Software Development Methodology Selection with Human Resource Management Approach and a New System Design on Database: Blockchain Application

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Abstract

The aim of the study is primarily to investigate the applicability of Blockchain technologies in the design of the ongoing recruitment process in the companies. This can bring a more professional perspective especially to the international companies by providing document transaction in fast and secure way.

Many of the problems in Human Resources departments includes recruitment problems. Today's recruitment process built on accessing information about candidates and eliminating those who does not meet job requirements based on their resumes. Therefore, Human Resource specialists often use career websites and it is significant to have an impressive number of resume in their resume pools. In the end, there is a resume pool that has been built with a very large unqualified and even false information about candidates. In addition, there are difficulties in getting the employees' equivalence certificates or transcripts about their education and proving their experience and certificates gained abroad. This causes delays in gathering and verifying the information and documents of job applicants. Although some mistakes are difficult to remedy, it is of great importance to be against fraud and to improve the hiring process. This is possible thanks to Blockchain Technologies and strategic process flow approach. Since Blockchain's main asset is solving the problem of trust between individuals, Blockchain based model is recommended with a new recruitment approach. BHR Platform represents a Platform which can be used for keeping records and transaction of documents in secure way. This platform recommends to create a decentralized Peer to Peer(P2P) network which stores reliable, trusted, transparent information. This will assure an effective recruitment process while decreasing operational costs.
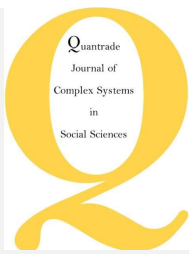
Keywords: Blockchain Technology, Human Resource, Information Management.

1. Introduction

Today's Human Resources departments, previously called as Industrial Relations departments, are established to increase employee's productivity and organize relations with industrial union. The process that started with the aim of making people work harder in the organization and protect worker's health. Later on it reached to the today's HRM(Human Resource Management) approach.

As a result of living in a digital world, employees use online platforms where they leave a small part of their identity every day. Therefore, one of the most important trends in the HRM is digitization of the processes. It is seen that most of the functions performed by the Human Resources departments have been transferred to the web environment as e-HRM. For instance, companies use career websites such as "indeed.com" or "kariyer.net" in Turkey, to find employee for their empty position and job seekers create their profile included their personal information, back ground and references to apply jobs. There are many reasons for this, such as saving time, reducing bureaucracy and costs are prioritized. With the increase in the use of communication technologies and applications to create an internal database, online applications have become widespread especially for recruitment process. This kind of HR(Human Resources) solution provides a structure that requires monitoring and management of many document-based processes.

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One of the most important elements in recruitment ecosystem is the verification of the information contained in the applicant's resume or his/her profile in the online career platforms. Today's hiring approach is based on the personal experience of the recruiter, and the first elimination (automatic or manual) among candidates is based on two factors:

- The characteristics of the applicant corresponding to the job description,
- The evaluation of the experience by the Human Resources (HR) expert.

There is always a possibility that the job seeker may distort the perception of the employer because of the online support he receives to make his profile look better. False information can be used, even in official government documents, which could lead to errors in data about employees. This potential risk to misrepresentation can lead to companies spending a significant amount of money, especially for high- value positions, to verify candidate's information. In addition, time and cost are spent to ensure that a candidate is the most appropriate person for the proposed role. Besides, the trust issue between the candidate and the recruiter is also come out when a person wants to find a job in a different countries. It is necessary to determine the target groups correctly in order to learn the motivation of these groups. There are 3 target groups for the recruitment process:

- Individuals: Job seekers or professionals who want to boost their profiles,
- Companies / Headhunter / Other Agents: Business oriented websites,
- Governments/Institutions that earn income indirectly.

Since Blockchain's main asset is solving the problem of trust between individuals, Blockchain based model is recommended with a new recruitment approach. The motivation behind this paper is to gives individuals the ability to control their official records. It aims to find a solution model to eliminate time consuming routine activities in recruitment process, reduce inefficiency of record keeping by increasing security of documents.

2. Several Studies

Ideas and experiments with regard to today's Blockchain concept have been carried out since the early 1990s, but only in 2008, with the publication of an official report by a group called "Satoshi Nakamoto", it has been widely adopted(Nakamoto, 2008). The first and most commonly known Blockchain concept is the crypto currency, thait is called Bitcoin(BTC). Bitcoin refers to network protocol which is underlying of the crypto currency.

On traditional server architectures, every application has to set up its own servers that run their own code in isolated silos, making sharing of data hard. If a single app is compromised or goes offline, many users and other apps are affected. On a blockchain, anyone can set up a node that replicates the necessary data for all nodes to reach an agreement and be compensated by users and app developers. This allows user data to remain private and apps to be decentralized like the Internet was supposed to work ("Ethereum", 2019).

The Blockchain provides a continuous public record protected against changes maden in the institution or against the loss of private records(Sharples & Domingue, 2016). There have been several studies for an employee to monitor and recruit someone's work experiences and the training credentials of that person. The approach of initiatives such as Fiduxa and Aworker to these problems is to create a pooled information network that confirms the identity information and work experiences of a job seeker(2018). One of the first examples is platform named "checkdiploma.org"("Diploma-Blockchain", 2017). It has been tried to produce a solution by the method of using a smart contract in the Etherium network for the storage of information.

