious threats to the i-Voting platform have not occurred.[25] However, one study concluded that 'the procedures Estonia has in place to guard against attack and ensure transparency offer insufficient protection [...against] a state-level attacker, sophisticated criminal, or dishonest insider'.[26] Particularly, 'the need to trust the central servers' was noted as a risk that remains to be solved.[26] Estonia rejected the credibility of the researchers.

Another issue that remains with any online voting system is the security of individual devices, which cannot be guaranteed. Improving the system and raising people's awareness on cybersecurity in cyberspace are the best ways to ensure the security and verifiability of votes. Recently, the government boosted the general framework and the user interface, to avoid errors of disclosing or opening votes.[25] To address this, Estonia is running cyber hygiene campaigns across the country. According to Taimar Peterkop, from Estonia's Information System Authority:

> 'Cybersecurity starts with us. If you have weak cyber hygiene, that's a problem. We need to raise awareness and educate people about using strong authentication methods'.[27]

Furthermore, Estonia has had to contend with the possibility of voter coercion or bribery. Outside of a controlled voting booth, it is possible for someone to watch a vote be cast. To combat this, Estonian citizens have seven days to cast their vote, and the possibility to re-cast in the case of an error or a coerced vote. Only the last vote is counted.

Dr. Mihkel Solvak, expert from Johan Skytte Institute of Political Studies, researched the perception of i-Voting reliability according to Estonians, and he discovered that 'Estonians have an overwhelming trust to i-Voting and it is continuously rising'.[24] This is reflected in the 43.75% of votes in the latest parliamentary elections' that were cast online. Compared to the 2017 local elections, there was an increase of 12.05% of online votes.[28] Further, the success of the e-enabled elections experiences has also been recognised from the European Parliament within one of its studies for the AFCO committee, where it stated:

> 'Internet voting for the European Parliament elections could build on the Estonian case'.[29]

The future of Estonia's voting system and the adoption of a similar online method by other countries depends on different factors and not only on the reliability of systems and platforms used to deliver the vote. Cost offers a great incentive for adoption. According to Prof. Dr. Robert Krimmer of Tallinn University of Technology, during the 2017 Estonian elections, an electronic vote cost half of the average cost of a paper vote. This was not only the 'lowest administrative cost per vote in Estonia, but likely also one of the lowest worldwide'.[30]

'[T]he reason blockchain exists, governance, is neglected'.

- Martijn Bolt, Blockchain Implementation Specialist

However, this low cost should be cut into by stringent auditing and continual security and usability updates as technology continues to evolve. One technology that gained fairly widespread interest for voting a few years ago is blockchain. Martijn Bolt, Blockchain Implementation Specialist, pointed to why this could be, saying:

> '[T]he reason blockchain exists, governance, is neglected'.

So, while it can outperform some other systems in regards to security and transparency, it is not the only technology or cybersecurity technique that can be used to secure online voting, or the best, but merely that it has several properties that make it very interesting for this use.

Rather we turn to blockchain for the conversations already underway around governance.

Blockchain for Voting

There are two main concerns related to online voting systems: reliability of technology used to secure the voting process and transparency of democratic procedures. While blockchain cannot do much for corrupted political institutions or disinformation, it offers a deeply secure option to run online voting systems.

It was designed to create a system in which disparate, and potentially adversarial, parties could interact in a safe environment. Information is both verified and decentralised, and therefore highly secure as it removes a centralised point for hackers to attack. As John Calian, Managing Director at trust2core, told us:

> 'A system that uses a traditional database for data [storage] has the proven weakness of data corruption due to the basic fact that data stored in a database can be changed (edited or deleted). This cannot happen in a distributed ledger (blockchain) based system'.

'A system that uses a traditional database for data [storage] has the proven weakness of data corruption due to the basic fact that data stored in a database can be changed (edited or deleted)'.

