DGOV3

DGOV3: A Blockchain-based Governance System that combines
Direct and Representative Voting Methodologies

Larry O'Brien

larry@larryobrien.net

FOR RELEASE AUGUST 9, 2022, at the BLOCKCHAIN FUTURIST
CONFERENCE, TORONTO

ABSTRACT

A blockchain technology-based voting and governance system would enable direct democracy voting in a contemporary representative governance process. We propose a solution that will engage more citizens in direct democracy while maintaining the discipline and stability of elected representatives to debate the laws, policies, and procedures required to provide practical options for voters to consider. Our proposed solution identifies criteria requiring direct democracy feedback from the community's citizens and methodologies to alter the weight of a representative's vote based on direct democracy voter feedback on specific issues that arise to a level of importance that requires community feedback. We propose a solution that combines the aspects of representative and direct democracy by employing blockchain technologies such as smart contracts, zero-knowledge protocol (ZKP), token voting, Distributed Autonomous Organizations (DAOs) and smartphones. Although privacy and secrecy constitute part of the solution, the main benefits are lost if they require trusted third parties to ensure the integrity of the direct voting process

1.0 INTRODUCTION

Everything about how society runs has changed over the past twenty years, except how democratic societies are governed. Creating a vibrant and free society will require active participation from its citizens and voting and governance evolution should embrace technologies that will encourage participation and enhance the trust in a democratic system. This paper introduces methods and systems for combining direct and representative democracy using blockchain technologies. It is the mission of Prior Arts (PriorArts.io) to explore ways to improve the world through the application of blockchain technologies.

2) CURRENT STATE OF DEMOCRACY

Representative Democracy

Representative democracy is a system of government in which citizens elect representatives to vote on laws on their behalf. Those who are elected, then meet to debate and make laws for the entire community or society.

Today, representational democracy is suffering from a deficit in confidence from the people. The frustration in the electorate is growing more intense with each election cycle. After an election, voter fraud and corruption accusations disconcert the average Citizen. Furthermore, after an election, the representative is immediately influenced by well-funded lobby groups and other special interest groups. Citizens believe the agenda is affected by lobbying, which affects the credibility of democracy.

Direct Democracy

Direct democracy means that people vote on policies and laws themselves instead of electing politicians to do so on their behalf. It is a form of democracy where all laws and policies imposed by governments are determined by the people rather than representatives elected by the people.

The challenge of direct democracy is that the complexities of today's civilization make it prohibitive for citizens to spend sufficient time making informed decisions. This worked well in Athens in 600 BC, but it is impossible in the fast-moving society of the 21st

century. Democracy has not kept pace with changes in our culture and, more recently, changes in our technological capability.

## 3) COMBINING DIRECT AND REPRESENTATIVE DEMOCRACY

Humankind has developed the technology to effectively merge direct and representative democracy in ways that were impossible to imagine twenty years ago.   These technologies include blockchain, DAOs, smart contracts, smartphones and voting tokens. The application of technology to engage large numbers of citizens in direct democracy under the umbrella of representative democracy will be a fundamental shift in democratic governance and provide a stronger voice for citizens in the governance of their community. Having an immutable, scalable, and transparent governance system that is independent of third-party interpretation is another evolutionary step for democracy.

4) HOW WOULD DGOV3 WORK?

 In the DGOV3 model, representatives elected by the people will research and debate laws, policies and procedures to govern a community of citizens. The constitution or by-laws of the community will define when specific laws, policies and procedures arise to a level that requires direct input from the citizens. Once that predetermined threshold is met, the representatives would identify a minimum of two options for review by qualified and non-partisan administrative staff to detail the cost, human resource requirements, and social impacts of the options that the representatives are proposing. These options are submitted to the DGOV3 DAO and transmitted securely and privately to the citizens for consideration and voting. The DGOV3 model will use technologies, such as distributed Blockchain, smart contracts, voting tokens, and token wallets to allow secure and private voting on smartphones and other modern communication tools.

