REPOSIUM

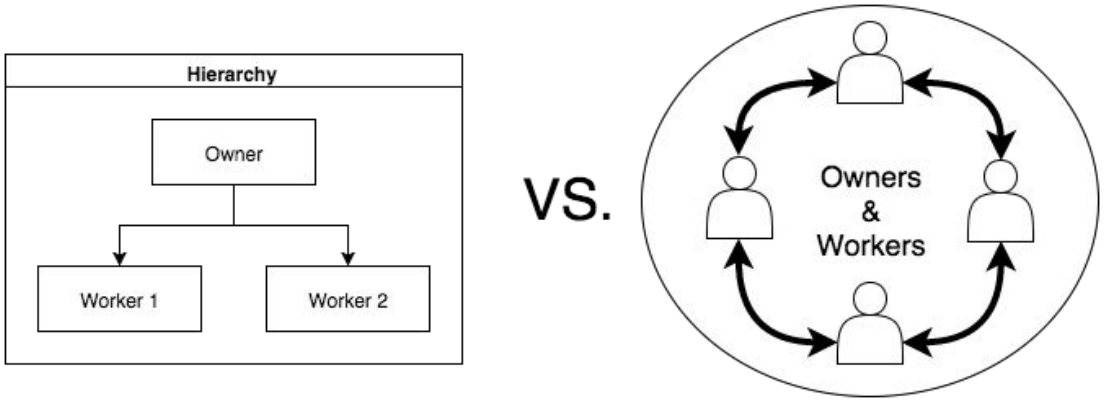
Concept of a Decentralized Collaborative Organization for Knowledge

Abstract

Through the emergence of new decentralization and automation-enabling technologies we are able to create completely decentralized, autonomous collaborative organisations and communities. By utilizing these technologies, combined with new incentivization, reputation and self-governance mechanisms we propose a DCO that is focused around the creation, moderation and maintenance of a decentralized knowledge base. With this we hope to establish a completely autonomous DCO that serves a large user base and further advances the research that is being done in regards to DCO's and the future of collaboration, reputation and self-governance.

What is a Decentralized Collaborative Organization (DCO)?

Unlike traditional organizations where a strict hierarchical structure is used for management and organization, in a DCO the organization itself is controlled and owned by those contributing to it. That means that participants have control and decisional voting power to influence the way the organization is run, and they have a clear incentive to further contribute to the organization.



1. Knowledge of the Crowd

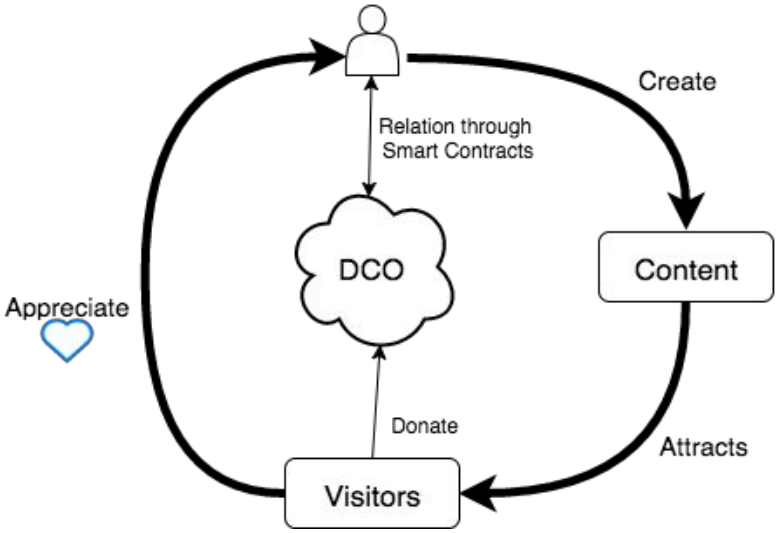
The desire for information is an inherent quality of our identity. Not only do we want to stay up to date with current world events, but we also want to acquire knowledge from the vast pool of wisdom shared by our ancestors. Websites like Wikipedia have largely shaped the way this information inquisition is happening digitally. Today it is possible to find information about pretty much anything and anyone online with a simple search query. This was only made possible through the large group of dedicated volunteers all around the globe which are behind the creation, maintenance and validation of content.

