

# Blockchain Technology Enhances Fairness, Credibility and Efficiency in Higher Education Evaluation

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**Abstract:** An exploration of how blockchain technology can be utilized to enhance the fairness, credibility and efficiency of higher education evaluation is presented in this paper. By analyzing the shortcomings of existing evaluation systems and the advantages of blockchain technology, a blockchain-based higher education evaluation scheme is proposed. The scheme can ensure the non-tamperability, transparency and traceability of evaluation data, which in turn improves the fairness and credibility of evaluation. Meanwhile, automation and efficiency of the evaluation process can be realized through the introduction of smart contracts.

**Keywords:** Blockchain; Evaluation of higher education; Fairness; Credibility; Efficiency; Smart contracts

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## 1. Introduction

Higher education evaluation plays an important role in ensuring the quality and sustainable development of higher education. Almost every country in the world has its own higher education evaluation organization, and the more famous higher education evaluation organizations include U.S. News & World Report, Times Higher Education, and Quacquarelli Studies. These organizations are influential and authoritative higher education evaluation organizations in the world. In recent years, there have been increasing voices of skepticism about the results of higher education evaluation<sup>[1]</sup>, and the issue of fairness in higher education evaluation has attracted widespread attention. There are many shortcomings in the existing evaluation system, such as non-transparent evaluation standards, non-standardized evaluation process and unfair evaluation results. These problems not only affect the quality of higher education, but also hinder the further development of higher education. Blockchain technology, as a decentralized distributed database technology, has the advantages of non-tamperability, transparency and traceability, which can effectively solve the problems of the existing evaluation system<sup>[2][3]</sup>. The aim of this paper is to design a blockchain-based higher education evaluation scheme to enhance the fairness, credibility and efficiency of evaluation.

## 2. Advantages of Blockchain Technology in Higher Education Evaluation

From a technological point of view, blockchain technology facilitates the establishment of a more fair, credible and efficient evaluation system for higher education.

### 2.1 Blockchain Technology Helps Improve the Fairness of Higher Education Evaluation

In the traditional educational evaluation process, the subjective factors of the evaluator often have a large impact on the evaluation results. However, by using blockchain technology, we can establish an evaluation system based on objective data to reduce the subjective factors in the evaluation, thus improving the fairness of the evaluation. Specifically, we can ensure that the scoring of each evaluation index is based on objective data by transforming the evaluation model into a smart contract on the blockchain, which is automatically calculated and generated by the smart contract, and at the same time made public on the blockchain.

### 2.2 Blockchain Technology Can Enhance the Credibility of Higher Education Evaluation

Each piece of evaluation data is finely stored on the blockchain in a tamper-proof form, which ensures the authenticity and integrity of the data. This model increases the trustworthiness of the evaluation results as the unique distributed nature of the blockchain avoids manipulation or tampering of the evaluation data by any single node. This innovative decentralized trust mechanism allows evaluation participants to have more trust in the evaluation results, thus increasing the fairness and transparency of the evaluation process<sup>[4]</sup>.

In addition, this use of blockchain technology helps to facilitate evaluation cooperation between different organizations and regions. By sharing unified evaluation standards, the comprehensiveness and objectivity of the evaluation can be ensured, which in turn improves the fairness and credibility of the evaluation. This mode of evaluation cooperation across institutions and regions not only helps to improve the overall quality of evaluation, but also promotes in-depth exchanges and cooperation among the various participants, realizing resource sharing and complementary advantages.

### 2.3 Blockchain Technology Can Facilitate Evaluation Efficiency in Higher Education

Evaluation in higher education requires the pooling of data from multiple sources, such as the structure of the faculty, student employment and research output. These data come from different organizations or companies, and different evaluation agencies need to repeatedly check the authenticity of the data in the process of using them. Blockchain can reduce the overhead of such repeated checking and achieve one certification for multiple uses. Specifically, the source data of educational evaluation can be stored in a hybrid on-chain and off-chain manner, where the authenticated source data is stored in the local database of each provider, while the fingerprints (hash codes) of the data are stored on the blockchain. In this way, different evaluation agencies can directly use the source data and verify its authenticity through the data fingerprint. In addition, smart contracts can be deployed on the blockchain for the calculation and statistics of evaluation indicator data. When the data reported by each data provider meets the requirements, the smart contract can automate the execution of the evaluation process and improve the efficiency and accuracy of the evaluation.

## 3. Reconfiguring Higher Education Evaluation Systems Using Blockchain Technology

There are many defects in the existing higher education evaluation system, such as low credibility of data, low degree of information sharing, opaque evaluation mode and low evaluation efficiency. The use of blockchain technology can build a comprehensive and highly credible higher education evaluation system. Through the use of smart contracts, the automated execution of the evaluation process can be realized, and the results of the smart contracts can be verified by all participants, thus ensuring the credibility of the evaluation results.

