A Decentralized Platform for Secure, Autonomous and Digital Labor Search and Workflow

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Abstract: **It is estimated over 90% of workers in India work in the informal economy, and are therefore vulnerable to exploitation in an informal and unregulated environment. In spite of the various labor protection acts, there exists no solution which ensures an exploitation free labor task-force and adherence to minimum wages, safety and maximum hour's regulations. Moreover, employers have to pay more and labors get less due to presence of hierarchal system of bribery and transaction fees. In this paper, we propose an online decentralized job search system based on blockchain for employers and job seekers to interact directly. This complete system would eliminate the exploitation faced by job seekers and the money wasted at various intermediate levels of job search. Also, pursuit of each job would be represented as a smart contract where payment would be deferred and also determined partially by quality of the work. Also, we propose a unique Aadhar based authentication system for ensuring authenticity of the digital identities of the people on the decentralized network. There is also the added benefit of ensuring that the worker is not underage by checking against the Aadhar API and thereby eliminating child labor.**

Keywords: **Aadhar authentication, Blockchain, decentralized, Informal economy, labor exploitation, smart contract.**

1. Introduction

Over 94% of the total workforce in India comprises of unskilled workers including mall and marginal farmers, building and construction workers, leather workers, weavers, fishermen, mill workers, maids, etc. The employment landscape of unskilled labor in India has not changed much during the past century. In spite of constituting such a large portion of the Indian economy, the essential output of this sector limits to a meagre 57%. This data can be perceived by the simple common known facts which involve illiteracy and poverty. Due to illiteracy, most of the workers are at the expense of the contractors or middlemen who put them to various jobs. However, this leads to a narrow view of the job availability and pay grades to the workers. Also, they settle for the immediate job which they find leading to poor quality of jobs for their employers, mismatch of skill to work and heavy exploitations at the hands of middlemen, both mentally and economically.

Labor exploitation in India can be attributed to the following factors:

1. Lack of Information and Education to the Laborers
2. Lack of Peer-to-Peer contact between laborers and labor seekers
3. Lack of Secure and Reliable Documentation
4. Debt Based Bonded Labor and Middlemen in Job Search.

In spite of the various labor protection acts, there exists no solution which ensures an exploitation free labor task-force and adherence to minimum wages, safety and maximum hours regulations. Moreover, employers have to pay more and labors get less due to presence of hierarchal system of bribery and transaction fees.

An ideal solution to this problem would be a system, which was so easy to use that even an unskilled person could use it. Additionally, such platform should be tamper-proof, should have an intrinsic and autonomous trust model and should match the employers directly to the job seekers. While job-matching platforms exist today, none of them can provide autonomous trust, the notion which allows employers and job seekers to trust the system without a third party or body ensuring the trust.

Blockchain based networks provide an excellent solution to this problem. Using a decentralized blockchain based platform to store all data relating to the job seeker's and employee's identity, job details, etc., this platform could essentially eradicate online fraud and manipulation of data. Also, Smart Contracts, which are an immutable, autonomous plan of actions would be used to represent each activity that happens on the network, allowing deferred peer-to-peer payments, assured delivery of set targets and automated workflow. In our paper, we propose ChainedIn, which will such a platform which would match the employer and Job Seekers in a secure, autonomous manner while maintaining trust. Also, the platform would have adaptive user interface, changing according to the demography of the person, hence allowing even illiterate people to use it efficiently. Also, the platform would have an Aadhar based digital identification system, which would ensure credibility of the users on the network and also prevent child labor. The implementation specifics of the platform are discussed in further sections.

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2. Related Works

In this paper, block-chain based system has been proposed for the migrant and workers of the informal sector of our society. One of the major concerns one can think of this system is the reliability of the worker assigned to the work. One way of being sure of his/her work ethic is by looking at the past jobs they have done i.e. their work history. In [1], the shortcomings involved in verifying the details of a job applicant's work history, the resources it takes not to mention its unreliability and inaccuracy is explored. A blockchain solution is proposed citing its positive qualities such as cost-effective, real-time work verification, trustworthy and privacy- preserving (work-history) data sharing along with the block chain's property of being an immutable distributed ledger technology, which does not allow a transaction to be modified once created. The advantage of the proposed system is that it will also allow prospective employees to bundle various records and send that bundle to prospective employers, who will then have the ability to verify each record against the version on the blockchain while still preserving the privacy of both parties.

The choice of choosing blockchain as the foundation for the system is due its unique capabilities [2]. The data integrity as well as immutable automated business logic (smart contracts) of the hiring process is handled by the Blockchain technology. The Ethereum based blockchain platform has automated payments, the creation of own non-fungible tokens, and managing project's success voting. This paper also introduces the concept of so-called non- which are used as proof of experience and reliability hence exploring one of the weakness explored by us during the SWOT analysis.

