

# Applicant Credentials Tracker for Employment Using Blockchain Technology

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**Abstract:** Recruitment of the right person for the right position is an enormous task and the core functionality of the Human Resource department. It is a procedure that encompasses identifying, attracting, screening, shortlisting, interviewing, selecting, recruiting, and onboarding. Many organizations outsource their hiring requirements, while others rely exclusively on ads, job boards, and social media platforms to recruit new positions with qualified candidates. The employee background check on performance and attitude is equally important before absorbing into the current Organization. There is an uncertainty for the recruiter as they are unaware of the candidate's current employment status. The candidate's efficiency can be measured from his/her certificates, their experience and performance in previous companies. These certifications and proof of experience can be manipulated, and fake credentials can be presented to the recruiter. This can be avoided through an authorized system maintaining the repository and updating the credentials of a candidate. Blockchain technology provides a reliable option for an authorized repository. The content in a block has a series of authorized miners before a change can be implemented, which is a secured procedure to keep the data intact. The permission to add specific user's academic and experience certificates would be given to authorized institutions and organizations so that scope for creating fake certificates by user is reduced and, in our application, the hiring organization can view users all certificates uploaded by different organizations and institutions during the interview process so additional time required for employee background check is reduced. This paper reviews the existing methodologies and proposes the design of a Blockchain Network, to facilitate the candidate verification and validity of information for the recruiters. The candidate can avoid carrying copies of credentials every time facing an interview board.

**Keywords:** Moonlighting, Blockchain, immutable ledger, consensus, smart contracts, validation.

## 1. Introduction

Blockchain is a distributed, immutable ledger that is used to record transactions, track assets, and foster trust. Trusted data and information are essential for sustainability of an organization. This revolves round employee efficiency and credibility. Information is the lifeblood of business. The faster it is received and the more accurate it is, the better the outcome. Blockchain is ideal for delivering that information because it provides immediate, shared, and completely transparent data stored on an immutable ledger that can only be accessed by network members with

permission. The progress of an employee in the organization is treated as a transaction and recorded as a block and can be made available to the authorized to genuinely verify before employing the candidate. Each transaction is recorded as a block of data. The data block records the information. These blocks form a chain of data as the candidate changes the organization. The blocks provide reassurance over the exact duration and sequence of employment, and the blocks are securely linked together to prevent sequence changes. Each successive block reinforces the verification of the preceding block, and consequently, the whole blockchain. This provides the blockchain with its key strength of immutability by making it tamper-evident.

Moonlighting refers to working secretly for a different organization while employed in one. Employee earnings and, ultimately, the standard of living could benefit from moonlighting. This concept poses a challenge to both employee and employer as background verification before offering employment is a lengthy scenario. Millennials are eager to switch businesses frequently and the average employment tenure is progressively declining. Additionally, hiring managers continue to have legitimate concerns about false CVs. The existing system does not handle dual employment issues. The candidate's

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trustworthiness can be guaranteed only through a highly secure and robust system. Blockchain technology provides a reliable solution through tamper resistant immutable systems. It eliminates the risk of tampering by a fraudulent actor and creates a ledger of trustworthy transactions.

## 2. Literature Review

Hardeep Kaur et al., [1] covers the concept of moonlighting and its effect on organizational growth. The disadvantages of moonlighting were, low productivity, loss of business privacy and competition threat, employees well-being and other ethical issues. Its advantages are improving the country's economy, the skill of employees and increasing the employee's network in the industry. Remedial measures suggested for the benefit of the organizations to effectively manage the moonlighting include signing an agreement by the employee to refrain from working a second job or to seek prior permission.

Kamal Adetunji Bakare [2] has interrogated and evaluated the impact on moonlighting on work performance in Nigerian public universities. It was found that the culture of moonlighting is not regulated but encouraged in Nigerian University which is affecting the performance of the Nigerian students. The corruption being another reason due to which the low funds are provided to the universities, to feed the large families the teachers in Nigerian Public Universities are moonlighting.