The University of Nicosia was the first educational institution that started to use blockchain architecture for the storage of diplomas and qu alification characteristics. Since the university is a member of various European educational organisations, their diplomas are accepted worldwide (Chen et al., 2019).

Another study have been started for this purpose is "The Fourth Pillar Platform". It is one of the first steps in the way of digital business identity checking, provides a way to personnels to activate the first BlockchainId ledger and register the information related to their job experience. It is therefore an indispensable tool for today's and future's employers to provide assistance in the recruitment process("4th Pillar Project", 2019).

The Massachusetts Institute of Technology Media Lab has developed a pilot application named "Block-certs" for verifictaion system. Blockcerts is a MIT Media Lab project utilizing the Bitcoin blockchain for digital notarization. The system allows MIT students to access and have their diplomas in a secure and certified digital file. This digital diploma being provided in addition to the standard physical diploma("How blockchain technology could impact HR and the world
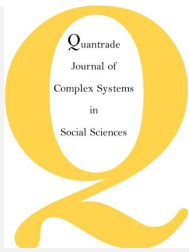
of work", 2017). The University has runned pilot program on the Blockchain technology in the summer of 2017 by enabling certificate validation service("Blockchain Credentials", 2017).

In this context, the system was implemented by Bahçeşehir University (BAU) to reach documents such as certificates and transcripts with blockchain while saving time. It is the application named CertifyIST which was first established in the BAU International University Washington DC campus. Beginning with the diplomas of the first graduates in Washington DC, they immediately issued an application whereby all students can hold all kinds of documents related to their certificates, diplomas and studies. There will be both mobile and website application. In this sense, CertifyIST is the first blockchain project in the university("Blockchain Uygulaması ile Sahte Diplomanın Önüne Geçilecek", 2018). Another Turkısh initiative is a project named "KryptEd" strives to create an ecosystem, supporting cryptocurrency and blockchain education through e-learning and physical academies, to educate the world ("KryptEd", 2018).

The University of Lefkoşa is the first education institution to produce authenticated academic certificates through the Blockchain(2017). The University of Bermingham also has maden the project named "BTCert" which is Blockchain based academic certificarte authentication system available to the public by publishing the academic certificates online (LiWu, 2018). Thus, the costs arising from repeated verification of the same information can be significantly reduced and the confidence in the input data is assumed to be correct.

## 2. Overal Design of Study

BHR Platform helps to create the information and protect it for companies that need this information in the future. It is an open decentralized database that authorizites everyone in the chain to view and justify the details of every record. BHR Platform allows transactions to be performed in shared, distributed and encrypted ledgers and in an environment where everyone in a business process accepts and verifies the transaction. The architecture is designed with the main philosophy of DLT (Distibuted Ledger Technology). Institutions using paper-based documents, wet signature, invoice or certificate can get benefit from BHR Platform. Because of some new and robust algorithms, such as cryptography, transactions of documents can take place between electronic wallets without central mechanisms.

BHR Platform provides a way to store up safe and reliable data about candidates or employees. It can be accessed by anyone if they have membership and permission. BHR Platform is a system that automates and accelerates the process of validating applicant's identity cards, prevents employers from being in need of multiple sources to check their back ground, reduces the use of counterfeit resumes, and reduces the total time spent by experts on recruitment. BHR Platform can also be developed to transform the payroll process, which adds an extra time and cost, by eliminating the intermediaries (such as banks) in the process.

BHR Platform allows the evaluation of skills (not only technical skills) which is very important for recruiters. This can solve the problem of the subjectivity of job interviews and allow employees get digital keys and own their identity. They sign into platform/apps locally without remote server or identity providers. BHR storage system allows users to fully control the data related to them. But storing a document on a blockchain is not the digital copy but rather a cyriptographic copy. Data is encripted and easily shared between applications. For example, an employer may use BHR Platform to verify a candidate's certification. To do this, data needs to be allowed to the access through BHR Platform by the certifying institutions, which gives candidates more control. It also reduces the time that employers spend to verify information about candidates.

It also allows people to check their personal data and earn money (personal information, contact information, etc.) from the data displayed by companies. BHR platform uses Ethereum and other cyriptocurrencies for simple p2p payments. Thanks to smart contracts, everyone in the recruitment process receives an award as "ETH token". Tokens will have static pre-determined price in dollar ($) and will not increase or decrease based on crowd sale. If someone wants to buy the tokens they send a particular amount of ether, when the contract acknowledges that this transaction is done, they receive their corresponding amount of ETH tokens ("What is An Ethereum Token: The Ultimate Beginner's Guide – Blockgeeks", 2018).