- John Calian, Managing Director, trust2core

To greatly simplify it, blockchains work by connecting many decentralised nodes, and naming some of those nodes as authenticators,[31] either explicitly or through computational power available to that node. As information is added to the blockchain, it has to be verified using Proof of Work, Proof of Stake, or some other authentication method that encourages honesty.[31] Once a transaction is approved, a new block is created, referencing the hash of the previous block.[31] This is recorded on the ledger, which is stored on every connected node.[31]

While blockchain introduces valuable benefits for voting thanks to its fundamental features, at the same time, the same features involve concerns that require further consideration. Those aspects and related pro and cons are namely:

- **Immutable** – Information on the blockchain is highly secure (although insufficiently decentralised blockchains are susceptible to 51% attacks)[32] and immutable, so once a vote is logged, it cannot be changed.[33] On the other hand, it also means there is little room for user error and that fraudulent votes could also be counted. Although this is also a common problem with traditional voting systems, the system must be made adequately secure. Moreover, as blockchains are

immutable votes recount may be a moot. While some see this as a positive change, it could also have serious implications for our democracies, but would only be the case if all voting took place on the blockchain – an unlikely scenario in the near future.

• **Decentralised** – There is no single server to be hacked. To change the election, a hacker would have to control 51% of validating nodes. As Leonardo Aniello, University of Southampton Lecturer, noted:

> 'Regarding integrity, once votes have been cast and stored in the blockchain, tampering with them becomes computationally impracticable'.

'Regarding integrity, once votes have been cast and stored in the blockchain, tampering with them becomes computationally impracticable'.

- Leonardo Aniello, Lecturer, University of Southampton

• **Transparent** – Any participant would be able to independently count and verify the results of the election.[33] However, citizens' ability to audit the voting system could become an issue, as most people are not blockchain or cybersecurity experts. In fact, as Madhav Bhat, Management Consultant & dGen Fellow, pointed out 'there is a lack of federal bodies that could authenticate and certify a blockchain-based voting architecture'. Additionally, transparency during the voting progress might have severe implications for choices as the election unfolds. Finally, the possibility of developing a technology able to de-anonymise the ledger adds greater concerns, although this technology is not likely in the next few years.

• **Compromised devices** – While information on the blockchain is highly secure, the devices that voters use may not be secure.

These emerging voting models offer to revive our democracies, decentralising power to return it directly to voters.

There are possibilities far beyond simply replicating our current voting systems online, though, that are being developed on blockchain technology. These emerging voting models offer to revive our democracies, decentralising power to return it directly to voters. Even without opening up alternative democratic votes to the broader voting public, these systems can be useful in legislative houses. Overall, they pose interesting possibilities, with various allowances for different risk levels.

4

Decentralised Democracies – New Voting Schemes

Decentralised Democracies – New Voting Schemes

We are living in an era of great changes and challenges - climate change, the rise of populism, increasing geopolitical conflicts, major effects of globalisation, and the increasing tensions around issues such as police brutality and racism - and now Covid-19.

The virus has added stress to several weaknesses in our systems, especially when it comes to national and citizens' welfare and individuals' equal opportunities, as it is a severe threat to our personal well-being. However, many see in it an opportunity to rethink and reshape our current systems. This crisis also aligned with one of the most globally watched elections - the US presidential election. Along with the other stressors, it has also revealed deep flaws in our voting systems, and when paired with the other crises coming to a head, an extreme level of discontentment with our political systems.

The development of an online voting option was already on the agendas of many countries to make our democracies more inclusive and faithfully reflect citizens' needs. Many 2020 elections were disrupted. Although experts have discouraged governments from quickly switching to remote voting systems due to security issues,[34] postponing elections is a severe oversight as it suspends citizens' possibility to replace a political representative or government. This poses a multitude of threats to entire governments. However, even elections that have continued have major issues. For instance, 'in the first round of local elections in France the turnout dropped from 63.5% in 2014 to 45.5% on March 15, 2020'.[35]

We want to explore not only means for logging votes online, but how our democracies could be updated for better representation.

Now is the time to take more concrete steps towards new remote voting systems. We can not "save" this year's elections, but there is a lesson we should learn from living through Corona: governments must be equipped to ensure the proper functioning of democracies even when unexpected crises arise. Currently, there is more than one option to develop a safe and reliable online voting system. We want to explore not only means for logging votes online, but how our democracies could be updated for better representation.

