

Streamlining Human Resources through Blockchain HR Technology: A Critical Perspective

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ABSTRACT

Technology changes at a fast pace, attracting global attention across industries, including human resource management. One of the innovations that can revolutionize human resources (HR) is blockchain technology, which uses smart contracts in recruitment, payroll management, employee administration, and more. This article aims to evaluate the influence of blockchain HR technology in the performance of HR management functions by examining earlier studies and documentary evidence. It highlights the challenges faced in the use of this recent technology for sustainability through qualitative research methods. Through document analysis, 45 papers were examined from Scopus, Web of Science, and reports from various credible sources, based on set criteria. Findings showed that blockchain technology significantly affects HR management functions. However, challenges were identified in implementing HR technology. Further studies should be conducted across more industries with quantitative validation of their results.

Keywords: Blockchain, Innovations, Human resource management, HR technology, HR functions, Perspective.

INTRODUCTION

Blockchain technology has drawn the interest of businesses, academicians, and practitioners in recent years (Hughes et al., 2019). The concept of blockchain technology has transformed traditional firms into blockchain-driven business enterprises (Wang et al., 2017). Various companies and corporations, such as IBM, Amazon, Google, Walmart, and Facebook, have invested large sums of money to explore blockchain's applicability to their businesses (CB Insights, 2019). According to Beck et al. (2017), financial institutions are considered pioneers in the use of blockchain

technology and succeed in various sectors including retail, shipping and transportation, and healthcare. Moreover, blockchain in financial sectors is utilized for trade finance, trade settlement, managing records for patients in healthcare, and warranty receipts and digital supply chain for retail chains (Deloitte, 2017). Blockchain technology has also been embraced by the United Nations for distributing aids and funds to beneficiaries worldwide (Debter et al., 2020). Hughes et al. (2019) stress that there is a high possibility that blockchain technology can provide solutions to different organizational functions in production, supply chain, and manufacturing.

Few studies have investigated the application of blockchain in human resource management (HRM) functions even though digitalizing HRM has been ongoing for decades (Mishra & Akman, 2010). Data provided by CareerBuilder reveals that job applicants widely fake their credentials. This includes fraudulent skills, job titles, experience, academic degrees, and more (Sakran, 2019). Researchers have opined that blockchain enables workers to share confidential information with their employers such as recruitment, smart contracts, attendance, data protection, secure transactions, fraud prevention, verification, etc. (Spence, 2018). According to Mire (2018), few companies utilize blockchain technology as solutions to HR issues including applicant data transparency, payroll administration, a freelance ecosystem, and rewarding employee mechanisms, even though companies continue to integrate technology in HRM.

In a global setting, only a few countries started to implement blockchain technology, and the top ten pioneers of this technology in descending order are the USA, China, Switzerland, Singapore, UK, Germany, Japan, South Korea, El Salvador, and Canada (Sharma, 2023). Of these ten countries, no major company applies blockchain to HR purposes, but rather they focus on cryptocurrency, supply chain, and other economic considerations. Based on this premise, this article aims to investigate the possibility of applying blockchain in the HRM of organizations and how it can add value to contemporary HRM.

According to Spence (2018), finding and hiring the best employees is crucial to HRM, especially amid contemporary complexity and the modernization of organizations away from traditional HR practices and toward a new age of modern and technologically motivated HR operations. Legacy challenges of HR include time-consuming curriculum vitae checking, verifying candidate applications, linking applications to different recruitment agencies and social sites, screening, authenticating, and validating through a series of tests (Yi et al., 2020). As technology advances, HR has started to become digitalized leading to the acceptance of the blockchain technology application in HRM. Rubio (2017) described blockchain technology as a disruptive innovation in HR that will potentially progress HR to make it more agile and creative. A study conducted by Chanda and Singh (2023) on 32 countries in North America, Europe, Asia, and other regions showed that studies on blockchain in HRM is a mounting field of interest and significance, however; actual studies are still scarce. Saif and Islam (2022) identified only 126 studies related to blockchain technology and HRM between 2016-2021.

HR departments devote lengthy hours to reviewing job applications to ensure they hire the right people. Companies also spend more resources on finding recruiters to assist in the recruitment process which can be streamlined by having job seekers directly contact recruiters (Michailidis, 2021). For example, HR Transformation

Director of Glass Bead Consulting Andrew Spence said, “There are problems with our recruitment of different types of workers. These include prejudice and bias, lack of visibility of available workers, low levels of trust in centralized social networks, spam, and high fees to intermediaries” (Erts, 2018, p. 1). He acknowledged the need for technological platforms such as AI and blockchain as instrumental tools to address this. Li et al. (2021) also added that common pitfalls discovered by the HR departments from applicants’ credentials include false resumes, inconsistent training experience to the actual job situation, unfair performance appraisal and salary distribution, etc. Given this above-mentioned gap, the main aim of this study is to examine and evaluate the impact of utilizing blockchain technology in HRM functions of organizations and highlight potential challenges. This article expands the study of HRM and can provide additional inputs for other quantitative studies.

