

# Decentralized Freelancing System - Trust and Transparency

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**Abstract** - Freelance job is the one where an individual works for themselves. Instead of being an employee of a company to perform a particular job, freelancers are self-employed and they search for work from different sources of majorly online sources. An employer hires a freelancer to complete their task, project, or service for them within the given timeframe. Freelancers often work various projects simultaneously for different clients. Both employer and employee may face various issues regarding unreliability, poor communication, late payment, delayed work, etc. In this paper, we proposed a blockchain-based system to provide trust between employer and employee and ultimately, trying to solve different issues in this process. Our project, HireChain, is a practical implementation of the Decentralized Freelancing System using Ethereum blockchain.

**Key Words:** Blockchain, Smart Contract, Decentralization, Centralization, Freelance.

## 1. INTRODUCTION

The recent advancement and increase in the gig economy are becoming very popular and many people derive their primary income through this market system. "gig" is a slang word which signifies "job for a predefined period". Business and organizations contract for a short-term with independent workers and provide them with the task and temporary position. Generally, gig employees include freelancers, project-based workers, independent contractors, and temporary or part-time hires.

The trend toward a gig economy predicted that by 2020, 40% of American employees would be self-employed. Globally, India is the second-largest freelance workforce after the US. [1] There are lots of issues in a centralized system handling this economic model which can be solved by a decentralized system. We introduce a blockchain-based market system which consists of clients, freelancers, and reviewers. Clients post job offers, freelancers apply for these and reviewers resolve disputes.

### 1.1 Freelancer

The term freelancer is used for a self-employed person as they take contract work. The Internet is one of the best marketplaces to find freelance work. Many online job platforms provide employers and employees all around the globe to collaborate. These platforms serve services like job posting, search, apply, get hired, work. When an individual or a business requires skilled workers for some

projects, short term or long term, they post projects or jobs, and freelancers apply for jobs using the platform. The employer then hires applicants who are eligible for this job.

Upwork's yearly report on freelancing in the U.S. found that 56.7 million Americans outsourced in 2018. Statista, a business data platform, predicts that by 2028 this number will increase to more than 86 million.[2]

### 1.2 Centralized Systems

Centralized systems are conventional (client-server) IT systems wherein there is a single authority that controls the system and is solely in charge of all operations on the system (Fig-1). All users of a central system are dependent on a single source of a service. Online service providers, such as eBay, Google, Amazon and the majority of other providers, use this common model of delivering services.

### 1.3 Decentralized Systems

A decentralized system is a type of network whereby nodes are not dependent on a single master node: instead, control is distributed among many nodes (Fig-1). Cryptocurrency service providers such as Bitcoin, Ethereum, Litecoin, and many other providers use this model of delivering services.

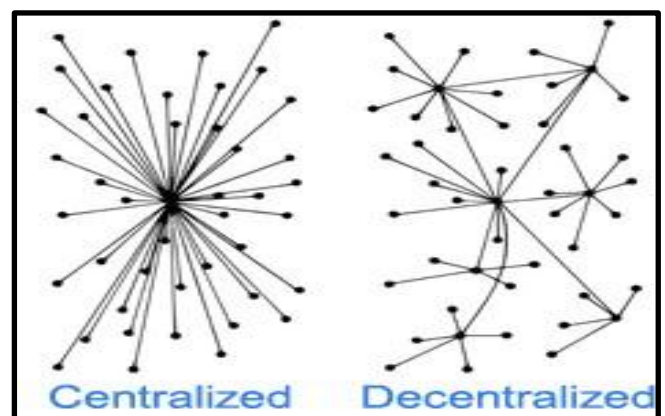


Fig-1: Centralized and Decentralized System

## 2. Terminologies

**Blockchain:** Blockchain at its core is a peer-to-peer distributed ledger that is cryptographically secure, append-only, immutable (extremely difficult to change),

and updatable only via consensus or agreement among peers.[3]

**Smart Contract:** A smart contract can be thought of as a small decentralized program that contains some business logic and a limited amount of data. Actors participants in the blockchain use these smart contracts or they run autonomously on behalf of the network participants[3]

**DAPP** is an application to solve a problem that requires blockchain services and blockchain infrastructure for realizing its purpose.

### 3. Literature Survey

Blockchain Technology can be used in all applications where a decentralized system is necessary to guarantee total reliability and transparency among people who do not know each other. Thus, the applications of blockchain technology are not limited to the creation of new financial technologies or the creation of digital currencies, but it can indeed be used for a variety of other applications such as validation of documents, digital identity protection, organizational data management and so on.