Decentralised Autonomous Organisations

Decentralised Autonomous Organisation (DAO) models were built on the Ethereum blockchain and represent either an 'autonomous company or organization that builds on a

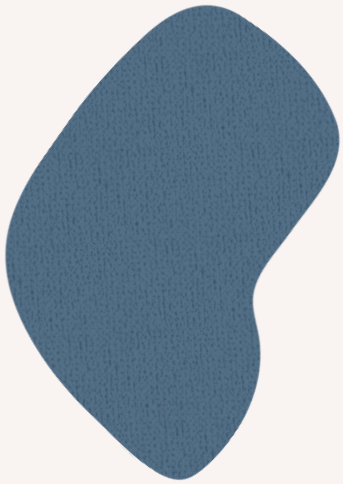
blockchain in which governance and rules are encoded in the form of smart contracts. The most important and basic characteristics of DAO are "decentralized" and "autonomous"'.[36]

DAOs aim to reduce human contribution in business management, decreasing company's costs and replacing the hierarchical and centralised scheme.

It is mostly applied at the private business level and aims to reduce human contribution in business management, decreasing company's costs and replacing the hierarchical and centralised scheme.

This scheme may not be applicable to national governments, especially at its current level of development. However, the automated, non-hierarchical structure provides interesting opportunities to explore how our democracies function, and potential solutions for either elective legislative houses to make decisions or radical governance changes for very small, local communities.

As with any blockchain-based systems, security, immutability, reliability, and transparency are baked into DAOs. As mentioned above, DAOs rely on smart contracts. Smart contracts are pieces of code, with set rules and outcomes, that become binding when on the blockchain.[37] Rather than being managed by people, DAOs are managed by smart contracts.



While blockchain technology provides a level of security to DAOs, as smart contracts are binding on the protocol, they are extremely susceptible to poorly written code. The advantages of this system are:

- Community-based decision-making, rather than reliance on one person.
- Transparent vote record.
- Automated decisions, once the rules are set.[38]

While not yet used in public governance, there are several potential use cases.

Managing government contracting is one such use.[37] It is well known that the process of contract allocation is often inefficient due to inter-agency interactions and the involvement of different actors in all phases. This also leads to a lack of transparency. The e-service could be used to submit any kind of government contract.[37] Smart contracts would then be used to track its execution and determine outcomes. In addition, the system automatically carries out all the steps of contract

acquirement - from contract preparation to contract auditing - while validating that requirements are met and making results available to all parties.

A second use is for legislative houses. Currently, they are often run by elected officials. However, due to party alliances, this can disadvantage certain parties or initiatives when it comes to voting.[38] Using a DAO in parliaments would reduce the risks involved in implementing this new technology, as it would be in a closed and controlled environment, but could improve the voting process and reduce the effects of partisan politics.[40] Already, DAOs are being developed for the management of political parties, so it would be interesting to see how it can change cross-party collaboration.[41]

The third use is the farthest from being realised. However, small villages or even small urban communities could employ a DAO to manage governance. This would remove the need for representational governance on the local level, as community members could automate much of the decision-making process without relying on one person. Services are already live which automate the creation of DAOs for non-developers.[42]

There are only three major security concerns that might threat this DAO service:

- Data integrity

if the data is altered or added to the blockchain from an unsecure oracle, or source, the consequences could be serious. However, this risk is very low due to the blockchain structure itself, as an attacker should deal with all the "honest" users to create new blocks.[37]

- Rule integrity

Once again, possibilities to compromise rules integrity are very limited as smart contracts execution cannot be influenced as long as the majority of users are "honest".[37]

- Data confidentiality

As we already pointed out, on blockchain, data is accessible to all parties and in case of sensitive data it might become a problem. However, here is where encryption comes by encrypting data before its submission. To avoid the abuse of this option, sensitive data can be defined in advance.[37]

Although this e-governance service example still has some limitations, it proves to us how the implementation of decentralised automated and efficient systems at the government level is very much possible.

Quadratic Voting

To enable voters to not only vote, but also represent their commitment to an issue, quadratic voting offers a solution.