### 3.1 Building a Layered and Transparent Data Platform for Higher Education Evaluation Based on Blockchain

The implementation of higher education evaluation involves multiple participants, including evaluation agencies, government departments, employers, social organizations and universities. In order to ensure the accuracy and fairness of evaluation, the first task of establishing a higher education evaluation system is to integrate the data of each participant into a credible platform for sharing, so as to eliminate the phenomenon of data silos in the field of higher education evaluation and to build an open and transparent ecology of education data.

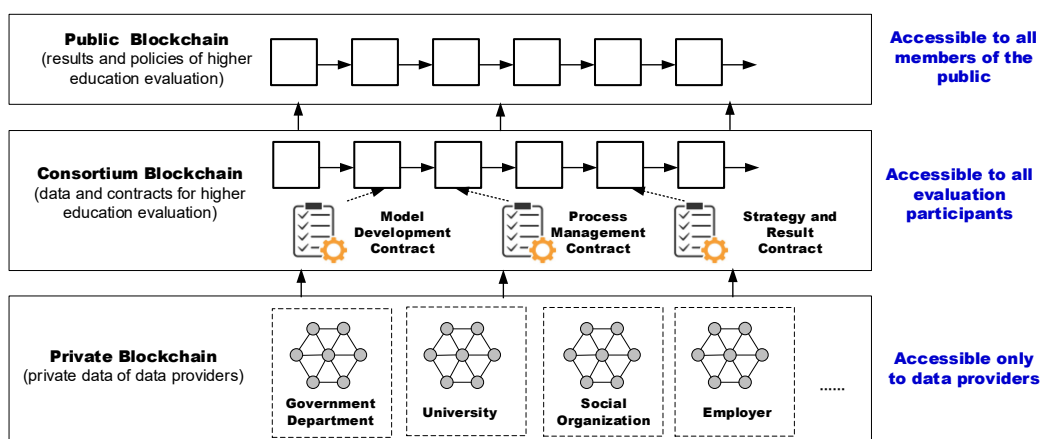


Figure 1. Blockchain-based hierarchical model of higher education evaluation system

For these participants, educational evaluation data are divided into three levels: private data of the providers, public data used for evaluation, and evaluation results open to the public. These three levels of data correspond to three blockchain technologies: private chain, consortium chain and public chain. Each participant deploys the private chain within its own institution to maintain the authenticity and traceability of internal data. At the same time, each participant in higher education evaluation activities jointly maintains a federated chain to upload evaluation data to the blockchain after endorsement by an authoritative organization. After the completion of the evaluation activities, the evaluation results can be released with the help of the public chain to accept public inquiries and supervision.

By using the above three types of blockchain technology, we have established a hierarchical and transparent data platform for higher education evaluation. The architecture of the platform is shown in Figure 1. At the bottom layer, government departments, employers, social organizations and universities each maintain their own business data. In the middle layer, each organization publishes its evaluation data to the consortium blockchain. These published data can be verified for authenticity with the help of cryptography and can be traced back to the data on the private chain. At the top layer, there is a bulletin board for publishing evaluation results. At the same time, this layer is also where government departments and evaluation organizations publish their evaluation policies or strategies.

Through this layered and transparent higher education evaluation data platform, we can ensure the authenticity and traceability of the data and improve the accuracy and fairness of the evaluation. At the same time, the platform can also promote information sharing and collaboration among all participants and promote the sustainable development of higher education evaluation.

### **3.2 Using Smart Contracts to Build Publicly Available Evaluation Models and Processes for Higher Education**

A smart contract is a program that is deployed on the blockchain and executed when specific conditions are met. The results of its operation can be verified by all participants on the blockchain, ensuring sufficient transparency. In Section 3.1, we completed the aggregation of trusted data for educational evaluation. Now, we will build the execution system based on these data and design the architecture of the higher education evaluation system using blockchain and smart contracts. The architecture includes modules such as evaluation model formulation contract, evaluation process management contract, evaluation strategy and result announcement contract.

**Evaluation Model Development Contract:** This contract is responsible for designing uniform evaluation standards covering multiple aspects, including curriculum, teaching quality, faculty strength and research achievements.

**Evaluation Process Management Contract:** This contract is responsible for the management of the evaluation process, including the qualification examination of evaluators, collection and analysis of evaluation data, and supervision of the evaluation process. All evaluation activities initiated by the evaluation organization will be recorded on the blockchain by the smart contract for review by all participants.

**Evaluation Strategy and Result Publication Contract:** This contract is responsible for publicizing the higher education evaluation policy and evaluation results, including the score, ranking and other information of each participating university. The public announcement also includes the strategy adopted for the evaluation.

With blockchain technology and smart contracts, we have successfully reinvented the higher education evaluation system. This system not only enhances the sharing of educational evaluation data and the transparency of the evaluation process, but more importantly, it greatly improves the fairness and efficiency of higher education evaluation.

## **Conclusion**

This paper proposes a scheme to reconstruct the higher education evaluation system using blockchain technology. By establishing a layered and transparent higher education evaluation data platform and deploying smart contracts, it realizes a higher education evaluation model and process that is data-sharing, traceable and open and transparent. The scheme can improve the fairness, credibility and efficiency of evaluation, promote information sharing and collaboration among the participants, and promote the sustainable development of higher education evaluation.

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