

Title

The interrelationship between Blockchain and HR Practices for Improved Performance



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Declaration

No portion of the work referred to in the dissertation has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Title.....	1
Declaration.....	2
Abstract.....	1
Chapter 1 : Introduction.....	2
1.1 Background	2
1.2 Research Gap and Problem Statement	4
1.3 Significance.....	6
1.4 Scope	7
Chapter 2 : Literature review.....	8
2.1 Blockchain.....	8
2.2 Blockchain adoption in HR.....	10
Chapter 3 : Methodology.....	14
3.1 Instrumentation.....	14
3.2 Criteria for selection of participation	15
3.3 Mode of connecting with respondents	16
3.4 BC Experts in Pakistan and Sampling.....	16
3.5 Number and duration of the interviews.....	17
3.6 Data Analysis	17
3.7 Profiles of the interviewees	17
Chapter 4 : Results.....	19
4.1 BC and HR	19
4.2 BC in Recruitment.....	19
4.3 BC in Record keeping	21
4.4 BC in Compensation and Benefit Management.....	24
4.5 BC in Contract.....	26
4.6 BC in Training Management.....	28
4.7 BC in Employee Relations Management	29
4.8 BC and Its Challenges	31
4.9 BC and Its Enablers.....	33
Chapter 5 : Findings and Discussion	37
5.1 Managerial and theoretical implications	42
5.2 Limitations	44

Abstract

Since 2009, blockchain technology has taken the world by storm and penetrated almost every field. However, the question regarding how Blockchain (BC) can benefit Human Resources (HR) department is still not answered thoroughly. This study contributes to the literature on HR and BC by finding out how the two can be converged to bring more efficiency in the context of Pakistan by using a semi-structured interview approach from professionals in the field of HR and BC. The study found out that BC can be used in HR functions to bring more efficiency in the process. HR functions, including recruitment, compensations, employee relations, contracts, training, and development and complains management can be resolved with the help of BC. Study also explores the challenges and enablers in the adoption of the BC in the field of HR. The study sheds light on the fact that industry professionals can expect the convergence of the two in the coming five to ten years.

Chapter 1 : Introduction

1.1 Background

Technology has significantly improved the way we live and how this world works. From analog, the world has entered a digital era. An era where there will be no need to fill out cumbersome paperwork to get into college or grad school, an era where employers will have access to all of the achievements, sets of skills, certifications, and licenses achieved by potential employees during their educational tenure and where the potential employees will be reached out by employers to let them know that they have all the required skills which make them a right fit for a specific position. Blockchain is also one such technology that has the potential to make all of this possible. Different governments, institutions, and organizations have either adopted or are piloting to adopt blockchain to revolutionize their functions. The revolutionary nature of blockchain can help humans in every walk of life such as government, education, finance, or healthcare. In recent years, it has been proposed that blockchain can also be used in convergence with HR to help managers achieve efficiency in HR Functions.

HR has come a long way. Technologies play a very important role in the efficiency of HR activities. Every day we see new technologies emerging, and many of them come with the potential to revolutionize existing practices. Blockchain technology also has got the potential to revolutionize the way HR works. The current revolution in technologies has triggered a change in HR professionals; there is an increased demand for the learning of new skills to upgrade the innovativeness and efficiency of organizations and HR departments (Hanggoro et al., 2022; Mishra & Venkatesan, 2021; Pinna et al., 2020). Currently, all HR management systems and HR information systems function based on Browser/Server (B/S) or Client/Server (C/S) framework, where client servers frameworks have to be installed in the system and browser server frameworks can be installed on the server and can be run via browser. Simply put, an Human Resource Information System (HRIS) can either be run through a browser or a PC, and such HRIS frameworks have their issues, such as no consistency verification and the possibility of malicious tempering of the information from members of the organization. Research indicates the development of conceptual models and viewpoints on how blockchain can be used to bring more efficiency (Dhagarra et al., 2019) regarding HR practices. There is very little empirical work performed in this context.

The existing research shows how blockchain can help companies in HR functions such as recruitment and selection and achieve efficiency (Dolzhenko, 2019; Peisl & Shah, 2019a). In the last few years, platforms underpinned by Blockchain technology such as **APPII** and **CVproof** have emerged to help graduates make authentic CVs, to help employers in the verification of the credentials of potential employees, and validation of certificates from the issuers. It is a great example of how blockchain can help organizations to find verified CVs with no falsehood and help them in credential verification (Dolzhenko, 2019; Olivas-Lujan, 2019). With the cases of Blockchain adoption in institutions such as MIT and UCL for diplomas distribution and with the advent of platforms such as **APPII** and **CVproof**, it is reasonable to say that blockchain has the potential to transform HR and its functions. These few examples highlight the significance of blockchain in upcoming years and thus demand the attention of the researchers to conduct further research, specifically empirical research, to investigate the usefulness of blockchain within organizations for various functions such as HR, Finance, etc. Previous research indicated that blockchain could benefit HR functions and envision new application models (Olivas-Lujan, 2019). Blockchain has the potential to radically change the landscape for HR because of its decentralized transactions, high transparency, immutability, and security (Peisl & Shah, 2019a). The current research work thus focuses on this emerging trend and aims to explore the linkage between blockchain and HR in the organizational context.

This study was aimed at finding the interrelationship between BC and HR and how both can converge and help in the improvement of the HR practices keeping in view the context of Pakistan. While reviewing the literature, we found out that the previous studies found their potential interrelationship are very few in numbers, especially in the context of Pakistan. In 2021, few papers were published on the said matter, but those papers were focused on India. In order to conduct this research, literature was reviewed, and semi-structured interviews were conducted to dig deeper into the matter. After careful analysis of the data collected, it was found that BC can be used to benefit HR professionals to improve the efficiency of HR functions. It was found that BC technology can help in the field of education and training, which will pave the way for HR processes to use the technology. Starting from recruitment, technology can be used to make the recruitment fast, reliable, and fraud-free. Moving on, the technology can help in record management, performance management, compensation management, training and development activities, employee relations, and contract management. The study also found out

about the challenges and enablers related to the use of the technology in the HR functions. An interesting fact found out about how BC can help in tackling us in making the workplace safe for everyone by helping in tackling incidents related to sexual harassment and financial misconduct. The end of the paper includes the future directions for the future researchers trying to dig deeper to understand the convergence of the BC and HR.

1.2 Research Gap and Problem Statement

According to (White, 2017), the scholarly interest in Blockchain adoption emerged in 2013, leading researchers to explore its applications across various fields. Since then, different researchers have shed light on this topic in the context of various fields. Unfortunately, not much work has been done on this topic in the context of HR. This study aims to address this gap by investigating the interrelationship between blockchain and HR. The rationale for this study is as follows:

- Past research have shown the adoption of Blockchain (Prewett et al., 2020) in government and enterprise (Tshering & Gao, 2020), supply chain (Hald & Kinra, 2019; Rogerson & Parry, 2020), and accounting and finance (Bonsón & Bednárová, 2019). But not much work has been done in the field of blockchain and its interrelationship with HR. The potential of Blockchain to enhance the HR employee life cycle, including candidate hiring management, HR operations, and knowledge management, remains largely unexplored.
- Blockchain can significantly improve the employee life cycle in HR, as it can make HR activities more efficient and efficient HR activities such as appropriate candidate hiring management and knowledge management are important drivers of success for industries and therefore, contribution to this topic is necessary (Peisl & Shah, 2019a).
- Moreover, due to the dearth of studies related to HR and Blockchain, scholars should continue to investigate blockchain applications, their diffusion, adoption, and the outcomes of such processes in HR (Olivas-Lujan, 2019). In the start, most of the found articles were based on theoretical pieces of evidence and overview on the interrelationship of Blockchain and HR, out of which many were opinion papers, analyses, and papers related to prototypes of Blockchain usage in the specific industries; however, during the course of the research, more articles related to the field were

discovered. Most of the literature related to charity works, financial services, health, hotel chains, and hair products, etc. and studied the opportunities and challenges likely to be faced by the blockchain and its adoption in HR. It was found that most of the literature didn't focus on the interrelationship of both and the factors involved in the convergence of both, especially in terms of developing countries.

- More research in this field is to be undertaken to understand how blockchain technology can revolutionize HR activities such as employee relations and recruitment (Dolzhenko, 2019; Peisl & Shah, 2019a). Specifically, there is a need to conduct empirical research in order to develop some models based on insights from the experts in the organizations to have a thorough understanding of the linkage of blockchain and HR and how it could be useful in a developing country context.

1.3 BC, HR and Pakistan's Growing Economy

The research on the interrelationship between blockchain and HR assumes particular significance within the context of the Pakistani industry. Pakistan, as a developing country, possesses a fast growing economy, which requires the efficient HR management for SMEs and developed organizations. Consequently, investigating the potential applications of BC technology in Pakistani industry HR practices becomes imperative to enhance HR effectiveness, productivity, and overall organizational performance.

An important area of examination pertains to recruitment in HR. Pakistani industry encounters challenges in recruiting and selecting suitable candidates due to factors including but not limited to limited access to reliable information, lack of transparency, and uneven competition. By leveraging BC technology, HR can establish secure candidate profiles, validated credentials, and transparent recruitment processes. This approach aids in mitigating issues related to fraudulent resumes, streamlining the hiring process, and ensuring fair and merit-based selection.

More importantly, knowledge management emerges as a critical driver of success for industries in Pakistan. Existing methods of knowledge sharing, and management often suffer from inefficiencies, information silos, and limited accessibility. In this regard, BC can provide a

decentralized and secure platform for storing, validating, and sharing knowledge and expertise throughout the organization. The resulting environment promotes collaboration, innovation, and organizational learning, thereby improving decision-making and cultivating a competitive edge. All of which can be crucial for HR in Pakistan's economy and contribute to success of the department and overall economy.

BC can address concerns related to employee records and payroll management in this context. By employing BC-based systems, HR processes can ensure the accuracy and integrity of employee data, eliminate possibilities of tampering or unauthorized access, and automate payroll procedures. This not only enhances HR efficiency but also instills employee confidence regarding the fairness and accuracy of their remuneration.

Overall, undertaking research into the application of blockchain in HR within the Pakistani industry holds immense promise. It can address specific challenges faced by the industry, including candidate hiring management, knowledge sharing, employee record management, and supply chain compliance. Embracing BC empowers Pakistani organizations to enhance their HR processes, foster innovation, and gain a competitive edge in the global marketplace. The research findings provide valuable insights to industry practitioners, policymakers, academia, and other stakeholders, which enables them to reap the transformational powers of BC and fully improve human resources within Pakistan's industrial landscape.