To enable voters to not only vote, but also represent their commitment to an issue, quadratic voting offers a solution.[43] This system was initially developed for the purchase of votes. However, by employing blockchain, multiple votes can be issued for each election, whether for a candidate or referendum, without the fear that votes will be "double spent" or transferred to other voters.[44] Therefore, using blockchain, these votes can be issued for free, while still ensuring that only the person to whom they are issued casts them as a vote.

With multiple votes, the electorate can then allocate votes as they see fit on the ballot. However, the weight of the votes are diminished the more they use for the same issue or candidate. For instance, if a ballot has three referendums, and each voter is granted three votes, a voter would be able to vote on each referendum. However, if this voter only cared about the first referendum, they could forego voting on the other referendums and cast all three of their votes for the first. However, this would not be counted as three votes, but rather the square root of three, or 1.73, Figure 3.[55]

Figure 3: Impact of Quadratic Votes

Number of Votes Counted for an Issue	Cost in Tokens
1	1
2	4
3	9
4	16
5	25
6	36
7	49
8	64
9	81
10	100

Source: [55]

The issue of majority rule 'could be resolved using quadratic voting concepts, which are feasible to deploy with blockchain platforms, and could lead to a more inclusive process of elections'.

- Swayam Shah, dGen Fellow & Distributed Governance Researcher & Consultant, Blockchain Evangelist

Therefore, while voters are able to give their votes more weight if they care about a certain issue more, the additional votes will not be enough to outweigh the vote of the basic population. This offsets, but does not remove, majority rule. As Swayam Shah, dGen Fellow and Distributed Governance Researcher & Consultant at Blockchain Evangelist, notes, the issue of majority rule 'could be resolved using quadratic voting concepts, which are feasible to deploy with blockchain platforms, and could lead to a more inclusive process of elections'.

This voting method is fairly complicated to track and account, and does not work in a system where votes cannot be attributed to a single voting ID, as second and third votes need to be weighted. That is why blockchain is central to large-scale, private quadratic voting. In order to keep votes anonymous, while still ensuring that second, third, and fourth votes are counted for the correct proportion, blockchain creates a transparent ledger and removes any chance of double spending votes.

This voting method was already trialled in the House of Representatives in the US state of Colorado.[45] While the allocation of 15 tokens per representative when voting on 15 bills was not particularly effective, due to the relatively low impact of second and third votes, when trialled with 100 tokens per legislator, the impact was far greater.[45]

The issue of coerced or bought votes under this system could be exacerbated, and the problem with transparency that blockchain presents are not resolved. However, even when used only in a closed and controlled system, such as parliaments, this voting scheme offers very interesting potential.

Could implementing a system that lets voters convey exactly how much they care about a matter change dropping voter turnout?

Advancements in privacy and security to make it viable for public use could turn this into a necessary lifeline for democracies, as Millennials and GenZ voting numbers, already disproportionately low, continue to drop.[45] Will the next generation, a decentralised generation, be convinced by traditional voting schemes? As feelings of powerlessness are repeatedly cited as a cause for low voter turnout among young populations, could implementing a system that lets voters convey exactly how much they care about a matter change this?

5

Considerations for Online Voting

Considerations for Online Voting

Beyond simply a different way to cast a vote, though, as we have covered, moving to online voting could open the possibility for a much needed update to our stagnating democracies.

While implementing a remote voting system, such as an online voting system, is a difficult upgrade for governments, it also appears as an indispensable step, especially in the midst of the Covid-19 crisis. Beyond simply a different way to cast a vote, though, as we have covered, moving to online voting could open the possibility for a much needed update to our stagnating democracies.

Although there are already some examples of successful systems of online voting and e-governance, this technological upgrade introduces many risks for individuals' security and right to vote. Major risks and concerns of online voting are related to security, secrecy, transparency, and trust.[46] At least some of these concerns hold true for all remote voting solutions, from online voting enabled by any technology to mail-in voting. In fact, many benefits of online voting are counterbalanced by negative aspects, which complicates the discussion of this solution even more. However, while these considerations show there are still improvements to be made, they also reveal some strong benefits to an online voting system. Additionally, research is well on the way to finding workable solutions.