This crowd of people is a powerful mechanism to create and spread knowledge, which further lowers barriers of entry for education and prosperity. Therefore, the incentives to keep the group of dedicated and passionate people to actively contribute to the global knowledge database are high, but often these people are not incentivized properly to encourage them to contribute. This is largely based on the fact that there is no clear incentivization scheme that makes it clear what the reward for a contribution is (except for altruistic reasons). Additionally, the entry barriers for contributions are often too high and the majority of people are excluded from ever providing their input, even though they are skilled and perfectly suited to contribute to the knowledge pool.

2. The Reposium Concept

The goal of Reposium is it to create a self-governing, decentralized organization that provides the right incentives for contributors to create and manage a completely decentralized database of knowledge. The Reposium DCO itself will consist of independent and autonomous Decentralized Collaborative Communities for important subjects and categories.

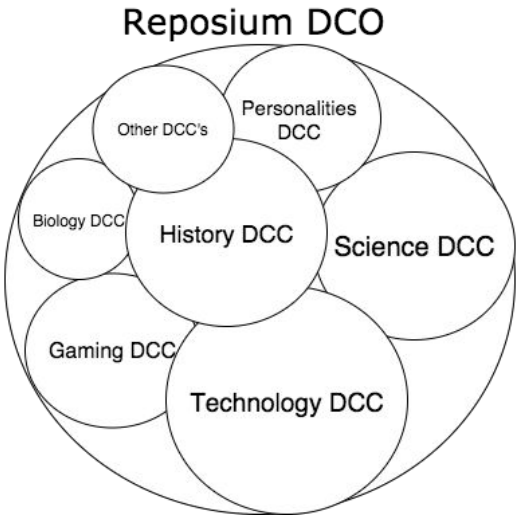
These goals of decentralization and self-governance of communities will be achieved by utilizing Ethereum as the Smart Contract provider, IPFS for storing the knowledge database, Bitcoin for storing the outcomes of votes and contribution trees into the Blockchain, and a new reputation system for determining the value of contributions and creating a balanced organization.



2.1. DCC's inside the DCO

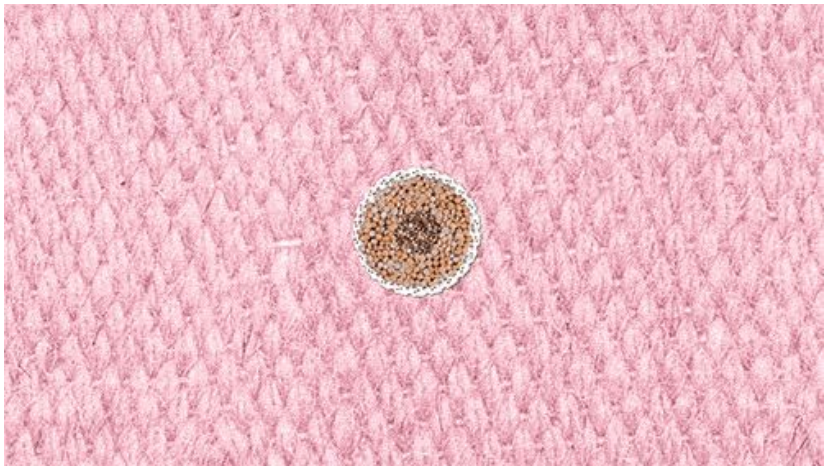
The Reposium concept revolves around the notion that active contributors in a community know best how to run that specific community. Because of this, we give each community (also called a DCC - Decentralized Collaborative Community) the full autonomy to design, develop, manage and promote their community independently.

What this means concretely is that there is one main DAO which is concerned about the general management and development of the platform (see 4.), but there will be independent DCC's which are responsible for operating, improving and developing their respective pages. For example, science related pages are run by the Science DCC, gaming related pages are run by the Gaming DCC, and so on. A DCC has the full authority to change the layout of pages (similar to Reddit Subreddits), they can add visualizations and special pages for the celebration of important figures or for a better display of the content. The DCC also has decisional power in determining what the generated revenues (see 3.3) are going to be used for.



The number of DCC's is determined by the popularity of a specific subject and its respective pages. A DCC will only be created if a subject is increasing in popularity and more visitors are starting to visit the subjects related pages. The reason for this is that it enables DCC's to be created if certain pages or categories become more popular than others, so that these categories get a more dedicated structure and allocation of resources. For example, there is a Science DCC consisting of all science related pages, including philosophy (because it is not so popular yet). As more content is added to philosophy and more visitors start appreciating the content, a new and independent DCC will spun out of the Science DCC, called Philosophy DCC. Now the Philosophy DCC gains more voting power and the full authority to determine how the philosophy related pages should be run.