Based on the above discussion, the following is the main research question:

Q1. How can blockchain help in improving the HR practices within the organizations in a developing country context?

1.4 Significance

This research will open gates for further research in the field of HR and Blockchain. Theoretically, this study will help in understanding the given phenomenon, and it will help in developing a framework that will help in understanding the interrelationship between HR and Blockchain. This research will also have managerial implications in a way that through this research, managers and government officials will have the knowledge about Blockchain adoptions, and they will make better and more informed decisions regarding the relationship between Blockchain and HRM before adopting this technology.

1.5 Scope

This research sought to investigate the possibilities of blockchain technology to revolutionize the HR departments of organizations in Pakistan.

The advantages of blockchain technology in HR departments in Pakistani organizations, such as improved efficiency, transparency, security, and cost reduction, were examined. Additionally, the factors that may impede its adoption were also identified, including lack of awareness and technical expertise.

This research was conducted in Pakistan, and respondents from multiple industries were interviewed. The outcomes of this study can be of great value to HR professionals, technology vendors, and policymakers involved in the intersection of blockchain and HR in Pakistan.

The purpose of this research was to explore the potential of blockchain technology in transforming HR departments in Pakistani organizations and to identify the challenges and opportunities for its adoption.

Chapter 2 : Literature review

2.1 Blockchain

Many organizations in the world are trying to move towards innovation in all fields of business to enjoy benefits reaped from IT innovations, and one such innovative technology is blockchain. Blockchain, also known as distributed ledger technology (DLT), is made up of two different words: block and chains. Blocks contain the information of all the transactions taking place in a network, and upon getting the desired or required number of blocks, the blocks are included in the journals, and a chain of those blocks is created, which gives this phenomenon the name of Blockchain, it is basically a distributed database where transactions and records are saved and governed by consensus mechanism (Swan & De Filippi, 2017). Invented by Satoshi Nakamoto in 2009, the main aim of blockchain was to create a secure cryptocurrency, but now, blockchain is everywhere (Nakamoto, 2008). It was invented with an aim to support the famous digital currency BITCOIN during global financial crises, which were invented with the aim that this currency would be free from the involvement of regulatory authorities (Frizzo-Barker et al., 2020). The first application of Blockchain was Bitcoin currency, but today the blockchain has become much more than just a support for the currency and permeated many fields. Blockchain technology enables the secure transfer of money, assets, and information via the Internet without the need for third-party intermediation, such as banks or other financial institutions (Swan, 2015) and uses validation, verification, consensus, and immutable recording process to ensure trust and security in its transactions. Despite the emergence of Bitcoin in 2008, literature about the application and influence of the underlying blockchain techniques only began to appear around 2013 (White, 2017). Blockchain technology has the power to revolutionize business models (Gaur, 2019) and HR models due to its characteristics, and in the longer run, Blockchain usage might be inevitable for HR. With the help of blockchain, we will no longer need banks or any other intermediaries, and blockchain will make the business and the world more decentralized (Iansiti and Lakhani, 2017). Blockchain is one of the latest technologies which can help its users to achieve objectives such as security, immutability, trust, and decentralization and eradicate the need of 3rd party intermediations (Fernandez-Carames & Fraga-Lamas, 2019). There are multiple other benefits of blockchain other than being immutable and decentralized such as it saves a lot of cost and time by reducing the need for central authority and unnecessary brokerage fees (Kim et al., 2020). Blockchain has an extraordinary potential to revolutionize business processes, and

it can be used to record and transfer anything, be that critical information or educational credentials (Gaur, 2019). Blockchain can solve many problems, such as storing the data with the help of Peer to peer (P2P) network, then verifying the data, and achieving end-to-end transparency (Cole et al., 2019). (Swan, 2015) has mentioned that blockchain is a technology that helps in enabling a secure flow of information and transactions of money and assets without involving any 3rd party organizations, including banks. The blockchain can work in various types of networking arrangements: 1) Public blockchains like Ethereum, bitcoins, etc., 2) Private blockchains such as Hyperledger, and 3) Hybrid blockchains like Dragon chain.

We know that blockchain is a disruptive technology and can be used to enjoy a wide range of benefits, yet we have to be ready for the challenges blockchain can pose to its users. Following are some of the challenges of blockchain:

- One of such challenge can be integrating BC into existing frameworks, so having a flexible deployment model is imperative.
- Other challenges might include cost, confidentiality, and security (Gaur, 2019; Tshering & Gao, 2020).
- Understanding how the blockchain works and how it can benefit can also be a challenge (Iansiti and Lakhani, 2017).
- The decentralization character of blockchain is itself theoretically vulnerable to attacks, but extremely strong computational power is required for such an act (Zīle & Strazdiņa, 2018), which means proper homework before adopting the technology is mandatory as the field is yet to mature (Bonsón & Bednárová, 2019). Hence, organizational (managerial willingness to adopt blockchain), technological (technical complexity and time constraints), and environmental (rules, regulations, government, and laws) factors can also pose many challenges to the adoption of the Blockchain (Bonsón & Bednárová, 2019).

The adoption of blockchain in many realms took momentum in 2016-2017, and it may not come as a surprise that most of the adoption has been in financial sectors (Zīle & Strazdiņa, 2018). There have been many cases of blockchain adoption in many organizations. In Pakistan, one company adopted blockchain for family remittance. This case in Pakistan shows that BC can have a bright future here since organizations are already using blockchain. Internationally, BC is

being used in different industries such as banking, healthcare, education, retail, and more (Gaur, 2019; Kamath, 2018; Kamišalić et al., 2019; Yiannas, 2018).

2.2 Blockchain adoption in HR

After analysis of literature through various resources such as Emerald, Springer, and ScienceDirect, it has been concluded that only a few articles have been published regarding the use of Blockchain and HR. The future for the research of Blockchain and HR in the South Asian context looks promising as research is starting to emerge in the subcontinent (Hanggoro et al., 2022; Mishra & Venkatesan, 2021). It is more obvious than ever that companies need to understand that investing in BC is investment for the future as many reputable organizations like Walmart, IBM, Deloitte, KPMG, and EY and institutions like MIT and Harvard have been actively investing in the concept of blockchain and its feasibility (Bonsón & Bednárová, 2019; Iansiti & Lakhani, 2017; Kamath, 2018; Kamišalić et al., 2019; Yiannas, 2018).

Researchers have claimed that it can be used in many areas of HR. Like MIT, HR departments can also use blockchain for the purposes of distributing certificates and verification of certificates. The certificates issued over BC will be quickly verifiable, saving the company time and cost. Large consulting companies point out that in the next 2–3 years, blockchain will start to be actively used in HR management as there are already examples of companies like Oracle and Cronobank that are using blockchain to improve efficiency in HR and recruitment (Dolzhenko, 2019). With the help of blockchain, organizations can choose the right candidate for a particular job, and it helps in the verification of records and confirmation of a candidate's level of education and efficiency. In fact, employers in the future might directly contact potential employees who match the job requirements as all the data relating to certificates, degrees, and other educational milestones will be recorded in the blockchain, and the potential employees might also charge companies and organizations for allowing them to go through their records, unlike current recruitment strategies such as headhunting, jobs posts, and third party recruitment. Therefore, early adopters can benefit from the transformation of existing approaches and rules (Peisl & Shah, 2019a). Blockchain technology can be put to great use in the recruitment sector as the recruitment sector, after all is a broker industry where the technology can assist in expediting commodity processes undertaken by intermediaries unlocking valuable capital to be put to better use by employers in growing or optimizing their businesses. In APPII's case, blockchain-enabled technology, which helps in the verification of candidates' credentials, suspends the need for the

broker role currently undertaken by 3rd party verification companies. The technology makes the process immeasurably faster and, at the same time, ultra-trustworthy. Blockchain technology ensures that the verification activity only happens once and is stored securely and permanently for any person or organization that wishes to view it.

Performance management and incident recording are yet another potential use of blockchain in HR. Due to its decentralized transactions, high transparency, immutable records, and security (Peisl & Shah, 2019a), many organizations in the US are trying to implement Blockchain-based to record incidents like sexual harassment, and many organizations might be using it for employee assistance programs. Vault Platform is an example of such a blockchain-enabled app that can be used to report any incident, such as sexual harassment, with complete anonymity. The report can be made directly to HR. The app also helps in investigating the past or present of the accused.

Pieces of evidence show that issues related to HR are bothering not only HR but also non-HR functions of the organization; both HR and non-HR functions in the organizations agree to the fact that there is a need to change the way records are handled by HR departments in the organization and blockchain can help with this in the HR industry (Mishra & Venkatesan, 2021). BC works for both ends of the employment - employer, and employee. It helps bridge the gap between the potential candidate and the employer and also provides a completely trustworthy record-keeping mechanism for skills, history, and educational certificates, which can help the employees in career growth in the future (Liu et al., 2020; Nurhasanah et al., 2021). Experts believe that BC technology can overhaul the entire system of HR department. With this technology, candidates will be able to share sensitive yet verifiable information with the recruiters or the HR departments, such as certificates, skills, qualifications, and achievements (Mishra & Venkatesan, 2021). For the existing employees, data regarding their past work history and task completed in the past will be recorded, which will enable the organization to create a road map of the achievements and skills of the employees and assign the right task or project to the right person (Nurhasanah et al., 2021). Records of failure and success of the employees and other critical incidents such as layoffs, promotions, demotions, or transfers will help HR make more educated and efficient decisions regarding the appointment, payroll, and career advancement of the employee which may or may not be completely employee centric benefit of

the BC (Michailidis, 2018). A usual recruitment process involves background checks and prior history checks of the potential candidate in order to know if the candidate has the potential and capability to perform the tasks and duties of the job at hand and this could mean a huge expense in terms of money and time, but with the help of BC this could be simplified to a great extent, and the right candidate can be selected in a much faster way (Sarda et al., 2018). Over time, HR has evolved significantly and transformed the employee experience, but BC technology will take it a step further (Michailidis, 2018).

