Implementation of Blockchain Technology in Human resource recruitment

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Abstract

Human resource management is a prominent part of an organization, which is responsible for hiring talents, developing different sorts of policies, and assisting in employee life cycle. In this fast-paced world, the functions of the HR department are still very tedious. A relatively long time is required by the organization to hire the right talent and organizational efficiency is suffering. Thus, to overcome this problem and speed up the process of hiring, the integration of blockchain would be helpful.

The major goal of this thesis paper is to investigate the possible benefits of implementing blockchain technology into human resource management especially in recruiting and suggests a prototype of blockchain application. Thorough research has been done to design the model of the system under the supervision of industry experts. Qualitative research has been done to collect the data where surveys and six structured interviews were conducted. Data analysis has been performed through thematic analysis. The main outcome of the study is to find the prevalent problems faced by hiring managers and examine how blockchain can solve those problems.

In conclusion, this research paper has investigated that the problems faced by hiring managers were fake resumes, lack of talented applications/ talent supply, lack of company’s branding, in-efficient work from third hiring party company and maximum time consumption in verifying candidate details. Further, it has been found out that by implementing blockchain technology, companies can get access to large number of talent pools, easily verify details, does not have to depend on third hiring party. These findings has allowed the author to suggest a prototype of the blockchain system and suggest for future study recommendations as well.

Keywords/tags (subjects)

Blockchain technology, decentralized applications, Blockchain-based human resource management, Human resource management, Web 3.0, E-HRM

Miscellaneous (Confidential)
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1 INTRODUCTION

This section of the thesis will discuss the background of the study, the aim of the study, describe the purpose and problem statement, and will describe how this study will be structured. In the background of the study, the author will examine the brief history of the topic and why the author chose to write a thesis on this topic will be discussed in the aim of the study. The purpose and the problem statement will deal with the research problems and areas of investigation with a set of research questions. The structure of the study will describe the anatomy and framework used for the study.

1.1 Background

Technology has developed tremendously over the past two decades. With the advent of the internet and other sophisticated technologies, revolutionary changes have taken place in the working culture of an organization. Almost every administrative unit and business process are influenced by technology where human resource management is no exception. The basic Human Resource Management processes include recruiting, training, appraisal, looking after benefits and compensation of the employees, and managing the workforce.

Traditionally, these processes were accomplished in the paper form maintained in a ledger. Bhuiyan et. al. (2014) has presented a detailed review of the overall advancements of human resource management processes and operations. They have briefly described the different timelines ranging from the pre-world war era, post-world-war era, the legislative era, the emerging Human Resource Information System era to the technology era, and finally, the emergence of strategic Human Resource Management. The personnel information such as name, address, phone number
were maintained in paper records. It was only after the first world war, use of computer technology became prevalent in the Human Resource departments followed by innovation and advancements in talent acquisition, wage mechanization and personal computer applications for staff use. (Bhuiyan et. al., 2014). It was the same time where a comprehensive management information system (MIS) was developed to efficiently manage employee information but the use of such a human resource management system (HRIS) was very limited. Further, the authors have mentioned the period between 1980-1990 to be a turning point for the Human Resource department as most of the companies directed their focus to reduce personnel costs through automation and productivity improvement measures. As a result, Human Resource Information System began to act as a complex analytical tool for record-keeping, and due to its growing popularity, such Human resources tools were now called Human resource management systems (HRMS) rather than Human resources information systems (HRIS). In recent years, most organizations tend to consider their Human resource management system as strategic human resource management. It is because firms genuinely believe that innovative employee support for sustainable competitive advantage and it is the intellectual capital that their competitors simply can't imitate.

Throughout the whole advancements in the Human Resource processes and its systems, the thing that has always remained constant is change. The technology has changed, the processes have changed, and the operations have changed. The change is inevitable, and it is because of such changes, the processes have become more effective and efficient. With the same nuance, full implementation, and adoption of blockchain technology in human resource management is not so far. Blockchain technology offers a highly secure, tamper-evident, decentralized ledger database that promotes transparency among the users and prevents centralization. Mishra, H. (2021) has suggested that implementing blockchain in Human Resource processes will help to verify candidates’ credentials, generate more trust, and enhance talent markets thereby benefitting companies to have the right access to talents in a relatively short span of time.
1.2 Aim of the thesis

The purpose of producing this thesis is the author’s genuine interest in combining new and emerging technologies with business processes. The author came up with the idea to dig deeper into how practical blockchain technology is and how it can be executed. The author chose blockchain technology as the technology advocates itself to be highly secure, trustworthy, decentralized, and distributed. Verifying such claims and understanding the process behind this phenomenal technology inspired the author to choose blockchain technology. Further, the author chose the Human resource management department as it is one of the crucial parts of an organization responsible for most of the business activities. Since Human Resource Management is highly prominent in an organization and technology is being built to enhance its processes, the author wished to explore the probable future impact the technology can address.

There has been lots of misconception about blockchain and since it has been more used in bitcoin, people aren’t aware of the advantages this technology possesses in other fields. Thus, the main motive of the author is to explore the different possibilities of this technology and to propose a solution to different Human Resource Management problems. Particularly, this thesis will focus on “Recruitment” processes in an organization. In today’s global arena, hiring the right talent has become an immense challenge. Companies have access to many talent pools, but they have very limited access to skilled manpower, which means that most of the applicants tend to put false achievements in their CVs and once they are hired, they cannot cope in the business environment causing huge time and economic loss for the company.

A risk advisory committee analysis of around 5000 resumes revealed that disparities were noted in 80 percent of candidate resumes, with 57 percent in advanced degree and 12 percent in markin (Suk Yi et. al, 2020, p. 132). Therefore, companies are looking for a solution that can provide them access to verified candidates and make
the hiring process shorter. Blockchain technology fits well in this scenario and this thesis aims to propose a blockchain system that can provide companies with verified candidates, making the hiring process much shorter and smoother.

This thesis paper investigates what is the main idea behind adopting blockchain in Human resources, how it can be highly impactful in the future, and how we can deploy such a system in practice.

1.3 The Purpose and problem statement

The purpose statement of this thesis is to “Understand the problems in recruitment and develop a blockchain-based model for recruitment in human resources management.”

As the technology is becoming more sophisticated, concerns over data privacy, biasness, forfeit documents and illegal practices have risen threefold. Such concerns are more prevalent in the Human Resource department of an organization, where both Human Resource managers and job candidates are in constant doubt of the processes involved. Human resource managers, while hiring, doubt the credentials provided by the candidates. On the other hand, Candidates fear the biases they must face to compete for a position. The solution to this constant dilemma is building more trust and a transparent system in which all the parties involved are treated fairly. Onik, M., Miraz, M., Kim, C. (2021) has stated that current industries are in desperate need and under tremendous pressure to maintain a fair, cost-effective, accurate, and traceable system for effective human resource management operations. In this scenario, Blockchain can be used to address those discrepancies in recruiting. Therefore, the main research problems or questions of this study are:

Research question 1. What are the problems faced by the Hiring managers while recruiting new candidates?
Research question 2. How implementing blockchain technology will ease the recruitment process?

Research question 3. What could a prospective system design look like for Blockchain enhanced recruitment?

Hence, this paper will investigate the inadequacies faced by organizations while hiring talent and give a practical overview of how the technology could be developed and implemented practically.