Cost

Remote voting systems rely on cutting edge, and often expensive, means to ensure the reliability of voters' registration and the security of the vote itself.

Many argue that an i-Voting system cuts down almost half of the ordinary election costs, since traditional elections involve several logistical and administrative expenses.[46] However, remote voting systems rely on cutting edge, and often expensive, means to ensure the reliability of voters' registration and the security of the vote itself. Moreover, it is important to account for the costs of training and awareness to onboard citizens to a new voting system.

According to an IFES 2020 White Paper, initial cost calculations don't represent the real entity of this expenditure.[46] This is even more clear when considering the time spent to get a wide adoption of the e-service.

Additionally, maintaining these systems as technology advances must remain a primary concern, and should be accounted for by any country that opts for online voting systems.

Turnout

'Between the early 1990s and the late 2010s, participation in parliamentary elections across the OECD [countries] decreased from 75% to 65% on average'.[47]

Turnout in elections is decreasing all over the world. 'Between the early 1990s and the late 2010s, participation in parliamentary elections across the OECD [countries] decreased from 75% to 65% on average'.[47] Online voting has been touted as the necessary change to reverse this trend, given the improved ease of access for many. However, in practice, the conclusions are split. In Estonia, for instance, we note that despite fairly widespread acceptance of i-Voting, this did not actually improve electoral participation.[28]

Age and preferences both affect voter turnout. Many assume that older age-groups will be less willing to vote via the internet or will need to be trained on the functionality of the e-service. However, as Florian Marcus, e-Estonia Digitisation Expert & Keynote Speaker, told us:

> 'In 2019, around 34,000 Estonians aged 65+ cast their votes - considering there were around 247,000 online voters, that's actually quite remarkable'.

The benefits of not having to organise a trip to the polls for older voters, who may have limited mobility or not have a driver's licence, is apparent in this data. On the other hand, the impact of online voting on young voters is not obvious. In Estonia, voters aged 18-24 years use i-Voting less than voters aged 55-64.[28] While a portion of citizens would prefer to continue voting on paper simply because they enjoy it, regardless of their age-group, introducing online voting is clearly not enough to increase voter turnout.

New models of democracy that allow voters to better trace their vote and perhaps even dedicate more of their voting power to issues they care about may be the solutions we need to address rising voter apathy, particularly among young voters.

Verifiability, Trustability, and Security

Online voting systems must have end-to-end (E2E) verification, to ensure that the counted vote was the same as the vote cast. However, this becomes difficult to maintain with voter privacy. These aspects are essential to a free and fair election, and one of the greatest barriers to online voting. Further, voting away from a controlled setting, such as the polls, opens up the risk of vote buying, manipulation, and coercion, making the system vulnerable to espionage or fraud. Trustability of online voting systems is undermined by the inability to recount votes in post-

election audits, as ballots online will likely either meet the requirements to be counted, or be thrown out during the initial count. Since post-election audits are a worldwide best practice, this might be a big disadvantage for online voting.[47]

Hacking and attacks on internet portals and governments' websites are a major concern, and one of the biggest setbacks to developing i-Voting systems. This was proved by a 2010 case in Washington D.C. The election commission launched a call to test an online voting system targeting voters living abroad and military personnel. It was violated in less than 36 hours.[47] This led to a wide public discussion which questioned the legitimacy and workability of remote voting technologies. Similar incidents impact public perception, and mean that online voting initiatives can face higher security demands than traditional voting, although, if this drives the development of more secure voting systems, this is not necessarily a bad thing.

Social Considerations

Cutting eligible voters out of the voting process is a form of voter suppression, and therefore, online voting systems must be created with all voters in mind to ensure access. However, online voting has also been proposed to increase access to voting, particularly for people with disabilities, as many polling stations are not adequately equipped for their needs. In addition, it would also offer a time-saving opportunity for those citizens who live far away from any polling centre or abroad. However, there are some factors that can undermine the inclusivity of i-Voting.

Digital Divide & Literacy

The availability of a suitable device to vote, internet access, as well as the quality of the internet connection itself, are essential for online voting.