Research has shown that BC can be used in compensation and benefits management (Salah et al., 2020). A growing body of research has shown that there is a promising future for BC in the reward management function of HR. An extension in the BC technology called "Smart Contracts (SC)" can be utilized for compensation and contract management (Pinna et al., 2020). Frameworks and models have been developed to use BC in the function of reward management (Wang et al., 2017). Employees can be rewarded in both financial and non-financial ways. With the help of this technology, employees can be rewarded for the value they add in terms of monetary and non-monetary benefits (Coita et al., 2019). Smart contract technology of the BC can come into play for reward management. Based on Smart contracts, frameworks can be developed which can be used for rewarding the employees in decentralized crypto-tokens which can be used to exchange presents or vacations (Coita et al., 2019). With Smart contracts in place, automatic contracts will be created automatically, which will authorize the payment of rewards to the workers if the conditions in the contracts are met (Pinna et al., 2020). The promotions, rewards or compensation will be smartly given to the employees and the employers will have less trouble managing the performance and overall progress of the employees and projects. In this way, transparency will be achieved in terms of sensitive issues such as reward management which in return boosts the morale of the employees and enables the organization to create a sense of fair treatment and establishes a positive atmosphere (Wang et al., 2017). Not only the payment of salaries will be optimized but the settlement of the payments will also be expedited with the BC technology, large enterprises are using Bitwage (a BC enabled platform) to pay salaries to the employees (Koncheva et al., 2019). Overall, with all the revolutions and use of cryptocurrencies for international payments BC is, in a true sense, revolutionizing the HR in this era (Michailidis, 2018).

The blockchain does not come without its challenges. One of the major challenges associated with the adoption of Blockchain technology is the cost factor, but the research has also shown that although the technology needs high installation and setup process costs compared to the existing system, however in the longer run, the returns should outweigh the investment cost (Onik et al., 2018; Salah et al., 2020). It is believed that Blockchain technology will be more cost-effective in the future (Michailidis, 2018). Adopting Blockchain technology requires a good amount of consideration, planning, strategy, and effective leadership. So, what organizations should do first is to take on board all the employees and managers who are interested in Blockchain technology and take the help of the IT department for educating the personnel and the successful implementation of the technology in the HR functions (Lukić et al., 2018). Keeping in mind the nature of Blockchain technology, the HR department should be ready to enhance the skills of the employees who might be affected by the adoption of Blockchain (Michailidis, 2018). One of the challenges could be the support from government bodies and key organizational figures for the adoption of blockchain. So if these figures support the adoption of blockchain, then resistance to the adoption of blockchain becomes difficult for the employees (Salah et al., 2020). Another major challenge associated with the adoption of blockchain could be the lack of awareness about the technology, followed by a lack of organizational readiness for change (Clohessy & Acton, 2019). Lack of competent personnel for Blockchain development and adoption, fear of getting laid off employees, security vulnerabilities, lack of widespread use cases of Blockchain in HR functions, and speculations about lower returns against high investments are also the leading challenges in the adoption of BC (Salah et al., 2020).

Chapter 3 : Methodology

This part of the study describes the methodology used to collect and analyze the data of the study to reach a meaningful conclusion.

3.1 Instrumentation

It is critically important to understand the technique for conducting the research in order to completely comprehend the concept. For this study, a thematic analysis approach was chosen. Since the idea of BC is relatively new for the field of HR and there is a dearth of previous research in this field so qualitative study was opted for, as a qualitative study is considered to be an ideal approach for scientists to explore a new concept or a phenomenon and it is considered a good approach to have an improved understanding (Aspers & Corte, 2019) Qualitative research is considered when we need to collect rich data about a phenomenon, to fill the gaps in the literature and provide a basis for future studies for further exploration and helps us understand the dynamic concepts of the world (Ohman, 2005). This in return, guided the way questions were asked and answered to, in order to understand the phenomenon. Hence, data was collected in the qualitative form to understand the phenomenon. Multiple probing questions were asked from the respondents for the study in order to understand the deep qualitative perspective of the topic. Questions were asked using what, how, why etc. to dig deeper into the concept.

Due to the fact that very little research has been conducted on the topic of HR and BC, exploratory research was conducted in order to understand the concepts and connect the dots. With the help of exploratory research, a thorough understanding of the concepts was gained. The interviews and discussions included theoretical aspects of the BC.

Since the existing knowledge regarding this topic is not enough to develop a questionnaire, we used interviews to collect data. For collecting in-depth knowledge of the topic, we used semi-structured interviews (Gill et al., 2008). Considering the nature of the study, the semi-structured interview approach was preferable due to its adaptability, flexibility, and the possibility of following up on interviewees' responses and providing informative material (Rowley, 2012; Salah et al., 2020). While attempting to understand the concept, Pakistani organizations were chosen as the context of the study. With the help of semi-structured interview, the respondents were given the liberty to explain the concepts and help in gaining valuable insights regarding the topic.

3.2 Criteria for selection of participation

The topic of blockchain is an emerging one so finding people related to the HR domain with knowledge of BC was difficult, so we went with a mix of HR professionals with theoretical knowledge of BC and BC experts with knowledge of HR. Respondents were considered from different business sectors to make results more generalizable. Part of the interview questions was asked from questions taken from previous studies conducted on BC (Barrett-Maitland et al., 2016; Tshering & Gao, 2020), and some questions were asked from the context from the literature review (Tshering & Gao, 2020). The respondents for the study were selected from multiple industries, including Banking, IT, telecom, academia and more. A mix of purposive and snowball sampling methods was used in order to find respondents. This research was conducted as an attempt to understand BC technology and to find out how and why BC technology can and should be used in improving the overall efficiency of the HR department of the organizations in Pakistan. An attempt was made to understand the usefulness of the said technology for the overall organization in general. Another aspect was to understand the underlying challenges and enablers for the adoption of the BC. In order to understand the aforementioned phenomena, open-ended questions were asked using what, why, how, and when questions. Such questions helped in understanding the context, reasons, facts, and meanings of the phenomenon. This is the reason why qualitative method of collection of data was used to understand the novel technology and its interrelationship with the HR and a deeper understanding was developed about the challenges, enablers and other facts related to the technology (Aspers & Corte, 2019; Gill et al., 2008; Ohman, 2005).

For this study, method of interviewing candidates was used to collect the data and understand the phenomenon. No other method of collecting the data was used due to multiple limitations. The limitations included a lack of BC experts in Pakistan with knowledge of HR and HR experts with substantial knowledge of BC, an outbreak of novel coronavirus disease, time for the collection of data, the willingness of the people to be included in the data collection process and more. Using the said method of collecting data helped develop useful insights related to the topic of BC technology as a science and its interrelationship with HR. Interesting insights were gained regarding the challenges and enablers of the technology.

3.3 Mode of connecting with respondents

Due to the covid-19 situation, no interview was conducted in person. Respondents were primarily contacted through LinkedIn. Other than that, resources like email, WhatsApp, and Facebook were used to contact the respondents. For conducting interviews, resources like Zoom and phone calls were used to reach the respondents. Probing questions related to BC were asked from the respondents to understand the concept of BC, its nature, origin, its usage in different industries and mainly the questions revolved around how can the BC technology be of use in the field of HR. After the first four interviews, the data was analyzed to find the themes and to find out if the research was going the right direction, and then more interviews were conducted. Before interviewing, the consent of the participants was solicited for recording the interviews. Two respondents didn't wish to get their interviews recorded so the interviews were not recorded. A cover letter with the questions to be asked and a short description of the study was sent to every respondent before conducting the interview. The data of the respondents and the recordings have been kept confidential and strictly used for educational purposes.

3.4 BC Experts in Pakistan and Sampling

The field of BC is still very understudied, and the field of BC and HR is even more understudied. This leads to the fact that the experts in the field of BC in Pakistan are a handful; most of them have some or little knowledge of HR. Following this, very few options were left. Currently, few companies like Faysal bank and a Fintech company have invested in the BC technology in order to improve the transactions system. Still, none of the companies have diverted their attention towards the adoption the BC technology to improve the overall efficiency of HR.

This led to the fact that the respondents were not chosen from a single company or industry. Due to the smaller number of BC experts with knowledge of HR, the selection of the respondents for this study was made on an open basis and not confined to a single industry or group of companies. So, respondents from multiple industries were taken into consideration ranging from IT industry to the telecom industry, from the shipping industry to the banking industry and from the education industry to the textile industry. The respondents held different positions in different companies in different departments. Respondents included males and females from multiple industries. Due to the challenges in the process of collection of data, as mentioned in the

discussion, no pilot interviews were arranged. After the analysis of every interview, questions were reviewed carefully to maximize the efficiency of the data collection.

3.5 Number and duration of the interviews

The optimum number of respondents for a qualitative study varies from context to context. Meanwhile, keeping in view the novelty of the BC technology, a total of 12 interviews were conducted with a duration averaging around twenty-nine minutes. For a study like this, this number and duration can be considered adequate (Rowley, 2012). The duration of the interviews was tweaked based on the information being given by the respondent with the sole purpose of finding out more about the topic.

3.6 Data Analysis

We used a thematic analysis approach to reach conclusive results. Initial coding and analysis of the codes was done using atlas.ti 9 (Friese, 2019) thematic approach is a well-known qualitative analysis technique to reach conclusive results in order find out about a new phenomenon and provide thick ground for the further studies. Themes were identified based on the data collected through interviews and transcripts. The thematic analysis approach is considered an effective way for the new researchers to make their way into the world of research (Kiger & Varpio, 2020).

The interviews were recorded for the purpose of proof keeping and transcription. Every interview was transcribed on an early basis to ensure the direction of the research was in line and in order to make any necessary changes in the question of the interview if the need be. Every interview was coded twice in order to ensure that all the themes presented by the data were completely identified and analyzed. Softwares like zoom, MS word, and Atlas.ti 9 were used in order the collect and analyze the data.

Moreover, the themes finalized after the careful analysis was revised and were used as headings in the results section. Themes such as BC and HR, BC and recruitment, BC and Recordkeeping, and more.

3.7 Profiles of the interviewees

SR NO	EXPERIENCE IN YEAR	INDUSTRY	LOCATION
1	20+	Blockchain	Pakistan
2	20+	Supply Chain	Dubai
3	3	IT	Pakistan
4	7+	Finance	Pakistan
5	5	Blockchain	UK
6	5	Banking	Pakistan
7	7	Banking	Pakistan
8	4	Blockchain	Pakistan
9	4	Telecom/Fintech	Pakistan
10	20+	Textile	Pakistan
11	4	IT	Pakistan
12	5	Education/Fintech	Pakistan
13	8	Education/Blockchain	Pakistan
14	3	IT	Pakistan

Chapter 4 :Results

After doing data analysis using atlas.ti 9, we reached some conclusive findings about the phenomenon.