1.4 Structure of the thesis

The thesis will be categorized into 5 prominent parts. The first part is the introduction part which describes the background of the study, the author’s motivation to research this topic along with purpose and problem statement. The second part is the methodology part which briefly describes the research design, research approaches, data collection method implied, and final data analysis methods. The third part is a literature review which outlines the previous research done in the past in this field. Further, the literature review will capture knowledge from all the related fields such as recruiting, Human resource management, blockchain technology, practical implications, and building of decentralized applications. The literature review will support my research approaches and will accord with my results. The fourth part is the result section which outlines the major findings of the thesis followed by conclusions and discussions.
2 METHODOLOGY

Methods and Methodology are generally perceived as a common term by a larger audience. Two similar-sounding terms have different meanings and applications. Goundar (2019) has explained research methods as a way by which a researcher conducts research whereas research methodology elaborates the research methods to the researcher such that researcher can proceed with the research. The technical difference between methods and methodology is that methods involve undertaking different sets of procedures such as interviews, surveys, tests. But methodology deals with the study of how research is to be carried out. It is the research methodology that assists to employ correct techniques to a research problem and thus it can be concluded that research methodology guides for the correct application of research methods.

2.1 Research design

Research can be briefly described as an investigation done on a particular topic using proper methodology and techniques. On the other hand, Research design can be concluded as a design process that is used for the research purpose. Pawar (2020, P.52) has described research design as a method of gathering information and technique for enabling the continuous development of different study procedures to yield comprehensive data. Asenahabi (2019) has clearly pointed out the main aim of the research design which is to interpret research problems clearly such that reliable answers would be provided to those questions at a minimum cost.
As illustrated in the diagram, there are different types of research designs. Boru (2018) has stated that the most used research designs are descriptive, exploratory, and explanatory. Descriptive research design helps to illustrate a situation, person, or event and is highly useful in answering questions that are relatively new and unexplored. Besides descriptive, Asenahabi (2019), has described explanatory research as a research purpose which examines the source/cause and give proper reasoning (explanation) to support or refuse the findings. On the other hand, exploratory research design answers the question of “Why” and “How”. Generally, exploratory research designs are for those topics where little research has been done and authors generally have little knowledge on the subject matter. The research design used by the author in this thesis is the exploratory research design. It is because the area of investigation is relatively new for the author and there are
important variables in this topic that are unknown to the author. Therefore, exploratory research design suits best for this thesis.

2.2 Research approach

Grover (2015) has described research approach to be a proper plans and methods for research which will allow researcher to gain valuable insights through data collection, analysis, and interpretation. According to Chetty (2016), the research approaches are divided into two prominent divisions:

1.) The approach of data collection
2.) The approach of data analysis

As shown in the diagram below, the research approach is categorized according to data collection and data analysis. For the data analysis approach, the inductive approach is described as a “bottom-up” approach where the research moves from specific observation to broader theories, and it is mostly used for the analysis of qualitative data. Further, the deductive approach can be described as a “Top-down” approach where the research becomes more specific from general. Deductive approaches are mostly used for quantitative data analysis (Trochim, 2006, as cited in spiderman, 2010).
Chetty (2016) has stated that methods of data collection are more prioritized than analysis in qualitative research whereas quantitative research ascertains real statistical values which can be interpreted and analyzed. Therefore, to make this thesis credible, an inductive approach with qualitative research has been implemented by the author. The inductive approach has been chosen because there are no available facts and figures that support the implementation of blockchain technology. General observations related to the technology have been carried out, where the author is trying to find a pattern and finally come to a certain conclusion and form a theory.

2.3 Data collection methods

The data collection methods applied for this study were interviews and secondary sources. Interviews were performed with different HR managers and people in senior management. Many different types of companies were approached for interviews and data collection. A prototype of a blockchain-based Human resource management system was built using a software called “Figma”. Interviewees were
shown the prototype design, where thorough feedback was taken, and interviews were carried out.

The interview is one of the most common and simplest forms of qualitative data collection. As stated by Dumay, J., & Qu, S. (2011), interviews ascertain substantial advantages for the research but there always persist a condition where interviewees must be considered competent and moral truth-tellers. Thus, Denzin & Lincoln (2000) as cited in Dumay and Qu (2011) considers the interview as impractical, subjective and not scientific. With due considerations for such problems, reliable interviewees were chosen, and their qualifications are stated respectively. Dumay & Qu (2011) has further elaborated on the qualities interviewers must possess to produce maximum credibility from the interview. They have suggested the interviewers should have sufficient expertise in the field to understand the answers more coherently, should have active/ intensive listening ability, and most importantly thorough preparation with reasonable questions. Therefore, to address such concerns, the author has enrolled in different blockchain-related courses, knows the programming language sufficiently, and has designed the Blockchain applications as well.

Semi-structured interviews were conducted where there were some prepared questions to ask, and the rest of the questions were asked as the interview proceeded. Semi-structured interviews were chosen as it is agile, approachable, and intuitive with the ability to reveal significant and often hidden elements of interpersonal and institutional functioning. (Dumay, J., & Qu, S., 2011, P.246). The interviews were performed face-to-face and were recorded for convenience. The interviews were conducted in English and were 40-45 minutes long. Further, there was a lot of information that could not be gathered from the interviews; therefore, secondary data was collected from different research papers, blogs, and newspaper articles. Since this thesis is on blockchain technology, many references were taken from a blockchain recruitment platform such as “Zinc”. Zinc is a UK-based start-up whose platform is based on blockchain and allows for the validation of credentials.
supplied by the candidates. Due to secure company policy, an interview with zinc employees was not possible but there are lots of ideas taken to design the application which serves as a basis of this thesis research.

For secondary data collection and literature review, the below-showed databases and search words were used to analyze different articles to be used. Different databases such as google scholar, EBSCO, Researchgate.com, and IEEE-Institute of Electrical and Electronics Engineers were used. All the keywords mentioned above were used to find the relevant articles. IEEE was only used to find articles relating to the system design of the system. All the materials were sincerely inspected before the study and a total of 24 studies were found relevant.

Table 1. Searched queries in a database

<table>
<thead>
<tr>
<th>Databases</th>
<th>Searched words</th>
<th>Delimitations</th>
<th>Results</th>
<th>Selected papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google scholar</td>
<td>Recruitment and selection, E-recruitment, blockchain technology, human resource management, Benefits of blockchain in human resource management</td>
<td>English, free full-text, 2010-2022</td>
<td>100</td>
<td>8</td>
</tr>
<tr>
<td>IEEE systems journal</td>
<td>Blockchain technology, blockchain based human resource system design, decentralized applications</td>
<td>English, full-free text, 2010-2022</td>
<td>25</td>
<td>5</td>
</tr>
</tbody>
</table>
### 2.4 Data analysis

The analysis process used for this study is thematic analysis with inductive and latent approach. The word “thematic” is an adjective of the word “theme”. In research, the theme plays an important role it allows the author to make a detailed study of the topic. It gives a clear direction to the author on what is being studied and how the subject matter should be approached. The analysis of theme including content is called thematic content analysis. Thematic content analysis is a common tool that is used in the interpretation of qualitative data such as interview transcripts. Vaismoradi et.al. (2016) ideates that, most people contradict the meaning of thematic analysis and content analysis. Both qualitative research methods possess some similarities such as they both use coding techniques to generate themes or sub-themes, possess the same analytical procedures but differ in considering between themes and categories. Themes, as described earlier, are used as a description of a concept whereas categories are used to describe the theme. The description given to the theme is called categories and the development of categories aids for the development of analytical themes (Vaismoradi et.al., 2016).
The process of conducting thematic analysis has been explained by Caulfield (2022) in the six-step process which is integration, coding, creating topics, assessing topics, outlining, designating topics, and summarizing. Anderson, R. (2007) has also proposed similar steps for thematic analysis. He has suggested making multiple records of interview transcripts, marking important points/units with the highlighter, collecting the units to make a pile, labelling each pile as themes, and analysing. Caulfield (2022) has stated that, with thematic analysis, a writer gets a lot of flexibility while analysing the data, therefore, the analysis sometimes becomes subjective and judgemental from the writer’s perspective. So, it is very important to give careful attention while resonating the responses.