Rupa et al., [3] performed analysis and research regarding providing security to medical certificates and medical reports using Blockchain technology. The proposed solution was a role-based authentication (mainly Regulatory Authority and Medical Evidence issuer) to provide security to the medical evidence. The different roles have different operations to perform and different duties to do. The cost of each operation was measured in terms of eth gas. Using the Ethash algorithm on the Ethereum platform or the SHA algorithm on the Bitcoin platform, every transaction is tracked in terms of hash values. The paper also gave a glance on how blockchain and overhead will affect as workload increases.

Omar S. Saleh et al., [4] did research on verification of educational certificates using a blockchain framework. He discussed different sources of fake certifications (namely Modified Documents, In-House Produced, Degree Mills, Translations, Fabricated Documents) that can happen. The proposed solution is built on the Hyperledger Fabric framework. It is a private Blockchain and also not a coin (or token) based blockchain. It has many benefits for Hyperledger distributed ledger such as transparent network, permissioned access, grievance redressal, uniquely Identifiable Digital Certificate etc. But it has very complex architecture and is difficult to implement.

Kritika Mittal et al., [5] built a private blockchain network for storing education certificates. The project involves three entities: organization, the user, and the verifier for verifying the certificates. These educational certificates are uploaded into the blockchain by the organization in the hash format generated using the SHA-512 algorithm for each user. Network provides the transaction ID for the upload which can be used by the verifier. The education certificates submitted by the user can be verified by the verifier by generating the digital certificate's hash value compared with the hash value present in the block which can be accessed using the transaction ID, thus a verifier can validate the documents submitted by the employee or user.

Dina Salah et al., [6] conducted semi-structured interviews with specialists of Human Resources Management (HRM) from various industries in one-on-one manner to determine the potential applications of blockchain in the HRM domain as well as the problems associated with its implementation. They performed a thematic analysis on responses that (analysis) involved steps such as Data Acquaintance, Generating Initial Codes, Themes Exploration, Themes Review, and Themes Naming. The study resulted in knowing the potential areas where blockchain can be applied and those areas include Performance appraisal in previous companies, reference verification, training center and trainers credential verification, salary surveys, and medical and criminal record verification. It also revealed factors contributing to implementation challenges for blockchain technology, such as government support, senior management, the central bank, and important organizational figures, widespread adoption of the technology across the world, funding allocation, providing proof of progress, addressing the problems that lead to employee opposition towards blockchain technology, for instance, fear of being laid off, incompetence, and strengthening security measures.

Nivedita Swapna Dhanala et al., [7] proposed a method that employs blockchain technology in the hiring process. The recruiting organization uploads the applicant list in the system. It categorizes the information about the candidates based on their needs. The system then validates the applicant's personal information before hiring them from the college database and law enforcement depending on which candidate is approved or rejected for this the proposed model uses the Practical Byzantine Fault Tolerance (PBFT) algorithm, which considers a message from a specific node to be faulty if it is not received in a specific timeframe. The scalability problems are reduced by PBFT, it has a better throughput value and minimizes latency. The Company/organization receives ranked and verified candidate lists that can be used to recruit candidates. The company then selects the best candidate and sends information to the candidate and company

database. The Recruitment management system is developed using the software testing tools Rinkeby and Ganache. In comparison to the Manual Recruitment Management System, this provides data that is verified, safe, and secure.

Vinu Sherimon et al., [8] proposed a “JobChain” platform which is based on block-chain to coordinate employment recruitments in different Ministries within the Sultanate of Oman. The proposed framework contains the Ministry of Civil Services (MOCS), Ministries (such as Health, education, etc.), Ministry of Manpower (MOM), Job Seekers, and Assets such as Job Vacancies, Job Categories, and Resumes. The JobChain prototype is designed using the Hyperledger composer playground, an open-source web-application tool. In the blockchain, ministries post job vacancies, and MOCS is in charge of approving job openings posted by other ministries. Qualified citizens may apply in accordance with the requirements. The Ministry of Manpower will validate this. The respective Ministry will inform applicants of the exam/interview information if the job application is initially accepted. The test and interview results are published in the blockchain, and the job opening status will be consequently updated. The proposed system offered a common platform for different ministries to collaborate with each other. It also increases credibility, reliability, and transparency in Oman between ministries and people seeking employment.