It is very easy to create a new token, issue a given number of tokens, and trade these tokens with Ethers – the Ethereum cryptocurrency, which has a monetary value – according to a given exchange rate. The contract stores the addresses of the token owners, together with the amount of owned tokens, and allows transfers only
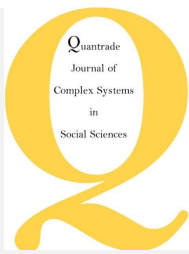
if the sender shows the ownership of the private key associated with the address. As you can see, Ethereum is by far the most used platform. Using the Ethereum address, when present, publicly available APIs is queried, gathering information about the total token supply, the number of token transfers, the number of token holders. It is also possible to obtain information on each transaction, and each holder, but this is beyond the scope of this paper.

The primary difference between Ethereum and any other cryptocurrency is that it's not just a currency, it's an environment. Here anyone can take advantage of the blockchain technology to build their own projects and DAPPS (decentralized applications) through smart contracts. This is a very important distinction because this very thing shows you the true scope of what is possible in Ethereum. The entire Ethereum network is a giant mass of nodes (computers) connected to one another. In fact, the entire network can be visualized as a single entity called the "Ethereum Virtual Machine" or EVM for short. All the transactions that have happened and will ever happen in this network are automatically updated and recorded in an open and distributed ledger.

In this case, all payments take place transparently in any part of the world. ETH token are directly linked to closure of job positions or placement of people. Also people can earn ETH Token each time they share their identity information with businesses through BHR platform and companies use the limited number of ETH tokens to find and hire employees. For transaction, if the sender has the requested amount of tokens in their balance, then the code will deduct the said amount of token from the sender balance and then add that value to the recipient's balance ("*What is An Ethereum Token: The Ultimate Beginner's Guide – Blockgeeks*", 2018). Users will obtain currency via buying it with ether currencies.

The platform should be able to store large amounts of private data (notes, transcripts, etc.). Educational institutions should be able to open private data only to the payer. The platform must guarantee the fairness of data transaction without the involvement of third-party agents.

The platform must work on confidential data based on its nature. Unauthorized Blockchains, such as Ethereum or EOS, require disclosing data publicly. While there are some others, such as Hyperledger, gives permissions to accessibility and lacks of public verification. Hyperledger wants to establish a distributed systems infrastructure for institutions and business networks ("Blokzincir", n.d.). The programmability is common with the Ethereum Platform and comes from the intelligent contract logic (Ölmez, 2018).

It is important to note that it is possible to use encryption schemes to store private data in public ledgers. This approach seems applicable but, suffer from incentives and scalability issues. Blockchain nodes would have to keep every document given by all educational institutions and uploaded from all over the world.

Therefore, education records should be available to the public. Moreover, the data disclosure process will be difficult to do in such an environment, in case of disagreement, Blockchain model will be used as an arbiter.

2.1. ERC20 Ethereum Standard For Tokens

The ERC20 standard is basically a specific set of functions which developers must use in their tokens to make them ERC20 compliant. While this is not an enforced rule, most DAPP developers are encouraged to follow the standards to ensure that their tokens can undergo interactions with various wallets, exchanges and smart contracts without any issues. This was great news for everyone because now they at least had an idea of how future tokens are expected to behave. When executed, the following 4 basic activities are what all the ERC20 tokens required to do:

- Get the total token supply.
- Get the account balance.
- Transfer the token from one party to another.
- Approve the use of token as a monetary asset.

ERC20 tokens have gotten widespread approval and most of the DAPPS sold on ICO's have tokens based on the ERC20 standard.

2.2. Procedure

The use-case scenarios that can be used by educational institutions and candidates are simple. Individuals should upload their original professional and academic letter of recommendation and download documents approved by institutions through BHR Platform. Institutions are charged a minimum amount for each document they upload to the Platform. This fee prevents misuse of the BHR Platform. Organisations may be rewarded when they upload employee's data into the platform. If the applicant's profile (including all relevant documents) is hidden, it has to be authorized by the applicant to download the document. If applicants unhide his own profile to the public domain, institution that downloads the document does not have authorization, but a fee is charged for this service. The candidate search engine and analysis tools are unhided to premium account users. Users are charged a monthly or annual fee for the premium account.

Applicants receive their documents showing their experiences and training information for free. In case of the loss of experience or training certificates cannot be verified, the effect of the previous employer will be eliminated due to the fact that all information is stored securely in the Blockchain.