As mentioned earlier, there are different approaches to research analysis, which are inductive and deductive. Allowing the data to establish a theme is an inductive approach whereas in deductive approach begins with some established themes which you predict to be seeing represented in the data, based on theory or prior knowledge. A deductive approach answers the question of “Will the author’s predetermined hypothesis allows the author a solid thought of what kind of subjects the author would anticipate discovering within the data?” whereas the inductive approach answers the question of “Will the author be constructing his own framework based on what the author investigates in the research?” Caulfield (2022). Also, it is important to know the distinction between the latent and semantic approaches in data analysis. Javadi & Zarea (2016) has described the semantic approach where the actual meaning of the data is analysed, and the researcher is not investigating for anything beyond what the participant has stated. However, in the latent approach, the researcher goes beyond the findings of the semantic approach, and efforts are made to develop a theory based on the relevance of the patterns.

Thus, this thesis will use the inductive and latent approaches of data analysis where the author will develop his own framework and will dive beyond what the participants have stated.
3 LITERATURE REVIEW

This part of the thesis will meticulously cover all the essential concepts of blockchain technology, Blockchain-based human resource recruitment system, the concept of recruitment and selection, human resource management, validation of credentials, and data privacy arising due to blockchain. The purpose of such a detailed study helps us to understand the importance of the blockchain system especially in recruiting and how new and emerging technologies are making the organization system more transparent and authentic.

3.1 Human resource management

Put simply, Human resources are the workforce of an organization that helps in obtaining organizational goals and objectives. The management related to such resources in an organization is human resource management. The concept of human resource management apparently may seem easy to understand and implement but the management of human resources has been a big concern for many organizations. Armstrong (2006) has defined human resource management as a systematic and holistic approach towards the administration of a company’s most significant resources- the people who work there and contribute individually and collectively for the achievement of organizational objectives.

There are generally four typical processes involved in the human resource cycle, they are hiring, assessment, compensation and training (Fombrun et. al., 1984 as cited in Armstrong, 2006).
As research done by Bhuiyan et. al., (2014) has stated that instead of the term “human resource management”, “personnel management” was widely used around the pre-world war-II era. It was around the legislative era (1960-1980), the rapid transformation of human resource management was seen. The main aim of Human Resource Management is to maintain organizational effectiveness by maintaining and enhancing the core competencies of a firm. The other objectives of Human Resource Management are human capital management, which is to retain a skilled and motivated workforce, intelligence management, honor management, and meeting the needs of the employers such as emotional support through empathy. Therefore, it can be concluded that Human Resource Management is a strategic part of a firm that assists in enhancing shared responsibility, rewards, goals, influence, and respect. (Walton, 1985 as cited in Armstrong, 2006).
3.2 E-HRM

As mentioned previously, in the early 2000s, the rapid advancement of Human Resource Management took place. They were considered as the backbone of an organization and to maintain a competitive advantage, organizations needed to nourish their human resources, which gave rise to a concept of “Strategic human resource management (SHRM)”, which specifically focused on developing the competencies of the employees while meeting their utmost needs. In the meanwhile, organizations not only recognized the concept of Strategic Human Resource Management but also adopted new technological trends, by which they transformed their workflow processes using technology and the concept of electronic human resource management (E-HRM) induced (Findikli, M., 2016). There is no one concrete definition of e-HRM but Findikli (2016) has described it as “the administration of human resource practices with the help of the internet, intranet, and networks, which support and automate HR functions.” Additionally, e-HRM can be also termed as virtual Human Resource Management, web-based Human Resource Management, business-to-employee, computer-based human resource management system (CHRIS), and Human resource information system (HRIS). As proposed by Vein, Lepak & Snell (1988) cited in Findikli (2016), e-HRM can be divided into Operational, relational, and transformational. Operational e-HRM focuses on administrative areas such as salary and data management. Relational e-HRM assists in recruiting, training, performance management, and rewards. Transformational e-HRM helps in strategic competency management, proactive expertise governance, and implement institutional transformational strategy (Findikli, M., 2016). The goals of e-HRM are to make improvements in the Human Resource process by increasing efficiency in their operations which reduces costs. e-HRM makes the working environment less constrained as work can be performed virtually side by side allowing for more precise Human Resource decision-making. Ruel & Kapp (2012) as cited in Findikli (2016) has stated the benefits of e-Human resource management is gaining committed, proficient workforce in an economic manner such that productivity is maintained in an organization. There it can be summed up from the above discussion as by implementing e-HRM almost every process such as planning,
recruiting, learning, performance management, career management, compensation, occupational safety, and health can be digitized and allow for more growth and organizational productivity.

### 3.3 Web 3.0

The modern technology we witness today has undergone tremendous changes in the past. With the development of the internet, the preliminary era was termed web 1.0. Web 1.0 is called the “read-only web” where a library of information was created, and the users could access that information via web-browsers or search engines. With the increasing demand for user-friendly web, web 2.0 emerged, where users not only could read the content but publish it as well. Web 2.0 is revolutionary and since it increased the participatory behavior of consumers, it is called “the social web”. As mentioned previously, change is an important prerequisite for transformation, therefore web 2.0 is being transformed to web 3.0, which is believed to “eliminate all the boundaries between digital content and physical content.” (Deloitte insights, 2020). Almeida & Laurenco (2011) further explains the benefits of web 3.0 as it will allow for easy web access in more efficient manner and will be highly beneficial to its users by integrating information from various sources and systems.
Table 2. Difference between web 2.0 and web 3.0, Almeida & Laurenco (2011)

<table>
<thead>
<tr>
<th></th>
<th>Web 2.0</th>
<th>Web 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main task</strong></td>
<td>Focus the power of community to create dynamic contents and interaction technology</td>
<td>Linked data, devices and people across the web</td>
</tr>
<tr>
<td><strong>Linking</strong></td>
<td>Walled gardens inhibit interoperability</td>
<td>Data and devices linked more easily and in new ways</td>
</tr>
<tr>
<td><strong>Content</strong></td>
<td>Individual and organization create content</td>
<td>Individual, organization, machine create content which can be reused</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>AJAX</td>
<td>RDF and OWL</td>
</tr>
<tr>
<td><strong>Website</strong></td>
<td>Google, Facebook, Wikipedia, eBay, Youtube</td>
<td>Dbpedia, sioc-project.org</td>
</tr>
</tbody>
</table>

From table number three, as shown above, web 3.0 enables linking data, devices, and people across the web where data and devices are linked more easily in a new way. The prominent examples of web 3.0 technologies are augmented reality (AR), Virtual reality (VR), IoT devices, Blockchain, AI, and others. Web 3.0 is all about giving more freedom to users while taking utmost care of data privacy and transparency.

### 3.4 Recruitment and E-recruitment

A critical yet promising task for any organization is recruitment. Recruitment in the general sense is the hiring process, where new employees are taken on board and are given the privilege of handling organizational goals. According to Compton et. al. (2010), A practice of attempting to uncover and persuade eligible contenders to apply for current or anticipated employment opportunities is referred to as recruitment. Just like the positioning concept in marketing, which suggests having the right product at the right time in the right place and at the right price; recruiting suggests to the on-board staff at the right time in the right place and at the right price. Compton (2010) further explains the necessary steps involved in the recruitment process and has divided the process into 5 steps. The steps involved are
deciding the organizational needs, job analysis, and description, deciding on a recruiter, publishing the job description, covering legislative aspects, and deciding on application methods. Bach (2005) has clearly described the organizational ideologies behind these processes. He has explained that the organization makes recruitment in two conditions. One, when a staff leaves the company, the other when a company is expanding. In both cases, it is very apt to deeply understand the organizational needs and perform job analysis such that strategic hiring is possible. The below-presented diagram illustrates the recruitment processes. When a company publishes their job, they are approached by many talent pools. Now the company decides and selects some candidates who match their job specifications and are offered jobs.