METHODOLOGY

In this study, qualitative research methods were employed, primarily document analysis of secondary sources. To ensure that the literature reviewed was relevant and updated, research articles and other information used were gathered from 2015 to 2023, except for four articles discussing the history of digitalization. A total of 45 documents were chosen based on established criteria and their relevance. Keywords used to identify sources were: “Blockchain HR technology and HRM”; “Blockchain and human resource functions”; “Blockchain technology and its impact on HRM functions” and more. The main indexing of sources used included Scopus, Web of Science, Google Scholars, and EBSCOhost. A process of elimination was employed to select the most relevant materials to meet the research objectives.

ANALYSIS AND DISCUSSION

Blockchain technology was popularized by Satoshi Nakamoto in 2008 with bitcoin, but it had already been used for cryptocurrency. Padmavathi and Rajagopalan (2021) state blockchain originated in the late 1980s from a problem of verifying timestamps on digital documents. Haber and Stornetta (1991) published an article titled, “How to Timestamp a Digital Document” and later in 1992, a design was added to the timestamp through the concept of Merkle Trees which aimed at increasing the efficiency by transforming time-stamped documents into a cryptographically secured chain of blocks. Then in 2000, Stefan Konst developed the theory of cryptographic secured chains which was later replaced by Hal Finney with his model called “Reusable Proof of Work”, which addressed cases of the double spending problem in cryptocurrency. Finally, bitcoin was developed in 2008 by Nakamoto which primarily used blockchain technology.

Blockchain technology is defined as a tamper-resistant, decentralized database of records that is shared in a distributed manner (Yaga et al., 2018, p. 4). Data or information is kept in various host computers, or distributed, whereby a community of users can access shared information safely. Crosby et al. (2016) also define blockchain as a chain of blocks ordered in a network of peers. There are three major stages of blockchain in terms of privacy, and these are fully public, private, and hybrid. Public blockchain means that its use is open to all users while private

blockchain has a specific group of users. Hybrid is a combination of public and private, which means that they can both access the data, but the public can only see portions of the assortment of data. Blockchain traditionally stemmed from the concept of financial ledger and one of its characteristics is that, once a block is added to the blockchain, the data or information cannot be deleted nor altered, hence it is immutable. In other words, any change of data from the previously created information will be stored in a new block with the details of the date and time of change. Blockchain technology is anticipated to be applicable to all areas of business activity, it has “game-changing” potential for all industries (Ahmed, 2019).

IMPACT OF BLOCKCHAIN HR TECHNOLOGY ON THE PERFORMANCE OF HRM FUNCTIONS

Mallick et al. (2022) stress that blockchain benefits employees and HR departments. Blockchain enables a technology-based approach to enrich HR roles and responsibilities that potentially enhance the efficiency and efficacy of future work. Li et al. (2021) found that the blending of HRM and blockchain technology fills gaps in issues that relate to training performance inconsistency, lack of quality recruitment, unequal salary distribution, and unfairness on the performance of enterprise appraisals causing a negative consequence on workers’ and loyalty. Such issues are threats to a company’s growth and survival. Ramadhan (2021) found that blockchain technology is an innovative technology that impacts screening methods by maximizing time spent, saving money and energy, verifying credentials, and reviewing job histories. However, Shruthi and Kavitha (2022) express that the use of blockchain technology has the potential to reduce the very need for HRM.

Nonetheless, many researchers claim blockchain technology potentially supplements people but cannot replace them. It positively impacts HRM functions in the areas of planning, recruitment and hiring, training and development, evaluation of employee performance, work-life balance, and decision-making. In addition, a recent study by Chen (2023) found that in the era of “Industry 4.0” blockchain has a significant impact on HRM. Blockchain-enabled trustworthiness in the recruitment process helps to avoid fraud and false claims during interviews, and there is enhancement of accuracy and efficiency of HRM functions, such as facilitating employee relations, improving training and certification processes, ensuring fair performance evaluations, and addressing pay equity issues.