All documents are stored forever, after the Blockchain based, end-to-end encrypted, distributed object is loaded into the storage area. Each file is fragmented, encrypted and distributed to the network. Only the parties and applicants have access to data regarding to applicant's certificates and references. Verification applications is shown in the Figure 2 and Information flow in the Platform is shown in the Figure 3.
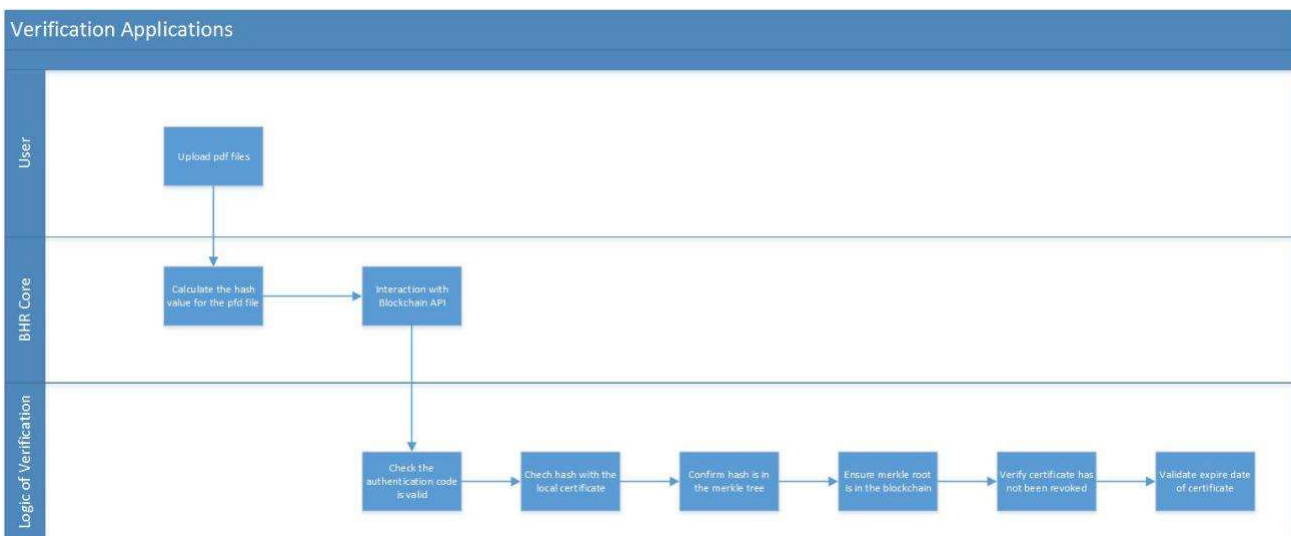

Fig 2. Verification Applications

2.3. Protocol Design

The infrastructure of the system consists of the following three products: BHR Protocol, PlatfromId and PlatformHr. BHR Protocol is a DLT based protocol which also forms the basis of the second product. PlatfromId establishes the self-directing individual identity. The creation of this digital identity opens up new possibilities, such as recruitment based on verified data and this is the third product concept called PlatformHr.

BHRProtocol is a protocol that allows users to securely exchange their assets in a digital environment without agents. It is fast, safe, inexpensive and DLT based solution. Exchange of documents and electronic delivery system(e-delivery) are promising issues of the future.

PlatformId is a protocol which gives chance to users to create self-governing identity beyond the user-centric identity. It allows verification of the user's identity and its approval in the DLT.

PlatformHr is a recruitment tool that can be measured and operated based on user's real backgorund. So far, employment processes have been based on recommendations and paper based informations and their resumes. PlatformHr will facilitate to the candidate search process.
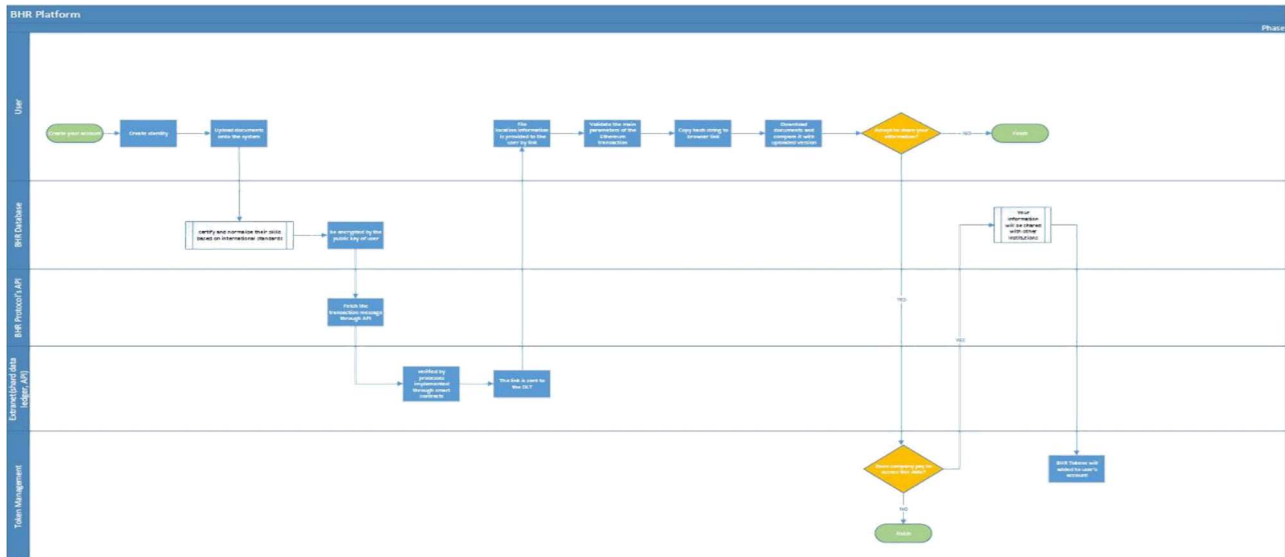

Fig 3. Information Flow in the Platform

2.4. Architecture Design

BHR Platform can connect to career sites such as; Linkedin or Monster.com and finds and removes the resumes of eligible candidates. Creates a field for each position and transfers all required data there. The key entities of the BHR Platform architecture are students, recruiters, witness, educators.
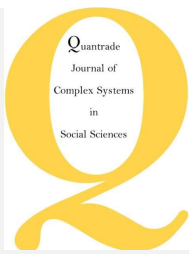
The architecture here divides the blockchain into two layers as special layer and open to the public. First one contains confidential data such as student's transkript and second one contains the information necessary to verify the integrity and accuracy. While students and educational institutions in the private layer, witnesses and recruiters are in the public layer.