4.1 BC and HR

This study was basically an attempt to bridge the gap in the literature for BC and its adoption in HR. With the help of data, multiple code groups were formed to help understand the phenomenon of how we can use the technology in the HR. Following are the code groups with the detailed findings:

4.2 BC in Recruitment

The topic of recruitment is the most studied topic when it comes to literature on BC and HR. Multiple authors and researchers have given their input regarding how the BC can be used in the recruitment process and how it can be useful. This study focuses on the theoretical part of what the BC can do for this function of HR.

The authenticity feature of the BC is very useful for the purpose of recruitment. With the help of BC, we can revolutionize the recruitment process of organizations. Systems like APPII are in place which are used for designing CVs with authentic and verifiable information. With the help of BC, we can get rid of fake resumes.

D:13 also mentioned this fact,

"there will be easy recruitment, easy verification. No fake resumes. Only Ideal candidate(s)."

So, not only can fake resumes be gotten rid of, but also a lot of time can be saved using BC-enabled recruitment.

D:4 mentioned:

"Such as I have taken any staff on board. Now his/her educational credentials need to be verified since everyone who comes here has attended at least three educational institutes. So, the credentials are sent to HR, HR sends them to third party organizations which in turn gets it verified and returns to the bank which takes 45 days, but it is subject to the existence of universities within Pakistan".

It can be argued here that as compared to developed countries, the verification process in Pakistan is either very slow or not very authentic, so the implementation of BC enabled verification process is likely to have a very high impact on the recruitment processes in Pakistan.

According to D:1, with the help of BC,

"The process will become more efficient, and we will save more time."

D:4 added,

"in recruitment, record keeping, such as checking the experience of the previous staff. so, efforts and additional duties of HR will be reduced, and time will be saved".

D:6 explains it like this,

"suppose all this biodata including your expertise and degrees and certification, if they are a part of BC, such as if we keep data (certifications) on BC, such as NED (University) Karachi, then a lot of hassle of HR dept. will be finished." With the help of BC-enabled recruitment, HR department will be able to look into more strategic matters due to the time saved. The recruitment process will be hassle-free.

D:7 mentioned,

"This makes data retrieving very easy and makes decision making very fast. A database where there is structured information regarding all these things in the shape of BC of skills, education, and competencies, I think I would be in a better position to make a decision and do recruitment in a structured manner, pinpoint manner, laser-sharp focus."

D:2 mentioned,

"each individual in your company will be documented in the BC as soon as he joins. His experience and education will be already listed.". This will make it easy for the employers to track the experience of the candidate and validate it

To sum it up, a BC-enabled recruitment process can be more authentic and accurate. As D:3 puts it, "Candidates will be coming from a proper and authenticated system, and employers will get authentic information about the candidates' prior employment history and validated documents."

D:5 mentioned,

"BC is useful to add transparency, authenticity, and verifiability in every process."

4.3 BC in Record keeping

Many companies find it difficult to either ensure the safety of the data or to keep the data temper and corruption free. While any theft or corruption of the company data ends up causing financial damage to the company, it also poses a question of its credibility. Such data breaches can cause companies to incur huge losses. Blockchain can provide a solution to such problems. With blockchain, the data stored is more secure, reliable, and immutable. The records can be saved not only in an authentic way but also in a temper-free environment which means with time, the information added to the records will not be temperable without the mutual consensus of the parties. Hence, justice and accountability can be ensured with the help of BC. D:6 noted, "BC can be implemented in HR. Starting from recruitment, referencing, payroll, and authentication of docs. Training and system record auditing, and even your end service benefits."

D:04 mentioned,

"the most important thing is that it (BC) helps us in verifications and data keeping."

D:5 added,

"Manager gives them any points, it can be recorded and calculated, and then you will know who is the better performer and what numbers can be allotted to someone."

D:2 added,

"BC is something that is immutable. which means once you store it, it can't be changed".

Thus, all the respondents believed that with the help of BC, a systematic record-keeping mechanism could be put in place, which will help in ensuring the verifiability of the information and accountability. This feature of record keeping also helps the employee in a way that with the help of the stored information, background checking of the candidates' work history can be easy and more authentic.

D:2 highlighted its importance,

"each individual in your company will be documented in the BC as soon as he joins. his experience and education will be already listed"

and D:4 highlighted the same feature of BC and discussed the way BC can save the time for HR by further elaborating,

"with the help of BC in recruitment, record keeping, such as checking the experience of the previous staff. So, efforts and additional duties of HR will be reduced, and time will be saved".

Finally, D:7 stated,

"employee or people record management can be organized in a very efficient way. We need that data to be retrieved for analysis, and through this mechanism, retrievability of the data can be much easier. So, data related to job history, experiences, training and development, capability development, education, skills, and competencies".

One possible avenue the record kept on BC can help in HR is in the form of performance management. With the help of BC, performance management can be simplified. The Smart Contracts feature of BC can help in minimizing the disputes related to managing the performance of the employees in the organization.

D:6 explained Smart Contracts' use in performance management in this way,

"In PM, see if we use Smart Contracts, which is computer coded program in BC which based on if it then that formula, SC has the capability to be subjected to fulfillment of some task".

Simply put, BC can help us in managing the data in a way that can also help us in managing the performance of employees. A validated account of all the events and performances can be put on the BC with real-time feedback. Also, the finalized feedback can also be stored on BC.

D:3 highlighted the role of BC in ensuring accountability,

"Some contracted employee goes against the contract, you can make it visible to him/her, as everything is stored."

D:5 also elaborated on the idea of accountability and anonymity, which is ensured by BC,

"if there is any dispute, such as someone claims that I am a better performer, then you can track the whole process, such as what has been done and how the manager has given feedback if you want to give some feedback about your organizations or senior managers, then usually ppl are not honest because they fear repercussions they might face or getting targeted for negative feedback so anonymity in this sense as well can be brought through BC and then it also keeps it authentic as if you complain about somebody then that somebody can't go and remove the complaint."

D:6 added, "smart contract will itself evaluate a member of an organization and tell what they have done the whole year and where they stand now."

Smart Contracts have the ability to measure the performance of any individual based on the completion of tasks and duties.

D:2 mentioned the process of how SC can work in performance management,

"What BC does is that through SC, every milestone is translated into actions and automated, e.g., if you tell me to teach these many subjects and you will pay me this many dollars, and when I teach you, you automatically transfer my money. SC is a very smart thing to do. They are smartly based milestones in the system. so automatic activity takes place. So, if any phase of performance is missed, payment will be stopped because SC does not see anything but performance."

We can infer that if we incorporate smart contracts in performance management, we can easily assess the performance of the employees and use the record to improve overall organizational efficiency.

D:13 added,

"Performance management will be easier. People will be able to justify performance management. Employers and employees will be happy."

To sum it up, BC can be a very useful tool to record data for future reference and in managing the performance of the employees of an organization. The immutable and temper-free nature of BC can help in recording critical incidents. Data stored can be retrieved in no time with a hundred percent authenticity. Overall, it can help build a more accountable and trust-free

environment in an organization. Experts also believe that with the help of AI and data stored on BC, predictive analytics can be run to forecast the supply and demand of the workforce in an organization. With the help of data stored on BC and trends, it can be predicted how soon an employee would stick to the role and organization and how long an average employee can stay in the current role. Not only that, but it can also save the company from incurring huge costs in terms of litigation, goodwill, and time. With the abundant availability of data in BC, data can be used to identify, interpret, analyze, and visualize the data to predict behaviors. In this process, data from past can be used to predict the future behavior of any subject and in this matter, employees. In today's fast-paced employer market, many industries are employee-driven and such predictive analytics can ensure an efficient supply chain of the talent for the employers.

4.4 BC in Compensation and Benefit Management

BC is popularly known with reference to cryptocurrencies, primarily Bitcoin since it was the first widespread cryptocurrency. To date, many people confuse BC with cryptocurrency. While it creates confusion for people, HR should be wise enough to see the window of opportunity that it opens. Cryptocurrencies are backed by BC. In other words, BC is a support system for all cryptocurrencies. What needs to be pondered here is that cryptocurrencies were initially introduced to eliminate the need for any intermediaries, i.e., banks or any other financial institutions, for any financial transactions. The same can be done in HR to make payments more secure and geographically boundaryless, which can solve the payment and remittance issues worldwide.

Smart contracts can play their role in compensation and benefits management as smart contracts function on the "if this, then that" phenomenon based on tasks set parameters agreed by both parties.

D:3 mentioned,

"You can pay the employee through blockchain, and you can make a smart contract and based on the terms of the contract, you can pay the employees as there is a concept in blockchain called smart contract through which when an employee completes any task then he will automatically

receive the remuneration agreed for that task. You can give a bonus to employees if they perform well, and that will be automatically done by Smart Contract".

D:5 highlighted,

"Internal working of HR such as payroll and reporting, to make it more auditable and compliant, so you can bring more transparency in these things".

D:9 added to the conversation of BC and payment of salaries respectively, "technically payroll function can also be greatly simplified with the help of cryptocurrency by reducing the need of paperwork and manpower".

D:1 talked about promotions and the role of BC in it,

"with the help of Smart Contract of BC, the person with say ten tasks, and say the person has accomplished 8, and then we will be able to decide if the person will be promoted in next year or not".

D:6, "some organizations can develop some native tokens such as Bitcoin and Ethereum, so org can develop tokens so that at the end, tokens can be given to performers at the end and those tokens can be redeemable in terms of cash, promotions and such. So, it is a good application if we bring PM to Smart Concepts".

So, we can easily conclude that we can incorporate BC in the compensation and benefits management of HR. The Smart Contracts technology within BC can help in the payment of salaries and improve the overall efficiency. The Smart Contract technology helps in automizing the process of payment of salaries. Which helps get rid of issues faced by the employees and organizations in the conventional salaries payment system. Not only does the BC help automize the process, but it also helps make the process secure and fast. If the organizations plan to implement BC in salary payment, there are many ways through which it can be achieved. Companies can either use the Smart Contracts technology for dispensing the salaries of the employees. Companies can also, tokenize the salaries and use any of the many cryptocurrencies to pay employees. It can also be used for rewarding the star performers for their outstanding performances. It can also be used to pay the employees who are geographically dispersed. With

the idea of intermediary-less transactions, peer-to-peer transfer of payments can be done with the help of BC and BC-enabled cryptocurrencies. It helps employers in saving time and costs otherwise incurred in a conventional salary payment system where salary management is a time taking and tedious job.