[4] proposes a blockchain-based system that aims to ensure respect for the rights of all actors involved in temporary employment, in order to provide employees with the fair and legal remuneration of work performances and protection in the case employer becomes insolvent. Their system also assists employers in processing contracts with a fully automated and fast procedure. [5] identifies the difficulties faced by the employees and employers, and narrows down the root of these difficulties to lack of transparency. It further states the implications of the solution to these difficulties which are increased complexity, constrained flexibility, and increased demand for accuracy. Finally, it suggests that a solution based on Blockchain Technology is a good solution to solve these difficulties, by creating a decentralized technical infrastructure for efficiently managing settlement processes of transactions.

In the whitepaper [6], they have designed a fundraising and freelancing platform operating on a decentralized network that runs on a blockchain with IRT, a protocol token, which is used by backers to fund projects which are submitted by project owners, and freelancers earn by providing work and services. This Network is built on top of Ethereum, the most well-known and secure blockchain for smart contracts and decentralized application development.

[7] analyzes various studies done to improve the performance of centrally controlled business processes, and states that the most serious issues of the centralized systems are lack of trust and divided data on different confidential ledgers. To overcome this, it suggests the use

of blockchain technology, which not only eliminates the necessity of a trusted third party but also provides a distributed shared ledger. [8] looks at the limitations, fallacies, and the capacity, in terms of maximum job requests satisfied, of the centralized systems for online freelancing systems. It then proposes a decentralized system for cases where the capacity exceeds the maximum capacity that can be served efficiently by a centralized system. [9] juxtaposes centralized and decentralized systems for online freelancing by means of a comparative study which is based on certain parameters such as management, control, work agreements, transaction management, transaction cost, etc. It aims to highlight the key differences between centralized and decentralized systems, and implicate the pros and cons of each.

### 4. Centralized Freelancing System

Centralization also exists in the freelancing system, as most of the existing freelance networks are governed by a centralized authority. A centralized freelancing system provides a common platform for freelancers and companies to connect and work with each other. The user data, interactions, communication as well as payments, all are managed by the centralized authority or the owner of such platforms.

#### 4.1 Benefits

**Well-established economic model:** Centralized platforms are more mature than decentralized freelancing platforms, as their economic model is based on transaction cost economics, in which the nature of transactions influences the contracts and the allocation of economic functions among platforms and markets.

**Improved dispute management:** The presence of a central authority for dispute resolution helps in better handling of conflicts between the employer and freelancer.

#### 4.2 Drawbacks

**Lack of fairness:** Middleman is involved between the employer and employee which compromises the trust.

**Possibility of frauds:** There is a possibility of frauds such as repudiation of payment and false claims on assets.

**Higher transaction fees:** In centralized platforms, the platform owner plays a vital role as an intermediary to facilitate functions such as task management, dispute resolution, and contract management. Subsequently, because of the intermediary services in centralized governance, the transaction cost is much higher than in decentralized governance.

**Lack of transparency:** Only the central authority has access to the ledger to verify the working of the system, not everyone is permitted to do so.

### 4.3 Examples

#### 4.3.1 Freelancer

Freelancer.com is the world's largest freelancing and crowdsourcing marketplace in terms of the number of users and projects. It connects over 37,714,641 employers and freelancers globally from over 247 countries, regions, and territories. It enables employers to hire freelancers to do work in a variety of areas from software development to sales and marketing, through their marketplace. [10]

#### Features

1. Free Job Posting
2. Contest Posting
3. Custom Offers
4. Job Sample Viewing
5. No-Cost Chat
6. Time Tracker
7. Secure Payments
8. Milestone Payments
9. Invoicing

#### 4.3.2 Upwork

Upwork is one of the largest global freelancing websites. It has millions of jobs posted annually, providing freelancers an opportunity to earn money by working for the companies in over 7 categories of work, exhibiting over 5,000 skills. Upwork makes it fast, simple, and cost-effective to find, hire, work with, and pay the best professionals anywhere, any time. [2]

#### Features

1. Job Posting
2. Needs Analysis
3. Candidates Shortlist
4. Profile Browsing
5. Proposal Reviewing
6. Chat Scheduling
7. Send & Receive Files
8. Feedback Sharing
9. Mobile Access

10. Work Diary

11. Global Payments

12. Invoicing & Reporting

### 5. Decentralized Freelancing System

A Decentralized Freelancing System is a type of freelancing system in which there is no central governing authority that controls the interaction between the freelancers and employers.

#### 5.1 Benefits

**Fairness:** There is direct contact between employers and employees without the need for any middleman. Every freelancer would be able to compete for any consignment which is posted on the platform.

**Elimination of frauds:** The cryptocurrency helps in eliminating the frauds involving a repudiation of payment and false claims on assets.

**No chances of identity theft:** The cryptocurrency wallets are secured and payments can only be made by the owner of the wallet and don't need any information to be shared with any sort of intermediary.