Certificate applying operations are designed to merge the hash of the certificate in a merkle tree (as it is not possible to store and kept large sized digital fikes in blockchain, data needs to be hashed) and send the merkle root to the Blockchain with a timestamp, signing by the majority of community members. The role of the certification authority in the process is necessity of signing in identity (like checking a driver's license). This authority has it's own key pair and uses it's private key to sign a digital certificate for the key holder.

User's personal data is stored on the private chains of the educational institutions. The public part of the network has only hashes of this data. The private segment does not allow any data except hashes to open access. This is done to

Store private and personal user data, as well as those materials that are protected by copyright or commercial confidentiality. Witnesses (to check the validity of transactions in public chain) will manage public chain of blocks, on which data created within each school is hashed. The witnesses won't have access to the data itself, only to the hashes of the data. Proof of stake consensus algorithm will be used in order to check the validity of transactions in public chain. This will provides energy-efficient PoS minting. In the Proof of Stake system, verification is performed randomly depending on the amount of coins in the wallet of the users. Accounts with a high amount of coins in the system are more likely to be used as validators and therefore receive more shares from each transaction (Akbaş, 2017).

When a user (sender and receiver) wishes to share documents, they must first go through onboarding process (eg: ID is only required for the first registration). Document can be selected and specifically be encrypted by the public key of registered users stored in the database. When this step is complete, the BHR Protocol is activated. It is sent to the BHR Protocol's API(Application Programming Interface)) which is a set of clearly defined communication methods between various components. The document is then redirected to the BHR Protocol Repository, which is securely copied and

stored. File location information is provided to the user by link in order to access to the document. This link is then collected on the DLT by a smart contract, and can be accessed by the reciever. The receiver Access the link provided by the smart contract. After the document is downloaded can be decrypted with user's private key. Documents are encrypted by a common-private key combination and stored in the data store. The links to access to the documents are saved in the smart contracts.

Receipt is sent to the receiver, the file location is saved in wallet. When it is received, recipient's private key is confirmed as proof that it is delivered to the address. In the event of an error, the sender is informed about this. The more document is confirmed, the originality of that user increases. In this way, a series of digital identity is authorized and verified by senders, the receiver becomes as "authenticated user". It creates a self-sovereign digital identity. The following steps of the BHR Protocol are:

- The document is sent to the BHR Protocol's API.
- The document is stored in the repository.
- The user is also provided with a link of the saved file location address.
- The link is sent to the DLT.

The receiver can download the document and the document can be decrypted with the password saved in the user's browser.

3. Results

Thanks to the developing technology, access to information is now very easy. It has also affected many business processes with the increase of online platforms and the use of electronic documents rather than written documents. This has changed traditional business manner in organisations. Since the HR unit has a strategic importance in order to achieve organizational goals, the HR processes are affected by these developments with a new Blockchain system.

Traditionally, some of the processes including recruitment and talent management face many problems such as difficulty to reach the right information. This causes the increase in the number of fraudulent crimes and damages the confidence of people. Verification systems have been developed in order to regain all of these, but these systems have not been easily accessible by users because of their expensive and central location. Blockchain technology, which provides solutions to problems, provides a safe environment and easy access to the right information from a decentralized and cheap way. Blockchain will continue to offer more opportunities while providing new way of management. There are three crucial point for this;

- Decentralization (allowing different parties who do not trust each other to share information without the need of a central manager),
- Irrevocable history (Blockchain databases can store not only the information of presents, but also all the previous information),

Anonymity and transparency (p2p network allows everyone to create a shared recording system at the same time, each node in the network agree about what blocks are valid and which are not by consensus mechanism).

The results of comparison between Blockchain platforms for applications is given in Table 1.

Ethereum and OBC are far in front of the other platforms in terms of usability. Both have multiple methods for interacting with the platform with even more planned for the near future. Ethereum has the most extensive documentation and the most support options of all the platforms investigated(Macdonald, Liu-Thorrold & Julien, 2017).

Ethereum(ETC) blockchain is one of the leading blockchain platform, due to the existence of a complete smart contract logic. It is built specifically for creating smart contracts; it has the ability to repeat or jump instructions when certain conditions are met and store information as variables. Therefore, public blockchain solutions like Ethereum, which store all of their transactions in open access, is acceptable.

The platform benefits from Ethereum Blockchain based technology to improve the services provided to users in recruitment and Human Resources industry. This encourages users to adopt and use the platform while providing transparency at a high level and eliminate the factors of instability.

