Incentives in Content-Sharing Network

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Abstract. In this paper, we propose that distributed network infrastructure and curation markets based on block chain can solve major problems that have caused public tragedy in traditional content sharing networks. We also illustrate how they can incentivize a distributed content sharing system to self-evolve into a value-generating and mutually-beneficial community ecosystem with a content-sharing platform Innerlight. In this system, anyone who creates valuable things to society will get a reward and the greater the contribution is, the greater the reward is.

1. Introduction

At present, in the traditional content-sharing network such as WeChat[1] circle of friends, Facebook[2], toutiao[3], Youtube[4] and Weibo, everyone tends to post more content. As a result, the content-sharing communities become more and more bloated and homogenized, filled with all kinds of advertisements and other messy content, which lead to public tragedy. Content-sharing communities face several major problems that are difficult to overcome [5], or require significant human and financial resources to overcome. The main problems are as follows:

- How to deal with information overload in the community?
- Who owns the data generated by the community?
- How to spontaneously maintain the motivation of governing community content?
- How do communities coordinate after conflicts?
- How to distribute the benefits of the community?
- How to ensure the content quality of the community?

Among them, the problem of information overload is the most obvious. After the information explosion, there is an urgent need for a suitable way to call on community members to reorganize information together. Otherwise, there is so much junk and overlapping information that it is easy to cause a flood which can completely destroy the community. In most centralized communities, content is overloaded and of low quality, requiring maintenance and sorting. However, the managers of these communities only want to manipulate the data by themselves, and it is difficult for them to actively open the data. Thus, in those communities, many participators are only volunteers, and as the maintainers of the community content, they have no reward and incentive. As a result, most communities lack the motivation to spontaneously maintain community content. When there is a problem with the manager who is in charge of a community, the members of the community have no good choice but to leave. At the same time, these managers who have the most important power in the community play a small role in the management of the community. It can also be difficult to coordinate if members of the community engage in behaviors inconsistent with managers’ goals. Then
How to motivate content sharing systems to self-develop into sustainable, autonomous ecosystems? It can be considered from two aspects of network infrastructure and curation mechanism based on block chain technology.

2. Distributed network infrastructure

![Centralized vs Distributed](image)

**Figure 1.** Centralized vs Distributed.

Compared with centralized network infrastructure as in Figure 1, distributed network infrastructure has three advantages as follows. Firstly, it does not need a management center. There is no third-party regulatory agency on distributed network, only every common node jointly maintaining the running of the entire network. Secondly, the data in the distributed network belongs to the common creators in the community. As long as the members of the community have access to the network, the data is open to them and no one can alter the data except its creator, and the ownership of the data is clearly marked by who produced it. Thirdly, not only data ownership can be marked, but also contributions to maintain community content made by community members can be marked. In this way, members can be rewarded according to the size of their contributions. For example, the author who writes a good article can be rewarded by the community according to the number of up votes from readers. Fourthly, without centralized managers, there is no conflict of interest of autocratic and centralized management, because the coordination of community conflicts is decided by all members of the community. In fact, this seems like a more democratic solution.

Judging the “decentralization” of a content sharing network has three dimensions as followed. These three dimensional rulers, at first glance, seem indispensable, but in general, they are independent of each other.

- **Architecture layer:** How many computers does a content-sharing network consist of in the physical world? How many computers can the system tolerate crashing while it is running without affecting its own performance?
- **Control layer:** How many individuals or organizations have ultimate control over the computers that make up the content-sharing network?
- **Logical layer:** From the interface and data structure that the system is designed for, is it more like a complete single device or a cluster of countless units?

For example, BitTorrent [6] is decentralized at the logical and architectural level, but at the control level it is controlled independently by a single company. IPFS [7] is decentralized at the architectural, control, and logical levels, and IPFS developer Juan Benet argues that decentralized systems at the logical level tend to be more feasible on network partitions. Block chain [8] on the control layer is decentralized, because there is no person or organization can control block chain. And on the architectural layer Block chain is also decentralized because there is no a centralized server can be attacked, but on the logic layer, the chain of blocks is centralized, because every block chain network...
has a common consensus and a central database (that is, the central ledger), at the same time, the behavior of the system is more like a single computer.

Decentralization of a content sharing network can guarantee the system is robust in the three aspects as followed.

Fault tolerance: A decentralized system is less likely to stop working due to an unexpected local failure because it relies on many components that work independently and is more fault tolerant.

Resistance to attack: The cost of attacking a decentralized system is higher than that of a centralized system. Economically.

Resistance to collusion: It is very hard for participants in a decentralized system colluding with each other. The owners of traditional enterprises often collude with each other for their own interests at the expense of customers, employees and the public.