**Secured and trusted payments:** The payments are made between crypto wallets which are highly secured by cryptographic keys. The network can be trusted because every transaction is verified by network and subsequently written on an immutable ledger.

**No Holds:** The smart contracts release payments instantly once the conditions of the transaction are satisfied and there are no intermediate holders to delay payments.

**No Limitations:** Anyone can apply for a job from anywhere in the world, there are no limitations on global access and payments.

**No Freezing on Your Account:** There is no central organization that can ban or freeze an account.

**Lowest Transaction Fees So Far:** The transaction fees charged are the lowest when compared to other forms of money transfer.

**Security Amount:** The smart contract holds the security amount and is trusted by both parties involved in the system as it's locked based on mathematical logic.

**Privacy:** The data specific to a user is controlled by the user and no one else.

**Transparency:** Everyone in the network has access to a distributed ledger to verify that the system is working properly at any instant.

**Limited T&C:** The Terms and Conditions are generalized and not regulated by any central authority.

## 5.2 Examples

### 5.2.1 BlockLancer

Blocklancer project has emerged as an innovative decentralized business model called the Distributed Autonomous Job-Marketplace (DAJ) because of the problems Freelancers face on a daily basis on present-day freelancing platforms.

Blocklancer provides decentralize platform governance features, allowing disputes to be voted and decided upon by Token Holders. When the employment contracts are completed, the entire 3% of the fees charged will be given to the token holder. In case of any disputes, token holders will be responsible for resolving the conflict via voting. This puts the decision-making power in the hands of those holding LNC similar to Proof of Stake. Token Holders get an incentive to participate in the dispute resolution process, which is decided by the majority of the vote, because the Token Holders who vote with the majority-side receive LNC from the Token Holders who voted on the losing side, resulting in lost LNC from those who vote against the majority.[11]

#### Features

1. Guaranteed Payments
2. Low Fees
3. Fair and Automated Dispute Settlements
4. No Censorship
5. Lancer Tokens

### 5.2.2 CryptoTask

Cryptotask introduces a decentralized task market based on blockchain technology. The key innovation is done by Cryptotask is a commercially scalable consensus mechanism with reviewer board selection built into the blockchain, including the escalation option that satisfies Nash equilibrium. The selection mechanism needs to satisfy the condition of secrecy in order to discourage potential collusion and off-chain communication between reviewers by implementing a reporting mechanism. In order to dissuade parties from using the waiting strategy, voting is carried out in two phases. This also includes a secret commit phase. [12]

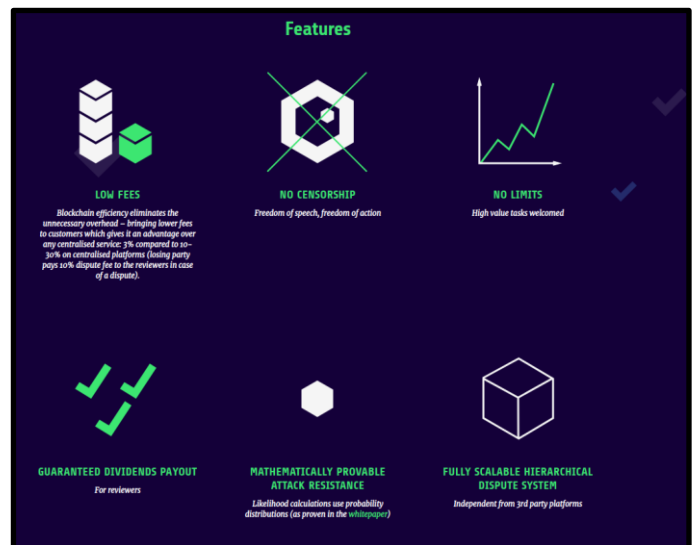


Fig-2: Features of CryptoTask

## 6. Hirechain

Hirechain is a decentralized platform where any individual or a business can post consignments or work opportunities and freelancers can apply for that consignment by making a bid for which they are willing to complete the consignment. [13]

### 6.1 Project Overview

Once a user is registered on Hirechain, he or she can apply for freelance opportunities and also post their own projects and hire people. This process takes place in the following manner:

- A user (employer) can post a consignment on the platform.
- This consignment is now visible to people who want to apply.
- The minimum amount for the job is entered by the employer.
- Different users (freelancers) can now bid on the project until the application deadline and the employer can view all the bids and work profiles of applied users in real-time in his project application board.
- If the employer selects a bid then the consignment is assigned to that freelancer and then when the task is finished, a review of the work is done.
- The amount is automatically transferred to the freelancer if there are no issues in the submitted work.



- In case of any dispute between freelancers and employers, the parties can raise the issue to dispute management of Hirechain, where field relevant and unknown people (reviewer nodes) verify and resolve the issue in consensus.