Implementation Process

 The citizens would create a constitution or by-laws defining procedures for the elected representatives and the specifications for a DGOV3 DAO. The constitution and DGOV3 are interdependent and will detail the roles of the representatives and administrative staff and the complex functions of the DAO smart contracts. The community will approve the final details and specifications before implementation.
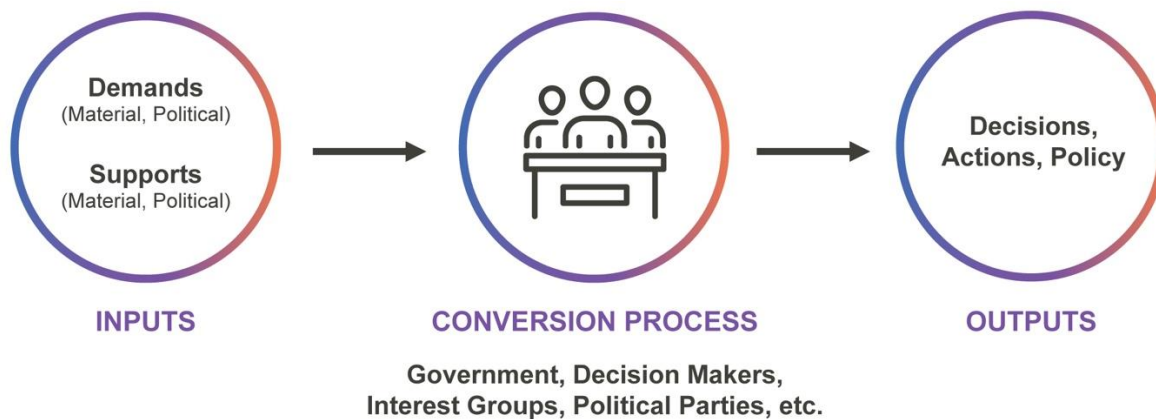
Fig 1 Direct Democracy Feedback

The elected representative's review, debate and prepare laws, procedures, and policies in accordance with the community constitution and by-laws. The representatives will manage the affairs of the community or government in a traditional majority rules method unless an issue or policy meets specific criteria that are predetermined and immutable. These conditions could be related to time, cost, or social impact. Once a policy, law, or procedure meets the criteria, the citizens will be provided at least two options that have been vetted by qualified and non-partisan administrative staff. The voter will choose the preferable option and use a voting token to register their support via smartphone. A smart contract within the Blockchain will tally the votes based on a predetermined voting algorithm. That feedback will be advisory or binding depending upon the community or government's rules.

The feedback is Direct Democracy, and the proposed system is called DGOV3 and can be smartphone-based as per Fig. 2 below:
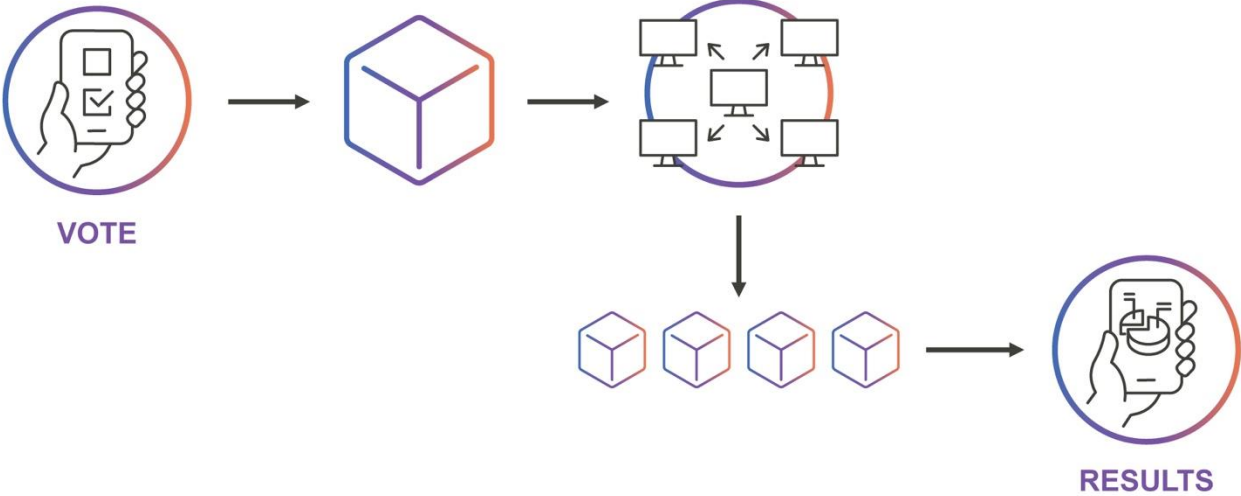
Fig.2 SMARTPHONE VOTING ON DGOV3