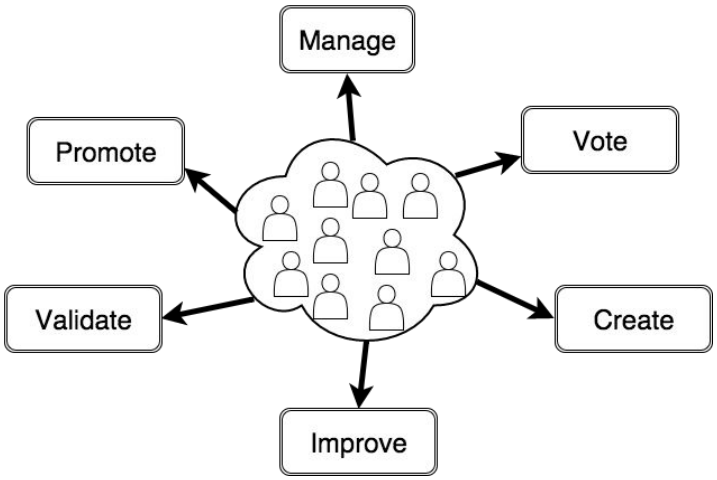
The perfect analogy for this concept is cell division in an organism. Cells grow and after reaching a certain size initiate a cell division process where the DNA is being replicated so that two identical cells can be created out of one. This is similar in a DCC, which grows in popularity and after some of its pages reach a certain popularity score the DCC will start a division process, creating a completely new DCC.



3. Contributors

Contributors are the driving force of the DCO. They not only control the DCO and the independent DCC's through a democratic decision making and management process, but they are also responsible for the creation, modification and validation of content for the decentralized knowledge base (DKB), whose purpose it is to attract visitors with specific information inquiries.

Overall, contributors perform 6 basic tasks that assure that the organization is run properly and that content in the DKB is created, improved and validated.



- **Manage.** Contributors are there to actively and collectively manage the DCC. They perform important tasks which include the maintenance and development of the platform and strategic and operational decisions about the direction of the DCC. An important factor in the way one can influence the management of the DCC is reputation, which is earned by creating content that gets appreciated by the community.
- **Vote.** A decentralized, transparent and public voting system enables for democratic votes to happen on important decision. The voting system is based on Ethereum and utilizes the Bitcoin Blockchain to timestamp voting information (such as description, outcome, etc.).
- **Create.** Contributors are there to create new content on a regular basis. This includes summaries of content, factoids, detailed descriptions and recent news updates. Creation of new content is key in keeping the organization live and attracting new visitors. That is why the content needs to be up to date (constantly **improved**) and **validated** for its accuracy.
- **Promote.** Since contributors have a direct stake in the success of the DCO, they have an incentive to actively promote the DCO's platform.

3.1. Contribution Initiative

The core principle of Reposium is it to avoid limits and allow anyone to become a contributor of a DCC. This means that anyone can submit content to the DKB (Decentralized Knowledge Base) and through increased work and continuous contributions earn influence in the DCC.

The two main ways one can contribute content is by creating new content or improving existing content, which includes edits and additions. Creating new content is a basic submission from a category in a DCC. For example, a new submission about a cryptographic cipher will be submitted to the cryptography category, which is managed by the Computer Science DCC. To combat spammers and rogue contributors, content that is submitted can be put down either by a vote in the DCC, or the visitors which downvote the content. If a content is downvoted or a vote against it was successful, it will be completely removed from the DKB. This is a self-healing process where the DCC (the organism) gets rid of unnecessary and inappropriate content in a democratic way, since the crowd is there to decide what happens with the content.

