Project Report
Incentive Token Challenge

Politicall

Team: FavelinhaChain

ETH students:
Natasha Catunda, cnatasha@ethz.ch
Ricardo Stirnimann, ricardst@ethz.ch

Invited students:
Leticia Cavalcanti
Michele Piccolini
Emmanuel Longa

Blockchain and IoT School 2018

All contributors contributed equally to this report

Zurich, April 30, 2018

Abstract

Blockchain is a technology that enables moving digital assets from one individual to another individual, in a safe way but with little to no bureaucracy to guaranteeing it. Most of the times people think about Blockchain as an application for money exchange, but the truth is that the technology can be applied to anything that needs an ownership. A lot of different industries are thought to be disrupt by this technology and one of them is the voting industry. There is already some softwares using Blockchain to make the voting system more transparent and accurate, like FollowMyVote software. This report explores the usage of those type of technology putting on top of it application of incentive tokens on a social platform. The tokens are earned and spent according to different activities on the voting system or on the platform. The aim is to incentive people to participate more on the political system, make it easier for regular people to engage not only as citizens but also as politicians, making more transparent not only the votation results, but the political system as a whole. The results is that a voting system can be developed with a build-in social network or attached to already existent social networks based on Blockchain - like Akasha - with transformation of the Akasha incentive tokens to the Politicall incentive tokens. The incentive tokens would reflect some sort of reputation and power (according to different actions) for both citizens and politics, namely: Honor token and Voice token for citizens' reputation and power, respectively; and Trust token and Power token, for politics' reputation and power, respectively.

i

Contents

List of Acronyms

BIOTS	Blockchain and IoT School at ETH Zurich
CRT	Citizen Reputation Token
CPT	Citizen Power Token
PRT	Political Reputation Token
PPT	Political Power Token

List of Figures

Introduction

1.1 Motivation and Literature Review

1.1.1 Blockchain

Blockchain is a technology that enables moving digital assets from one individual to another individual, in a safe way but with little to no bureaucracy to guaranteeing it. It works similar to a traditional data-base but with blocks of information linked to each other cryptographically[1], in a distributed data ecosystem. A copy of the transactions stays on each node of the system [2], and every time a transaction is added then each node updates its ledger. The blocks stays at the system forever making the information traceable, with techniques to prevent guaranteeing privacy. The cryptography makes sure that the system is tamper proof [1]. The nodes (or a peer-to-peer network) with a copy of the ledger on each computer makes it much more difficult to suffer from a fraud because in order to do that, the whole system would need to be hacked at the same time with the same information.

[3] defines Blockchain as:

> "The blockchain is a distributed database that provides an unalterable, (semi-) public record of digital transactions. Each block aggregates a timestamped batch of transactions to be included in the ledger or rather, in the blockchain. Each block is identified by a cryptographic signature. These blocks are all back-linked; that is, they refer to the signature of the previous block in the chain, and that chain can be traced all the way back to the very first block created. As such, the blockchain contains an uneditable record of all the transactions made."

The expert Finn Brunton, on the Wired interview [4] has a much more complete description:

1

"A Blockchain is a persistent transparent public append-only ledger. It is a system that you can add data to and not change previous data within it. It does this through a mechanism of creating consensus between scattered (or distributed) parties that do not need to trust each other but just need to trust the mechanism by which their consensus has arrived at. Blockchain relies on some form of challenge such that no one actor on the network is able to solve this challenge consistently more than everyone else on the network. It randomizes the process and in theory ensures that no one can force the Blockchain to accept a particular entry onto the ledger that others disagree with. It relies on a mechanism for a peer-to-peer network that can maintain updates to the ledger and then verify those updates in such a way that it is impossible to defraud and impossible to alter after the fact."

This system essentially removes the need for middle mans [1], making much more easier a lot of processes to happen. There is no single, centralized database or server, but rather the blockchain database exists across a decentralized network of machines, each acting as a node on that network[3].