The risks incurred by the temporary workers is the main reason behind this system. The nature of their work involves taking special legal protections and many aspects and risks taken into account for both employers and employees [3]. The system is proposed for ensuring the rights for all actors involved in a temporary employment with respect to provide them with the fair and legal remuneration of work performances and a protection in the case employer becomes insolvent. A decentralized system D-ES (Decentralized Employment System) which is implemented on top of the DLT (Decentralized Ledger Technology) which is basically a blockchain system in a web-based environment and using the concept of smart contracts for the various authentication tasks. A case study in an agriculture field is also explored in this paper.

Due to the nature of the hiring of workers being similar to the practice followed during hiring for companies by the HR department, the similarity of the needed which is non-biased, efficient, transparent and secure, Blockchain is used to help uphold the required specifications.[4] A Blockchain based Recruitment Management System (BcRMS) as well as Blockchain based Human Resource Management System (BcHRMS) algorithm have been proposed and from the analysis of the results obtained by them it is concluded that the proposed system holds definite advantages compared to the existing recruitment systems. Future research directions have also been identified and advocated.

The concept of crowdsourcing is the process where an individual or an organization utilizes the talent pool present over the Internet to accomplish their task(s). Their qualities include reduced cost, better quality, and lower task completion time. For getting the best workers, a reputation system needs to be put in place. It would work on ratings provided by the task posters which has been identified as one of the attack surfaces of the application from users or the platform owners, with malicious intents who can jeopardize the reputation system with fake reputations [5]. So in order to combat this, a blockchain based approach is proposed to manage reputation system with each step of crowdsourcing process managed as transactions in Blockchain. This helps in establishing better trust in the platform users and addresses various attacks which are possible on a centralized crowdsourcing platform. An Ethereum based framework utilizing IOTA's consensus mechanism for reducing the cost of task evaluation to almost zero is built.

3. Proposed System

The proposed blockchain based system is for it being a portal for the workers to register and use it as a job site while the employers can use it to hire workers and assign jobs to them.
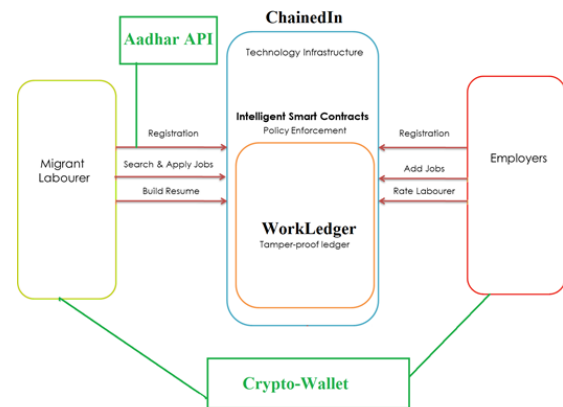

Fig. 1. Architecture diagram

From the get-go, we can identify the different modules involved in such a system which are-

- *User Registration* – Both the workers and the employers register an account with the system with a password and a unique username is generated which is their identity in the blockchain of the application. The registration also has the feature of user authentication via Aadhar API which would be used for identity authentication as well as ensuring that the worker is not underage.

- *The dashboard*- The dashboard for the users of the system vary depending on the role – Workers can view the jobs posted and their details such as the person in

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charge and apply for them. The Employers can post jobs onto the blockchain and verify once the job is completed

- *Rating System* – Upon the completion of the job, the employer can rate the worker and give their feedback which would be reflected in the worker's history.
- *Resume Builder* – The worker dashboard would provide the option for downloading the work history of the said worker containing the ratings given along with the employer feedback and the overall rating of the worker.

All the users of the platform have a cryptocurrency wallet which is used to pay for all the transactions and operations performed such as job posting, job acceptance, payment etc. Each transaction is recorded and the blockchain cannot be modified by any third party hence ensuring integrity of the system.
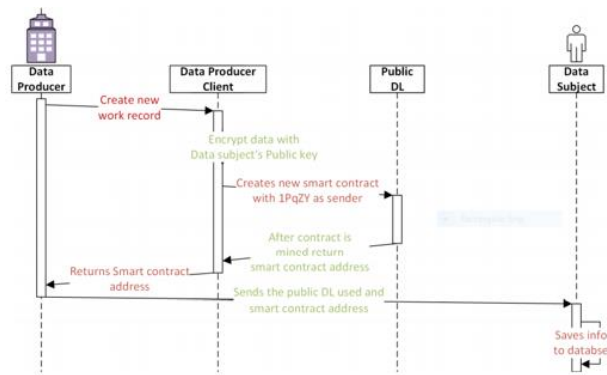