5) System Block Diagram
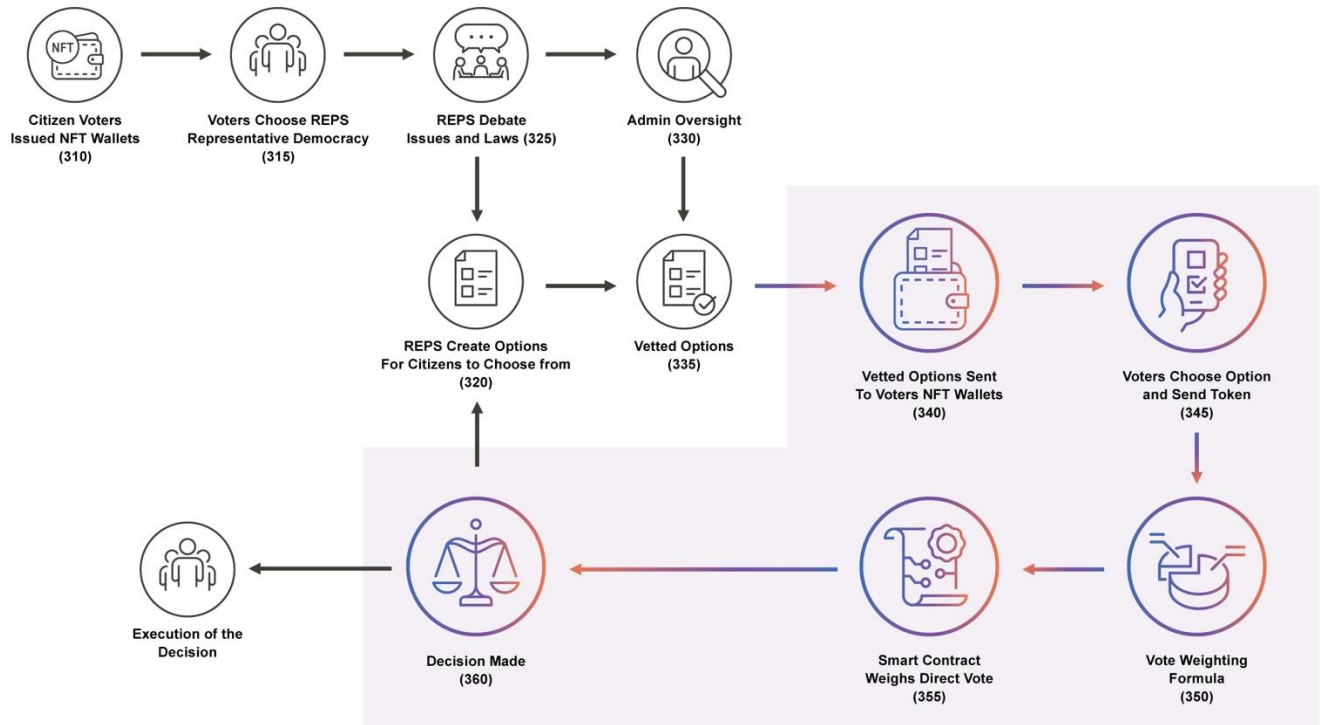
6) Governance Process for DGOV3

The following is an example of the process flow for a hybrid "direct — representative" voting and governance model based on Fig. 3 above.

a) Representatives are elected by various voting systems, including casting ballets, postal voting, and electronic voting using a variety of formulas to determine the successful representatives: first-past-the-post, preferential voting, and other methods used in contemporary democracies. (315)

b) During the election process, each voter is issued a specialized wallet that will have a blockchain address for each unique voter. The wallet will specify identification information sufficient to confirm a citizen's identification when voting. (310)

c) The elected or selected representatives manage the administration and make laws and policies. (325)

d) Issues needing direct citizen input are identified as part of creating the DGOV3 DAO. (335)

e) The criteria required for invoking direct democracy are determined before implementing a DGOV3 system.

f) When an issue has arisen to the level required for invoking direct democracy, the elected reps will debate and produce at least two viable options for the voters to consider.

g) Qualified administrative staff will review the options and prepare a summary of each option's financial, human resource, and social implications. (330)

h) A specialized voting token will be sent to each voter's unique citizen wallet. The Voting token contains the vetted options proposed by the elected reps. (340)

i) The voting token will also include the comments from the qualified administrative staff of the government or community. (330)

j) The representatives supporting each voting option will also be identified.

k) The citizen votes for the option that most closely aligns with their position. (345)

l) Smartphones can be used to send the voting token to a DGOV3 blockchain address, which will record the voter's choice. (345)

m) A smart contract will tally the voter support of the vote within the DAO. (340)

n) Vote weighting mathematical formulas will be defined before implementing the DGOV3 system. (355)

o) The administration processes the approved law, procedure, or policy that the people selected, and the law, procedure, or policy is implemented. (360)

p) A direct vote will be held if the community wants to alter the constitution or smart contracts.