IMPACT OF BLOCKCHAIN TECHNOLOGY ON RECRUITMENT AND SELECTION

Mukherjee et al. (2022) stress that with the advent of blockchain technology, many fake resumes were uncovered. These cost businesses and firms huge amounts of money as they often receive undesirable results such as job mismatches, poor performance, work environment incompatibilities, etc. Determining the right source for recruitment and hiring is crucial to the HR department and requires a lengthy decision-making process. Blockchain technology enables recruitment digitally, where a prompt decision is reached, for instance in shortlisting applicants who meet vacancy criteria, hence minimizing if not eliminating the manual hiring procedures.

Companies spend huge outlays in contracting recruitment agencies to perform screening processes which can be eradicated using blockchain resulting in savings on time and resources. Moreover, verifications of CVs, certificates, work experiences, skills, and other credentials can be done directly without third-party participation, and validation of the applicants' claims is done in the initial phases. Traceability of voluminous applicants' credentials can be performed anytime as they are safely stored digitally and secured.

Biswas (2018) stresses that blockchain technology can eliminate traditional CVs through digitalizing content such as skill sets, rewards and accolades, educational history, and others. Tarpey (2014) claimed that blockchain technology reduces incidents of false claims on CVs to zero. Colleges and universities also play a significant role by publishing encrypted applicants' credentials, enabling employers to look for relevant information. The Massachusetts Institute of Technology has mechanized a system called "digital diploma pilot program" wherein the students directly receive certificates after course completion. Another system that verifies the truthfulness of the information given by applicants in their CVs is "CVerification" which operates as a decentralized verification procedure to ascertain that applicants are honest in giving personal information and other related employment credentials. Analoui (2017) and Mehedi Hasan Onik (2018) note that although the integration of technology is vital to enhance efficiency and effectiveness in HR functions and processes, there is still a need for more secure, transparent, and safeguarded recruitment and selection addressed by blockchain-based recruitment management systems. Mehedi Hasan Onik (2018) has devised a recruitment management system powered by blockchain technology (see Figure 1) that verifies, collects, and ranks applicants for shortlisting. It also validates applicant records about employment experience, educational attainment, acquired training, criminal records and other violations if any.

Figure 1

The block-based recruitment process, adapted from Mehedi Hasan Onik (2018).



IMPACT OF BLOCKCHAIN TECHNOLOGY ON COMPENSATION MANAGEMENT

Burke (2022) pointed out that payroll preparation occupies 90 percent of the time consumed by HRM for domestic and international employees in an international company. McRae and Aykens (2020) reported that good compensation management, especially for contingent and gig (temporary workers or freelancers) employees creates flexibility for work that does not require regular or permanent employees. Blockchain technology is a booster in assuring confidentiality and security issues for validating worker profiles, compensation payments, work-hours calculation, and corresponding compensation for gig employees (PWC, 2023). Moreover, blockchain helps pay overseas workers using their domestic currency including tax compliance (McRae & Aykens, 2022, Panda et al., 2021; PWC, 2023). Once the data or transactions are entered into the blockchain, they will be digitally signed, stored in a shared ledger, and distributed to all the network participants. Every salary and wage disbursement is validated by network members based on updates in the ledger. With the advent of blockchain technology, compensation management has become flexible, easier, and real-time for domestic and international disbursements.

According to Comport (2023), blockchain technology has impacted compensation management in the form of the significant benefits it provides such as improved transparency, secure and efficient payroll management, removal of intermediaries, facilitating real-time data, automated functions, and tamper-proof record-keeping in a decentralized ledger. Calculations of salaries and wages are automated, thus, manual processing is eliminated, there is a cost reduction, and greater accuracy in compensation management. It also enables an immutable ledger of salary payment transactions, employee data encryption, and risk reduction. In terms of intermediary elimination, blockchain could perform the self-executed smart contract that accelerates peer-to-peer transactions by allowing direct payments between workers and their employers to trim transaction costs.

IMPACT OF BLOCKCHAIN TECHNOLOGY ON TRAINING AND DEVELOPMENT

Training and development is crucial to employee advancement and an organization's achievement of competitive advantage. Gil et al. (2015) explains that meeting a company's competitive advantage by learning organizations can be realized by enabling employees to train to overcome changing environmental dynamics. It is important that organizations spend time, effort, and resources to ensure training adds value to performance, however, the growing pressure of these organizations to lower training costs is unresolved with questionable assumptions about how employees are evaluated (Kraiger, 2002; Pineda, 2010). Some organizations implement e-learning to lower the training costs and efficiency but have encountered challenges due to the isolated nature of digital learning (Gil et al., 2015; Miller, 2012). Advanced training methodologies like blended learning, though effective and efficient, have become irrelevant amid the introduction of blockchain, artificial intelligence, the internet of things, and automation (PWC, 2023). According to Jain et al. (2021), the practicality of