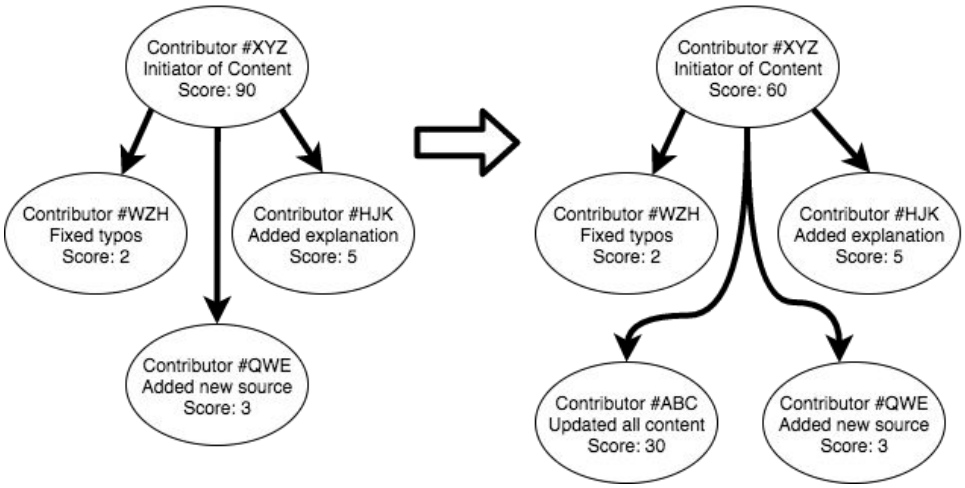
Improvements to existing content are basically soft-forks of the content, where 51% of the members in the contribution tree are required to accept the new content. This democratic voting process assures the integrity of the content and makes sure that the original creator of the content (i.e. the source) is in consent with the edition.

3.2. Contribution Trees

It is important to create a fair environment where contributions can be mapped to its source and rewarded. For this we introduce the concept of contribution trees which are part of the metadata structure of every page inside the DKB.

A contribution tree consists of a root (the originator of the content) and branches which include the contributions of other contributors to the original content such as spell checks or additions to the content. In addition to the name of the contributor and the contribution, each node in the tree also includes a scale which is basically a number determining the importance of the contribution. This offers an objective way for rewarding contributors to content and making it possible for anyone to be rewarded properly for their contributions.

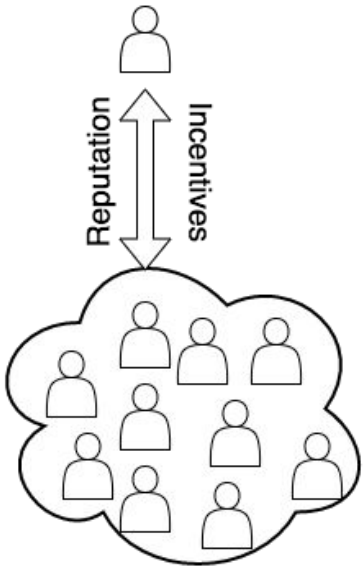
As pages are edited, the contribution trees are updated, which means that the “importance score” for each node in the tree is also changing, depending on how important and how appreciated the new content additions are. An example is a page describing Quantum Computing which was initiated by user XYZ and improved by several other independent contributors. After a while the page is slowly updating, but with a new breakthrough in Quantum Computing user ABC is able to add plenty of new content to the Quantum Computing page. With this user ABC has made an important contribution to the Quantum Computing community and should be rewarded accordingly by receiving a higher importance score in the contribution tree.



These contribution trees play an important role in dividing reputation and donations of contributors on a page. If a user appreciates the content of a specific page and donates money to the creators of the content, this sign of appreciation is turned into reputation for the contributors in the contribution tree, and the money is distributed among the nodes in the contribution tree in relation to their importance score. The higher the importance of a node in the tree, the more reputation and the higher payout that node will receive.

3.3. Contribution Incentives

Attracting new and retaining existing contributors ensures that the DCO will grow and the content of the DKB increasing and improving. That's why Reposium needs a good incentivization mechanism that provides a clear way to reward contributors through reputation scores and monetary compensations.