7) Criteria for Invoking the Direct Democracy Process

Direct democracy will only be invoked when it meets well-understood criteria.

For example, if the impact of a policy, procedure, or law will have a long-term impact ("X" years), then that "X" years is the criteria. A city, for example, may want to cancel a significant transportation infrastructure project, which, if cancelled, will have a longterm impact on the transportation modes used by the residents and voters. In this case, the citizens have a direct say in the outcome of that decision.

Alternate criteria could be financial and include the cost of infrastructure exceeding a certain percentage of the annual budget. Criteria will depend on the needs of the government or community.

8) Security and Privacy for Tokenized Direct Voting

Security and privacy represent the most critical issues for implementing a DGOV3 type of DAO. Future threats to security will be quantum computing-based hacking and intrusion methods. These threats will require novel methods of securing data in the post-quantum cryptographic environment, including a) Data-Centric Security (DCS) and Symmetric Key Frame Encryption (SKFE); and b) Multivariate Polynomial Public Key (MPPK) methods that work well with smartphones due to smaller digital signature sizes. Fortunately, numerous government and private organizations are committing resources to address the threat of quantum computer-based hacking.

9) Vote weighting

Another critical factor is the relationship between the weight of the representative's vote and the citizen's vote. Given that this relationship merges direct and representative democracy, it would provide the most significant benefit for restoring citizen faith in the democratic process. There are numerous ways to weigh voting results, including first-past-the-post, quadratic voting, or preferential ranking.

 Here is an example of equal weighting or "first-past-the-post" methodology using one million voters, ten elected representatives, and three voting options presented to the community as a proposal for direct voting:

Assume 500,000 citizens did not use direct voting; these votes are distributed equally amongst the ten representatives. Each rep now has 50,000 votes related to their position.

Voting option one (four reps) has 200,000 votes;

Voting option two (four reps) has 200,000 votes; and

Voting option three (two reps) has 100,000 votes.

For example, if 75% of the direct citizen votes are for option three, representatives 9 & 10 get 375,000 (75% of 500,000), and position three will have a weighted value total of 475,000 votes.

A simple adding process determines the winning option as follows:

Choices	Distributed Votes	Direct Votes	Total Votes
Option one	200,000	62,500	262,500
Option two	200,000	62,500	262,500
Option three	100,000	375,000	475,000
Total votes	500,000	500,000	1,000,000

The people choose the preferred option.

The above is only one example of a voting formula. Weighting formulas would be established in the DGOV3 and agreed upon before establishing the DAO.

10) Conclusions and Observations

1) Due to technological advances, introducing a direct democracy feedback loop into representational democracy is a practical and achievable goal.

2) Having an immutable, scalable and transparent hybrid of direct and representative government that is independent of third-party interpretation is an evolutionary step for democracy.

3) This fundamental shift to the governance of democracy should address the cynicism, malaise, and lack of legitimacy that is increasingly common in contemporary democracies by giving citizens a louder voice in community decisionmaking via direct voting.

4) The DGOV3 hybrid direct and representational democracy model obviates the historical problems with direct democracy by requiring elected representatives to debate the law, policy, or procedures before directly engaging the voters.

5) With non-partisan and qualified staff providing a critical non-political analysis, the voter can make a more informed choice knowing a particular choice's financial and social impact.

6) A DGOV3 operating on a distributed blockchain with smart contracts and security would prevent human intervention in the election of representatives and the direct voting process.

7) Once established, there will be reductions in government or community governance expenses since voting will become as efficient as logging in and using an application.

8) The most significant future threats will be from quantum computer-assisted hacking. Additional research and development will need to continue to advance to ensure the secrecy and privacy of the voting process.

9) There is a requirement for substantial additional research and development related to combing direct and representative democracy using blockchain technologies.

10) The continued development should be crowdfunded in an independent, nonpartisan, not-for-profit organization.

Acknowledgements and Notes:

1) Special thanks to i) Dr. Ian Lee, Associate Professor of Business, Carleton University and ii) Prior Arts DAO Team Members: JY Martineau, Edgar Baum, MK Marsden, Tim Ragan, Graeme Barlow, Randy Marusyk, as well as MBM Law for supporting this vital project.

2) Prior Arts' mission is to identify, define and quantify problems that can be solved using Blockchain technologies.

3) DGOV3 is a not-for-profit, non-partisan spin-off of Prior Arts intended to promote the evolution of voting and governance for the betterment of freedom and democracy.

4) DGOV3 methods and systems are covered under US patent application 63/348,950 "Systems and Methods for Political Governance That Combine Representative And Direct Democracy using Decentralized Blockchain Technology," filed June 3, 2022.