The availability of a suitable device to vote, internet access, as well as the quality of the internet connection itself, are essential for online voting. The divide in stable and fast internet access between urban and rural areas must be accounted for to ensure that rural populations are not cut out of the voting population.[29] Social differences are also apparent in the European digital divide, and are linked to education, gender, income, and age. However, it is expected that internet access and computer literacy will become widely diffused over the next few decades. One portion of the population that will likely continue to face issues with this are people experiencing homelessness. Voting access has long been an issue for those without a permanent residence, and limited access to connected devices mean that continued efforts to increase access to voting materials remain for this population. Therefore, introducing an i-Voting system must be carefully

planned so as not to increase inequalities in political representation, as a poorly implemented system might favour groups who already have above average voting rates, and usually belong to the wealthiest social classes.

Studies on the European Parliament's internet voting experiment attest that the principle of universal suffrage can be weakened if online voting becomes the only modality to vote.

Studies on the European Parliament's internet voting experiment attest that the principle of universal suffrage can be weakened if online voting becomes the only modality to vote. In this case, people who belong to the aforementioned groups will likely be excluded from the democratic process.[29] Furthermore, while i-Voting is often designed to make the right to vote more inclusive, during the planning of online platforms, specific needs of people with disabilities have to be considered. Otherwise, the risk of leaving some citizens without an alternative option to vote remotely is very high, making it an additional barrier to their vote.[48] Before the introduction of an internet voting system, the government should take steps to account for any issues that may arise.

The complete eradication of in-person polling stations or mail-in ballots seems unlikely, as people without access to devices or the internet will still need a means to vote. However, if online voting becomes a primary means for voting, and physical voting booths are reduced, further steps to include populations that cannot use the online platform will have to be taken. This also applies for voters that find the platform difficult to use. Even though a highly usable and intuitive platform is accepted as one of the most important elements of online voting, alternative solutions must remain available to those that find it prohibitively difficult to vote with.

Minorities & Immigrants

Finally, issues related to minorities and immigrants with host-country nationality must be addressed. In the first Estonian i-Voting experiments, Russian-speaking minority has suffered systematic exclusion from the online voting system, as the platform is provided only in Estonian. This specific issue stresses the possibility of a major failure if inclusion does not remain a priority in the planning process. However, it remains an issue with paper ballots as well.

Regarding immigrants, OECD analysis shows that the gap between non-native and native-born residents remains constant for the period between 2008-2016 in almost every surveyed country.[47] Estonia, Hungary, Israel, Lithuania, and Poland were the only exceptions. Across Europe, most countries only grant citizens full voting rights. Long term

residency can generally make immigrants eligible for citizenship. However, studies reveal that these populations participate in national elections less than native-born populations.[49] However, the implementation of the i-Voting system in Estonia increased participation among naturalised citizens. Voter registration, which is often based on national IDs, could become a barrier for non-native citizens. Compounding this is the fact that online systems often only offer one path forward, whereas registering with in-person, often allows for a wider array of accepted identification documents.

Awareness and knowledge of the social and political environment of specific countries are always necessary prerequisites, especially when implementing changes to the very fabric of our democracies.

Implementing a new system of voting, especially an online voting option, brings both a wealth of opportunities and risks. While the positive or negative experiences of one country can be used as important models, it does not ensure the success or failure of the experiment itself. In other words, awareness and knowledge of the social and political environment of specific countries are always necessary prerequisites, especially when implementing changes to the very fabric of our democracies.

6

Conclusion

Conclusion

This year, one of the most watched elections globally will take place amid the Covid-19 pandemic. And, while mail-in ballots have not proven to be fraught with mass fraud,[50] they are susceptible to higher amounts of voter error. For the most part, there is no correction system, or vote curing, for incorrectly cast mail-in votes. It is estimated that 7% of mail-in ballots will be randomly thrown out in the US presidential election.[51] This is enough to swing the election.[52]

With ever declining voter turnout, especially among young voters, we must correct and reverse these trends before they completely invalidate democratic processes.

However, issues with our democracies have been brewing long before this year. With ever declining voter turnout, especially among young voters, we must correct and reverse these trends before they completely invalidate democratic processes. It is essential to do so before the next generation, the decentralised generation, reaches voting age in 2030.

