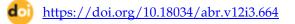# Internet of Things and Blockchain Revolutionary Integration in the Business and Financial Sector

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ABSTRACT

Many applications of the Internet of Things have been developed, and these applications are causing people's lifestyles to shift. The Internet of Things (IoT) finance refers to the various applications of the Internet of Things that have the potential to extend financial services throughout the entirety of the IoT commodities transaction, subvert traditional finance & Internet finance services, and make the financial business processes more intelligent, transparent, and accurate. This article presents the design and implementation of a financial management platform based on the combination of blockchain technology with supply chain logistics. Supply chain finance is integrated using blockchain technology to synchronize the system of bank account payments, achieve the automatic flow of funds, process supervision, and automatically settle account periods based on smart contracts. Therefore, this research paper aims to discuss the function of blockchain technology within the Internet of Things (IoT) and financial applications. These two domains stand to benefit the most from its implementation. In addition, this study investigates the concerns regarding privacy and security associated with it and offers some thoughts regarding how these issues can be addressed. In the final step of this process, the public perception of blockchain technology addresses how various parts of society view blockchain technology.

Key words: Internet of Things (IoT), Blockchain, Business Process Management (BPM), Financial Sector

INTRODUCTION

The implementation of the fourth industrial revolution (known as Industry 4.0) can use various technologies, all of which significantly impact how BPM operates (Bodepudi et al., 2021). The Internet of Things (IoT), Blockchain, embedded systems, wireless sensor networks, industrial robots, and artificial intelligence are some of the technologies that fall under this category (Reddy et al., 2020). This article focuses on two essential technologies for business process management (BPM). The Internet of Things and blockchain technology are examples of these technologies. Nevertheless, the coverage of all enabler technologies is in no way intended to be comprehensive in nature (Amin & Mandapuram, 2021).

Because billions of networked items can communicate, the vision of the Internet of Things (IoT) will become the future focus of privacy and business. The development of

new applications is made possible by utilizing various cutting-edge technology (Ballamudi et al., 2021). Having immediate access to knowledge about the physical world and its things promotes efficiency and productivity, which in turn creates fantastic opportunities in one's professional and personal life. Because of these newly arising requirements, it is necessary to entirely modify already established business procedures to exploit the potential offered by the Internet of Things fully.

More and more people, machines, containers, homes, and vehicles are being outfitted with sensors to report their condition, receive instructions, or even take action based on the information they receive (Chang et al., 2017). The Internet of Things can potentially revolutionize how individuals engage with the world around them. Automated, data-driven decision-making can optimize system and process performance, increase enterprise efficiency, and improve the quality of life thanks to the

ability to electronically monitor and manage things in the physical world. Sensors may help businesses make better and more efficient use of their assets by monitoring machinery in production halls to track products in transit on the high seas (Deming et al., 2018). The Internet of Things also has the potential to drastically transform or improve processes and procedures in private households or the healthcare industry, particularly in treating patients who suffer from chronic illnesses such as diabetes. The Internet of Things has the potential to drastically alter the scope of what can be accomplished with information technology by blending the digital world with the natural world (Da Xu, 2011). Numerous technical and organizational obstacles will need to be cleared to achieve this goal, and all of the already employed business procedures will require revision. To be more specific, businesses that intend to use the technologies of IoT in the future need improved tools and methodologies to examine the processes that are currently in place and adapt them to IoT.

It is generally agreed that the technology that underpins Bitcoin is called Blockchain. However, the potential applications of Blockchain go far beyond simply serving as a platform for digital currency transactions. Blockchain technology allows an increasing number of participants to maintain a record of unchangeable, secure, and permanent transactions without the need for a central authority. A further disadvantage of this system is that the transactions are not recorded in a centralized location, which is an essential feature. The technology of Blockchain opens up a variety of possibilities for the reform of collaborative business processes, such as the processes involved in logistics and supply chain operations.

In most cases, it is necessary to rely on reputable third-party service providers to carry out procedures of this nature. Some examples of such providers are hubs and escrows for electronic data interchange. The central design creates hurdles to entrance and discourages the development of new processes (Desamsetti, 2016b). These procedures can be carried out in a peer-to-peer fashion with the assistance of Blockchain, and they do not require any trust to be placed in centralized authorities, nor do they necessitate trust between all of the different groups of stakeholders. Specifically, this is accomplished by converting a collaborative process model into a smart contract that functions as a template. Following this, instance-specific smart contracts are built using this template as a starting point. This is done to observe or carry out each instance of the procedure. Because of this basic proof-of-concept design, there is no longer a need to improve the efficiency with which resources are used. Undoubtedly, the cost of Blockchain technology is susceptible to the volume of data registered on the ledger and the frequency with which the smart contracts update the data (Gutlapalli et al., 2019). Reducing the amount of code, the rate at which data is written, and the amount of data kept in the smart contracts is vital to making Blockchain technology a workable

alternative for executing collaborative business activities (Thaduri et al., 2016).