Huimin ZHANG et al., [9] have discussed how Human Resource management can be benefited by using blockchain technology, Blockchain Technology can be used to address these problems, and how the features and characteristics of blockchain are useful in addressing them. They proposed an HRM mechanism based on a two-level alliance chain for managing the HR work. The system is split into two sections. enterprise first level, and enterprise second level. data non-repudiation is achieved using keys. Information of employees is stored in a blockchain node and can be used for his authenticity.

Dr. Maria P Michailidis [10] analyzes the new technology blockchain which is transforming the Human Resources task in an organization. How blockchain is being used in human resources management. one survey identifies 0.5% of global organizations(firms) are using blockchain to minimize their work. According to the same resources he observed 80% of global firms will be using the blockchain in their organization for data storage in the next 10 years. The non-repudiation nature of blockchain increases trust in digital assets like certificates, pay slips, etc.

The research paper [11] suggested a Blockchain-based Recruitment Management System (BcRMS) and a Blockchain-based Human Resource Management System (BcHRMS) algorithm. The applicant's information or profile is verified and ranked using BcRMS (Blockchain-

based Recruitment Management System) algorithm. The algorithm includes a list of candidates as well as a list of databases that will be used to validate the information. Upon successful validation, a ranked list is produced in accordance with the specified requirements of the company. The system uses BcHRMS (Blockchain-based Human Resource Management System) Algorithm to add a new block to the existing blockchain after an organization successfully completes hiring or signs any agreement with the candidate for this, the proposed system uses Merkle tree-data structure (hash-based) for data storage. Data is hashed twice in this system before being stored. The suggested approach can validate, store recruiting and other HRM-related information, removes the need for middlemen and offers a low-cost solution.

### 3. Drawbacks of Existing System

- An additional process of employee background check is needed to verify all the documents provided by the user and there is no validation whether the certificates provided by the user are legitimate.
- There is no specific tracking mechanism to find if the candidate is employed in multiple organizations.
- In the absence of a well-defined infrastructure or module at the place where a candidate is seeking employment, it will be mandatory to carry physical copies of the certificates.

### 4. Proposed Methodology

The blockchain network proposed in this project uses sepolia ethereum blockchain which enables faster processing of blocks in the network. The Institutions or Companies registered with the system will be given partial write access and the candidate will be given Read-only access. Organizations with participants who are familiar with one another use permissioned blockchains. A central authority establishes the rules controlling who may participate in the network and make transactions. By achieving a Consensus, all participants in the blockchain network validate transactions. These transactions are carried out by a smart contract, which adds a new block to the blockchain and modifies the data in a distributed ledger.

The system is proposed with three entities: User, Institution, and Company. It determines employment status using a blockchain application and it also stores details such as educational background, certifications, and employment status. The certifications must be created and uploaded to the blockchain by the institutes. User profiles contain status about the current employment which is useful identification of work status.

- **INSTITUTION MODULE** : The educational

institution is granted authentication or permission to access the Dapp and upload digital certificates of their users, such as students or alumni, in a multi-step process. First, the educational institution would typically be required to register on the blockchain network and be given appropriate permissions to access the Institute Module. Once authenticated, the educational institution would use the Institute Module to upload a digital certificate to a user's profile. This is done by entering the user's username and respective certificate into the Institute Module's interface. The Institute Module would then initiate the process of uploading the certificate to the IPFS storage in the background, ensuring that the certificate is stored in a decentralized and immutable manner, making it tamper-proof and resistant to data loss or corruption. Finally, the Institute Module would add an entry to the user's profile on the blockchain network about the certificate and metadata related to the certificate, ensuring the authenticity and integrity of the certificate, as each transaction is validated and recorded on the blockchain using a consensus algorithm.\