4.5 BC in Contract

As mentioned in the earlier part of this chapter, the Smart Contracts can help a lot in the field of HR. When it comes to contracting any particular job or task, Smart Contracts can really come in handy. Smart Contracts have characteristics that help in the onboarding of new contracts and managing the performance and compensation of both parties, which can help the managers and companies hire better, assign better, track better and save both time and effort. Contracting can be made internationally, and a more widespread market can be tapped with the help of BC. An automated system of payment assessing the completion of tasks can make the managers' job a lot easier, and managers can focus on more strategic problems. With the increase in globalization and offshoring, managers can benefit from a wider candidate pool with lower costs and higher profits. This happens when international organizations hire talent from developing countries on a freelance basis or contract basis. Platforms like fiverr.com and freelance.com provide help to buyers and sellers of the services, but that comes with multiple challenges in terms of cost and authenticity. With the smart contract technology, more authenticity and reliability can be brought into such services and contracts. Also, with this technology, the cost of intermediaries can be saved. This will help talent from developing nations like Pakistan to reap the benefits of employability worldwide. The rise in the gig economy can see a boost in the future with the help of Smart Contracts.

According to D:8,

"You can use BC in the recruitment process. You can write contracts on BC".

D:5 added to the discussion, "hiring can be done through smart contracts. Through smart contracts, both parties are safe".

D:9 highlighted the role of Smart Contracts in managing the performance and payroll of the contract employees and how smart contracts can minimize the potential dispute which might take place during the payment schedule,

"You can show deliverables of contracts on smart contracts. Such as, I have a freelancer, and if he delivers and I have to pay him, but I don't, then in that scenario, you can commit the payment on escrow, and you can save yourself from any dispute".

D:7 also mentioned, "Recruitment and contract writing of such employees can be facilitated with the help of BC".

D:5 added, "You need short term and contract basis workers, and you have to pay them in other countries then this way smart contract can be used."

Experts highlighted that not only in the recruitment process of (contracted) employees but also the management of their payroll, performance, and other disputes can be dealt with, with the help of Smart Contracts.

D:3 highlighted,

"You can make a smart contract, and based on the terms of the contract, you can pay the employees; if you think some contracted employee goes against the contract, you can make it visible to him. as everything is stored. Because no single party can change the contract without mutual consent, this is how you can show them that this was the contract in the start, and you went, or you are going against it".

Smart Contracts save both parties in terms of contracts, performances, and payments and overall improve accountability.

Overall, with the help of Smart Contracts, we can make the contract easily visible to all the employees. Since the contract would be visible to both parties, no one can take advantage and misuse the authority.

As D:6 mentioned,

"BC doesn't see anything but performance."

Management of time can also be done with the help of this system.

As D:14 said,

"we can assign time restrictions to people and get the help of smart contracts. Information like screen sharing and screen time can be used to track the performance of such people".

So, to knit it all up, D:6 mentioned,

"so, this is one thing as everything will be verifiable, and management will not give undue favors due to set parameters."

So, it is clear that with the help of BC and specifically with the Smart Contracts technology of BC, we can manage the contract and permanent employees in a more efficient way. The use of this technology can help us in managing the hiring of employees, managing the overall performance and payroll all the way to the end of a contract or tenure. The use of Smart contracts can promote more accountability for both parties in the contract. Developing countries like Pakistan face many challenges in terms of the management of contracts, and many times, parties from either side can be vulnerable to the breach of contracts and unsafe in terms of employment laws. Smart Contracts can help the contracts to be more airtight to hold up in case of any dispute.

4.6 BC in Training Management

Relatively, there is still a dearth of knowledge among experts regarding how technology can be used to enhance training management in HR. However, many institutes around the world are offering BC-enabled verifiable training programs, degrees, diplomas, and certifications backed by BC. More often than not, HR departments around the world struggle to get the training and educational certificates of the candidates verified for their authenticity. Verification of the documents takes a lot of time for the HR department. The idea of having a degree and educational credentials which are verifiable by BC can save lots of time for HR. One of the avenues being considered for exploration is e-learning with the help of BC.

Talking about the relationship between BC and Training management, D:2 elaborated,

"certification and courses and skills can be obtained from many sources, and all the info about your training and skills will be on BC."

When we save the information of training and development activities on the BC, it can serve us in many ways. One of the ways is that while the training and development department plans on training the next lot, the department will already have sufficient knowledge regarding which employee of the organization has completed what kind of training and certification, as all the records will be maintained on BC. Records related to the overall skillset of the employees and the reviews related to employees' skillset and their level of expertise will be stored on the BC. Even the evaluation made by the peers can be stored on the BC. Employees will themselves be able to track their training records. This overall helps the company to build a knowledge management and knowledge sharing mechanism, which finally helps the company and HR to enhance the overall skills set of the employees and identify gaps in the employees' skill set.

Adding to this point, D:3 mentioned,

"Pool of employees can be made, and their information can be stored so that this employee gets noticed by learning new skills and it will be beneficial for the employees' career-wise. You can store the certificate and also verify the training certificate".

We can summarize that HR can benefit from BC technology in terms of managing the training of employees. With the help of BC-backed training certificates, degrees, and other educational documents, we can easily verify the educational credentials of the employees. This not only saves time but also improves the chances of getting authentic information about the existing and potential employees of the organization. Not only that, with the help of BC, the records of all the employees regarding their needs of training can be stored as the records of the ones having certifications and training on multiple topics. With the help of this information, HR can easily and efficiently run a training and need analysis campaign, and HR can easily trace the most credible individual to train the potential trainees, thanks to the verifiable certificates. There are institutes such as **edgecoin** and **Accredible** which provide BC-enabled certification for education providers like google and **udacity**. Through these services, companies can provide one-click verifiable certifications and training to the employees. In other words, with the help of BC, managing and sharing knowledge will become much easier.

4.7 BC in Employee Relations Management

While gathering data, multiple findings were made regarding the use of BC in HR to manage employee relations. When it comes to BC in HR, not only does the employer/manager but also

the employee reaps the benefits of the technology. As mentioned in previous discussions, not only does the employer/manager save time, cost, and energy but also the rights of the employee are protected. Data can become more accessible to the both parties, and no party can exploit and deny the rights of the other party. In other words, both employer and employee can save their time, cost, and energy and protect their rights. So, the BC is a win-win for both the parties.

D:3 elaborated on the point of a win-win situation in terms of the authenticity of data and trust,

"In blockchain, there is a system called consensus algorithm which actually means that for entering a data, you have to get the consensus of the participants. The participants should be of a consensus that the data being entered is correct. So, when authorized participants agree to the authenticity of the data, then the data will be entered. Otherwise, you can never enter the data. So, the participants have a trust in the data that the data is authentic and reliable".

One of the major aspects of managing employee relations is managing the grievances of the employees, and with the help of BC, a new platform called vault has been launched with the help of which managers can take note of all the grievances of the employees and manage them in a more streamlined manner.

About grievances, D:5 mentioned,

"I think to launch a complaint and then its investigation, such as harassments as you know these cases are on the rise these days. so, we can use BC in all these things.

D:10 mentioned,

"Everything will be recorded, and people will have knowledge about their data. More issues will be resolved in lesser time. Organizations will save money in the form of litigation. Cases of grievances such as harassment will be easily resolved with the least bias. Generally, complaints about harassment and unfair treatments or maybe grudges or prejudices can be reported and investigated through BC".

D:5 highlighted the factor of anonymity and mentioned,

"If you want to give some feedback about your organizations or senior managers, then usually people are not honest because they fear repercussions they might face or getting targeted for negative feedback so anonymity in this sense as well can be brought through BC and then it also

keeps it authentic as if you complain about somebody then that somebody can't go and remove the complaint."

D:13 mentioned,

"More attention will be given to the issues related to employee relations. Employees-related issues such as litigations and harassment will be able to resolve without any bias".

D:5 also mentioned,

"Complaints about harassment and unfair treatments or maybe grudges or prejudices can be reported and investigated through BC."

Another aspect that the BC can help employee relations with is attendance management. Attendance management can be completely revolutionized with the help of BC.

D:5 described how BC could be used in BC and mentioned,

"I think you can take attendance on BC. You can attach a biometric system on BC. as to when they enter the office and when they leave the office. If that's what you are looking for. Other than that, you can track the number of hours employees have worked".

D:6 mentioned,

"We can see about employees attendance, with their thumb impression, which is connected with SC, and to see if they have been punctual, their leaves have been in balance, all these things will be evaluated with SC."

We can conclude that with digital ledger technology, BC can help in managing the employee relations in a better way. From managing impartial recruitment and selection practices to managing attendance and from managing any grievances to managing cases of harassment, BC can help HR in managing the stakeholders in an efficient way.

4.8 BC and Its Challenges

Like any other technology, BC faces a multitude of challenges in this world. Especially, in a country such as Pakistan, where adoption rate of technology is much slower than the rest of the world. When we compare groundbreaking technologies, including such as the Internet, comparatively, BC can still be considered a newer technology. Like any other technology, there

is much hype around the BC, but it doesn't always ensure that the masses are completely well-aware of the technology and its scope. The adoption rate of new technologies in Pakistan has always been slower than in many other countries worldwide. In a world where everything is going digital, Pakistan still struggles to adopt new technologies and ensure to maintain the public trust in digitization in the domains like digital banking.

Talking about the challenges related to the BC and its adoption, according to the respondents, the most commonly found challenge was awareness of the technology and misunderstandings created by the hype around the technology. First and foremost, the technology is usually confused with Bitcoin or any other cryptocurrency. It is noteworthy here that the BC technology is a supporting technology for the cryptocurrencies, including Bitcoin, and not the currency itself.

Other challenges were also highlighted by the respondents. The main among them was the newness of the technology. Due to its nature, there is no clarity among the masses.

D:4 also mentioned,

"New technology will feel some resistance before getting implemented."

Another challenge related to BC is human resources.

D:9 mentioned,

"it is not just about adopting BC, but also about who will manage, and who will check its integrity, and how it will be accessible."

D:6 mentioned, "at this stage, the biggest problem is generally, and in terms of HR in Pakistan, we have a small number of BC specialists. If you don't have a good workforce, then adoption is definitely difficult".

D:2 mentioned,

"You will need experts and architects and the whole team of BC for integrating the HR matters of that organization to BC."

D:5 also highlighted the challenge of trained resources for the BC by mentioning, "training on the new system will be a challenge."

The overall mindset of the people matters when it comes to the adoption of any technology. Few respondents mentioned the mindset and the focus of HR toward the BC as a challenge.

D:5 mentioned,

"There is this mindset about "if it is not followed in the west, how can we do it." that causes more delays."

D:13 mentioned.