When comparing centralized and decentralized content sharing networks, they need to be viewed dynamically, not statically. Centralized content networks, such as Facebook, are generally in place when they launch, but the speed at which they can be optimized is limited by the efforts of the company's employees. But a decentralized content network may start out as a semi-finished product, but if the environment is right, it can continue to attract new contributors and grow exponentially. Take, for example, the competition between Wikipedia and its centralized rival, Encarta [9], which in the early 20th century was far better, with more extensive and accurate terms. But Wikipedia [10] iterates faster because the ethos of decentralization and community governance attracts a large number of volunteers for content production. By now, Wikipedia is the most popular reference site on the Web, and Encarta closed in 2009. In addition, in network governance, managers of a centralized content network can decide many important things, such as how information is sorted and filtered, how users are recommended and blocked, and users have to sacrifice privacy and surrender control of their data. In a distributed network, these important decisions are made by the community, following open and transparent mechanisms, and providing a level playing field for third-party developers. And therefore in the future, the value of decentralized networks will continue to rise.

3. Curation Markets
The goal of Curation Markets [11] is to use the blockchain to form a set of reasonable community mechanisms to ensure that the whole community will develop in the right direction under the guidance of a unified goal. For example, content is maintained better and better, attracting more members with common goals to join the community, creating and maintaining more and better content, and so on, forming a positive cycle. In a nutshell, curation markets allows groups to coordinate around shared goals and benefit from the value they collectively create. It does this by adding rules of tokenized value creation and maintenances to content sharing platform. And it is built on Ethereum [12], a decentralized world computer. It is a new way for collaborators to coordinate and share the value that is communally created. Curation markets solve the core problems in content sharing networks as followed.

- Let all members own the value they create: both the creators and maintainers of community content share the collective benefits from their content sharing network.
- Improve community coordination: Members of a community often work together to achieve a common goal, allowing individual organizations or teams to collaborate more effectively. At the same time, this collaboration is based on "rewards depending on contributions", which quantifies the contribution of individuals in the group into a kind of convertible value, so as to motivate team members. In essence, Curation Markets is our creation of a share-holding "company" for every kind of valuable information and content in the community, and the shares of this company can be divided infinitely, and the shareholder is not restricted by any geography, politics, color, language, identity, and any member can join.
- Increase the novelty of shared content: all the participants use tokens to maintain the community's growing content, and tie community members' individual interests more closely to
community content. Curation Markets allows members of the community to share and co-create any intellectual output and virtual assets.

- The rules of value creation and community maintenance in tokens are created in smart contracts so that all members of the community can automatically monitor and maintain the community's content and share in the value jointly created.

Curation markets are intuitive incentives for content sharing communities.

4. Content Sharing system based on IPFS and Blockchain
In reality, we have proposed one content-sharing system InnerLight based on IPFS network[13] and BlockChain, which is a creation and public discussion platform about mental health. InnerLight put copies of articles from creators on IPFS network to achieve distributed storage of contents and complete the first step of returning the data to creators. At the same time, it also encourages creators and readers to maintain the sustainable development of the system through blockchain-based cryptocurrency. In addition to IPFS and Blockchain, ranking algorithms contributes to make Innerlight to be a decentralized autonomous ecosystem.

This system uses distributed network as its fundamental architecture and use block chain to curate the virtual community. IPFS is a distributed Peer-to-peer network to make the content sharing system faster, safer, and more open, and it is also a distributed file system that seeks to connect all computing devices with the same system of files, which provides a high through-put content-addressed block storage model with content-addressed hyperlinks. For a virtual content sharing community, if the power of autonomy is more effective than centralized supervision, the distributed network coupled with decentralized block chain is a very good solution, because the inherent advantages of block chain will enable Curation Markets to motivate the content-sharing community to evolve itself into a good ecosystem.

5. Curation markets in Innerlight
Curation Markets can be created on cryptocurrency based on blockchain. Each participant serves to reduce information asymmetry around the specific shared goal of that Curation Markets. Simon de la Rouvière[15] suggests that there are 2 core components to a Curation Market: How tokens are minted? and how curators are rewarded for reducing information asymmetry? So how exactly does Curation Markets work in Innerlight?

In the design of the Curation Markets in Innerlight, it includes the following features:

- Tokens can be minted at any time at a price set by a smart contract.
- As more tokens began to circulate, they became more and more expensive.
- The amount of cryptocurrency paid in tokens such as ETH is kept centrally in a public pool.
- Tokens may be withdrawn from the available supply at any time (“burnt”), with a proportionate amount of money taken from the public pool.

- Tokens are used to raise money for the maintainers of the content community who then can maintain the content and information of the community in proportion.