using blockchain enables companies to achieve training effectiveness because of the zero-change characteristic of the technology. They added that blockchain technology contains data that enhances employees' training performance by quantifying employee learning by organizations wherein the data includes views and responses from supervisors, teachers, peers, and others that notify the applicants of their competencies and skills for better performance. The progress of learning organizations will be facilitated by the establishment of a blockchain-based training system. Blockchain promotes data traceability, a tamper-proof ledger, and trustworthiness, and simplifies the training and development needs of employees, outcomes, evaluation, and more. Traceability means that employees who have gone through many workplaces are still traceable as employees' career advancement and other related credentials are kept in blocks for easy tracking.

IMPACT OF BLOCKCHAIN TECHNOLOGY ON PERFORMANCE MANAGEMENT

To promote employees' career development in a company, it is vital to evaluate performance and keep secure, confidential employee records. Studies have shown that to achieve real-time responses, secure and safeguard information, maintain effective performance management, systems, and professional advancement enhancement, companies need technology (Buckingham, 2015; Panda & Satapathy, 2021). The introduction of blockchain performance management systems aids all stakeholders in having error-free, objective, and traceable information about employee performance (Caputo, 2019; Niveditha et al., 2023; Sathya et al., 2021). For example, when a new worker is hired, a new block is created, which becomes available to all stakeholders so that they can provide feedback on the worker's performance and at the same time conduct a multi-rating evaluation. The utmost impact of blockchain technology on performance management systems is the minimization of paperwork, and the increase in employee data confidentiality and security (Lokre et al., 2021; Sekhar, 2017).

IMPACT OF BLOCKCHAIN TECHNOLOGY ON EMPLOYEE RECORDS MANAGEMENT

Human resource managers acknowledge that one of the most tiresome functions in HRM is updating employee records. Human resource information systems contain information that is related to the creation of new employee records for work history, training record details, performance scores, notifications such as immigration and tax information, and other records (Analoui, 2017). Job information for applicants is verified by a blockchain-enabled distributed ledger in a blockchain human resource information system. For management purposes, data is added to the blocks related to compensation, medical insurance, healthcare, pay and benefits, etc. Keeping data on attendance securely is a vital function of blockchain technology apart from other maintenance records—similar to the ID2020, a non-government agency digital ID provider that utilizes blockchain technology to gather and verify biometric data.

BLOCKCHAIN TECHNOLOGY AND THE “GIG” ECONOMY

Smart contracts are the most common choice for companies' HRM. At the height of the COVID-19 pandemic, when people were working from home, digital platforms surged (Delouya, 2023). According to the United States' Internal Revenue Service, the number of “gig” workers has tripled between 2017 and 2021, which rapidly increased people's use of digital technology. Blockchain smart contracts can be used to manage “gig” employment arrangements, as immutable and enforceable rights and obligations are developed for all members in the network. Furthermore, blockchain enables immediate payments to “gig” workers the moment assigned tasks are completed. Smart contracts with blockchain technology smoothen the distribution of cash flows for “gig” workers.

The utilization of smart contracts is expected to surpass traditional paper-based contractual agreements. The immutability of obligations as per agreements and enforceability are clearly outlined (Ranosa, 2018). With compensation management, once a contract and code are fixed, work outputs are referenced through an assigned code. With payroll distribution, according to Day (2018), human resource functions are streamlined specifically for payroll and onboarding by implementing the idea of “If This, Then That.” Examples of blockchain applications in smart contracts include automatic payments to employees based on the number of hours worked as recorded in the irreversible blockchain. Once a new hire meets all documentary requirements, including agreeing to terms and conditions, and background information checks, the new hire automatically gains access to use the company system.

CHALLENGES OF USING BLOCKCHAIN TECHNOLOGY IN HRM

Blockchain provides many benefits like automation, security, and transparency. However, there are also challenges in implementing blockchain, as its application to businesses and industries is relatively recent. Six of these challenges are now outlined below.

First is a perceived lack of skilled employees. The scarcity of professionals who have expertise in operating blockchain is still an eminent challenge. Hiring these experts increases costs as blockchain technology continues to evolve.

Second is technological loopholes. While blockchain technology promotes security, one of its key challenges is the coding flaw in developing decentralized applications (dApps). The decentralized blockchain called Ethereum has the functionality of a smart contract that enables access to developers to install and download dApps on their system that can be utilized by users to hack instantly the system. Hacking by users threatens data such as employee records on bank details and financial transactions. Blockchain must ensure that data is protected and secured to prevent hacking and other criminal acts.