- **USER MODULE** : The system maintains a comprehensive profile of each candidate, which includes all the certificates and qualifications they have earned, as well as any relevant employer reviews from their previous organization. This profile is stored on a blockchain network, ensuring that it is tamper-proof and cannot be altered by any party. The candidate has read-only access to their profile, which means that they cannot modify any of the data, further enhancing the credibility of the system. By providing quick and easy access to candidate credentials, the system helps to streamline the hiring process and reduce the risk of fraud. Employers can trust that the information they receive is accurate and up-to-date, which can help them make informed hiring decisions. Overall, the system represents a significant advancement in the field of hiring and recruitment.
- **COMPANY MODULE** : The system provides a reliable and efficient way for organizations to verify the credentials of potential employees. When a user applies for a job position, the Company, which refers to the organization, verifies the candidate's profile to

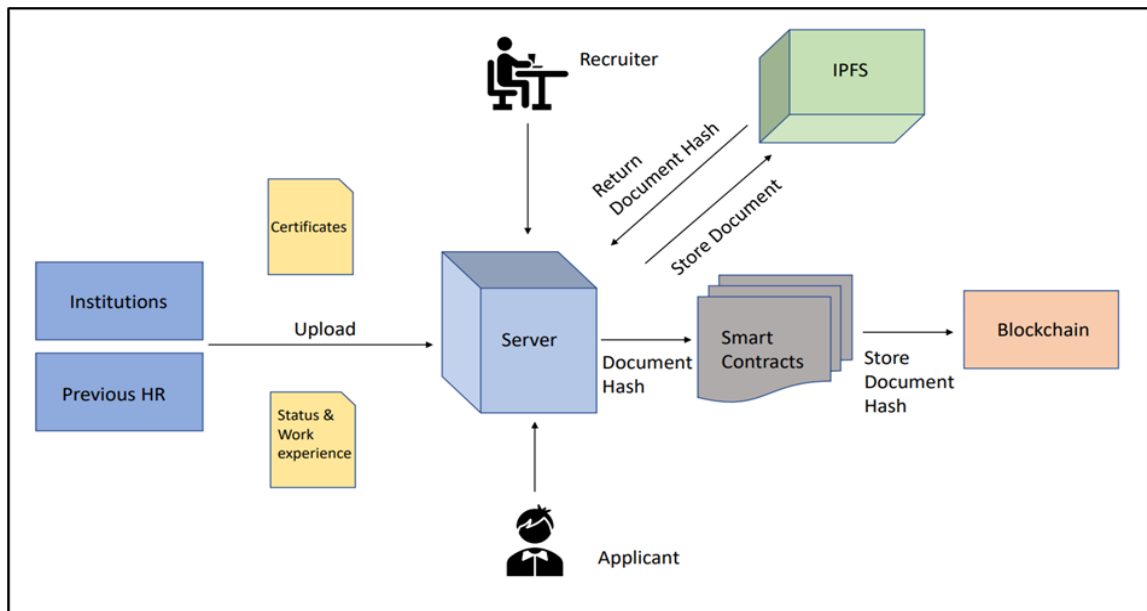
ensure that they meet the necessary qualifications and requirements for the job. This helps to ensure that organizations make informed hiring decisions and hire the best-suited candidates for the job position. The employment status of the user in their profile can only be updated by the organizations. This means that employers can update the employment status of their employees when they leave or switch to a new company. By restricting the access to update employment status, the system ensures that the employment status of the candidate is up-to-date and accurate. This also helps to prevent any instances of moonlighting or dual employment, which can compromise the integrity of the hiring process.

## 5. Implementation

The Implementation of the proposed system will be done using the sepolia test network of MetaMask. Three separate contracts are developed for three different entities (Institute, User and Company) and the maximum control is distributed between Institute and Company leaving limited control to the user over his/her profile. The smart contracts are deployed online in remix IDE which are written in solidity language, which defines the complete entity properties and methods.

REACT-JS is used for building the front-end UI enabling better user intractability. The features like adding certificates and work experience for a user are implemented with the help of smart contracts. As these details are stored in the decentralized blockchain system, they are difficult to alter/change. Thus, making the system more secure and robust. This ensures trust and speeds up the hiring process. The recruiters can view the user's profile by searching the username of the user. The employment status is bound to the company and cannot be altered without the right access for a user, by any other company.

