



HTTPB: Integrate Blockchain into HTTP, A Method to Increase Democracy in E-Commerce Online Review System

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Abstract. Existing e-commerce online review systems face several issues, including undemocratic behaviours of e-commerce companies to delete and or modify user reviews. A systematic literature review is carried out by us to investigate the problem. A peer-to-peer online review system is proposed based on Blockchain technology.

Literature study reveals few other researchers have attempted to use Blockchain technology for the similar problem. These existing studies have a few limitations and have ignored some essential elements of reviews. We have extended work to fill the gap in the knowledge. In our solution, reviews need to be uploaded through HTTPB (Blockchain + HTTP) protocol. Reviews will go to the smart contract first, and the hash value will be recorded on Blockchain. Afterward, reviews will be passed through HTTP protocol and stored on centralised server of e-commerce websites. A comparison of hash values will confirm whether reviews have been tampered with or not. Our solution has sought a middle ground to ensure data access control and protect e-commerce platforms' digital assets compared with other blockchain-based solutions.

Keywords: E-commerce review system · Blockchain · Democracy · Digital assets

1 Introduction

Since its invention, the Internet has improved the quality of life. Based on the rapid development of the Internet and communication technologies, billions of users use the Internet daily for various social and commercial activities. It produces digital footprints and patterns of individuals, groups, and societies [1]. Continuous development of technologies has helped to overcome the various challenges of the Internet, e.g., data security. HTTPS [2], TLS [3], WPA2 [4], and Kerberos [5] are among the many protocols that are used today to improve the security of data.

However, after decades of evolution, the Internet is currently facing another challenge. Internet giants are controlling large-scale data and see these data as their valued virtual assets [6]. The central authority model brought by HTTP gave them extreme power in processing data. We have seen the misuse of this power in US elections 2016

[7] and spreading fake news on YouTube [8]. A key challenge is that Internet users have lost control of their digital data. One of the areas where the loss of data control has impacted users badly is e-commerce.

Many e-commerce companies, such as Amazon, Alibaba, and Jd.com, have recently become top companies with high market value. E-commerce can grow even further if issues of trust [9] and data security are solved. E-commerce platforms have designed review systems to help users identify the reputation of a particular seller and choose more reliable products as a mechanism to build trust.

We investigated review systems adopted by many e-commerce companies and studied literature about them. We found that a major threat is that e-commerce administrators have excessive power to delete or modify reviews uploaded by users, which leads to users being easily misled [10]. It is negatively impacting the transparency, openness, and democracy of the Internet. Therefore, we propose a blockchain-based solution to maintain freedom of speech and democracy in an e-commerce review system. Our solution integrates HTTP with Blockchain, utilising HTTPB (HTTP + Blockchain).

2 Background

From chaos to autarchy, until today's democracy, human society has undergone thousands of years of evolution. However, the internet is going backwards. Since the world wide web was first established, the internet was considered an equal virtual community where every participant presents any opinion freely. Nowadays, internet companies rely on their solid market share, monopolize all the rights of speech. In the e-commerce market, whether Amazon firmly occupies the top position in the global market or Alibaba and JingDong form a duopoly in the local market, the balance of power is gradually leaning towards these capital oligarchs. Since users upload data to e-commerce platforms to present their opinions, e-commerce companies have complete control over modifying or deleting public voices. Thereby, many users report or compliant about their voices have been buried.

The occurrence of blockchain offers the public opportunity to redistribute control over free speech. Blockchain is a distributed ledger integrated by P2P networks, timestamps, smart contracts, and other technologies, and blocks are verified by PoW, PoS, PBFT protocols, etc. The basic philosophy is "one machine, one vote", which is compatible with the philosophy of democracy. Blockchain applications have been widely discussed in academia and industry recently. Blockchain has potential to provide openness and transparency in various industries, as the data on blockchain is immutable, traceable and transparent. For example, IPFS is considered a distributed storage protocol that can replace HTTP [21], and blockchain is proposed to manage personal data more securely [22]. Although it is still early to deploy blockchain in the industry, some industries have started small-scale experiments using blockchain, such as energy markets [23].