According to [1] the Blockchain has the possibility to bring near instant digital asset transfer, asset movement and security of data movement, having great impact on the financial services, anything with properties or ownership.

While a lot about Blockchain is thought as an application to coin exchange, [5] cited a many industries that blockchain will disrupt, namely:

- Banking and Payments;

- Cyber Security;

- Supply Chain Management;

- Forescasting;

- Networking and the Internet of Things;

- Insurance;

- Private Transport and Ride Sharing;

- Cloud Storage;

- Charity;

- Voting;

- Government;

- Public Benefits;

- Healthcare;

- Energy Management;

- Online Music;

- Retail;

- Real Estate;

- Crowdfunding;

In the scenario of changing voting systems in Switzerland by using Blockchain that the object of this report will explore.

1.1.2 Voting system in Switzerland

In Switzerland practices of direct democracy occurs in parallel with representative democracy, being the Swiss system classified as a semi-direct democracy [6].

Switzerland has three political levels share power: the Confederation, the 26 cantons and over 2,250 communes. The Swiss federal government, (the Federal Council), is made up of seven members, who are elected by parliament. The Swiss parliament, or (Federal Assembly), has a total of 246 members, who are directly elected by the people. Switzerland has a bicameral parliament: the National Council (200 members) and the Council of States (46 members). At 2017, 15 political parties are represented in the Swiss parliament. Those parties with the largest share of the popular vote are represented on the Federal Council. [7]

The primary source of funding for political parties is membership fees and donations. There is no federal obligation for parties to disclose their accounts or their donors. However, the some cantons have introduced their own party funding rules. [7]

Also voting occurs in various issues including both initiatives and referendums, where policies are directly voted on by people, and elections, where the populace votes for officials. In recent decades, voter turnout at elections and referendums has been below 40% [7].

Despite of the fact that there are polling stations on votation time, most of the votes are done in advance by mail. In a lot of cantons votes are cast using paper ballots. Which can be manually counted or weighed on a precision balance.

A lot of those techniques on the Swiss political system comes with some issues. Political parties that has more influence, hence more money, will have the probability of having its candidate elected, showing an unequal money distribution for candidates marketing campaign. Even if people can vote by post, some might need to go on the polling stations, but they have a few and they are far away. The accounting system is exposed to a several flaws, i.e. how to know that my vote was counted correctly? How to guarantee the security of information or that no one interfered on the results? This makes the results more questionable. And finally, after candidate is elected, there is no follow up or feedback system between candidates and voters, making the politics actions sometimes further away of planned initially, with the voters having no option, during

the mandate, to express their opinions - except for the big issues which are voted in referendum four times a year. But, then less than half of the population is active on the voting system, making the decisions less representative.

In summary, the issues can be categorized in:

- Low interest (low participation);

- Distance from voting place;

- Low accountability;

- Trust in the election results;

- Costs of campaign influencing the election of who has more money for advertisement rather than for who have better ideas;

- Hard to follow up candidate's actions;

- No clear relation between voting and the improvements in society.

Some Blockchain technologies are already trying to tackle the issue with lack of transparency and security with the personal votes. It is the FollowMyVote [8], which is a online voting platform that promises to add complete transparency - where voter can track the vote, without compromising voter privacy and also adding accuracy on the elections results. Those are all characteristics that can only be provided by Blockchain technology.

This platform can solve some issues, but is still lacking some incentives. Those incentives ideas is what will be developed on the Policall app developed on this report. We believe that all those issues can be solved with Blockchain, or a junction of different approaches for the Blockchain technology, which will be explicit on the next sections of the report.

1.2   Problem Statement

Is it possible that with incentive tokens on Blockchain we can tackle the current aforementioned voting issues?

The Politicall app tries to tackle this issue on the voting system, by adding different tokens that can be earned and spent in a very similar way as a social platform for political system. Where politics and citizens could spend and earn tokens, building influence according to their actions rather then having influence with money. The tokens would also encourage people to be active, to earn more tokens. Politics actions would be more easy to follow, and people were be able to give feedback in the form of tokens. Finally, the Blockchain technology would guarantee the accuracy of the results, pretty much similar to the FollowMyVote software.