![Talent Flows](image)

**Figure 3. Staffing processes, Bach (2005)**

It has been a decade now, the terminology “E-recruitment” is gaining more traction. Traditionally, companies used to list their job vacancies in newspapers but with the advent of technology, job seekers apply for the job online through different online mediums such as LinkedIn, Monster.com, indeed, glass door, and others. Hence, E-
recruitment is a process by which an online medium is used to publish a job and hire a candidate which has been advocated in the article written by Kapse et. al. (2012).

As seen from figure five below, indeed.com is the number 1 job search e-recruitment platform with 250 M monthly active users followed by LinkedIn (57.5 M), glass door (55M), and monster.com (6.2M). With these numbers, a general analysis can be done of how popular e-recruitment platforms are and it is through such platform companies that have access to many talent pools. The revolution is yet, to begin with, the commencement of web 3.0 technologies.

![Monthly active users in different job searching platforms](image)

Figure 4. Monthly active users in different job searching platforms

### 3.5 Overview of blockchain technology

Blockchain is an emerging technology and was practically implemented when Satoshi Nakamoto developed Bitcoin using Blockchain. It simply can be considered as a digital ledger where transactions are stored in a distributed and decentralized fashion. The technology is believed to be highly transparent, secure, immutable, and decentralized. Yaga et al (2018) have stated that the concept of a decentralized
system was proposed by Leslie Lamport, by giving a metaphor of Paxos; that the parliament must function even if legislators constantly change. Here, Lamport simply referred to a distributed system where the influence of central authority is negligible. The concept was to remove the middleman between any transactions, e.g., removing banks while transferring money. Until 2008, the idea was just in the paper until pseudonym Satoshi Nakamoto developed Bitcoin using Blockchain technology. It was after the development of Bitcoin, Blockchain technology got due attention. As the name suggests, Blockchain technology functions in Blocks. The Block is an integral part of the whole system that constitutes its fingerprint called hash, the hash of its preceding block, and transaction details.

Figure 5. Block and Block linkage in Blockchain, good audience (2018)

The above-shown diagram represents a block and its chain. A Block contains data, its hash, and the hash of the previous block. The first block created is called the “Genesis block” which won’t have the previous hash value. The second block would have the hash value of the first block and the third block would have the hash value of the second block. If a hacker tries to tamper with the data of one block, the information available on another block would also change. Tampering of information in blockchain is almost impossible unless 51% of the miner’s community tries to
tamper with the block. Such a scenario is very hard to arise and therefore, we call the blockchain system more secure and advanced with high transparency.

There are different elements of a blockchain system. They are peer-to-peer networks, open or closed source software, messages, chains of cryptographically secured blocks, consensus algorithms, incentivization schemes, and state machines. When various transactions take place, it needs to be verified or should have a mutual consensus of the participant in the network. The network is often called peer to peer network. The validators are called miners. Satoshi Nakamoto developed a system in which whoever validates the transaction would be awarded a bitcoin. Recently, the award for each transaction verified is 12.5 Bitcoin. Messages are in the form of transactions. To validate a transaction, it would use high computation power, as the transactions are in the form of complex codes. Once the sender using his/her digital wallet signs cryptographically and sends it to the receiver, the validators or miners validate the transactions using consensus rules. Consensus rules apply in validating transactions. Three major consensus algorithms are popular, and they are Byzantine fault tolerance, Proof of Work, Proof of stake. After validation, new blocks are added to the system. The first block created in the network is called Genesis Block. Since the other block contains the unique hash of the preceding block, tampering with one of the blocks would cause disturbance in the whole network.

Smart contract in an integral part of blockchain where Szabo (1994), has described the benefits of smart contract is to satisfy contractual transactions such as in payment, liens, confidentiality, whereby minimizing the malicious activities and need for third parties. The execution of transactions is fully automated without the need for a third party. Smart contracts consist of code and data. Whenever a user performs a transaction using a cryptographic signature, the code is deployed in the network and thus executed by nodes on the network. Smart contracts ensure good performance between the contracting parties. Smart contracts do not depend on the third party and have even low transaction fees. An example of smart contracts is Ethereum smart contract, Hyperledger Fabric chain code. The smart contract is
divided into two categories: Deterministic and Non-deterministic (Alharby and Moorsel, 2017). Since smart contracts deal with the sensitive issues of political, legal, and corporation, executing smart contracts in blockchain might require some external information from these intermediaries. If information is needed from the external source, it is termed as non-deterministic and if the information is not needed from the external source, it is called a deterministic smart contract. According to Alharby and Moorsel (2017), the smart contract consists of account balance, private storage, and an executable code. When a user performs a transaction to the contract address, verification of the transaction needs to be done, which is called mining by miners or validators.

Figure 6. Smart contract system, Moorsel & Alharby (2017)

The above diagram illustrates the function of smart contracts. The smart contracts are coded and are executed if the conditions are met and helps in adding a new block to the chain of related information. Blockchain has huge potential to develop into the best technology that ensures secureness of the data, low transaction cost, and minimization of trusted third parties. Blockchain technology can be used in different business domains such as smart property management, Internet of things,
E-commerce, Music right management, voting, payment, insurance, supply chain, and many more. Although the huge benefits are possessed by this technology, it is still in its infancy and there are numerous technical barriers, business, legal and behavioral challenges that need to be addressed for the smooth implementation of the technology. Blockchain networks can be divided into permissioned networks and permissionless networks.

The permissioned networks can be simply identified as a network that requires strong authentication or only authorized personnel can access. Permissioned networks can be compared with the intranet of a certain organization that requires proving a strong identity for authentication. Since the permissioned model restricts many participants, it requires relatively less computation power and transactions are usually faster (Yaga et. al., 2018). Hyperledger, CORDA, Quorum are permissioned blockchain platforms. This network model works as both a centralized and decentralized system. This type of model network is suitable for any organization that wants to keep its information private. Permissionless networks are solely decentralized and accessible to everyone where participants in a network are allowed to publish a block without central authority ruling over them (Yaga et. al., 2018). Since the software is open source where anyone could publish a block, the danger of phishing and malware attacks increases. To prevent such hazardous attacks and to keep the network sanitized; consensus algorithms are used widely.

3.6 Blockchain-based Human resource recruitment system design

Most organizations implement HRMS (Human resource management system) to look after all the human resource operations of an organization which includes different processes of employee life cycle such as recruiting, payroll, compensation, promotion, and so on. With the induction of blockchain technology into human resources, the HRMS system is now called a blockchain-based human resource management system (BcHRMS). A lot of studies have been done to propose such a system. Lee, J., & Seo, H. (2021) has proposed a human resource pool recruitment
system based on private blockchain. They have designed a decentralized application (Dapps) including a web UI where permitted parties are given full control over the system. Wang et. al. (2017) developed a human resource information management model based on blockchain technology which they believe will “adopt consistency verification, byzantine agreement, the public key and private key encryption mechanism, including a hash test and a series of security algorithms and protocols to ensure security in management, storage, tampering, and other aspects.” (Wang et. al., 2017, P.170)

Further, Wang et. al., (2017) suggests that present human resource management information systems use B/S or C/S framework. The table presented below summarizes the difference between the present Human Resource system and blockchain-based Human Resource system, also highlighting the greater benefits assured by blockchain technology. It can be concluded from the table that a blockchain-based Human Resource system helps more in verification, information encryption, and increase transparency.