The certificates are stored in IPFS (Interplanetary File System), which is a distributed file system, used for storing and sharing data. This enables easy sharing and fast loading capabilities, making the system more efficient. Every action is recorded in the blockchain as transactions and only valid users will perform actions which makes the system more trustworthy. The system architecture is as follows:



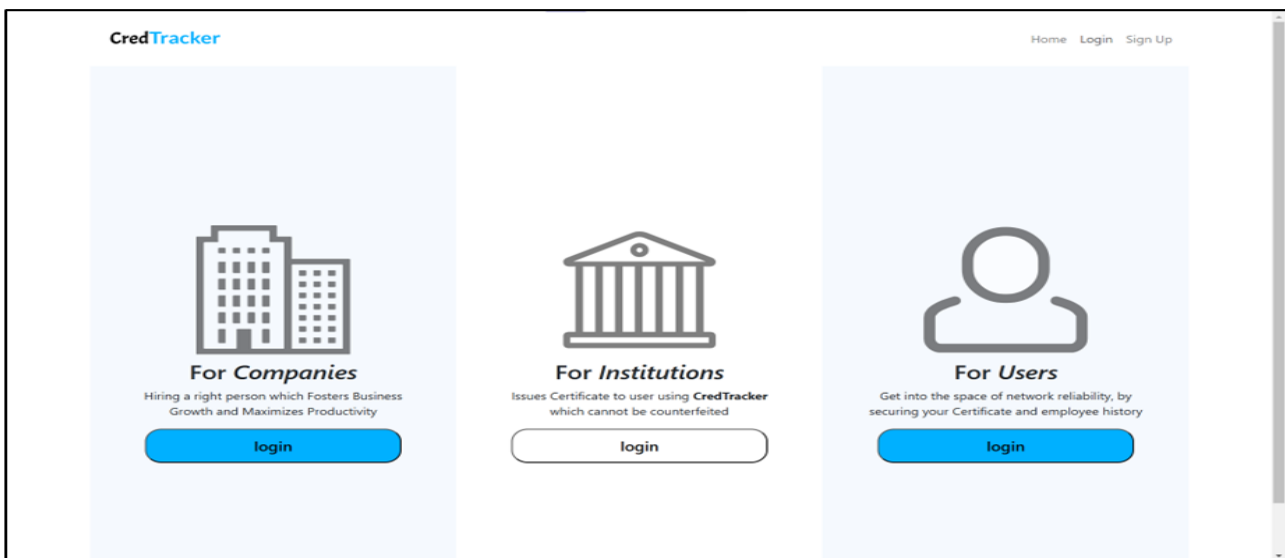
**Fig:1-** System Architecture

## 6. Results

The users (companies, institutions, users) sign in using their respective credentials. After signing in, each user is directed to his respective dashboard and can perform their respective tasks such as : The institution uploads the user's education certificates, the organization uploads the user's

skill certificates and work experience, the user can view his certificates in his dashboard. These certificates can be viewed by hiring company HR by entering user details during the time of interview and can verify them.

**Login Page:** At login page different users (companies, institutions, users) can sign in using their credentials or can sign up.