Third is a lack of unified regulation. Laws and regulations associated with blockchain technology are still to be standardized. Government regulations need to be properly outlined to ensure that the application of blockchain technology to businesses is based on legal requirements. Specific rules and regulations are needed for the full implementation of blockchain technology. Globalizing regulations in the

use of blockchain technology is a major challenge because of the localized nature of laws and policies. The immutability of records can be a challenge for countries that allow the alteration of data based on their own regulations.

Fourth is low scalability. Processing large data sets and growing numbers of members in a network can lead to delays, especially using bitcoin and Ethereum. The delay in transaction processing also implies higher cost expenditure. As a result, large-scale businesses need more members to handle their information and reduce any delays (Varaprasada Rao & Panda, 2023).

Fifth is insufficient privacy protection. The use of permanent data can be sourced in an uncontrollable manner. The potential risks of gathering unverifiable information are high, along with insufficiency of privacy protection and the illegal use of permanent data. The difficulty of verifying digital records is a critical issue (Tucker & Catalini, 2018). Moreover, transactions stored in a blockchain are pseudonymous which means they are linked to digital addresses rather than the personal information of people. When cases arise that need personal identities, especially for confidentiality and sensitivity, privacy becomes a challenge. It is difficult to balance privacy and transparency.

The sixth challenge is the risks involved in handling employee databases. The blockchain offers immutability and a safe governance framework for private information by enabling the encryption and storage of personal data. But much as with school records, the integrity of data saved on the blockchain primarily depends on the procedures and integrity of the person who makes the first entry. Therefore, some experts argue that it is more practical for blockchains to serve as an employee database of record moving forward, rather than being thought of as a trustworthy archive of data from the past.

CONCLUSION AND RECOMMENDATIONS

This article focuses on determining the impact of blockchain HR technology on HRM functions by reviewing relevant literature and source materials. Blockchain technology may affect HR less than other areas, as few studies have affirmed the contribution of blockchain application to HRM functions efficiently and effectively. Even so, HRM clearly benefits training performance, the quality of recruitment, salary distribution, and the performance of enterprise appraisals. As an innovative technology, it significantly impacts screening methods by maximizing the time spent, saving money and energy, verifying credentials, and reviewing job histories. While there are apprehensions that blockchain technology can potentially reduce the need for HR, if not supplement it, in fact it positively impacts HRM functions in recruitment and selection, hiring, training and development, the evaluation of employee performance, employee record management, and the “gig” economy.

We concur with Chen (2023) in that blockchain technology has a significant impact on HRM in the era of Industry 4.0. Blockchain-enabled trustworthiness in the recruitment process avoids fraud and false claims during interviews. It enhances the accuracy and efficiency of functions such as facilitating employee relations, improving training and certification processes, ensuring fair performance evaluations, and addressing pay equity issues. Blockchain technology contains data that enhances employees’ training performance by quantifying employee learning by organizations

wherein the data includes views and responses from supervisors, teachers, peers, and others, notifying workers of their competencies and skills for better performance.

However, challenges are still apparent regarding the newness of blockchain technology in HRM. These challenges include but are not limited to the perceived lack of skilled employees, technological loopholes, lack of unified regulations, low scalability, and insufficient privacy protection. To date, many studies have been focused on the conceptual stages of blockchain development and its impact on different industries. Businesses and countries that are on the verge of implementing blockchain technology should consider the readiness of laws and regulations in the adoption of the technology and the availability of experts in the field. Vulnerability to cyberattacks and hacking is possible without adequate safeguards and protection. In other words, the adequacy of privacy protection is very important to prevent fraud and cyberattacks. Also, low scalability occurs if a large size of data is processed and the increasing number of members in the network results in longer processing transitions. For HR managers and executives, implementing blockchain implies enriching HR roles and responsibilities that potentially enhance the efficiency and efficacy of future work.

A quantitative assessment of the application of blockchain to HRM functions, considering a generally large and statistically justifiable sample size, should be carried out by future researchers. They can identify large-scale companies for the study and generate findings from how they use blockchain technology. Sustainability measures should also be in place to ensure the long-term implications of the utilization of blockchain technology in HRM. While there is still no concrete procedure on how to best use blockchain technology, continuous research and assessment helps provide updated information to HR managers and practitioners. Future research considerations should also emphasize cryptographic and technical problems, market designs, privacy, and trust.

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