<table>
<thead>
<tr>
<th></th>
<th>Consistency verification</th>
<th>Storage equipment</th>
<th>Encryption mechanism</th>
<th>Internal operation</th>
<th>Real time</th>
<th>Tamper resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>C/S framework</td>
<td>None</td>
<td>Host</td>
<td>Common password encryption</td>
<td>Yes</td>
<td>Poor</td>
<td>Can be modified inside</td>
</tr>
<tr>
<td>B/S framework</td>
<td>None</td>
<td>Network server</td>
<td>Common password encryption</td>
<td>Yes</td>
<td>General</td>
<td>Can be modified inside</td>
</tr>
<tr>
<td>Blockchain technology</td>
<td>Yes</td>
<td>Each node of block chain</td>
<td>Public and private key encryption</td>
<td>Public</td>
<td>Strong</td>
<td>Cannot be modified</td>
</tr>
</tbody>
</table>
Table 3. Analysis of different design models Wang et. al. (2017)

Besides this, Onik et. al., (2018) have proposed a more efficient system that is easily understandable. With their proposed private network blockchain system, they have a database, which has tons of information about applicants. The job candidates are required to upload their credentials such as education, right to work permit (RP), previous experiences, and so on such that this information will be verified using the blockchain system, which will then publish or rank the list of verified candidates to the company to make their decisions.

Figure 7. Blockchain-based recruitment management system, Onik et. al. (2018)
The ranking of the applicants are assessed according to the compatibility score established by each company in their database. With this, company decides which candidate to hire based on their organisational need. (Onik et. al, 2018, P.13)

Figure 8. Blockchain-based recruitment system design, Onik et. al. (2018)
The above-presented diagram illustrates the algorithm of the proposed design by Onik et. al. When a job seeker applies for a position in a company, their data is sent to the database for verification. This database has all the required information available from educational institutions, previous companies, training institutes, and so on. The validity of the information supplied is checked through the system and if the system does not find relevant data, applicants end up being rejected and the opposite is true if data is verified by the system. Similar taxonomy and system have been explained by Xu et. al. (2017) as well. Going the next step further, Chen et. al. (2019) have designed a blockchain system where cross-domain digital talent can be developed. Their study and system design aims to deal with the problem of talent supply and tries to make smoother transition of applicants from academics to industry. Sarda et. al. (2018) has developed a work-history fraud prevention system to tackle problems of fortified and misleading documents supplied by the candidates which will authorize prospective employees to send their qualifications to their prospective employer where all their qualifications will be checked using the records present in the blockchain. The information now supplied by the candidates will now remain in the blockchain system and since it depends on the hand of applicants which information to submit, the applicants have the power over their data.

Arenas, R., & Fernandez, P., (2018) have developed a permissioned blockchain for verifiable academic records. Their proposed system awards digital credentials that can be easily verified, remove centralization, and allow for low costs and resources consumption. Therefore, there are lots of probable blockchain systems designs that have been proposed to serve the Human resource department of an organization from verifying work history to educational history.

### 3.7 Problems in Recruitment

The ever-growing problem in HR is bad hiring. Bad hiring is done by HR managers when job seekers falsely showcase their knowledge and experiences to get the job. Hall (2017) as cited in Suk Yi et. al. (2020), by analyzing a survey about bad hire states
that “37% of employers had less productivity, 32% wasted time to recruit and train the employees, 31% found unmatched and poor work quality, and 50% of new hires quit within six months.” (Suk Yi et al., 2020, P.132).

According to SHRM (2018), 85% of 4000 survey respondents have witnessed forfeit documents supplied by job candidates. Educational documents are the most important documents that should be submitted in a job application process. It has been found out by HR managers that the candidates knowingly have inflated their GPA, falsely claimed to have received academic honors, and made up a fake degree. Furthermore, in this era of the internet, protecting information has been a great concern. News about data breaching is common nowadays where general consumers are worried if their data is being mishandled. This problem is common in Human resources, where they are vulnerable to major cyber-attacks. These pertinent problems in HR cause huge economic loss for the company and retards its growth. Therefore, there is an immense need for a system that can surpass such fraudulent activities. In this context, blockchain can act as the best tool to verify candidate details and help in the selection process.

3.8 Benefits of Blockchain in HR

PwC (2017) as cited in Suk Yi et al (2020), states that blockchain can be useful in performing background checks/credential verification, payments, job matching platforms, and personal identity management. It has also been suggested that the technology will streamline most of the Human Resource processes and the system will be so engaging and transparent that it can address Human Resource issues directly by communicating with the stakeholders. By analyzing the potential future hazards and allowing for filling positions with effective strategies, blockchain adds more value to day-to-day organizational activities. As mentioned above, hiring is a lengthy process and as per the Australian financial review, it takes about 68 days to fill a vacant position. This much of time is taken by internal administration or third parties to authenticate the candidate credentials. Blockchain allows companies to
validate the candidate authenticity through a third-party ledger or candidate keys. Not only the system checks the educational and work credentials, but blockchain can also help in verifying legal documents such as criminal records, health records, driving licenses, and so on. The technology not only safeguards the regular contracted employees but also promotes the gig economy creating a better talent market. When creating a blockchain ecosystem, data of probable candidates must be entered into the system. Here, the candidates can ask to monetize their qualifications since they are sharing their details and further candidates will have the upper hand to maintain their privacy. With this, candidates are obliged to transfer authentic details, though companies must pay a certain amount. It is a win-win situation for both the candidates and the companies since more trust has been created. On that note, the technology just saved time and increased the cost-effectiveness of a company. Most companies depend on third parties for payment of their employees and checking their working time. Blockchain removes the third party and automates all the transactions. To sum up, integrating blockchain technology into Human Resource Management, allows for administration of information, recognition, designations, honors, relocations, coaching, rewards, remuneration and experience management. (Onik et. al., 2018)

3.9 Synthesis of knowledge base and proposed system design

To further enhance the credibility of this study, the authors have tried to come up with a wireframe of the blockchain-based human resource management system. The wireframe is solely based on the author’s best knowledge about the system which has been prepared by going through a lot of blockchain system design literature. The name of the application is given “Blorect”, which is made up of the combination of word blockchain and recruit. The concept used here is strong theoretical as very little application of blockchain has been witnessed in HR. The overall system design is:
Blorect is an application that works on blockchain technology and makes the recruitment process seamless. Blorect main aim is to help the HR department of an organization with credential verification. For this, Blorect has tried to create an ecosystem that involves different parties such as police stations to check the criminal history of applicants, government, or immigration services to check the right to work status of the applicants, educational institutions to verify their educational certificates, previous companies’ data to check references, banks details for payment and security clearance. By partnering with those organizations, we will only have verified, and authentic details related to the candidates. Blorect will pay a certain amount to all those organizations for publishing information into our databases. All the data will be securely stored, and anonymity will be maintained. Now, when a candidate applies for a position, they are required to upload a national ID or passport in their application, where each national ID is given a unique number. The companies then go to our database and search for the candidates, where they can gather data
related to the applicants in a matter of time. The system is highly transparent such that both recruiters and candidates can see how many candidates have applied, what are their qualifications, and in the end, it even shows who has been hired. It takes only a matter of time to make the final selection. Once the selection has been done by the companies, the smart contract will execute, and the selected candidates will be hired as per the company policy. Further, in the future, the company can regularly update the candidate achievements into the database. Also, other companies can see how many qualified candidates other companies have hired, which helps the companies to make even more effective strategies while hiring. This will eventually create a trustworthy network system where not only companies are benefited but all the parties involved are mutually benefited. Candidates will work even hard to gain authentic credentials which will increase the quality of the workforce and hence achieve organizational goals even faster. Therefore, this is how blockchain can bring revolution in human resource management.
This chapter will describe and summarize all the major findings of the study. The results obtained from interviewing and surveying candidates were analyzed by transcription and open coding. The author went through the interview recordings several times and developed relevant codes that could potentially answer the research questions. A total of 15 interview questions were asked, which was solely aimed to answer the research questions. After collecting and summarizing the interviews, transcription, and coding of the interviews were performed which allowed the author to come up with several sub-themes, which were again analyzed to come to a specific theme. Themes are the probable results of the study. The table below provides the summary of the interviewees along with their experiences, roles, and company size.