Fig. 2. Work history creation

The proposed system is based keeping the following goals in mind,

- *Ironclad User Identification and Credentials* – The users of the platform – the laborers and the fore-masons both have their identities authenticated. Using the uniqueness of India which has implemented Aadhar card system and which also provides and API service to authenticate the identity of users and also helps eliminate child labor by setting the minimum age of job.
- *Painless Payment Processing-* The proposed system could provide the system of payment for the users for the work done in-platform in terms of cryptocurrency or digital wallets.
- *Remote and Transparent Hiring for Workers* – This feature of the platform would help ease the hiring process of the workers by way of a website based system along with better accountability and transparency of the process.
- *Smarter Candidate Matching* – The technology ensures the skills of the users of the system along with a detailed work history without any outside influence.

Another system to be implemented is the skill rating system which would be helpful during the hiring process to ensure the quality of the worker.

Due to the nature of blockchain, the integrity of the documentation in the work process is guaranteed by the nature of smart contract. The guarantee of the quality of work can be ensured using the concept of staggered payments where a portion of money would be payed after the work is completely to the satisfaction of the customer. The money is held in escrow and hence the workers are guaranteed payment and hence the clients can directly interact with the workers and eliminate the middlemen. This would decrease the overall costs and ensure the security of the job due to the identity authentication module of the system. The work history of the worker is also stored in the blockchain and is available to all thereby helping the clients choose workers based on the rating system and also help workers advertise their skills.
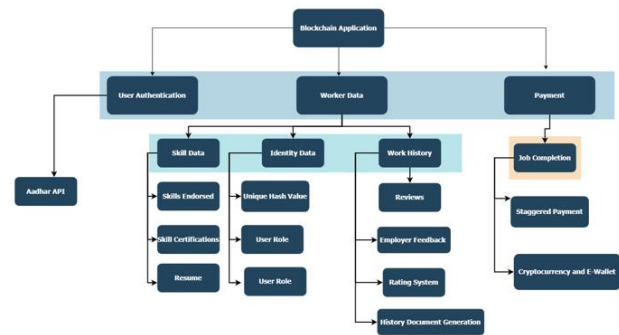

Fig. 3. Component block diagram

Each transaction has a certain cost thereby ensuring that the system is not utilized excessively. Also due to the nature of the blockchain, there is no central repository/ database of information. Instead, the information is decentralized and stored on the network of nodes and would not be affected even if one of them fails.

The proof of concept of the proposed system is a blockchain based web application and hence there is a need for the following things:

- A central server
- A frontend accessed using a browser
- A way to store data - This could be database in typical application. However, our application is blockchain based and hence the data is stored in the form of a blockchain accessible from every node.

It has been deployed on an Ethereum test network using Ganache and deployed on a server using NodeJS.

4. Results

The work proposes a blockchain based web application which helps the job seekers and employers match directly. The trust is ensured by the usage of smart contracts which ensure timely payments, validation of the quality of work by third party and immutability of records on the network. The network is

established in a peer-to-peer fashion where the digital identity of each individual is enforced using the Aadhar API, which provides all information while registration of the user on the platform.

Also, the adaptive UI makes it very easy for a particular person to search and post for jobs. The whole system is self-correcting, i.e., in case of any discrepancy, the whole blockchain becomes invalid and such an invalid block is rejected immediately by the network. The smart contracts constitute the very details of the work like amount, quality, quantity, time, etc. and ensures a hassle-free experience for both the worker and employer.

Also, such a contract allows staggered payments between n parties. Some employers might see having a contractor to handle multiple job seekers as a service. The proposed system performs well on that dimension too by allowing smart contracts with n users, each user where is a person which plays some part in the contract and holds promise of payment of their portion. In totality, the systems solve the issues presented as the problem statement in our literature earlier.

5. Conclusion

A decentralized and autonomous system for labor search not only decreases labor exploitation, but also improves the quality of work that the employers often don't get in a random match. A worker rating system coupled with quality of work helps the workers have a digital resume which they can show to their potential employers.

Adaptive UI based on language and UI complexity change makes the platform usable universally. All data is stored in a decentralized fashion hence ensuring autonomy, security and trust in the process of job search. Also, the system is robust to wrong reviews by incorporating third parties in the validation process of the work that is completed finally. Aadhar based identity authentication provides credibility to the users on the platform. In the future, our system can be expanded to incorporate different levels of validation through thirds parties to make the system robust to false ratings for a user. Also, cryptocurrency could be used along with UPI payments to ensure timely and easy peer-to-peer payments.

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