Our research focuses on designing an applicable model based on blockchain technology to empower online review systems in e-commerce, strengthen the freedom of speech and ensure democracy. The online review system allows users to leave product reviews after purchase to help other users make purchase decisions. However, as the

ultimate data manager, e-commerce sites have absolute power to modify any review, which betray the spirit of Internet equality and democracy. At present, many researchers have proposed solutions in this field, but these solutions are designed to maximize users’ interests without considering the interests of e-commerce platforms. Data in review systems is widely used in big data analysis today and is considered as intangible assets, which are directly connected to the business performance of the platform. This competition between users and platform resembles zero-sum game in sociology, the price for users’ voices to be heard is forcing the platform to give up access control to the data. Without legal or political intervention, deploying these models is not realistic from the e-commerce platforms’ side. Thus, “glorious revolution” is more realistic. We proposed a new communication protocol, namely the HTTPB protocol. HTTPB could protect freedom of speech without any negative impact for e-commerce to use data in customer reviews.

3 Literature Review

Blockchain’s integrity, resilience, and transparency make it an attractive technical option to be integrated with enterprises’ business [11]. Due to the characteristics of Blockchain technology, it is widely proposed in energy [12], logistics [13] and in the finance sectors [14]. The central model is a most prevalent model in most e-commerce organisations. Transaction will be done with the help of a third-party entity, e.g., Amazon. However, excessive power is given to platforms in this model, giving them full access to processing data. In order to change this undemocratic situation, many scholars suggested applying Blockchain technology to building peer-to-peer reputation and review systems in e-commerce. ①Salah, Alfalasi and Alfalasi proposed a model using IPFS to store online reviews [16]. ②Zulfiqar et al. developed a peer-to-peer online review system based on Ethereum to prevent tampering with reviews by the centralised authority itself [17]. Interests of e-commerce companies are ignored, and many other defects still persist, a brief advantages and disadvantages analysis as shown in Table 1.

PEST analysis model describes four external factors that decision-makers of a firm need to carefully review when making a strategic transformation, political, economic, social and technical factors [20]. Among these four factors, economic and technical factors significantly restrict the deployment of Blockchain in the e-commerce review system. From a technical perspective, the scalability and security of Blockchain still need to be improved. According to Gartner hype cycle 2019, Blockchain data exchange,

Table 1. Online review systems comparative analysis

Model	①	②	③	Our model
Protect online democracy	✓	✓	✓	✓
Anti-fraud	✓	×	×	×
Data storage integrity	×	×	×	✓
Protect websites’ digital assets	×	×	×	✓

Blockchain society need 5–10 years, more than ten years step into maturity, respectively [18]. From an economic perspective, in the era of big data, data is regarded as the invisible asset of Internet enterprises. By implementing suitable data analysis, companies could customise their business activities accurately, e.g., customised advertising [19]. Transforming data to a Blockchain network will make companies lose control of the data and further damage companies’ finance. Keeping the balance between consumers and companies is crucial to deploying Blockchain solutions in the e-commerce review system. Thus, a transitional solution is more realistic at the current stage, considering both consumers’ and companies’ benefits.

4 Conceptual Model

We proposed a conceptual model that considers both consumers’ and the platform’s interests. Aiming to build a more democratic e-commerce review system to guard consumers’ freedom of speech. Details of the designed model will be elaborated in the following section:

4.1 Process Data through HTTPB Protocol

In our model, users’ reviews are transported via HTTPB. The data will be first uploaded to the smart contract, an open-source, self-executing digital program written in Solidity language based on Ethereum virtual machine. With the execution of the smart contract, Blockchain will record the hash value of uploaded data. Afterwards, HTTP requests will be sent over to the server, as shown in Fig. 1. A key task in the smart contract is calculating and keeping the hash value of uploaded review data on Blockchain. The hash value will be stored in a individual block accompanied by other variables, including domain address, sender address, timestamp, and a Boolean variable “Verified”. We have listed essential variables and their data type, as shown in Fig. 2. Our literature investigation shows that some users upload large-scale data to the review system instead of pure textual data, e.g., video, image. Thus, storing all the large-scale data in Blockchain is still a challenging task, especially for those industries requesting high TPS (transaction per second), such as e-commerce. Every e-commerce website should register a unique address in the Blockchain matched with their domain, which allows users to view the status of their tampering activities (Table 2).