"Lack of training, lack of trained employees, lack of focus towards digitization, lack of trust in BC, lack of digitization in Pakistan, the mindset of the employees and employers towards improving the organizational processes using BC."

It is easily understandable that the awareness regarding the use, adoption, and application of the technology is seen as a major challenge hampering the overall growth of the BC in the industry and overall system. A solid understanding and investment in the technology to fully comprehend the idea behind the technology can help us improve the overall system. Challenges other than awareness, include challenges related to fear of digitization, mindset towards the adoption of new technologies like BC, focus on the adoption of technology like BC, and the newness of the BC. Understanding these challenges and finding the solutions to these challenges will be imperative to accelerate the adoption of the BC technology.

4.9 BC and Its Enablers

There are always some factors that can work as enablers for the adoption of technologies anywhere. In terms of Pakistan, there are many factors that can play the role of enablers for the adoption of BC technology. The foremost enabler for the adoption of the technology is improving the overall awareness related to the technology in the masses and the HR. Other than that, training the resources entering the market and the ones already existing in the market can drastically improve the situation. A push from the customers and government can also act as a good enabler for the adoption of the technology.

While answering the question regarding awareness,

D:3 mentioned,

"Awareness about the benefits of BC", could help in enabling the adoption of BC.

D:6 mentioned,

"Create some awareness regarding BC and if you meet HR professionals and create awareness in BC in HR."

D:7 mentioned,

"I think at least what academia can do is to enhance the overall awareness of ppl in the shape of webinars from BC professionals."

D:10 mentioned,

"Covid has shown us that digitization can be possible in Pakistan. People need to be educated first".

D:14 mentioned the enablers of BC by saying,

"Goal setting, awareness, start small, and government support".

D:8 mentioned about education, transition, and adoption of BC,

"Transitioning of going from existing hr system to BC will require time and training and verification and investments, so all these things are hampering the initial drive of adopting BC."

Another way to enable the smooth adoption of BC in HR should be starting it slow and taking small steps with proper measurements to ensure the long-term effectiveness of BC.

D:8 mentioned,

"We can let the data flow from the new BC platform and see whether it is being beneficial or not and then after one year of understanding the system and training of the human resource and using this system".

D:5 mentioned the slow piece-wise adoption of BC and said,

"You should start small. You should take a critical function and then duplicate the learning on the system which is already running. for example, pay roll function can be used for this purpose. And see how it works. Do it piecewise and then scale it up".

An interesting case of the time of covid-19 proves how some unusual events like covid-19 can lead to drastic changes in the system and how such changes can facilitate change and help in the adoption of technology and digitization.

D:7 mentions,

"The speed of mental shifts in the covid has been very fast. Keeping that in mind, it is likely that very soon, awareness of such things will be there in HR professionals".

D:10 also mentioned, "Covid has shown us that digitization can be possible in Pakistan. People need to be educated first".

D:7 further elaborated,

"I think in covid, everything about awareness is changed."

Finally, a push from within the company, customers and clients, and government bodies can enable the adoption of BC in the system.

D:4 highlighted about how push from external sources can act as an enabler by mentioning,

"See WhatsApp has become a necessity, so everyone is using it. same goes for BC, when it will become a necessity for everyone, it will be used in Pakistan. same goes for zoom".

D:5 highlighted the importance of a push from within the organization from different departments, which will enable the adoption of BC by HR and mentioned,

"if these depts take initiatives or push the departments or bring awareness to the people of HR dept. then I think HR will move in that direction."

So, it is evident that many factors, such as awareness among the masses regarding the usefulness and limits of the BC can play the role of enablers. Other enablers can include push from the internal and external bodies of the organizational system, trained workforce including BC

engineers and HR force equipped with knowledge regarding BC, and finally starting small and taking small steps towards the clearly set goals. All these enablers, when combined, can lead to a successful adoption of the BC in the organizations of Pakistan and can help the HR department a great deal.

Chapter 5 : Findings and Discussion

This part of the thesis discusses about the findings and how these findings are in line with the previous studies conducted in Pakistan and all over the world.

The aim of this study was to investigate the potential convergence of BC technology and HR in a developing country such as Pakistan. The study aimed to identify the specific HR functions that could benefit from the implementation of BC technology, which is yet to be explored and understood by the general population. The adoption of this technology is arguably more beneficial to developing countries than developed countries. However, the context for its implementation in a developed country can differ significantly from that in a developing country. This is because the regulatory practices and rules governing developed countries are generally more advanced than those in developing countries.

One of the features of BC technology that can benefit developing countries like Pakistan is the verification of credentials. In Pakistan, organizations often face challenges in verifying the authenticity of job applicants' resumes and experience letters. BC technology can offer a solution to this problem by providing a tamper-proof and decentralized database of verified credentials. This can significantly reduce the risk of hiring individuals with false credentials, which is a common issue in developing countries.

Another feature of BC technology that can benefit both employers and employees is Smart Contracts. Smart Contracts are self-executing contracts with the terms of the agreement written directly into lines of code. These contracts are stored on a decentralized ledger and can be programmed to automatically execute certain actions when specific conditions are met. In the context of developing countries, where the rule of law is weak, Smart Contracts can be especially useful in safeguarding the rights of both parties in an employment contract. This is because contracts need to be airtight to hold up in case of any disputes.

However, the implementation of BC technology in HR practices in developing countries faces several challenges. One of the main challenges is the lack of awareness and understanding of the technology among the general population. Additionally, the lack of infrastructure, including internet connectivity and power supply, can limit the implementation of BC technology in certain regions of developing countries. Moreover, the cost of implementing BC technology can be prohibitive for many organizations in developing countries where resources are limited.

To conclude, the convergence of BC technology and HR has the potential to offer significant benefits to developing countries like Pakistan. In particular, features such as verification of credentials and Smart Contracts can improve the efficiency and transparency of HR practices. However, the implementation of BC technology in developing countries will always be challenged by multiple barriers and roadblocks.

This study found out the truth behind the BC and how BC can be used in order to achieve effectiveness in the various functions of HR. Blockchain is being used in different industries, such as education in institutes such as MIT (Kamišalić et al., 2019) and. Other than this, there have been cases like Walmart and IBM (Kamath, 2018). The results from the study clearly show that HR functions can truly benefit from the technology. The distinguishing features of BC make the technology a great fit for its use in the field of HR. There are lots of issues and challenges that the HR faces on a daily basis and BC can help solve the issues and overcome the challenges. The study found the BC can help the employers and HR from the very start of the employee life cycle of recruitment all the way to manage the employee relations and more. The study furthered the limited findings of previous studies regarding the use of BC in the HR (Olivas-Lujan Miguel, 2019).

Use of BC in HR starts from the very start of recruitment (Lukić et al., 2018; Peisl & Shah, 2019b). The study found that with the help of BC, managers can now tackle the challenges of ensuring valid previous experiences and credentials verifications. The BC enabled documents issued by the institutions and experience certificates issued by companies can make verifications of the credentials and experiences very easy and very effective. So credential verification is one of the most important things BC can do for the HR (Michailidis, 2018; Tariq et al., 2019)

BC can help HR in a great deal in order to maintain the data and keep the records of the employees safe. Secure features of the BC technology make it easier for the managers to store the data with authenticity and with the utmost security. With the help of this secure and authentic data, a business can make informed decisions and also use it to perform predictive analytics. A better decision making system with the help of predictive analytics can enhance the organizational performance and prepare the business for the forthcoming challenges (Iqbal et al., 2021).

Businesses can use BC in HR in managing the compensation of employees (Chillakuri & Attili, 2021). The study found out that with the help of tokenized payments system, managers can now pay the employees and manage the whole salaries payment system more efficiently. With the help of Smart Contract, which is an innovation with the BC technology, managers can streamline the process of payment of salaries to employees. With the help of "if this, then that" mechanism, the technology takes care of phase wise payment of the salaries based on the completion of tasks and achievements of targets. Not only this, the smart contracts can help the HR in managing the employment and performance of the employees in a more positive way (Chillakuri & Attili, 2021; Hunhevicz et al., 2022). A streamlined process ensures merit and transparency.

One of the aspects of HR where BC can be used is training management. Previous studies mention that BC can improve the efficiency of the training and development programs. The research on the blockchain with relation to HR has covered topics like challenges and opportunities related to the technology and the application of technology in the fields of HR, such as training and development (Jain et al., 2021). With the help of BC enabled certificates, managers can track the training needs analysis of the employees, and with the help of BC and data, predictive analytics can be run in order to understand the skill gaps in the employees of the organization (Jain et al., 2021; Spence, 2018) such analytics can enable the organizations to tackle the challenges posed by the ever changing market dynamics (Nurhasanah et al., 2021).

Another aspect of the HR and BC is employee relations. Effective management of employee relations is extremely crucial for the success of the company and employee retention (Dolzhenko, 2019). With the help of BC, the employee relations can go very smoothly due to its features (Tariq et al., 2019) the BC ensures merit, authenticity, security, verifiability and accountability (Graf et al., 2020). With these features, HR can ensure that every individual of the

organization gets fair treatment. An interesting finding of the study was that with the help of BC, HR could stop the incidents involving harassment of any kind. Thanks to the openness of data, the grievances of the employees can be managed efficiently.

Lastly, the study debated about the challenges and the enablers for the adoption of the technology in HR. Just like any other technology, BC faces challenges and resistance during the acceptance period (Michailidis, 2018). The technology is relatively new, and there is a lot of misunderstanding and hype around the technology. The confusion of technology with the cryptocurrencies makes it difficult for even the educated lot of the country to understand it and make use of it in the daily life. Awareness related to the technology is still low, making it hard for the businesses and people to think optimistically about it. With all the challenges, there are enablers that can make the flow of the adoption process smooth. With more focus on digitization, more awareness, and push from external environmental factors, technology can be adopted on a relatively rapid pace. Interestingly, the case of covid-19 serves as a great example of how the use of technology can be promoted under intervention by natural and environmental factors (Agarwal et al., 2022).

Current literature highlights the role of Blockchain in HR in the areas of verification of documents, recruitment and selection, training and development, and employee management. Still, blockchain has much more to offer in HR. Research has already shown that both HR and non-HR employees are indifferent over the view that blockchain can revolutionize the HR industry.

This part of the findings section describes key findings to summarize this study's overall contributions to the literature.

- Foremost, this study is conducted in Pakistan's context, and no previous studies have been conducted in Pakistan aiming to understand the interrelationship of HR and BC.
- It was found that keeping in view the characteristics of the technology, HR functions can be revolutionized.
- BC technology can help secure data in HR as it is temper free and more secure than traditional HRISs.