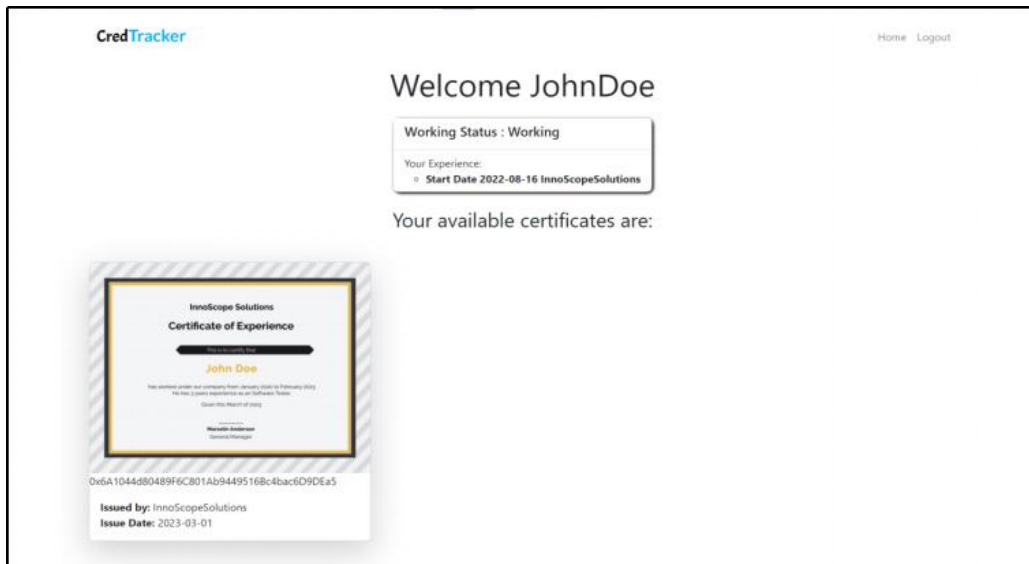


**Fig:2-** Login Screen

In the login page a user can see both sign in and sign up options. A new user can sign up using the sign up option while a registered user clicks on their respective login option which means the company will click the login button under company picture and respectively the institutions and users. After that the each

user(user,company,institution) is shown a login page where the user enter his username and password to login

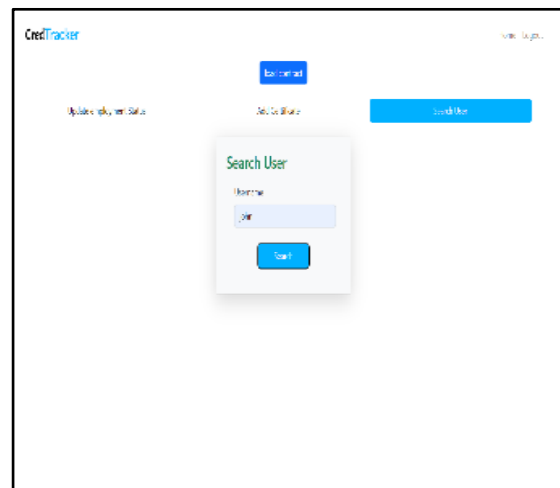
**User Dashboard:** At the user dashboard user can view his certificates and work experience.



**Fig:3-** User Dashboard

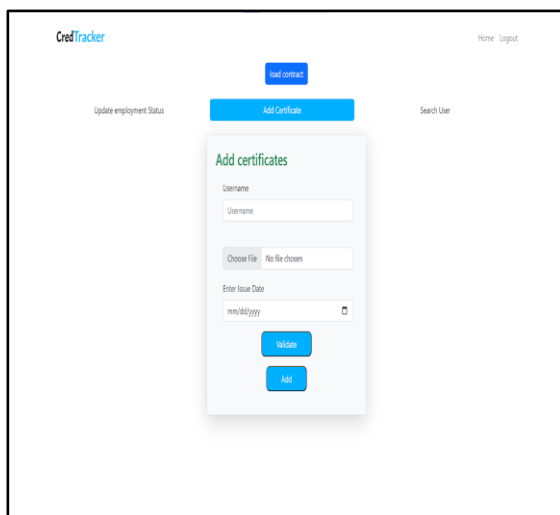
When a user or candidate is logged in successfully the user is redirected to the user dashboard. The user dashboard shows the information such as the user's working status, that is, whether he is currently employed or not and all his previous work experiences including company name and period of work. The user can view his certificates issued with the institution name who issued the certificate and the issue date.

**Organization Dashboard:** In the organization dashboard the organization can add certificates to the user, update his employment status and view the certificates and user's work experience by searching the user using his/her username.



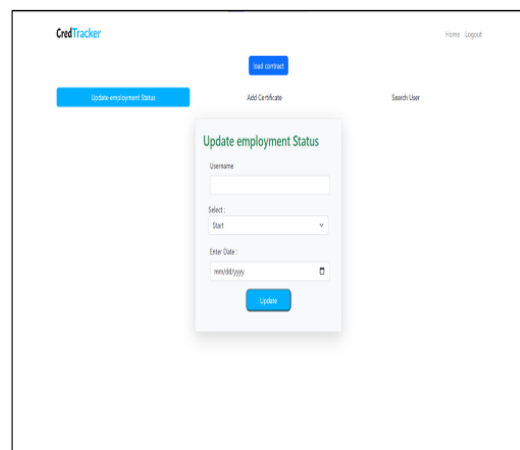
**Fig:4.2-** Search User

In search user section the organization can search a particular user by entering his username. After the successful search the organization can view the user data like his working status and previous experience and all his/her certificates.