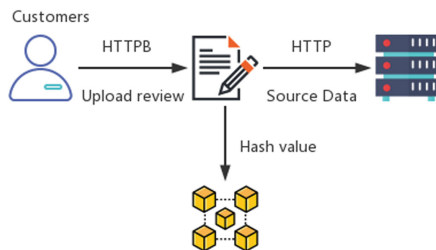


Fig. 1. HTTPB conceptual model

Algorithm 1: Compare hash value on Blockchain and Website server

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Input: Data extracted from Website, SourceData
         the Hash Value recorded on Blockchain, HashValue
         The ID of the review, ReviewID
Output: Review is genuine or not(Boolean value), Verified
1 for Every Block generated in T, take the ReviewID do
2   Find the review on E-commerce website with the same ReviewID
3   if ReviewID not exist on E-commerce website then
4     | return False;
5     | continue;
6   if hash(SourceData) = HashValue on this Block then
7     | return True;
8   else
9     | return False;
10 end procedure

```

Fig. 2. Data verification algorithm

Table 2. Essential variables

Variable	Data type
Domain	Address value
Sender	Address value
Data	Hash value
Time stamp	Integer
Verified	Boolean
ReviewID	Integer

4.2 Data Verification

After uploading data from user end via HTTPB, the uploaded data will still be stored in the centralised server. Thus, the website administrator retains the access to delete or modify the data. In order to further scrutinise and discover unreasonable tampering activity, an authentication progress will be executed in each period, period has been set as T. The websites need to periodically return the hash value, and then compare these hash value with the hash value recorded on Blockchain. If the hash value sending by the website match with the Blockchain, the variable Verified will turn to True, otherwise set as default (False). Algorithm is shown in Fig. 2.

4.3 Information Disclosure and Voting Mechanism

During each authentication period, the Block with deleted or modified data will be published on an independent web page. However, some deletions or modification are reasonable according to website policy. Thus, we will give sufficient flexibility for these Blocks to avoid reasonable deletion /modification be marked out. Once one of the following two conditions has been met, the variable “Verified” in corresponding Block will turn to True.

- 1) Data sender agrees with data deletion or modification
- 2) Website should upload source data, and why they deleted it to initiate a voting progress, every node in the Blockchain network could vote it as reasonable or unreasonable. For data uploaded in $(n)T$ authentication period, if more than 50% nodes vote yes in the next authentication period $(n + 1)T$, then variable “Verified” in this Block will turn to True.

5 Model Analysis

5.1 Advantages

Our proposed model has three main advantages compared with current review systems and other Blockchain-based solutions:

- 1) Our model can limit the e-commerce platform’s power to delete or modify user data. The hash value of the uploaded data will be recorded on the Blockchain, and then passed to the e-commerce website through HTTP. Any unethical deletion or modification will be identified through periodic comparison.
- 2) Losing access to users’ data will be financially harmful to e-commerce companies, as these data have been widely used to improve user experience, e.g., big data used in recommendation system. E-commerce platforms keep the right to store and use users’ data.
- 3) Compared with other Blockchain solutions, this is a more secure, less money-consuming option. The hash value is stored in Blockchain, and source data is still stored in the centralised server as usual, preventing data loss. Using tokens to motivate nodes in IPFS network to store data securely is expensive, especially for some reviews that might be very large in scale. Only recording hash value is a more financially feasible option.

5.2 Challenges

Our model is an original model, which balance consumers’ and platforms’ interests. However, from the user perspective, there are some challenges to this model. First, this protocol could only tell the public how democratic a platform is rather than to stop its central authority. Second, the voting mechanism could not restrain all kinds of attacks. Such as the Sybil attacks can be carried out by registering multiple accounts and manipulating these accounts to change public opinion in voting.

6 Future Work

This research is still in the theoretical exploration stage. In the next step, we will deploy this model in Ethereum, adjust the parameters in the model, and empirically verify whether this research helps on providing a more democratic channel at the consumer level. In the future, we hope to design and deploy a more comprehensive e-commerce review system, which will have more elements to prevent dishonest behaviour on e-commerce. Our future theme will include but not limited to the reputation-token exchange model, decentralised reputation systems, and identification of dishonest behaviours.

7 Conclusion

At present, e-commerce companies generally use a centralised server to store product reviews. Excessive power will harm consumers' freedom of speech. Decentralised blockchain technology can protect users' democracy, but the Blockchain is not suitable for storing large-size data at the current stage. On the other hand, data, as the core intangible asset of Internet companies, financially impacts the business performance significantly. We propose a novel theoretical model to solve this dilemma by recording the data's hash value in Blockchain, and periodically compare hash values with the data from websites to identify how many reviews have been deleted or modified. While ensuring high compatibility, it also ensures that the company's data will not be leaked and provides the public with a way to scrutinise the website's democracy status.

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