1.3 Objectives

The objective of this report is to describe how would the whole app for the political system works, explaing the incentive tokens, the way that they are spent and earned and finally to show a simple mock-up of only the voting system, with a user interface and the implementation code with the smart contracts on blockchain.
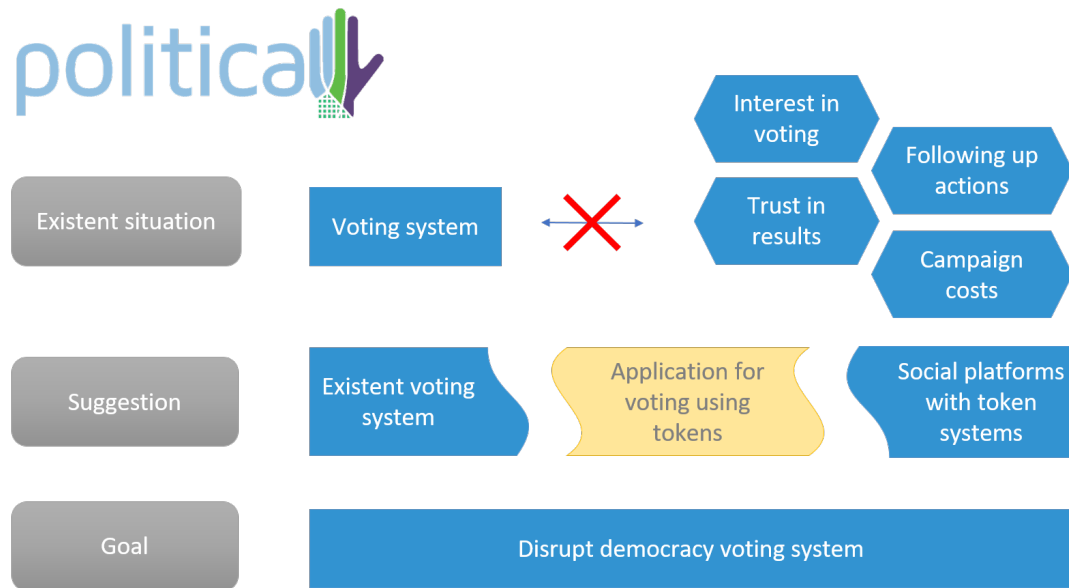

Figure 1.1: Diagram showing the existent situation, the suggestion and the main goal. Source: Authors.

Conceptual Model

2.0.1   Overview and Names

Voting Plataform: POLITICALL

- Token 1 Citizen Reputation (CRT): honor

- Token 2 Citizen Power (CPT): voice

- Token 3 Political Reputation (PRT): trust

- Token 4 Political Power (PPT): power

- Token 5 Vote: vote

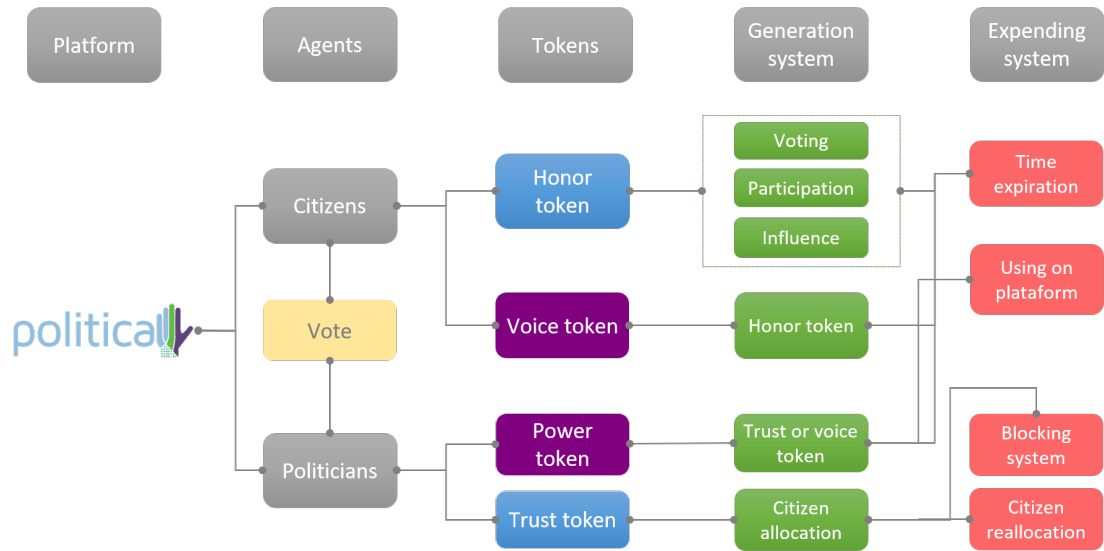An overview of the tokens can be seeing at **Fig. 2.1** below:

Figure 2.1: Structure of generation and expending systems of tokens. Source: Authors.

Guidelines:

Politicall is an app for the voting system in Switzerland, it aims to make the voting more transparent and trustful and also incentives people to participate more by many different actions with the different tokens, i.e. following up politics, making opinions to earn tokens to have more power, etc. It aims also to make the political system more flat in terms of who has the power as a candidate. The power would come from development of products (opinions etc) instead of marketing financed by who has more money. Finally it makes easier for the voting times (at least four times a year) dispute of being a much more robust and reliable system.

Tokens

1. Citizen Reputation

How to earn it?

- Voting (For congress man or for polls);

- Giving feedback for politicians (by giving them a political reputation token, what is done periodically within the app);

- Proposing a poll and receiving feedback tokens on how popular it was (number of likes it had, if it went up to voting, if it was accepted);

- Engaging other people to vote and use the app.

How to lose it?

- With time (expiration);

- Spending with the Citizen Power Token;

2. Citizen Power

How to earn it?

- By spending Citizen Reputation Tokens;

How to lose it?

- Creating polls;

- Posting an opinion;

- Converting into Political Power Token if the citizen becomes a politician/decides to run an election;

- Expiration with time;

- Liking an opinion;

- Promoting a post.

What is the purpose of having it?

- Is a way to control how many posts/liked/polls a person can create on the network;

- Helps a new candidate to run a election if he is already a well known citizen from the chain.

3. Political Reputation

How to earn it?

- If citizen allocates these tokens on the politician feedback periodically.

How to lose it?

- A percentage (%) of those tokens is blocked if politics votes on polls/decisions disagree with the opinion of his constituents (majority of the district that elected him);

Two observations should be done here, and it is that this Political Reputation token has this restriction of blocking the token but it expires with time, and also that is possible to have a negative reputation.

The idea for the blocked tokens is to have a smart contract that automatically matches if the elected candidate is voting on the same polls that the majority of population from the district that elected him. The aim is to periodically check if the candidate if doing what people that elected him was expecting. This also assures that the app is being active not only 4 times a year.

What is the purpose of having it?

- The unblocked tokens could generate a spendable token: Politician Power Token.

-

4. Political Power

How to earn it?

- Through Political Reputation tokens;

- By converting Citizen Power token.

How to lose it?

- Promoting campaigns in the network;

- Form coalitions;

- Post an opinion;

- Request/Promote an opinion/market research;

- Promote Low voting opinion by citizens.

What is the purpose of having it?

- Having political influence in the network.

5. Vote

How to earn it?

- When entering a poll to vote.

How to lose it?

- When casting a vote.

What is the purpose of having it?

- Vote on a poll or candidate (4 times a year).