**Fig:4.1-** Add Certificate

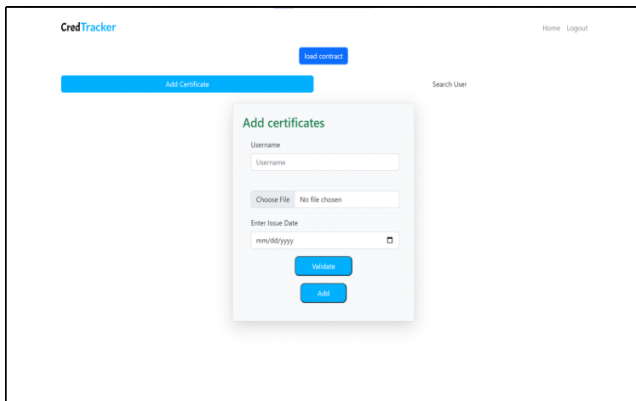
In add certificate the organization can certificate such as experience certificate, training certificate provided by the company just by giving the username (user's username to whom certificate needs to be uploaded), uploading the certificate file and entering the issue date of the certificate and clicking on the add button.



**Fig:4.3-** Update Status

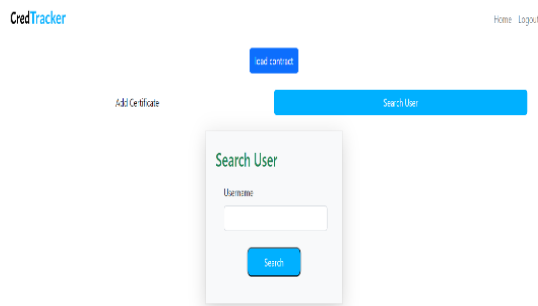
In update status section the organization updates user's employment status by entering the joining date and termination date. If organization adds user's start date the status with change to employed and after termination when organization add end date the status is changed to unemployed.

**Institution Dashboard:** In the institution dashboard the institution can add academic certificates and view user certificates and user's work experience by searching the user using his/her username.



**Fig:5.1-** Add Certificates

In add certificate the institution can upload the certificate such as academic certificates, training certificate provided by the institute just by entering the username(user's username to whom certificate needs to be uploaded), uploading the certificate file and entering the issue date of the certificate and clicking on add button.



**Fig:5.2-** Search User

In search user section the institution can search a particular user by entering his username. After the successful search the institution can view the user data like his working status and previous experience and all his/her certificates.

## 7. Conclusion and Future Scope

With a distributed ledger that is shared among network participants, record reconciliations are no longer delayed. Smart Contract recorded on the Blockchain can be automatically invoked to increase the throughput and speed of the transactions. The proposed system stores the

employment status of a candidate, employee's performance appraisals, references of the previous employers thereby avoiding third-party interference in candidate credential verification. Thus, making the system cost effective and less time-consuming.

The proposed system has the potential for further enhancement by including various additional features to cater to the ever-evolving needs of the recruitment process. One possible future scope is to integrate a skill-based search functionality to enable organizations to search for candidates based on specific skills required for the job. Another possible feature is to incorporate a system for verifying the credibility of companies and educational institutions to avoid any fraudulent or misrepresented job applications. Additionally, the system could also include the capability to analyze applicant data to predict potential job performance and provide useful insights for recruiters. These enhancements would facilitate seamless hiring and provide valuable insights to organizations for improved decision-making.