Table 1. Comparison of Blockchain Platforms

| Platform	Mechanism	Prog. Language	Data storage	Currency	Advantage	Disadvantage
Ethereum	Proof-of-work algorithm called Ethash, has a dynamic block size limit	Solidity, Facilitate the developme nt of smart contracts	Data and contracts are not encrypted, all data is public ("What is Ether", n.d.)	Ether; Tokens via smart contract	Allows development of smart contract and applications (Omohundro, 2014)	Ether is only available by mining, weak against 51% attacks, llack of privacy
IBM Open	Part of the Linux foundation, BFT and PoET consensus algorithm	Golang, Java and Javascript	No mention of how documents would be achieved	None, but one can be created using chaincode	Best suited for business orienmted applications	Distinct levels of permissioning, replay attack resistance mechanism is not available
Hyperledger project	Governed by Linux foundation, PBFT consensus algorithm	Golang, Java	Account based data model	None, Tokens via chaincode	Provide privacy, no fee required for transaction	Vulnerability to sidechannel attacks
Eris	Tendermint (BFT) consensus algorithm,	Solidity or Serpent	Account based data model	None, currency is depend on how the platform is composed	Partnered with a few other organisationslik e Ethereum	Only certain nodes have the job of validating transactions, involves third parties, needs to be developed
Sawtooth lake	Proof of elapsed time(PoET), open source and an Intel project	Python	Account based data model	Users are able to define their own currency	Smart contract application	Have not been fully implemented yet, Not suitable for security sensitive applications

Blockchain structure can be selected according to software language used in the platform. When defining the business model, proper Blockchain should be Ethereum Blockchain since it has a high rate of unit processing per second, especially for the contract structure it provides.

3.1 Overall Characteristics of Target Group

20 years ago, when the accounting experts began to replace paper bills with electronic invoices, the situation they went through is happened in the recruitment process today. As a result of increased productivity, business margins have also improved, and the same is happening in the Human Resources sector. In the last 8-10 years, there has been a significant change in HR Technologies. HR solutions were switched to cloud-based platforms.

According to the Robot Vera Report, the volume of investment in new solutions for recruitment reached $ 2.4 billion in 2015, which is 60% more than in the previous year ("Robot_Vera_Wp_Eng_1.3.2.pdf", 2017). In the coming years, it will continue to reshape the customer experience, and to place advanced mathematical analyzes and social media into the new platforms.

Today, 38% of companies are already working on digital HR, but only 9% believe they are fully prepared for this("How blockchain technology could impact HR and the world of work", 2017). If Blockchain's capabilities are fully utilized, technology will create more accurate and effective approaches to Human Resources. All processes from recruitment to payroll transactions will change with Blockchain and allow HRM to become different.
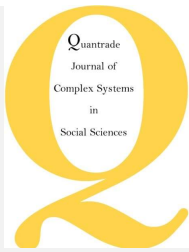
4. Discussion

Blockchain technology is still in testing phase and there are some issues in the application for free encrypted security system. Benefits and some of the quality problems in Blockchain application are discussed below.

4.1. Privacy and Security Awareness

Most of the people applying for job positions need to translate documents (previous experiences etc.) if they are in foreign languages. This can also change the content of the entire document in the wrong translation because it means another possible trap for the employer. It is important that job seekers have control over their personal information, as well as employers know the information correctly and reliably.

The structure behind Blockchain is that a copy of a process note book is shared between each node on the P2P network. This note book is synchronized with a reconciliation algorithm, and updates are shared as soon as each new block is processed and added to the previous block. All this is encrypted for extra security. If a node attempts to log in incorrectly, it will not be voted on by other nodes and fake data will be rejected.

It enables employees to confirm their training, skills, performance information and evaluate new members and allocate them to the most appropriate roles. In return, it gives people a comprehensive, Blockchain based reliable record of training, skills and performance.

4.2. Performance Evaluation

Human Resources experts have difficulty in evaluating the candidate in an unbiased manner because they do not have an objective source of information. The candidate can write down information about himself on his resume but these informations might not be true at all. BHR platfrom, enables employees to confirm their training, skills, performance information and evaluate new members and allocate them to the most appropriate roles. In return, it gives people a comprehensive, Blockchain based reliable record of training, skills and performance.

Employees' performances can be recorded for years without requiring any special effort or cost and this will make evaluation easier. The fact that the database is built through mathematical planes will be an excellent advantage for the employer in both the evaluation and recruitment process. It is also a program will be enabling to scan the area or region needed when running a project("4th Pillar - Blockchain Sisteminin İnsan Kaynakları Alanına Uyarlanması", 2018).
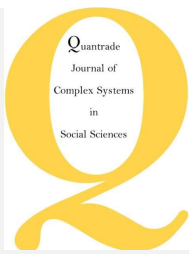
4.3. Scalability Issues

One of the most challenging problems encountered in Blockchain applications is scalability. To ensure theoretically proven security, the Blockchain application must have a large number of full nodes. Otherwise, the application may cause a less centralized system, such as Bitcoin. Blockchain's scalability limits depend on the size of the data in the Blockchain, the processing speed and the delays in data transmission. On the other hand, the delay between transaction submission and approval is affected by the reconciliation protocol.

For example in Bitcoin (block per block, 10 minutes block interval and 6 minute block approvals) required time between transaction submission and confirmation is approximately 1 hour and in Ethereum it is about 3 minutes;12 second block confirmation(Chen, Xu, Lu & Chen, 2017).