Therefore, we have explored various new voting models currently being developed using blockchain technology. While these are not a magical fix for all of the problems and fundamental steps must be taken to further secure these systems before they can be deployed to the voting public, they gesture towards future solutions. We look forward to continued innovation in the technology to make it workable. Additionally, use in legislative houses remains a primary sector to trial these systems.

Based on our analysis, we both expect and recommend:

1. The EU Parliament should trial quadratic voting in the next 5-10 years.

Already trialled in the Colorado House of Representatives,[44] this voting system could be a great benefit to the multinational body. It would help to ensure that different nations could give greater weight to issues they care most about - the issues that impact them most. Additionally, by following the example in Colorado, the EU Parliament has the opportunity to test the utility and ease-of-use of such a system, without having to make it viable for the entire voting population.

2. DAOs will begin to be used by multinational civil societies and smaller, digitally robust villages.

Several NGOs are already trialling the use of DAOs.[41] However, they will have great use for large, multinational organisations, in order to remove power hierarchies, but still improve communication and decision-making processes across borders.

For even more radical communities, this system could also be useful for very small, local elections, in the event that a community wants to avoid a strong hierarchical structure. As Eylon Aviv, Partnerships & Builderco.org Project Lead at DAOstack told us:

> 'We have quite a bit more to work out through and experiment with until DAO systems will be able to replace/compete with traditional governance systems, but we are on the right track'.

'We have quite a bit more to work out through and experiment with until DAO systems will be able to replace/compete with traditional governance systems, but we are on the right track'.

- Eylon Aviv, Partnerships & Builderco.org Project Lead, DAOstack

3. Voter turnout will be bolstered by greater transparency and more reactive democracies.

Voter turnout continues to decline. Steps to ensure that voters can make sure their mail-in ballots have arrived are being implemented.[53] However, given the number of ballots that are thrown out due to issues,[51] [52] updating this so that voters can see that their vote was counted in the election could help to boost participation. Further steps, like quadratic voting, while much farther out, could radically improve political participation, particularly among younger generations.

4. Online voting will be an option in five to seven countries by the 2029 EU elections.

Online voting remains a major step for many nations, due to security risks and legal challenges. However, several nations in Europe have already offered online voting. While Estonia seems unlikely to pull their i-Voting service anytime soon, Switzerland plans to relaunch an updated version of their online voting system this year.[54] We hope that in the next decade, encryption and cybersecurity, which will allow other European countries to test and adopt online voting systems. In addition, given that the European parliamentary elections are the second largest democratic elections in the world, the EU could likely lead this progress toward more direct and digital democracies.

5. Online voting will increase the number of referendums and special elections.

The difficulty of requesting mail-in ballots or attending the polls every few months reduces voter interest in elections if they occur too often. However, referendums can have higher voter turnout than elections for representatives. Therefore, if voting were simplified to the point that it took only a few minutes and could be done from anywhere, a greater amount of referendums could improve voter turnout. We expect that as governments look for ways to include their electorate in

governance, there will be a move towards Switzerland's direct and representative hybrid democracy.

While changing voting systems often demands constitutional reform, Germany proved that this is not impossible, with the necessary reform to their over-large Bundestag. However, while these changes should not be entered into lightly, they are overdue.

As we prepare for the coming wave of elections, with the end of the corona crisis uncertain, and continuing issues in our democracies, developments in technology should be a primary concern. Governments must ensure that voting remains accessible, but this is not enough. Interest and trust in our democracies needs to be revived and restored if our democracies are to continue.

These will bring much greater systematic changes to the functioning and utility of democracy, changes that will decentralise power back to the hands of the governed, and ideally, revive their interest.

Technology is only one path forward. But, the alternative voting models that we explored are far beyond simple technological changes. These will bring much greater systematic changes to the functioning and utility of democracy, changes that will decentralise power back to the hands of the governed, and ideally, revive their interest.