Table 4. List of interviewees

<table>
<thead>
<tr>
<th>Title</th>
<th>Responsibilities and experiences</th>
<th>Company size and internationality</th>
<th>Length of the interview (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment consultant</td>
<td>Talent acquisition responsibilities; 8 years</td>
<td>Medium; Finland</td>
<td>35 min</td>
</tr>
<tr>
<td>Role</td>
<td>Experience</td>
<td>Type</td>
<td>Duration</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------------------------------</td>
<td>--------------------</td>
<td>----------</td>
</tr>
<tr>
<td>HR lecturer and Former software developer and HR manager</td>
<td>HR and digital innovation lecturer; 6 years</td>
<td>Individual</td>
<td>45 min</td>
</tr>
<tr>
<td>CFO and former HR manager</td>
<td>CFO responsibilities; 10 years</td>
<td>Medium; Europe</td>
<td>41 min</td>
</tr>
<tr>
<td>Talent acquisition manager</td>
<td>On-boarding of staffs; 4 years</td>
<td>Medium; Europe and Asia</td>
<td>38 min</td>
</tr>
<tr>
<td>CFO and co-founder</td>
<td>CFO related responsibilities</td>
<td>Medium; Europe and the USA</td>
<td>36 min</td>
</tr>
</tbody>
</table>
### 4.1 Theme 1. Problems faced by Hiring managers

Table 5. Coding for Research question 1

<table>
<thead>
<tr>
<th>Theme 1</th>
<th>Citation</th>
<th>Code</th>
</tr>
</thead>
</table>
| I1      | “Since we are only operating in Finland, our brand penetration is low in the market. So, we tend to receive fewer applications from qualified candidates from all over the world.”
“We have experienced a lot of times when people do not want to work with us. They are unaware of what we do and do not trust our company culture. That’s why we are not receiving applications where we do not have many choices to make.” | Lack of branding |
| I2      | “There are many instances where personally, I have encountered fake resumes and for sure I could prove those applications were counterfeited.”
“There was an email address of the company that the candidate has put on in his resume as his previous workplace. When I emailed the company, the managers did not about the applicant.” | Fake resume |
| I3      | “Once a candidate applied in our company with his long work history and it took us 2 months to finally verify his work experiences.”
“Our work is fast-paced and more demanding in terms of skilled manpower. So, we make frequent hiring in our company but once they are hired, we come to know that they do not have appropriate skills. If we had more access to verified candidate skills and information, a lot of time and effort would have been saved.” | Lack of easy access to verified candidate information |
| I4      | “Our company is scaling fast and we regularly open new positions every time. We get many applicants but very few of them are qualified and most of our positions are vacant still now.” | Lack of talent supply |
4.2 Theme 2. Benefits of implementing blockchain technology

Table 6. Coding for Research question 2

<table>
<thead>
<tr>
<th>Theme 2</th>
<th>Citation</th>
<th>Code</th>
</tr>
</thead>
</table>
| I1      | “As far as I know, Blockchain is a transparent system and HR is a part of an organization where lots of bureaucracies occur. I think such discrepancies could be solved using blockchain.”

“If things would work as you have explained in your blockchain-based recruitment system, it will be fantastic for job applicants as they can determine their own worth and for the company, it is a very good thing.” | Reduce selection biases |
| I2      | “Credibility and secureness are the main principles of blockchain. So, I firmly believe in HR; blockchain will keep companies safe from candidates who apply with fake resumes.”

“What I expect from blockchain is mutual trust and loyalty. If this system would be implemented, candidates have to bear a lot of risk to lie.” | Prevention from candidate fraud |
<table>
<thead>
<tr>
<th>ID</th>
<th>Comment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>I3</td>
<td>“I already told you earlier that our company spends a lot of time validating the information. Therefore, I think with such a system, we could have faster, easier, and convenient access to candidate information.”</td>
<td>Easy and faster access to verified information</td>
</tr>
</tbody>
</table>
| I4 | “By implementing blockchain, we could potentially witness access to many candidates and select candidates that suit best for us. Not only companies can choose candidates, but candidates also are able to choose the company of their choice. I strongly believe the technology will allow more freedom from both parties.”  
“With blockchain, we can keep track of qualified individuals. We can see how willing they are learning new things. I believe blockchain will help us to expand internationally more quickly.” | More access to talent supply                                             |
| I5 | “Since, we heavily rely on third-party HR sourcing companies, implementing such a system can eliminate third parties and can also guarantee a decreasing cost of hiring. The hiring process would be faster and cheaper.”  
“Is not this amazing? You have general idea of what type of candidate you want and then you just log in into the system, search for the qualified candidates and directly talk to them about possibility of working together. It would surely reduce a lot of time, mental effort and money.” | Decreasing cost of hiring and labor                                     |
4.3 Theme 3. Proposed front-end system design

Figure 10. Proposed Blockchain-based system design
Above stated interviews and diagrams were narrowed down by the author to specifically answer the research questions. These results are concluded from the interviews performed by the author. Due to the unavailability of the other 3 respondents for an interview, the author used google forms to collect related information through the survey. The survey result showed that all hiring managers were aware about blockchain but they did not have enough understanding of the technology. They responded the problems faced as getting candidates verified data, talent supply and sometimes managing cross border payments. When asked, why does it take longer time to fulfill the position, everyone responded the same answer which is lack of applications from qualified candidates. All of them have found the candidates lying on their resumes and all hiring managers do reference check through phone calls and emails as supplied by the candidates. 2 of them responded they do not want to change the existing recruitment system and maybe want to adopt blockchain in the future, if it provides access to large number of talent pools and helps in shortening the hiring processes. 2 of them believe that blockchain will be the future and all of them agree about the institutional constraints that can limit the use of blockchain which are governance barriers, sensitive data breach threats, doubtful payback on investment and unproven technology.
5 CONCLUSIONS AND DISCUSSIONS

5.1 Answering the research questions

This research paper aims to dig deeper into the problems faced by hiring managers, how blockchain technology would solve those discrepancies, and suggest a blockchain-based human resource system design. The thesis revolves around the issues faced by the Human Resource department of an organization.

RQ1. What are the problems faced by hiring managers while recruiting new candidates?

Findings suggest that Hiring managers constantly face the problem of fake resumes, inefficient workforce, lack of applications from qualified candidates, increasing the cost to fill up the vacant position, and more time consumption in verifying candidate details. Most HR managers are now worried about the fate of their companies where hiring personnel has become a more complex and challenging task in this present era. Hiring managers must be more careful while hiring as they carry the responsibility of managing organizational effectiveness. Due to advanced technology, candidates find a way to tamper with their CVs and provide falsified information making hiring managers’ jobs extremely complicated. Not only fake resumes, but Hiring managers are also now getting into the trap of networks or references created by the candidates for the sake of getting the job. The problems faced by the hiring managers as stated above are in line with the previous research done by Suk Yi et. al (2020) and will be explained in sub-chapter theoretical and practical contributions.