2.1 Token Description

2.1.1 Citizen Reputation Token

The CRT represents the activity and popularity of one citizen. Every citizen has a balance which gets affected by following mechanics. Voting on the Blockchain Voting System will increase the balance of the voter significantly, implementing this should be very easy because the address of the voter will be checked by the smart contract responsible for the voting which will trigger the CRT-smart contract, rewarding the holder of the address with CRT. The social platform this system is connected to will affect the balance of each citizen granting CRT for various interaction such as for example giving feedback to politicians, joining polls, posting popular opinions etc. This contract will have a devaluation mechanic like inflation or expiration to prevent immense buildup on certain accounts. Implementing the CRT should be possible even without a deeply developed social platform. There could be very simple smart contracts which get triggered by simple actions eg. donations to campaigns and others. Controlling the amount of CRT token should be possible by implementing inflation. This too is not depended on a functioning social network platform. A working social platform would be very beneficial in any case, because of the vast possibilities of actions which can be rewarded with CRT, which makes the whole concept more dynamic. The CRT like the name suggests is based on "reputation" which is something one gains by interacting with people. The more interaction there is between the registered citizens, the more effective and representative the CRT becomes. Somebody that is very active and has a lot of people listing and watching will hold a lot of CRT. In that sense the CRT is completely disconnected from the actual content the holder distributes. This may have some bad side effects like "dangerous" or "bad" content getting a lot of attention because the poster hold a lot of CRT. Later we are going to talk about how to solve this issue.

The CRT is a "passive" coin in the sense that it doesn't actively get spend. One cannot get rid of CRT other than waiting for inflation or expiration to devalue the CRT one holds. To actually "use" ones reputation, we disconnected the spendable token from the generating token. We decided go this way because the CRT should be an actual representation of reputation, and this reputation doesn't get "spent" in the sense like coins get spent. To actually reward citizens with a lot of reputation, we created the active Citizen Power Token.

2.1.2 Citizen Power Token

The Citizen Power Token represents like the name suggests the power to interact and change the topics discussed on the social platform. We implement a contract which can be called by a citizen at any time he wishes to get citizen power tokens. After getting

a request this contract will evaluate based on time passed since the last request and number of CRT holded how many CPT are granted. Citizen power tokens are spent by starting polls/campaigns on the voting Blockchain and by doing social interactions on the social platform. Every defined interaction will trigger this contract which burns CPT on the account of the citizen. This token will loose its value over time (expiration date rather than continuous inflation) to prevent citizen to build up CPT and spend it at much later point, where it does not reflect his actual participation in society. In a sense the CPT really reflects the power each citizen holds. The definition of power in the oxford dictionary states: Power is "The capacity or ability to direct or influence the behaviour of others or the course of events." We thought of the CPT as a token which converts the "passive power" of the CRT to actual power. A citizen can change or direct the topics discussed on the social platform if he is ready to spend CPT. He also can express his opinions more effective by reaching more people (like the Instagram or YouTube feed which features the posts with more CPT spend on them). There are limits to what a normal citizen can influence and change, but the CPT should make it easier for citizens which have interesting ideas and political ambition to enter the game of politics. There is an obvious difference between citizen which are politically ambitious and citizens which just want to participate in a discussion and inform themselves about upcoming topics. That led us to the decision to implement another layer of complexity by differing between "politicians" and "citizens". To be able to get the status of politician a lot of CRT will be needed. The CPT can be sold to other accounts for other currency, to give people the option to get any use out of their CPT if they don't have political ambition. This option may bring some issues which are not completely discussed yet but for now we'll stay with it.

If a citizen decides to change his state to politician, he will be able to convert CPT to Political Power Tokens at a fixed exchange rate which ensures that only citizens with a lot of CRT can actually convert a useful amount of Political Power Tokens. This is useful to give people the chance to be aware of their influence and actually use their high citizen reputation. Politicians have more freedom both on the voting platform and on the social platform. Their actions are very influential but also very costly on their power. To represent the power of politicians we invented 2 additional coins.