4.4. Wasted Resources

According to the Bitcoin Energy Consumption Index, Bitcoin mining spent 13% of the toral energy consumption and energy used in mining is about $ 15 million a day. The annual average electricity consumption of Bitcoin is around 32 TWh. In this case, Bitcoin consumes more energy than the energy spending on 20 countries in Europe and total 159 countries all around the world(Yli-Huumo, Ko, Choi, Park & Smolander, 2016).

Time issues is another example, a resume in PDF format takes about 3mb space in kariyer.net platform database, or a video uploaded to Linkedin takes about 20mb space in its database. This information is stored in databases. But a bitcoin

transaction in a distributed ledger takes a small space with around 250 bytes. This means that takes about 1/85000 of a space of an average video in the database.

4.5. Legislation and Risk Reduction

With Blockchain, important steps are being taken to ensure that different sectors in the international arena are integrated with technology. In this context, we can give examples of several attempts for blockchain technology. Sweden have been taken a step to perform the storage and management of the registry records with blockchain(Chavez, 2016). The global technology company Bitfury aimed to place all the electronic data of the country into the infrastructure of the system by realizing the largest state blockchain agreement with Ukraine ("Ukraine launches big blockchain deal with tech firm Bitfury", 2017). The collaboration between Propy, California-based blockchain company, and the State Agency for eGovernance of Ukraine will allow for real estate transactions to be settled online, making use of smart contracts. Widely accessible, this means of buying real estate will open the market to foreign investors(Nation, 2017). This shows that, recognition of the documents are requested to be recognized and there will be no discrimination on any grounds thanks to Blockchain's secure structure.

BHR Platform provides a safe infrastructure which is capable of direct document Exchange, compatible with the legislation without intermediaries. It is required to have the document digitization solution for secure document transmission and legislation sould be arranged for ICO in Turkey.

4.6. Challenges and Benefits in Practice

It facilitates multinational enterprises to manage their international payments, including tax liabilities, by enabling them to create their own corporate currency. This also increase productivity by automating and reducing routine tasks and data driven processes such as payrolling. Ensures the prevention of counterfeiting, including both employees and companies, and enhances security in Human Resources departments.

The most important benefit of the system is that it is fast. For employees, having a fast, reliable distribution mechanism will bring savings. It is also a very pleasing method for the employer, since international documents and the funding via other channels will cost a lot. The system used in the evaluation of employees will be subject to automation rather than subjective opinions. This will bring a more professional perspective to the company("4th Pillar - Blockchain Sisteminin İnsan Kaynakları Alanına Uyarlanması", 2018).

Because of this structure, many candidates will create public profiles, and institutions will have a wider candidate pool, more information about people, and more precise search results. It encourages the employer to choose these candidates instead of others who do not have validated documents.

However, the quality of the coding must be tested and guaranteed. Just like we've been using the Internet for years, but we continue to see the cyber attack, the Blockchain needs to evolve to be safer, user-friendly and verifiable before it becomes as common as the Internet.

5. Conclusion

Thanks to the developing technology, access to information is now very easy. It has also affected many business processes with the increase of online platforms and the use of electronic documents rather than written documents. This has changed traditional business manner in organisations. Since the HR unit has a strategic importance in order to achieve organizational goals, the HR processes are affected by these developments with a new Blockchain system.

Traditionally, some of the processes including recruitment and talent management face many problems such as difficulty to reach the right information. This causes the increase in the number of fraudulent crimes and damages the confidence of people. Verification systems have been developed in order to regain all of these, but these systems have not been easily accessible by users because of their expensive and central location. Blockchain technology, which provides solutions to problems, provides a safe environment and easy access to the right information from a decentralized and cheap way. Blockchain will continue to offer more opportunities while providing new way of management.

According to findings, worldwide successful and well-established organizations are willing to continue their path with more conventional systems and does not target to capture the rapidly changing technology. Unlike financial practices, recruitment process do not trustworhy in the current situation. This means that the use of Blockchain technology in Human Resources will probably be limited to justifying educational back ground at first. As it is explained before, applications related to Blockchain technology are still in an experimental phase and have not been fully implemented yet. Most of
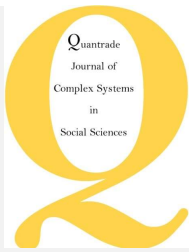
people trust third parties that is why this technology is not accepted by most of the corporate institutions. The reason for the rise of coin cost is large players. In the following periods, all of the coins will be fixed to move in a certain range. Otherwise, it will not be possible to use them as an investment tool.

People can communicate with each other even if they do not know and do not trust each other. The cost of translating the student transcript is now costs a lot. When the original of the document should be delivered, it is not possible to perform the same operation over and over again. With Blockchain system; the transaction fee can be $ 5 and can be done in 10 minutes while providing secure, automatic and fast document submission while acting as a notary for remittances. The greatest advantage of Blockchain is to prevent document fraud and inability to change data. These are the issues that central systems cannot provide to us.