To apply the Curation Markets concept, we created a token in the community Innerlight called lightcoin just as likecoin[14]. For example, in the community, each participant can use the lightcoin to vote, such as psychological consultant Tom posted an article which topic is "how to really solve the problem of children anorexia " in the community, a lot of members find that this article can solve the problem in real life, so they vote for this article. In order to encourage more authors to create more high quality content, as the author of this article, Tom is given a part of lightcoins. It's like Reddit has its own algorithm, which converts a user's thumb up to a post's content quality rating to allow more valuable posts to emerge from the community and steer the community in a better direction. In this way, lightcoin can be used not only to motivate members of the community to share more valuable content, but also to mobilize more resources for content sharing development in a variety of ways. It is worth mentioning that we have designed a curation mechanism that rewards the best responses in Innerlight as in Figure 2. It allows people to “ask” anything about mental health or psychological
problems and provide a financial bounty in Lightcoins (the cryptocurrency of the system) to incentivize the best responses. Bounties, at their core, can incentivize behaviors. Need 20 people you are not necessarily familiar with to help you solve your obsessive-compulsive disorder? Give a bounty for your question and learn from the best answers. Just as in Cent [14], with bounty contract, users will be enabled to participate in different implementations of incentive structures that allow for the exchange of creativity and financially-based value.

### 7 days left 16 lightcoins

**How to solve the problem of anorexia in children aged 6 to 12?**

My child usually does not like to eat, the stomach is always bloated, mouth tastes, stomach inside also often accumulates food, and I really hope he can eat normally, grow fat, healthy and healthy.

Can you help me?

**Asked By Jane**

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**Figure 2.** Reward the best responses.

In Cent [15], the key algorithm is that the readers (not the requester) vote on which responses get the bounty. In our system, we propose an algorithm that the requester and the readers vote on which responses are the best and both answer creators and voters for the best answers get the bounty. This way can incentive requester to continually add significant bounties to the system, motivate high quality content to be posted within a specified period of time and attract voters to participate in sorting out the best responses.

Given the amount of bounty given to the top \( n \) answers \( X_i \), the amount of bounty given to voters for the top \( n \) answers \( X_j \) and given the total amount of the bounty \( X \)

\[
X = X_1 + X_2
\]  

(1)

Answers are ranked according to their score based on the number of their votes. The number of votes per answer includes requesters’ votes and the votes of other participants, and we believe requesters’ votes are more important than other voters. Given the score of the answer of ranking \( i \) \( Y_i \), the number of votes from the requester \( Y_{i_r} \) and the number of votes from other participants \( Y_{i_p} \)

We have the score function

\[
Y_i = \alpha Y_{i_r} + Y_{i_p} \quad (\alpha \geq 1)
\]  

(2)

Given the amount of bounty to the answer of ranking \( i \) \( Z_i \)
We have the bounty function for the answer’s creator

\[
Z_i = \frac{n-i+1}{\sum_{j=1}^{n} j} X_1
\]  

(3)

Given the amount of bounty to each vote for the answer of ranking \( i \) \( H_i \)
We have the bounty function for the answer’s voter

\[
H_i = \frac{(n-i+1)}{\sum_{j=1}^{n} (n-j+1) Y_{i_p}} X_2
\]  

(4)

According to the above algorithm, requesters can get satisfactory and valuable answers because in this way, creators have dedicated their wisdom to these answers and participants have been motivated to try their best to pick out the best answers. In this way, anyone who wants to provide their value to society via a decentralized network will get a reward. This mutually-beneficial value will turn humanity’s best intentions into reality. Thus, share your knowledge or do whatever you can to create
valuable things, you are proofing your value-add to society and eventually in the future as a value-generating entity you will become something like a currency that can be invested in [15].

6. Conclusion
In this paper, we propose that distributed network infrastructure and curation markets based on blockchain can solve major problems that have caused public tragedy in traditional content sharing networks. We also illustrate how they can incentivize a distributed content sharing system to self-evolve into a value-generating and mutually-beneficial community ecosystem with a content platform Innerlight. Decentralization of a content sharing network can not only guarantee the system is robust in the three aspects of fault tolerance, resistance to attack and resistance to collusion, but also continue to attract new contributors to achieve the same goal and grow exponentially. Following open and transparent mechanisms, the value of decentralized networks will continue to rise. Curation markets can solve the core problems in content sharing networks, which can enable all members own the value they create, improve community coordination and increase the novelty of shared content. In this way, curation markets can incentivize the whole community to develop in the right direction under a unified goal. Eventually, in this system, anyone who creates valuable things to society will get a reward and the greater the contribution is, the greater the reward is.

Acknowledgments
The authors would like to acknowledge the supports provided by the Program of Science and technology from ChongQing Municipal Education Commission (KJZD-K201805501), China Scholarship Council, the Key Project of “13th five” Chongqing Education Science in 2019 (2019-GX-185), the Research Project on Teaching Reform of Chongqing Education Commission in 2019 (193561) and the Research Project on Science and Technology of Chongqing Education Commission in 2019 (KJQN201905803).

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