2.1.3 Politician Reputation Token

Every registered citizen will receive upon creating their account a fixed amount of PRT. The total supply of the token will not change except for deleting/creating new citizen accounts (e.g. death/birth). The citizen will be able to allocate their PRT on accounts of politicians (people which hold Political Power Tokens). The contract also safes the amount allocated by one citizen directly on the Blockchain. Every politician knows his/her balance on PRT which is derived from various citizens. Citizens have the possibility to retract and newly allocate their share of PRT however and whenever they like. This ensures almost real time feedback for the politicians how strongly they are being backed by their citizens and the trends of change. It also will play a important

role in obtaining political power. By successfully doing politics on the social platform and elsewhere, politician can get the citizens to "trust" them and citizens can show their trust/approval of the politician by allocating many PRT. Like the name suggests the PRT really represents the reputation one politician holds from all citizens. For both partys this token is very central because in the current political systems the politicians are not obligated to hold their promises and talks they gave to get voted. They are not held "accountable" for what they tell us. This token ensures real time feedback for the people and politicians to ensure the politicians actually does what his citizens want.

To control the actions of politicians even more we created another contract. This contract will trigger whenever one politician and his citizens vote on a proposal, It will take in both decisions and compare them. If a politician actually voted differently than most of his citizens (which allocated PRT at his account) the contract triggers automatically, punishing rogue politician by blocking a certain percentage of his PRT. It wont be very dramatic if a politicians does this once or twice. But if he does it regularly, the effect of this contract will get heavy and much of his PRT will get blocked. Blocked PRT wont generate any Political Power Tokens.

2.1.4 Political Power Token

This Token is obtained by having PRT, which implies that only politicians actually can have it. It works a lot like citizen reputation, but a much more powerful version of it. Blocked PRT wont generate PPT, so if politicians are not doing what their citizens want, they generate less PPT. Politicians spend PPT to control the topics and flow of discussion on the social networks (like deciding what topics are discussed, gathering statistical data, doing polls, etc). They get insight in much deeper data than citizens and their actions on the social platform get weighted heavier. On the voting platform the can decide which topics get polls and what things people can vote on. The PPT concentrates a lot of power, so it wont be exchangeable no matter what. Being a politician is a full time occupation so the needed Political Power to do certain actions will be expensive.

2.1.5 The Social Platform

Introducing the tokens we talked a lot about a "Social Platform" on which certain actions can be performed. These action will then be rewarded in some form and cost certain amount of tokens. This social platform is until now a concept which doesn't exist in this form to date. There were ideas to connect this whole project to Facebook, Twitter and co. but this inevitably brings a lot of issues like centralization, trust in third parties, verification, expenses etc. In an ideal world we'd develop a new social network which is controlled by the government (same government which controls the voting Blockchain and the voting systems). This would ensure a lot of trust in the platform. We are conscious of the difficulties and the complexity with actually connecting a social network to a Blockchain let alone to such a complex political emphasized system. This is one

of the biggest unsolved problems we encountered and it likely will be for most of the Blockchain related ideas which want to solve problems in politics. There just isn't a good way around the human part of politics and with that comes the need for a social network. We are very interested in the future of Akasha and similar projects and are closely following the development.

2.2 Token Implementation - Code

The code right now is a voting platform in the form like we talked earlier about. One can start simple voting "rooms" which then are managed by the creator. He then can invite other participants by typing their public address into the invite bar. The invited individuals get a voting token, created by a smart contract. They can spend the token on the different voting options, these options are managed by the create too. After some time a smart contract checks the balance on the options addresses and returns the results. This ensures absolute trust in the voting system because every transaction from creating the voting "room* to actually voting to the results are saved on the Blockchain. Our version works with the Ethereum network but ideally this voting system would have an own separate Blockchain. Right now every member of the Blockchain network can check how the others voted by reading the corresponding transactions on the Blockchain. By using a bit of cryptography (FollowMyVote.com) and a separate Blockchain we could solve that problem.

Results

The results of the hackaton stuck to a simplified version of the whole idea. The implementation tried to tackle the voting system part, with some feedback information of the incentive tokens, both for the user interface as for the code development.