RQ2. How implementing Blockchain technology will ease the recruitment process?

Findings suggest that blockchain technology could act as a saver from many discrepancies faced by Hiring managers as the technology would help to provide
Hiring managers with only verified candidate information which significantly reduces the hiring period, allows access to a large network of the talent pool, reduce selection biases and access to authentic and reliable candidate details. Such benefits are possible because blockchain provides for decentralized and peer-to-peer networks where only authentic candidates are registered. With this, not only companies but also candidates have the autonomy to choose their company to work with and in the time being, candidates can access their skills and develop if needed. This will promote more competitive and qualified candidates, which is beneficial for both the hiring company and the candidates themselves.

RQ3. What could a prospective system design look like for blockchain-enhanced recruitment?

A blockchain system model has been designed and proposed taking into consideration the system designed by Wang et. al. (2017), Onik et. al. (2018), Arenas & Fernandez (2018) and Sarda et. al. The author has proposed his own system as the author found some discrepancies in the systems studied in other research papers. Every system design, the author would go through has incomplete orientation of the parties involves. Therefore, the author has tried to connect the dots and has proposed a system which involves entire ecosystem of participants needed in making hiring decisions. The back end of the system has been thoroughly described in the synthesis of knowledge section (see 3.9) and the picture of the front-end of the system has been kept in the result section theme 3. The design consists of a database that constitutes information of candidates along with their educational background details, previous work experiences details, information from government authorities and other relevant details. Since those details are already verified, and when a company logs in through their system, it would allow selection for only verified plus qualified candidates. The system can be logged in as a candidate or a recruiter. When logged in as a recruiter, they can see their job postings and how many people have applied. For each candidate, they are given unique ID. This is a common system prevalent now in every company. The difference in the authors proposed system
design is while verifying the data. Now the recruiters can go to the database, enter the unique ID and get the verified result in a matter of time. If the company liked the candidate, they could continue as per their own company rule like interview, or, they can directly send job contract to the candidates through the execution of smart contracts. The case is same for candidates. They can log in as a candidates and access to all the company job opening through one network where they are shown job postings according to their qualifications and can apply in a single click without the need of completing hectic forms. They can monitor their job progress in real-time, see who have been selected and accordingly assess their own qualifications. This will allow for more disciplined and genuine from the candidates.

5.2 Theoretical and practical contributions

Here, the author will reflect upon his own findings co-relating with previously mentioned literature works as explained in the literature review. The author will mainly emphasize how the results comprehended with the previous literature. For the problems faced by the hiring managers for RQ1, the findings are in line with the previous research done by Suk Yi et. al (2020). In my point of view, such genuine problems are due to increasing unemployment, the presence of advanced technological scams, and the lack of quality training/education of candidates. Also, due to increasing population and competition, it has become hard for almost everyone to get a job matching their studies. This creates social pressure and insecurities amongst the candidates such that they are urged to lie in their resume where they can get a job.

Further, the authors findings correspond with the research done by Onik et. al (2018) and Suk Yi et. al (2020) and answer the questions regarding how blockchain technology can help in Human Resource recruitment. In my point of view, blockchain is revolutionary and for sure, it will bring drastic changes to the recruitment industry. But for these, there is a need to create a vast ecosystem of different organizations where we can check the validity of the information. It is a tedious and hectic task
that can be possible in the upcoming decades. Once the system is implemented, the task of Hiring managers and the overall company becomes very much easier and simpler, further promoting transparency and accessibility. Therefore, the author has proposed a new design system which has been described in RQ3 in sub-chapter 5.1.

On that note, the study has suggested that there lies a problem in a recruitment industry where blockchain could address those potential issues. Therefore, it is advisable for both blockchain developers and HR practitioners to work hand in hand and solve those issues. The findings ease the task of blockchain developers as the study has suggested what are the burning problems, how it can be solved and what could be a possible system design of the application. The study has clearly described all the things that a blockchain developers needs to take in consideration while building a recruitment system and has also suggested how to approach different organization to form a solid network of parties. Moreover, this study has shed light on the problems tackled by HR managers while recruiting a candidate. Since HR managers do not have technical knowledge to grasp the understanding of blockchain technology, this study has explained the working mechanism of blockchain technology in recruitment in simple words such that HR managers are aware of how the system works. It is therefore, as suggested by the study, the application of blockchain technology is practical to both HR managers and blockchain developers.

5.3 Assessment of research process and results quality

As mentioned in the previous section, most people do not find interviews credible as it must be assumed that the interviewees are highly competent and moral truth-tellers. Maxwell (1990) as cited in Whittemore, R., & Chase, S. (2001) has comprehended that “Certainty in scientific inquiry is futile” and therefore, it becomes tougher to ensure the validity of qualitative research. Hence, to authenticate qualitative research, many researchers such as LeCompte & Goetz (1984), Popay, Rogers, & Williams (1998), and Altheide & Johnson (1994) used or implemented the word “Validity” to ascertain the credibility of qualitative research.
It was Lincoln & Guba (1985) as cited in Whittemore, R., & Chase, S. (2001), who gave literal meaning to “Validity” as credible information obtained from a factual source which concludes that “Qualitative research is contextual and subjective versus generalizable and objective”. (P.524). It is, therefore, the author believes that the information collected either from an interview or secondary source is worthy to analyze the implementation of blockchain technology into Human resource management for recruiting. Since the subject area is still in its exploring phase and it is believed that no one has the perfect understanding of what blockchain technology could be in the future, the validity of the data collected depends on person to person but certainly, they will differ by a small extent. This study had 3 research questions to answer. The first two research questions must be answered through surveys and interviews while the last research question must be answered through detailed analysis of literature review. The last research question took most of the author’s time. It is because of the complexity involved in designing the blockchain-based system where the author had no previous experience in designing and programming. The author learned programming languages, learned product designing, learned to use User experience (UI) tools, and learned about back-end system designing which took almost 2 months. The author tried to consult with different software developers and blockchain enthusiasts to finally design the system. For the preparation of the first two questions, the author first made a detailed study on the topic and prepared interview questions which took around a month.

The next challenge the author witnessed was collecting the relevant data through interviews because of the busy schedule of the participants. It took the author more time to collect the interview, gather them and analyze them. Since the topic and the technology is relatively new, not much analysis was found while in the research purpose, which made the author in constant dilemma whether the results comprehended with the present scenario and research questions.

The technology is complex to understand and finding relevant articles that match my study was hard to find sometimes. Some articles were not in English but contained
great insights into the thesis. It took time for the author to translate the language and finally understand the concepts. The author found very few start-ups working in this field. Their business model and operations procedure were unclear to the author and to access their content, the author must pay heavy fees. There were many instances where the author was short of data and related research papers.

5.4 Ethical consideration and trustworthiness

In every scientific study, the safeguarding of human volunteers through the application of suitable ethical norms is paramount. (Arifin, S., 2018, P.30). While conducting any interviews, the interviewees are considered subject matter experts. There are multiple scenarios where interviewees are not comfortable in answering the questions because of their limited knowledge of the respective field. Therefore, in such a situation, it is the prime responsibility of the authors to manage the confidentiality of the interviewees, which can be termed as ethical considerations. For this study, various ethical considerations have been considered through informed consent/ voluntary participation, maintaining anonymity/confidentiality, performing private interview sessions, doing secure data analysis and dissemination of the findings, and data protection.