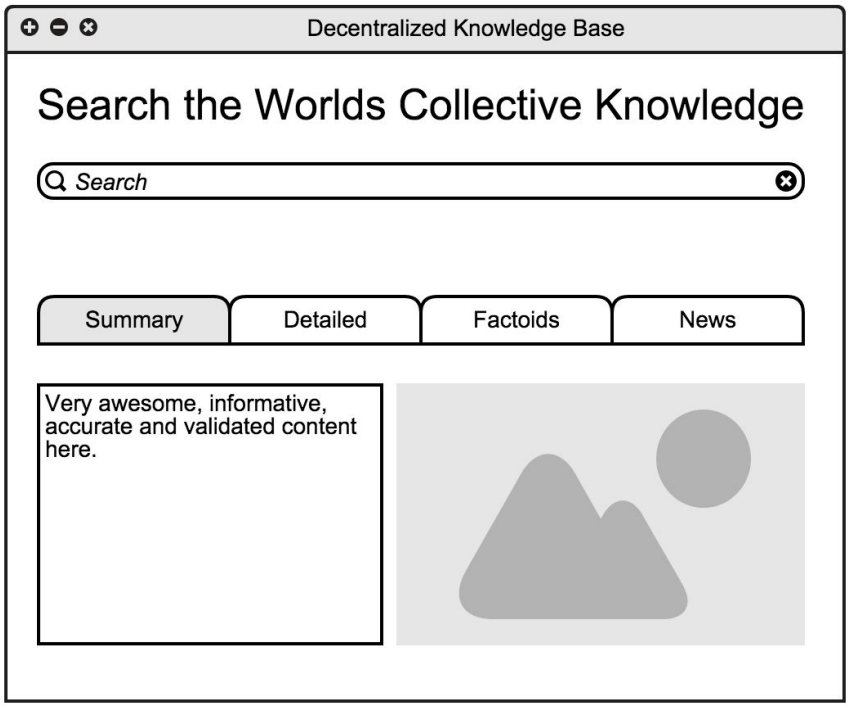
Monetary compensations make it possible to reward dedicated and active contributors of the DCO. These will largely consist of donations and tips (microtransactions) given by visitors of the platform that appreciate content. Donations can be sent to a single page, a DCC or the overall DCO. If money is sent to a single page, it is distributed among the nodes in the contribution tree. If the donation is sent to the DCC the money is distributed proportionally among the most important pages and most important contributors in that community. If the money is sent to the overall DCO, it will be sent to a reserve waiting for the DCO contributors to vote what the money should be used for. In most cases, money sent to the DCO will be used for general maintenance, but it can also be distributed among the most active contributors of the entire platform. Tips are another way to create a unique way for visitors to appreciate content by directly tipping the content creators. These microtransactions can be easily faciliated by integrating an existing third-party service to Reposium.

Another way to generate money for the DCO is through grants by companies or governments. If such grants are successfully acquired by the DCO, they will be sent into the reserves waiting for the DCO members to collectively decide what the money should be used for.

4. The Platform

The most important part of the DCO is the decentralized knowledge base (DKB) which needs to be actively managed by adding, improving and validating content. The front of the DKB is a web- and mobile-platform (from now on known as “platform”) which makes it easy for visitors to access the DKB and get their desired content.

The goal of the platform is it to create a useful product that provides complementary information to the existing, detailed description of subjects delivered by Wikipedia. Through this the platform is able to leverage the existing knowledge base from Wikipedia and is able to add unique content on top of it, which creates a new system for users to contribute to the platform.



Initially users will be limited to only create short and concise summaries of the detailed descriptions of a subject (provided by Wikipedia) and Factoids about a subject. The reason for this limitation is it to determine the correct structure of the DCO, but our goal is it to allow users to create “soft-forks” of full-page content provided by Wikipedia, creating a newer, more accurate and informative knowledge base.

An example of a website that leverages the existing content provided by Wikipedia and creates a new product (instant search of content) is https://github.com/domschiener/instant-wikipedia.

4.2. Decentralized Knowledge Base (DKB)

The decentralized knowledge base is at the core of the Reposium DCO. The majority of the work inside the DCO revolves around creating, updating and improving content for the DKB. As the name suggests, the DKB is completely decentralized, both in who can contribute, and how the entries in the DKB are stored. For storing the content entries we will utilize IPFS (https://ipfs.io)

During the early beta-phase of Reposium, we will regularly download the Wikipedia dumps and upload them to IPFS. The contributors will then be able to create additional content to the full page entries already provided by Wikipedia, namely summaries of content and factoids. In a later phase once the community is ready and the concept has been fully tested, we will enable users to edit full page entries.

By utilizing structured data (through DBPedia or WikiData), we can create a "semantic overlay" to the platform which offers a richer and more informative user experience when a user searches for a specific subject. We can for example change the way people get to their desired information by extending the way search queries can be made on the platform (http://dbpedia.org/use-cases/revolutionize-wikipedia-search-0), and we can also create "portable knowledge". This means that website owners can utilize the provided API to make search queries to the DKB and get their desired content, semantically formatted and structured, making it more easy to display the content on a website.

5. Reputation and Influence

Since anyone can contribute to the DCO, reputation plays an important role to instill order into the organization. Reputation determines the contributors influences in the DCO, since reputation itself is a certification that a users contribution is appreciated by the community. Therefore, the more appreciated the content of a contributor is, the higher the reputation and the more influence the contributor will have in the general guidance of the DCC and the DCO. Additionally, reputation plays a crucial role in determining the payout distribution from donations and tips, which means that there is a direct correlation between reputation and monetary compensation.