However, if privacy is the sole purpose and trust is not a problem, block chain databases do not provide an advantage over a central database. Therefore, different sectors are willing to use DLT to take advantage of their different features. There is a potential that this situation will change and develop in the coming years. There has been a transition from Blockchain 1.0 to 2.0. Scripts and scenarios are prepared for Blockchain 3.0. As the use of Blockchain systems becomes widespread, this solution will be used in online platforms, which are used today in many countries. In short, in this way Blockchain's HR applications will be widely adopted and used in many different areas.

References

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved from https://bitcoin.org/bitcoin.pdf

Ethereum. (2019). Retrieved from https://www.ethereum.org/use/

Sharples, M., & Domingue, J. (2016). The Blockchain and Kudos: A Distributed System for Educational Record, Reputation and Reward. Retrieved from https://link.springer.com/chapter/10.1007/978-3-319-45153-4_48

(2018). Retrieved from https://www.fiduxa.com/wp content/uploads/2018/02/FiduxaWhitePaper-1.0.pdf

Diploma-Blockchain: Diploma-Blockchain. (2017). Retrieved from https://checkdiploma.org

Chen, C., Rhodes, D., Davis, A., Brown, B., Campbell, R., & Balashova, A. (2019). University of Nicosia is the First University in the World to Publish Diplomas of All Graduating Students on the Blockchain. Retrieved from https://blockexplorer.com/news/university-nicosia-first-university-world-publish-diplomas-graduating-students-blockchain/

4th Pillar Project. (2018). Retrieved from https://www.the4thpillar.io/wp-content/uploads/2019/01/whitepaper.pdf

How blockchain technology could impact HR and the world of work. (2017). Retrieved from https://www.pwc.co.uk/issues/futuretax/how-blockchain-can-impact-hr-and-the-world-of-work.html

Blockchain Credentials. (2017). Retrieved from http://www.blockcerts.org/

Blockchain Uygulaması ile Sahte Diplomanın Önüne Geçilecek. (2018). Retrieved from https://bau.edu.tr/icerik/13711-blockchain-uygulamasi-ile-sahte-diplomanin-onune-gecilecek

KryptEd. (2018). Retrieved from http://www.krypted.org/

Li, R., & Wu, Y. (2018). Blockchain based Academic Certificate Authentication System Overview. Retrieved from https://intranet.birmingham.ac.uk/it/innovation/documents/public/Experiments/Blockchain-based-Academic-Certificate-Authentication-System-Overview.pdf

What is An Ethereum Token: The Ultimate Beginner's Guide - Blockgeeks. (2018). Retrieved from https://blockgeeks.com/guides/ethereum-token/

Blokzincir. Retrieved from http://Blockchain.tubitak.gov.tr/blok-zincir.html

Ölmez, A. (2018). Blok Zincirde Farklı Bir Perspektif: Hyperledger. Retrieved from https://medium.com/unichain-tr/hyperledger-fabric-ve-hyperledger-composer-4fe95ce91d18

Akbaş, Y. (2017). Proof of Stake Nedir ?. Retrieved from http://www.bitcoinakademi.org/proof-of-stake-nedir/

What is Ether. Retrieved from https://www.ethereum.org/beginners/

Omohundro, S. (2014). Cryptocurrencies, smart contracts, and artificial intelligence. *AI Matters*, *1*(2), 19-21. doi: 10.1145/2685328.2685334

Macdonald, M., Liu-Thorrold, L., & Julien, R. (2017). The Blockchain: A Comparison of Platforms and Their Uses Beyond Bitcoin. *Advanced Computer And Network Security The University Of Queensland*.

Robot_Vera_Wp_Eng_1.3.2.pdf.(2017).Retrievedfrom

https://drive.google.com/file/d/0B1F2QfF_SatMOEN5VUhXUWpBNVU/view

4th Pillar - Blockchain Sisteminin İnsan Kaynakları Alanına Uyarlanması. (2018). Retrieved from https://steemit.com/ethereum/@ozgr/4th-pillar-blockchain-sisteminin-insan-kaynaklari-alanina-uyarlanmasi

Chen, G., Xu, B., Lu, M., & Chen, N. (2017). Exploring blockchain technology and its potential applications for education. Retrieved from https://doi.org/10.1186/s40561-017-0050-x

Yli-Huumo, J., Ko, D., Choi, S., Park, S., & Smolander, K. (2016). Where Is Current Research on Blockchain Technology?—A Systematic Review. *PLOS ONE*, *11*(10), e0163477. doi: 10.1371/journal.pone.0163477

Chavez, G. (2016). Sweden tests blockchain technology for land registry. Retrieved from https://www.reuters.com/article/us-sweden-blockchain/sweden-tests-blockchain-technology-for-land-registry-idUSKCN0Z22KV

Ukraine launches big blockchain deal with tech firm Bitfury. (2017). Retrieved from https://www.reuters.com/article/us-ukraine-bitfury-blockchain-idUSKBN17F0N2

Nation, J. (2017). Propy Partners With Ukraine, Offers Foreign Investors Real Estate Opportunities. Retrieved from https://www.ethnews.com/propy-partners-with-ukraine-offers-foreign-investors-real-estate-opportunities