On **Fig.** [?] is a suggestion of how the app could look like. It would at least the polls to vote, the information about each candidate - and his/her reputations and actions tokens and the feedback that you have earned the incentive tokens of participating.

Figure 3.1: User interface of the App to be utilized with the voting system. Source: Authors.

A very simple version of the software was developed and functioning for the creation of new polls and receiving tokens based on ethereum. The software code which is part of this report is open source and available at https://github.com/VittoriDavide/VotingApp.git.

The connection with a social platform is a way bigger implementation which it would not be possible on the timeframe of the hackaton, but stays as a suggestion for future developments.

Discussion

The online voting system with the social platform would still not solve the problem of a possible coercion of people to vote on who they do not want to. But since this does not seems to be an issue in Switzerland (it would be an issue in other countries), since people already vote by letters, this concern was not explored at the development of the tokens.

The open challenge with the platform is to find the better way to implement the social part of the system. Should it be implemented a separate social network only for this or could it be coupled with Blockchain based social networks such as Akasha? How would be the detailed implementation of this social network?

Our team had a limitation on the coding side, since one of our coders was sick at least half of the hackaton and also most of the team, including the coders were not students from ETH. The development of the code was followed by us, but with a very limited influence on the language implementation, since neither Natasha Catunda or Ricardo Stirnimann are from the computer science field.

Conclusion

The Blockchain technology as an easier and cheaper solution for tackling the lack of transparency and the lack of accuracy of the voting system is a very possible solution. More complex systems involving the integration of social media also based on Blockchain could be an opportunity to explore more potentialities on incentive tokens.

As a first step the online voting system could be either developed or applied already existent ones, like the FollowMyVote. Physical structures on votation time would still be available, but not for receiving votes, but mostly for helping people on how to vote.

Second step should be the development of the social platform, as the way of implementing for real the incentive tokens. The social platform is a crucial feature on the idea. Maybe the first step should develop already a voting system prepared to receive the social platform. Hopefully this application makes the scenario for Swiss political system more dynamic and participatory, either for following the politics as for participating more actively in politics.

As a more far away future, we believe that with further developments the project has the power to disrupt not only voting systems but whole political systems in Switzerland and other countries. The application could be (carefully) applied in other countries and help them to have a more direct democracy, avoiding the nuisance, corruptions and concentrated power that comes from centralized structures.

As discussed previously, the platform still not solve a problem of voting coercion, and this is important when extrapolating the application outside Switzerland. It is still very common people buy votes, and this situation would be facilitated if people are not on a supervised circumstances. The need of the supervised places takes out the ease of the online application, i.e. the comfort of voting at home. So this is a question that still remains open if it would be possible for the whole world to have similar applications.

The software code which is part of this report is open source and available at https://github.com/VittoriDavide/VotingApp.git.

This project report was written as part of the spring 2018 course 'Blockchain And the Internet of Things (851-0591-01L)' run by M. Dapp, S. Klauser, and D. Helbing.

Bibliography

[1] Government Office of Science. Block chain technology, 2016. URL https://www.youtube.com/watch?v=4sm5LNqL5j0.

[2] Ian OByrne. What is blockchain? badgechain medium, 2016. URL https://medium.com/badge-chain/what-is-blockchain-5e4498f05c20.

[3] Audrey Watters. The blockchain for education: An introduction, 2018. URL http://hackeducation.com/2016/04/07/blockchain-education-guide.

[4] blockchain expert explains one concept in 5 levels of difficulty-wired-2017, 2017. URL https://www.youtube.com/watch?v=hYip_Vuv8J0.

[5] 19 industries the blockchain technology will disrupt-2017, 2017. URL https://futurethinkers.org/industries-blockchain-disrupt.

[6] Pierre Cormon. *Swiss Politics for Complete Beginners*. Slatkine, 2 edition, 2015.

[7] swiss political system, 2017. URL https://www.eda.admin.ch/aboutswitzerland/en/home/politik/uebersicht.html.

[8] The online voting platform of the future - follow my vote. URL https://followmyvote.com/.