This completes the broad overview of Hirechain working (Fig-3) and its technical implementation is discussed below.

### 6.2 Core Technologies Used

**Ethereum:** Ethereum is a global, open-source platform for decentralized applications. On Ethereum, you can write code that controls digital value, runs exactly as programmed, and is accessible anywhere in the world.

**Solidity:** Solidity is a programming language used to implement smart contracts and deploy them on the Ethereum Blockchain. It has been developed by Ethereum.

**IPFS:** The InterPlanetary File System (IPFS) is a protocol and peer-to-peer network for storing and sharing data in a distributed file system. IPFS uses content-addressing to uniquely identify each file in a global namespace connecting all computing devices. With content-addressing, files "can be decoupled from origin servers, and instead, can be stored permanently. This means content can be stored and served very close to the user, perhaps even from a computer in the same room.

### 6.3 Implementation

In this project, we explored a variety of different technologies. We used javascript to make our web application and solidity in order to implement the smart contract and then deploy it on the Ethereum blockchain.

In our project, the smart contract was the core section where all the business logic was implemented using Solidity. We used the remix IDE to code the smart contract and we deployed it on the Ropsten Testnet. On deploying the smart contract, we received an Ethereum address which is the unique address of the smart contract on the blockchain. Ethereum addresses are represented in the form of 40-character long hexadecimal strings. An example of an Ethereum address is 0xb3deec8f570966e145af6ef28618cb6dfbcbb8. After this, we can basically interact with the smart contract using our web application. We used the javascript library called web3.js to interact with the smart contract.

We have used the ABI and the address of the smart contract in order to interact with the smart contract. ABI stands for *application binary interface*. In general, an ABI is an interface between two program modules, one of which is often at the level of machine code. The interface is the de facto method for encoding/decoding data into/out of the

machine code. Using Web3.js we can call the functions of the smart contract and therefore perform different tasks.

We have created two main smart contracts, one that handles different users and the other handles how different users can post as well as apply for freelance services. Users had an Ethereum address, which consists of a public key, and a private key. In Ethereum, these keys are generated using elliptical curve cryptography. The address and public key are known publicly but the private key is not shared with anyone. We store the addresses of all the users on the blockchain. The documents like resumes are uploaded on IPFS which is a decentralized file storing system. Once the document is uploaded a unique hash is received and this hash is mapped with the user and stored on the blockchain.

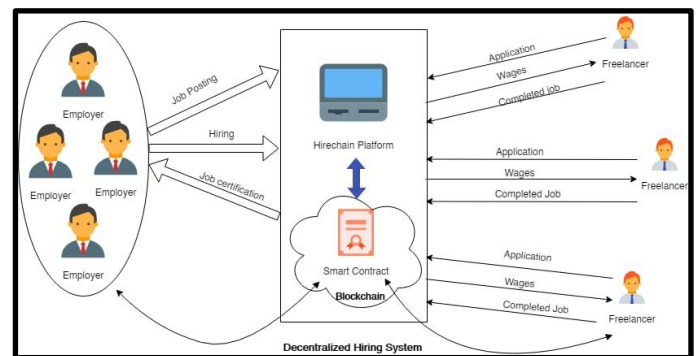


Fig-3: Architecture of a decentralized freelancing platform

### 7. Comparison between Centralized and Decentralized System

The comparison between some of the centralized and decentralized freelancing systems is tabulated in Fig-4.

Features	Decentralized Platform		Centralized Platform	
	Hirechain	Blocklancer	Freelancer	Upwork
Fee for Clients	0%	0%	3%	2.75%
Fee for Freelancer	1%	3%	10%	20%
Money Withdrawal	Immediately into Ethereum Wallet	Immediately into Ethereum Wallet	2.75% fee for money withdrawal Additional 5% for currency conversion. Within 3 days.	\$0.99 fee Upto 4 days
Protection from Censorship	Yes	Yes	No	No
Secure Payment	Yes	Yes	No	No
Dispute Management System	Yes, Reviewers manage.	Yes, Token Holders manage.	Yes, Freelancer.com manages.	Yes, Upwork manages.
Privacy	Yes	Yes	No	No
Fairness	Yes	Yes	No	No

Fig-4: Observation

## 8. Conclusion

The popularity of freelancing among masses is growing rapidly. However, the centralized freelancing system has many disadvantages like lack of fairness, higher transaction fees, lack of transparency and also the possibility of fraud. Because of these limitations, we conclude that a decentralized system is a better alternative, which ensures privacy, fairness, transparency as well as lower transaction fees. Thus, in our proposed method, Hirechain, we have implemented a fully decentralized freelancing system with all the aforementioned advantages, thus ensuring trust and transparency among the freelancers and employers.

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