## References:

- [1] Kaur, H. and Saini, M.K., A Review Study on the Concept of Moonlighting and its Impact on Growth of Organization.
- [2] Bakare, K.A., 2021. Moonlighting and Organizational Culture in Nigerian Public Universities.
- [3] C. Rupa and D. Midhunchakkaravarthy, "Preserve Security to Medical Evidences using Blockchain Technology," 2020 4th International Conference on Intelligent Computing and Control Systems (ICICCS), 2020, pp. 438-443, doi: 10.1109/ICICCS 48265.2020.9120948.
- [4] Saleh, Omar & Ghazali, Osman & Rana, Muhammad Ehsan. (2020). Blockchain Based Framework for Educational Certificates Verification. Journal of Critical Reviews. 7. 79-84. 10.31838/jcr.07.03.13.
- [5] Khandelwal, H., Mittal, K., Agrawal, S., Jain, H. (2020). Certificate Verification System Using Blockchain. In: Gunjan, V., Senatore, S., Kumar, A., Gao, XZ., Merugu, S. (eds) Advances in Cybernetics, Cognition, and Machine Learning for Communication Technologies. Lecture Notes in Electrical Engineering, vol 643. Springer, Singapore. [https://doi.org/10.1007/978-981-15-3125-5\\_27](https://doi.org/10.1007/978-981-15-3125-5_27)
- [6] Dina Salah, Maha Hafez Ahmed, and Kamal ElDahshan. 2020. Blockchain Applications in Human Resources Management: Opportunities and Challenges. In Proceedings of the Evaluation and Assessment in Software Engineering (EASE '20).

Association for Computing Machinery, New York, NY, USA, 383–389.  
<https://doi.org/10.1145/3383219.3383274>

Computing and Communication, 11(3s), 175–183.  
<https://doi.org/10.17762/ijritcc.v11i3s.6179>

- [7] N. S. Dhanala and R. D., "Implementation and Testing of a Blockchain based Recruitment Management System," 2020 5th International Conference on Communication and Electronics Systems (ICCES), 2020, pp. 583-588, doi: 10.1109/ICCES48766.2020.9138093.
- [8] Vinu Sherimon, Sherimon P.C and Alaa Ismaeel, "JobChain: An Integrated Blockchain Model for Managing Job Recruitment for Ministries in Sultanate of Oman" International Journal of Advanced Computer Science and Applications (IJACSA), 11(2), 2020.  
<http://dx.doi.org/10.14569/IJACSA.2020.0110252>
- [9] Li, Long, Zhang, Huimin and Dong, Yinhong. "Mechanism Construction of Human Resource Management based on Blockchain Technology" Journal of Systems Science and Information, vol. 9, no. 3, 2021, pp. 310-320. <https://doi.org/10.21078/JSSI-2021-310-11>
- [10] Michailidis, M.P. Blockchain Technology: The Emerging Human Resources Challenge. Preprints 2021, 2021050035 (doi: 10.20944/preprints202105.0035.v1)
- [11] Onik, Md Mehedi Hassan & Miraz, Dr & Kim, Chul-Soo. (2018). A Recruitment and Human Resource Management Technique Using Blockchain Technology for Industry 4.0. 10.1049/cp.2018.1371.
- [12] P.V.Siva Kumar, Sriramudu, Chaitanya Palli, J. Adarshavathi and Padmavathi Guddeti, 'A Proposed Blockchain Model to Enhance Student Knowledge', 2nd International Conference on Computer Networks and Inventive Communication Technologies (ICCNCT - 2019), 23rd – 24th may, 2019. ICCNCT 2019, LNDECT 44, pp. 107–115, 2020. [https://doi.org/10.1007/978-3-030-37051-0\\_12](https://doi.org/10.1007/978-3-030-37051-0_12)
- [13] Thota, D. S. ., Sangeetha, D. M., & Raj , R. . (2022). Breast Cancer Detection by Feature Extraction and Classification Using Deep Learning Architectures. Research Journal of Computer Systems and Engineering, 3(1), 90–94. Retrieved from <https://technicaljournals.org/RJCSE/index.php/journal/article/view/48>
- [14] Mohan, D. ., & Nair, L. R. . (2023). A Robust Deep Model for Improved Categorization of Legal Documents for Predictive Analytics . International Journal on Recent and Innovation Trends in