About dGen

After Gen X, characterised by big societal shifts, Gen Y, better known as millennials, and the digital native Gen Z, the decentralised generation will grow up in a future shaped by different dynamics and technological developments. AI, blockchain technology, and IoT will individually bring disruption to many industries, but it's at the crossroads where we expect our whole socio-economic fabric to change.

dGen is a not-for-profit think tank based in Berlin, Germany. We focus on how blockchain technology can contribute to a decentralized future in Europe and what this might mean for people, society, private entities, and the public sector over the coming decades.

Emerging technology focused on decentralising society will shape the next part of the twenty-first century; The dGen will grow up with opportunities for borders to fade and traditional networks to dissipate. Meanwhile, most blockchain developments are still in the early stages; focusing on building solid products and exploring regulatory requirements to create a fertile yet safe environment for companies and investors. The industry is focused on solving the big topics right now, while we encounter a lot of great ideas in the blockchain community about adoption. It's time for those ideas to find a purpose and for the real decision-makers in the world to learn what decentralisation will mean for them.

We're working with a team of researchers exploring how decentralisation will shape our future. Our insight reports focus on specific topics and industries to drive ideas for adoption in Europe. If you're researching how decentralisation is shaping our future, and would like to get involved, please get in touch at dgen.org. dGen is part of Beyond, a venture studio exploring a new world. For more information, go to beyond.ventures.

Authors

Evelyne Buzziol

Evelyne holds a bachelor's degree in Chinese language from Ca' Foscari University in Venice, spending a year of her studies at Capital Normal University in Beijing. She then completed an MA in International Relations and Diplomacy at the University of Padua, where she worked as a student assistant on a one-year campaign against gender-based violence - campaign promoted by the Italian Delegation of the Council of Europe. At dGen, she works as Project Coordinator, managing project development and growth, and looking for new business opportunities for the company.

Maggie Clarendon

Maggie has a Bachelor of Arts from Willamette University in Gender Studies and English Literature. Trained in literature, critical theory, and gender studies, they are now exploring the ways that technology is changing the landscape of human interaction. At dGen, they are the Editor.

Contributors

Jake Stott

Before founding dGen, Jake was originally a partner at Signal Ventures, investing in blockchain tech. In late 2017 he founded hype partners to help build and nurture ecosystems for blockchain projects and has worked with many top 100 projects. With these combined experiences he is able to distinguish legitimacy, necessity, and nonsense in this space. Jake is one of the founding partners of Beyond, a venture studio exploring a new world.

Nick Dijkstra

One of the founders of dGen and with a rich background in tech, Nick knows how to build organisations from scratch and can transform ideas to great tech products. As a former Product Manager at LiveIntent and Director of Customer Success at Avari he shipped software to a user base over 15% of the US population and has organised 200+ events in Berlin. As the COO at hype partners he is currently helping top-tier blockchain firms strategise their market approach. Nick is one of the founding partners of Beyond, a venture studio exploring a new world.

Francisco Rodríguez Berenguer

Francisco has a degree in Business and Law, and is currently working for dGen to communicate its vision for blockchain adoption to an audience of thought leaders in tech companies, corporates, and the public sector as a researcher and marketer.

Contributors

Tikshala Gothankar

Tikshala is a Master's Student in the EIT InnoEnergy program, focused on sustainable business and innovation in the energy sector. A tech enthusiast, she is researching on the possible applications of emerging technologies that address the most pertinent issues of the industries.

Ferry Tillekens

Ferry is the Dutch Ambassador for dGen. Ferry studied for a Master in Business Development and Entrepreneurship at Utrecht University. Currently, he is a project manager a 2Tokens, a foundation based in the Netherlands that aims to pave the path towards tokenization in everyday live. He is invested in providing unbiased, easy-to-digest information about the current state of new technologies, exploring real use cases for tokenization, and pushing himself to compete in a half triathlon in the next year.

Alex Lovegrove

Alex is the UK Ambassador the dGen. Alex received her undergraduate degree in Human Geography from the University of Southampton, during which she enjoyed exploring the interconnection between society, technology and place. Currently working in Planning Policy, she works to promote the adoption of emerging technologies to address the challenges of increasing urbanisation. Beyond tech, Alex loves to travel and is hoping to work or study overseas in the future.

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