- This study talks about both perspectives, i.e., employer and employees, and outlines the benefits BC can bring to both parties.
- Talking about employees, one of the most distinctive contributions of this study is related to the Sexual harassment of employees. BC can help improve mechanisms related to sexual harassment cases making whistle-blowing easier and more anonymous.
- In many industries in Pakistan, HR is considered as a support department, and as the BC helps in saving time for the HR department, HR will focus more on strategic issues faced by the companies
- BC can save employees and employers from fraud in the existing weak rule of law in Pakistan with the help of smart contracts and help in protecting employee rights.
- False resumes are very common in Pakistan, and BC enabled verification process helps employers and makes the hectic verification process much easier
- This study also contributes that along with the benefits, there are many challenges related to BC. Adopting BC in a country like Pakistan is very difficult as Pakistan is much averse to change and new technologies. The lack of awareness makes it difficult to understand the benefits of BC technology and its benefits beyond cryptocurrencies. The mindset of concentrating the power in a few hands would make it difficult for the companies to adopt BC, which is aimed at decentralizing the power.
- With the help of this study, more avenues for research will open up for future scholars to understand more aspects of the technology and its interrelationship with BC. The study bridges the gap between BC and HR in the Pakistani market.
- This study also describes enablers that will help in the enablement of the adoption of BC in HR. Since Pakistan is an outsourcing economy, pressure from authorities and buyers of services can help in the enablement of the adoption of the technology alongside with other enablers.
- This study creates awareness within the scholarly communities regarding the theoretical side of the BC and helps connect the dots for HR to understand the technology in relatively easier terms.

5.1 Managerial and theoretical implications

False or fraudulent resumes and forged experience letters are not uncommon in the hiring processes of many organizations in Pakistan. The potential benefits of utilizing blockchain technology in addressing this issue are explored in this study. Organizational managers in Pakistan can gain valuable insights into the potential advantages of employing blockchain technology to combat this problem. The findings of this study may also be applicable to other developing countries facing similar HR challenges.

While not a comprehensive solution, blockchain technology may offer a promising avenue for organizations to improve their hiring processes and minimize the risks associated with fake resumes. The study serves as a starting point for further exploration and consideration of blockchain technology within HR departments.

One significant advantage of blockchain technology is its ability to streamline the verification process, resulting in cost savings and time efficiency for organizations. Typically, organizations spend a considerable amount of time and resources verifying the records of new employees. Some organizations even hire third-party verification services, while others neglect this process, leaving themselves vulnerable to legal and commercial consequences. The use of blockchain technology provides a more efficient and effective means of verifying employee data, thus reducing the risk of fraudulent activity.

The study indicates that blockchain technology has the potential to impact multiple aspects of HR management, including recruitment, payroll management, employee relations, and training and development. It provides a promising solution for enhancing data security, transparency, and efficiency in HR processes. By storing employee data such as salaries and performance reviews on a distributed ledger, blockchain ensures that this information is much more secure than traditional methods of storage.

In addition to data security, blockchain technology can promote effective communication between different departments and stakeholders by ensuring that all parties have access to relevant data. It enables the creation of legally binding employment contracts, providing greater security for both employers and employees. By freeing up time typically spent on time-

consuming HR functions such as recruitment, attendance management, and payroll, HR professionals can invest their time and energy into more strategic issues faced by organizations.

The study also addresses potential challenges and enablers for the adoption of blockchain technology in HR departments. Despite the many benefits of this technology, managers must consider various factors before implementation.

This research makes a substantial and unique contribution to the existing literature by effectively addressing the scarcity of studies on the interrelationship between BC and HR, particularly within the context of developing countries such as Pakistan. The initial review of available literature reveals a predominance of theoretical discussions, overviews, opinion papers, and analyses, with limited specific focus on the integration of BC technology in HR practices. Through its emphasis on empirical studies, this research effectively fills a critical gap in the literature, providing a comprehensive and in-depth understanding of the potential benefits and challenges associated with the adoption of BC in HR within developing country contexts.

Furthermore, this research significantly expands the knowledge base on BC applications, diffusion, adoption, and outcomes within the HR domain. Existing studies predominantly concentrate on the utilization of BC in sectors like charity works, financial services, health, hotel chains, and hair products, without specifically exploring its interrelationship with HR. As a result, this research sheds light on a novel and unexplored area, greatly enhancing our understanding of how BC technology can be effectively integrated into HR processes to improve efficiency, transparency, and trust, especially in developing country settings.

Moreover, the empirical investigation of the linkage between BC and HR within the context of developing countries offers valuable insights into the unique challenges and opportunities present in such environments. Developing countries often contend with distinct socio-economic factors, regulatory frameworks, and technological landscapes that can significantly influence the implementation and adoption of BC technology in HR. By empirically exploring these factors, this study provides a nuanced understanding of the contextual intricacies, enabling practitioners

and policymakers to make well-informed decisions regarding the implementation of BC solutions in HR practices.

Ultimately, this research makes a significant contribution to the broader research literature by unlocking the transformative potential of BC in the field of HR. The findings of this study have direct and practical implications for organizations operating in developing countries, enabling them to harness the power of BC to enhance various HR activities, including candidate hiring management, knowledge sharing, employee record management, and supply chain compliance. By effectively bridging the gap between BC technology and HR practices, this research offers new perspectives and insights, making a meaningful contribution to the advancement of knowledge in both the BC and HR domains.

To conclude, the adoption of blockchain technology provides a promising solution for the challenges of HR management in developing countries. While not a comprehensive solution, BC technology offers significant potential to enhance HR processes, promote efficiency and transparency, and reduce the risks associated with false resumes and other fraudulent activities. This study provides valuable insights into the advantages and challenges of blockchain technology adoption and should be considered by organizational managers looking to improve their HR processes.

5.2 Limitations

The present research on the uses of blockchain technology in the human resources (HR) sector has several limitations that are worth noting. Firstly, this study is exploratory in nature and represents one of the earliest attempts to investigate the potential of blockchain technology in the Pakistani economy. As such, it is limited by the availability of empirical data regarding the industries that are most receptive to innovative technologies like blockchain. In order to better understand the applicability of blockchain technology in HR, further empirical research will be necessary to identify which industries are most open to this technology and why.

Secondly, while this study has identified some of the potential benefits of blockchain technology in HR, further research is needed to understand the challenges that organizations may face when adopting this technology. Specifically, it will be important to investigate how firms that have already adopted blockchain technology have dealt with the challenges of implementation and integration with existing HR systems. By identifying these challenges and how they have been addressed, future research can provide guidance to firms considering the adoption of blockchain technology in HR.

Thirdly, more research is needed to understand which specific areas of HR are most likely to adopt blockchain technology in Pakistan. While the present study has identified some potential applications of blockchain technology in performance management, further research is needed to investigate how blockchain could be applied to other areas of HR such as recruitment, employee onboarding, and compensation management.

Fourthly, while the banking industry has been a pioneer in the adoption of blockchain technology, more research is needed to understand how other industries can benefit from this technology. In particular, future research should focus on how blockchain technology can be used to improve efficiency and management in different sectors and departments. This will help to provide a more comprehensive understanding of the potential uses of blockchain technology in HR and other areas of organizational management.

Another limitation of this study is that the current trends indicate that the banking industry seems to be the most interested in investing in blockchain technology. While this is understandable given the potential benefits of blockchain for remittances and payments, it is important to investigate the potential applications of blockchain technology in other sectors as well.

Additionally, future research should focus on collaboration between blockchain experts and HR professionals to better understand the technology and its potential uses in the HR sector. This

collaboration can help to bridge the gap between technical expertise and practical application, and ensure that blockchain technology is implemented in a way that maximizes its potential benefits for HR.

Finally, more research is needed to identify the enablers for the adoption of blockchain technology in HR. By identifying the factors that facilitate the adoption of blockchain technology, future research can provide guidance to organizations looking to adopt this technology in a way that maximizes its potential benefits.

In conclusion, while the present study has identified some potential applications of blockchain technology in HR, further research is needed to better understand the challenges and opportunities associated with this technology. Specifically, future research should focus on identifying which industries and areas of HR are most receptive to blockchain technology, how challenges associated with implementation can be addressed, and how collaboration between blockchain experts and HR professionals can be promoted. By addressing these limitations, future research can help to provide a more comprehensive understanding of the potential uses of blockchain technology in HR and other areas of organizational management.

References

References

- Agarwal, P., Swami, S., & Malhotra, S. K. (2022). Artificial Intelligence Adoption in the Post COVID-19 New-Normal and Role of Smart Technologies in Transforming Business: a Review. *Journal of Science and Technology Policy Management, ahead-of-print*(ahead-of-print). <https://doi.org/10.1108/JSTPM-08-2021-0122>
- Aspers, P., & Corte, U. (2019, 2019/06/01). What is Qualitative in Qualitative Research. *Qualitative Sociology, 42*(2), 139-160. <https://doi.org/10.1007/s11133-019-9413-7>
- Barrett-Maitland, N., Barclay, C., & Osei-Bryson, K.-M. (2016). Security in social networking services: a value-focused thinking exploration in understanding users' privacy and security concerns. *Information Technology for Development, 22*(3), 464-486. <https://doi.org/doi.org/10.1080/02681102.2016.1173002>
- Bonsón, E., & Bednárová, M. (2019). Blockchain and its implications for accounting and auditing. *Meditari Accountancy Research, 27*(1), 1-15. <https://doi.org/doi.org/10.1108/medar-11-2018-0406>
- Chillakuri, B., & Attili, V. S. P. (2021). Role of blockchain in HR's response to new-normal. *International Journal of Organizational Analysis, ahead-of-print*(ahead-of-print). <https://doi.org/10.1108/IJOA-08-2020-2363>
- Clohessy, T., & Acton, T. (2019). Investigating the influence of organizational factors on blockchain adoption: An innovation theory perspective. *Industrial Management & Data Systems, 119*(7), 1457-1491. <https://doi.org/10.1108/IMDS-08-2018-0365>
- Coita, D. C., Abrudan, M. M., & Matei, M. C. (2019). Effects of the Blockchain Technology on Human Resources and Marketing: An Exploratory Study. In A. Kavoura, E. Kefallonitis, & A. Giovanis, *Strategic Innovative Marketing and Tourism Cham*.
- Cole, R., Stevenson, M., & Aitken, J. (2019). Blockchain technology: implications for operations and supply chain management. *Supply Chain Management: An International Journal, 24*(1), 1-15. <https://doi.org/doi.org/10.1108/scm-09-2018-0309>
- Dhagarra, D., Goswami, M., Sarma, P., & Choudhury, A. (2019). Big Data and blockchain supported conceptual model for enhanced healthcare coverage. *Business Process Management Journal, 25*(1), 1-15. <https://doi.org/doi.org/10.1108/bpmj-06-2018-0164>