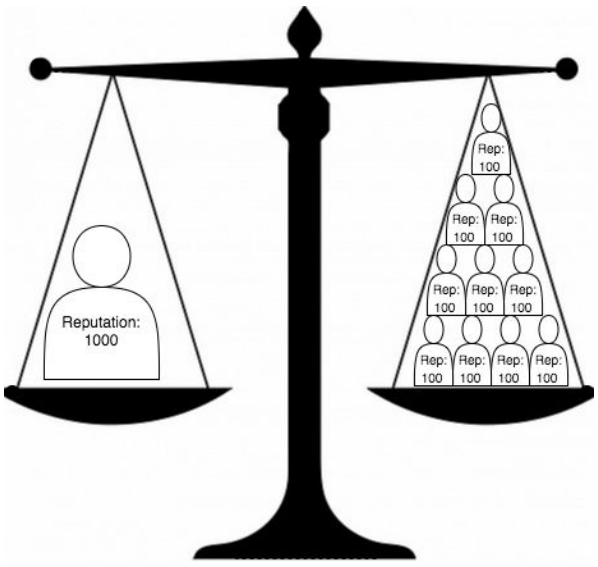
Designing a reputation system for an altruistic community is a difficult task, especially if we consider what is at stake (influence in the DCO). The reputation system needs to provide an objective judgement of contributions, which incentivizes honest participants to further contribute and disincentivizes dishonest ones. In Reposium the community are the judges of contributions, if they appreciate content (e.g. for its accuracy, quality or great explanations) they can like it, which increases the reputation of those in the contribution tree proportionally to the importance of their contributions (see 3.2. for information about contribution trees). Reputation is not proportional, that means an appreciation of one's content does not mean an equal increase in reputation. The reputation system is designed to make it much more difficult to get a higher reputation score and thus, more influence in the DCO.

With an increased reputation score, contributors also gain additional abilities such as being able to edit content directly or punish users by downvoting content. These increased abilities are basically smart contracts that are associated with that specific contributor. If the user is being dishonest, the community can vote and revoke the smart contract access to the contributor, stripping away the increased abilities.

An important aspect of the Reposium reputation system is that reputation can not only increase, but also decrease. Inactivity is punished by a decreasing reputation score, similarly, contributing low quality content will decrease a contributor's reputation score. This is important in creating a balanced environment where only the most active contributors are able to influence the general management of the DCC and the DCO.

6. The Voting System

A democratic voting process ensures that the DCO is managed with the full consent of its users. Although it should be noted that our voting system is not designed to be fully democratic where 1 vote equals 1 contributor. In the DCO voting power is directly correlated with the reputation score of a user. This means that the most active contributors, whose content is appreciated the most by the community, have higher influence in the management of the DCC's and the DCO.



The rationale behind this is that a high reputation means that the community appreciates the contributors content, which in turn means that the contributor (most likely) has a much better overview and insight into how the DCC and the DCO should be managed. Additionally, in such a system, users with no reputation have no influence and cannot change the outcome of a vote, thus making it impossible to spam or attack the voting system.

The Vision of Reposium

With this project we hope to create a decentralized collaborative organization consisting of independent communities that collectively create, improve and manage a decentralized knowledge repository. Through this we want to even further lower the entry barrier for knowledge to be created and spread.

Reposium itself is a social experiment that furthers the research in the field of self-regulating and autonomous organizations. If the model is successful, we hope to replicate it across other sectors and create more DCO's that help create content that users of the internet greatly appreciate.

Where to go from here?

This document is a first step in explaining the overall concept of Reposium. It leaves out some of the important details and there are still some unanswered questions, especially about content creation, reputation and voting. But these questions will be answered in more detailed papers/blog posts in the future. Reposium itself will have to undergo thorough research and I'm sure that it will require many iterations until we get it right and have created a system that is both balanced, fair and ensured that visitors and content creators are in symbiosis.

So far, Reposium is a one-man team (now you may wonder why I said “we” the whole time? Well, “fake it till you make it”.) but I’m looking to create a dedicated team to help realize this vision of Reposium.

What I am specifically looking for:

- Node.js and Python Developers
- Smart contract developers for Ethereum
- Front-end Developers
- Designers and Graphic artists
- Great minds that think they can contribute greatly to this project

If you are interested in this, here is my contact information:

Email: dom@fileyy.com

Twitter: https://twitter.com/domschiener