To conduct the interview, the author personally approached the interviewees and shared a brief explanation of the study and data collection process. All the interviews have been conducted through the free will of the participants where they consented voluntarily. They were given interview questions beforehand and a consent agreement was signed which mentioned that the participants can have full freedom to participate or decline the offer and were given appropriate time to go through questions/ information sheets and decide whether they wanted to participate in the study. All the participants were obliged to sign the consent agreement. Further, participants were given the right to withdraw their participation in the middle of the study, and authorization to record the interview for data analysis has been taken from the participants. It was the author’s prime responsibility to give proper
consideration in maintaining the anonymity and confidentiality of the interviewees. The anonymity was maintained by not revealing participants’ names and personal identities throughout the research study. The interviews were conducted one on one privately and quietly without access by outsiders. Once the interviews have been conducted, data transcribing has been done in a private room using earphones, making sure that the recordings would not be heard by anyone. For the credibility purpose, candidates were pre-informed that their responsibilities, company size, countries of operation would be mentioned while reporting the data and the candidates were assured that the recordings would be stored in password-protected devices.

5.5 Limitations of the research

It is a well-known fact that it is hard to predict the future. No matter how much analysis be done or experiment to be conducted, the future is unseeable. The same analogy can be done with the technology and technology business. Technology is rapidly evolving. Human mankind has just witnessed the power of web 2.0, which is breath-taking and revolutionary. Now, we are about to enter web 3.0 and it is yet to experience the benefits the technology will deliver. Thus, the limitation of the study lies in its future trend where finding relevant articles was tough. Few well-explained articles were present on the internet to base my research study. On the other hand, there are many limitations to inductive qualitative research. All the participants were not subject matter experts both in HR and blockchain technology, their responses cannot be highly accurate as they are speaking with their limited knowledge.

For research question 1, the problems in recruitment differ according to the country, company size, and methods of operations. Therefore, a generalized statement cannot be made while in the second research question, very few people are aware of the technology and its benefits. It is not diligent to solely rely on participants’ hypotheses and knowledge regarding the technology. For research question 3, the system is proposed by the author, which cannot be considered reliable as the author
does not have any previous experience in product designing or coding. The system design has been made with the author’s limited knowledge and expertise and thus cannot be fully considered a reliable design. Also, there can be multiple limitations while conducting interviews as it was the authors’ first-time interviewing candidates for academic writing.

In this research, the author went through different research articles, conducted interviews with a maximum number of HR managers. Therefore, to increase the credibility of the research, the author recommends interviewing the blockchain developers and enthusiasts working closely in revolutionizing the recruitment industry. Multiple start-ups are working to enhance recruitment with blockchain technology. Therefore, it is recommended to understand their business model, how they have tried to build the proper ecosystem for recruitment, and their customer retention approach. By examining their strategies and technology, a clear understanding of the concepts can be done. It is also recommended to analyze how big and reputed companies have used the blockchain system in their business operations.

5.6 Implications for further research

As mentioned earlier, technology is constantly changing. With the advent of revolutionary technologies, human mankind is exposed to unlimited benefits and opportunities. But with every invention, there comes a lot of hurdles to cross. This principle is no exception to blockchain technology. Since the technology advocates itself to be decentralized, peer-to-peer connected, and highly transparent, practically building such a system is a challenging task. Also, there are a lot of ethical and data privacy concerns that blockchain technology has not been able to solve yet. On the other hand, Human resources in an organization are facing a lot of recruitment problems such as fake resumes, increased hiring cost and time, inefficient workforce, lack of verified data, which can be permanently solved by changing the existing
systems. The responsibility of Hiring managers is becoming more complex, more challenging, and more demanding.

The author recommends interviewing more software developers, blockchain developers and hiring managers working closely in revolutionizing the recruitment industry. There is a need of tremendous research in this field. Also, there are multiple start-ups, that are working to enhance recruitment industry with blockchain technology. Therefore, it is recommended to understand their business model, how they have tried to build the proper ecosystem for recruitment, and their customer retention approach. By examining their strategies and technology, a clear understanding of the concepts can be done. It is also recommended to analyze how big and reputed companies have used the blockchain system in their business operations. For example, Walmart is using blockchain technology in its supply chain process. They have created a system to manage invoices of their many freight carriers. Thus, we can carefully examine the blockchain operations led by big corporate giants and propose a system for a decentralized and more secured world.
6 REFERENCES


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7 APPENDICES

7.1 Appendix 1. Interview questions

1. How would you explain the concept of blockchain technology?
2. How would you explain the concept of e-HRM and Web 3.0?
3. What do you think are the major problems faced by HR managers or companies in general while making the new recruitment?
4. Why do you think filling up a vacant position is such a lengthy process in an organization?
5. Do you think that the recruitment process in an organization must be transparent?
6. What do you think about the changes that should be made in a company to make more strategic hiring?
7. Do you believe that the current workforce in the labor market is not qualified for an entry-level job as well?
8. What do you think is the reason that most candidates lie on their resumes?
9. What do you think are the most deciding factors when choosing a candidate?
10. Are you aware of the human resource recruitment system used by the companies?
11. Do you find any drawbacks of existing human resource recruitment systems?
12. What is your take on replacing the existing human resource recruitment system?
13. What do you think about the feasibility of implementing blockchain technology in recruitment?
14. What can be the probable use of blockchain technology in HR functions?
15. What are the problems in the labor market that you feel blockchain can solve?
7.2 Appendix 2. Survey Questions

1.) Have you heard about blockchain technology? (Yes, No, Maybe)

2.) What is your understanding level regarding the concept of blockchain technology? (1-5)

3.) What do you think are the problems faced by HR managers while recruiting?
   - Verifying the educational skills of the employees
   - Getting candidates verified data about candidates’ performance from existing employer
   - Managing cross border payments
   - Talent supply
   - All of the above

4.) Why do you think filling up a vacant position takes a long time in an organization?
   - It takes time in verifying candidate details
   - HR managers must depend upon third-party to validate candidate credentials
   - Organizational bureaucracy
   - Lack of application from qualified candidates
   - All of the above

5.) Have you ever found a candidate that has lied on their resume? (Yes, No, Maybe)

6.) How do you perform background checks of the candidates?
   - Through third party assistance
   - Through phone calls and emails as per the information supplied by the candidates
   - Through social media such as LinkedIn, Instagram, and Facebook
   - I depend upon on my gut feeling
   - No background check is done

7.) Have you ever felt the shortage of talented and qualified applications to your job openings? (Yes, No, Maybe)
8.) Do you think the existing recruiting system must be changed in your organization? (Yes, No, Maybe)

9.) Are you ready to adopt a technology that enables you to find only verified candidates, give access to many talent pools, and shorten the hiring process? (Yes, No, Maybe)

10.) What can be the organizational barriers that might restrict the application of blockchain in your company?
    - Regulatory issues
    - Potential security threats
    - Uncertain return on investment
    - Technology is unproven
    - All of the above

11.) Do you think blockchain will be the future? (Yes, No, Maybe)
7.3 Appendix 3. Consent Form

Thesis title: - Implementation of blockchain technology into Human resource recruitment

Name of the author: - Ram Chhetri

- I thus affirm that I was provided, read, and accepted the above study's information sheet and that I am happy to address the research questions.
- I realize that my involvement in the survey is entirely voluntary and that I am free to leave at any stage, for any reason, and without prejudice to my right to privacy.
- I acknowledge that the authors will retain all information and data acquired securely and confidentially and that every effort will be taken to ensure that I am not identifiable as a study participant, and I permit the authors to keep relevant data.
- I verify that I am aware that participating in this study necessitates me be interviewed and that I accept this.

I agree with the above points and wish to take part in the above study.

Participant name……………………………………

Participant signature………………………………

Date…………………………………………………

Information of the person taking the consent

Name………………………………………………

Signature…………………………………………

Date………………………………………………
One copy for the subject and one copy for the author.