- Dolzhenko, R. (2019). Economics of Using Blockchain in the System of Labor Relations. Computer Science On-line Conference,
- Fernandez-Carames, T. M., & Fraga-Lamas, P. (2019). A review on the application of blockchain to the next generation of cybersecure industry 4.0 smart factories. *Ieee Access*, 7, 45201-45218. <https://doi.org/doi.org/10.1109/access.2019.2908780>
- Friese, S. (2019). *Qualitative data analysis with ATLAS. ti*. Sage.
- Frizzo-Barker, J., Chow-White, P. A., Adams, P. R., Mentanko, J., Ha, D., & Green, S. (2020). Blockchain as a disruptive technology for business: A systematic review. *International Journal of Information Management*, 51, 102029. <https://doi.org/doi.org/10.1016/j.ijinfomgt.2019.10.014>
- Gaur, N. (2019). Blockchain challenges in adoption. *Managerial Finance*, 46(6), 849-858. <https://doi.org/10.1108/MF-07-2019-0328>
- Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: interviews and focus groups. *British dental journal*, 204(6), 291-295. <https://doi.org/doi.org/10.1038/bdj.2008.192>
- Graf, M., Küsters, R., & Rausch, D. (2020, 7-11 Sept. 2020). Accountability in a Permissioned Blockchain: Formal Analysis of Hyperledger Fabric. 2020 IEEE European Symposium on Security and Privacy (EuroS&P),
- Hald, K. S., & Kinra, A. (2019). How the blockchain enables and constrains supply chain performance. *International Journal of Physical Distribution & Logistics Management*. <https://doi.org/doi.org/10.1108/ijpdlm-02-2019-0063>
- Hanggoro, D., Windiatmaja, J. H., & Sari, R. F. (2022). Blockchain-based Attendance Management and Payroll System using Hyperledger Composer Framework. 2022 IEEE Region 10 Symposium (TENSYPMP),
- Hunhevicz, J. J., Motie, M., & Hall, D. M. (2022). Digital building twins and blockchain for performance-based (smart) contracts. *Automation in Construction*, 133, 103981.
- Iansiti, M., & Lakhani, K. R. (2017). The truth about Blockchain. *Harvard Business Review*.

- Iqbal, N., Jamil, F., Ahmad, S., & Kim, D. (2021). A novel blockchain-based integrity and reliable veterinary clinic information management system using predictive analytics for provisioning of quality health services. *Ieee Access*, 9, 8069-8098.
- Jain, G., Sharma, N., & Shrivastava, A. (2021). *Enhancing training effectiveness for organizations through blockchain-enabled training effectiveness measurement (BETEM)*. <https://doi.org/10.1108/jocm-10-2020-0303>
- Kamath, R. (2018). Food traceability on blockchain: Walmart's pork and mango pilots with IBM. *The Journal of the British Blockchain Association*, 1(1), 3712. [https://doi.org/doi.org/10.31585/jbba-1-1-\(10\)2018](https://doi.org/doi.org/10.31585/jbba-1-1-(10)2018)
- Kamišalić, A., Turkanović, M., Mrdović, S., & Heričko, M. (2019). A preliminary review of blockchain-based solutions in higher education. International workshop on learning technology for education in cloud,
- Kiger, M. E., & Varpio, L. (2020). Thematic analysis of qualitative data: AMEE Guide No. 131. *Medical teacher*, 42(8), 846-854.
- Kim, K., Lee, G., & Kim, S. (2020, 2020/09/01). A Study on the Application of Blockchain Technology in the Construction Industry. *KSCE Journal of Civil Engineering*, 24(9), 2561-2571. <https://doi.org/10.1007/s12205-020-0188-x>
- Koncheva, V. A., Odintsov, S. V., & Leonid, K. (2019, 2019/12). Blockchain in HR. International Scientific and Practical Conference on Digital Economy (ISCDE 2019),
- Liu, L., Han, M., Zhou, Y., Parizi, R. M., & Korayem, M. (2020). Blockchain-Based Certification for Education, Employment, and Skill with Incentive Mechanism. In K.-K. R. Choo, A. Deghantaha, & R. M. Parizi (Eds.), *Blockchain Cybersecurity, Trust and Privacy* (pp. 269-290). Springer International Publishing. https://doi.org/10.1007/978-3-030-38181-3_14
- Lukić, J. M., Salkić, H., & Ostojić, B. (2018). New Job Positions and Recruitment of Employees Shaped by Blockchain Technologies. *Leadership & Management: Integrated Politics of Research and Innovations*, 314.
- Michailidis, M. P. (2018, 2020-11-17). The Challenges of AI and Blockchain on HR Recruiting Practices. *The Cyprus Review*, 30(2), 169. <https://search.proquest.com/scholarly-journals/challenges-ai-blockchain-on-hr-recruiting/docview/2193108119/se-2?accountid=135034>

- Mishra, H., & Venkatesan, M. (2021). *Blockchain in human resource management of organizations: an empirical assessment to gauge HR and non-HR perspective*. <https://doi.org/10.1108/jocm-08-2020-0261>
- Nakamoto, S. (2008). A peer-to-peer electronic cash system. 4. <https://bitcoin.org/bitcoin.pdf>
- Nurhasanah, Y., Prameswari, D., & Fachrunnisa, O. (2021). Blockchain-Based Solution for Effective Employee Management. In P. K. Pattnaik, M. Sain, A. A. Al-Absi, & P. Kumar, *Proceedings of International Conference on Smart Computing and Cyber Security* Singapore.
- Ohman, A. (2005). Qualitative methodology for rehabilitation research. *Journal of rehabilitation medicine*, 37(5), 273-280.
- Olivas-Lujan Miguel, R. (2019). Blockchains 2019 in e-HRM: Hit or Hype? In *HRM 4.0 For Human-Centered Organizations* (Vol. 23, pp. 117-139). Emerald Publishing Limited. <https://doi.org/10.1108/S1877-636120190000023010>
- Olivas-Lujan, M. R. (2019). Blockchains 2019 in e-HRM: Hit or Hype? In *HRM 4.0 For Human-Centered Organizations*. Emerald Publishing Limited.
- Onik, M., Miraz, M. H., & Kim, C.-S. (2018). A recruitment and human resource management technique using blockchain technology for industry 4.0. <https://doi.org/10.1049/cp.2018.1371>
- Peisl, T., & Shah, B. (2019a). The impact of blockchain technologies on recruitment influencing the employee lifecycle. European Conference on Software Process Improvement,
- Peisl, T., & Shah, B. (2019b, 2019). The Impact of Blockchain Technologies on Recruitment Influencing the Employee Lifecycle. *Systems, Software and Services Process Improvement*, Cham.
- Pinna, A., Baralla, G., Lallai, G., Marchesi, M., & Tonelli, R. (2020, 2020-October-19). Design of a Sustainable Blockchain-Oriented Software for Building Workers Management [Original Research]. *Frontiers in Blockchain*, 3(38). <https://doi.org/10.3389/fbloc.2020.00038>
- Prewett, K. W., Prescott, G. L., & Phillips, K. (2020). Blockchain adoption is inevitable—Barriers and risks remain. *Journal of Corporate Accounting & Finance*, 31(2), 21-28. <https://doi.org/doi.org/10.1002/jcaf.22415>

- Rogerson, M., & Parry, G. C. (2020). Blockchain: case studies in food supply chain visibility. *Supply Chain Management: An International Journal*.
<https://doi.org/doi.org/10.1108/scm-08-2019-0300>
- Rowley, J. (2012). Conducting research interviews. *Management research review*.
<https://doi.org/doi.org/10.1108/01409171211210154>
- Salah, D., Ahmed, M. H., & ElDahshan, K. (2020). Blockchain Applications in Human Resources Management: Opportunities and Challenges. *Proceedings of the Evaluation and Assessment in Software Engineering*, 383-389.
<https://doi.org/doi.org/10.1145/3383219.3383274>
- Sarda, P., Chowdhury, M. J. M., Colman, A., Kabir, M. A., & Han, J. (2018, 1-3 Aug. 2018). Blockchain for Fraud Prevention: A Work-History Fraud Prevention System. 2018 17th IEEE International Conference On Trust, Security And Privacy In Computing And Communications/ 12th IEEE International Conference On Big Data Science And Engineering (TrustCom/BigDataSE),
- Spence, A. (2018). Blockchain and the Chief Human Resources Officer. *Transforming the HR Function and the market for skills, talent, and training. A Blockchain Research Institute*.
- Swan, M. (2015). *Blockchain: Blueprint for a new economy*. " O'Reilly Media, Inc.". https://doi.org/doi.org/10.1007/978-3-319-98911-2_1
- Swan, M., & De Filippi, P. (2017). Toward a philosophy of blockchain: a symposium: introduction. *Metaphilosophy*, 48(5), 603-619.
- Tariq, A., Haq, H. B., & Ali, S. T. (2019). Cerberus: A blockchain-based accreditation and degree verification system. *arXiv preprint arXiv:1912.06812*.
- Tshering, G., & Gao, S. (2020). Understanding security in the government's use of blockchain technology with value focused thinking approach. *Journal of Enterprise Information Management*. <https://doi.org/doi.org/10.1108/jeim-06-2018-0138>
- Wang, X., Feng, L., Zhang, H., Lyu, C., Wang, L., & You, Y. (2017, 6-9 April 2017). Human Resource Information Management Model based on Blockchain Technology. 2017 IEEE Symposium on Service-Oriented System Engineering (SOSE),
- White, G. R. (2017). Future applications of blockchain in business and management: A Delphi study. *Strategic Change*, 26(5), 439-451. <https://doi.org/doi.org/10.1002/jsc.2144>

Yiannas, F. (2018). A new era of food transparency powered by blockchain. *Innovations: Technology, Governance, Globalization*, 12(1-2), 46-56.
https://doi.org/doi.org/10.1162/inov_a_00266

Zīle, K., & Strazdiņa, R. (2018). Blockchain use cases and their feasibility. *Applied Computer Systems*, 23(1), 12-20. <https://doi.org/doi.org/10.2478/acss-2018-0002>