Blockchain technology also has the potential to enhance the quality of the results produced by corporate processes. When it comes to supply chains, tracking materials and commodities based on Blockchain might allow for comprehensive tracking and prevent the introduction of counterfeit items and the substitution of high-quality materials with those of lower quality (Desamsetti, 2016a). This would be possible by avoiding the introduction of phony products. Another sector that could benefit from implementing Blockchain technology is the insurance industry. In this sector, the management of claims could become more efficient if the technology is used. If implemented, blockchain technology could provide a mechanism to prevent the procedure from using stale or inaccurate data.

INTEGRATION VS. NETWORKING

It is also possible to employ blockchain technology to facilitate an improved integration of business processes within an organization. It has also been proposed that Blockchain might be used for linking software, making it possible to create an internal network in which the information systems are connected for data exchange. The Blockchain's networking capability is widely used despite this activity having little support. One of the most commonly supported applications for blockchain technology is the creation of a registry for various products (Desamsetti & Mandapuram, 2017). On distributed ledgers, transactions involving any product's custody transfer should be recorded, registered, and investigated. Tamper-resistance, independence from third-party central chronicles, audit-readiness of records, and security are only a few advantages. Collaborative procedures are made possible by this type of solution. This will allow multiple parties to work together to form partnerships and examine the development process (Gutlapalli, 2016). These parties include government agencies, banks, vendors, and purchasers. The technology known as Blockchain possesses the potential to significantly alter a wide variety of corporate procedures across a broad range. As Blockchain continues to make its presence known, it will likely fall to process specialists to ensure that the value created comes from identifying the opportunities that Blockchain can support in business processes rather than merely replacing existing technologies with others. This is because value formation will likely depend on discovering those opportunities.

BLOCKCHAIN FOR BUSINESS PROCESS

BCT makes it possible to carry out collaborative business processes that include untrusted partners even when no trusted authority is involved. Multiple carefully chosen services, each of which can be controlled and certified

using a smart contract, are responsible for carrying out the operations that comprise business processes (Bodepudi et al., 2019). However, BCT by itself only creates a relatively small amount of value. For the business process to be innovative in Industry 4.0, several different technologies must be connected. Workflow modeling is one of the most critical technologies of business process, as it enables the design, coordination, and validation of tasks, in addition to the parties involved who are accountable for task execution (executors). Workflow modeling techniques such as Petri Nets, the Business Process Management System (BPMS), and process modeling techniques such as pi calculus will be utilized for mathematically and formally modeling business processes. As a result, validation of tasks and executors can be accomplished through specification languages and compliance checking. Workflow modeling methods have seen a widespread application with Web Services because of the SoA-based technology that lies beneath the surface of Web Services. It makes it possible for the seamless composition of services to be used in business processes (Wu et al., 2019). Service workflow is a word made up to describe business processes carried out with the help of services acting as executors. Some technologies, such as service process definition languages and compliance checking, are unique to this context. Service-oriented architecture and the Internet of Things make the Everything as a Service (EaaS) concept possible. This convergence makes it possible for devices such as sensors, software, people, and nearly anything else to connect to the Internet. To facilitate the smooth integration of services built on top of the Internet of Items (IoT), SOA provides standards that bind together the interoperability among physical and virtual objects to be regarded as services. Behind the scenes, the Internet of Things is supported by various technologies (Viriyasitavat et al., 2018). These technologies include Wireless Sensor Networks, which rely primarily on interconnected intelligent sensors to sense and monitor; Condition Monitoring Systems (CPSs), which enable real-time conditions and fault monitoring and replacement of equipment; and RFID, which has been used in logistics, pharmaceutical production, retailing, and supply chain management since the 1980s.

To this point, BCT has been gaining traction in various industries, including the financial sector, the logistics sector, the manufacturing sector, the recruitment sector, the energy management sector, the online music sector, the healthcare sector, and the insurance sector. In the coming years, there will be a noticeable increase in the number of applications. As a consequence, Blockchain and other related technologies have significantly influenced the development of new information and communications technology (ICT) and enterprise system technologies. Blockchain technology makes it possible to protect information using encryption, ensuring it cannot be altered. One of the top priorities of Industry 4.0 will be the automation of business processes, which will undergo

significant improvements along the way (Dekkati et al., 2019). To accomplish this objective, multiple technological approaches are being utilized. Standardization, extension, scalability, and interoperability among different types of services are some of the technical factors that the design of Blockchain-enabled business process architecture must consider before it can be considered complete. BCT can be implemented in any tier, from the IoT layer at the bottom to the services and business process layers. This section is devoted to the application, primarily focusing on Blockchain in business processes.

Business process management is used to streamline operations in trusting organizations. Enterprises seek to work with multiple organizations or enterprises with specific skills to survive in the competitive market. Contracts, reputation, criminal records, recommendations, and history are used to build confidence (Thodupunori & Gutlapalli, 2018). The initial wave of business process change is SoA. Business processes are modeled by service workflow, where services execute coordinated tasks. SoA standard and cloud computing enable global service composition and interoperation. Business processes encounter several uncertainties when the number of services increases and they are spread. New services with the same functionality develop, old services become obsolete, and QoS changes over time. Service selection and composition for service workflow must incorporate QoS, real-time monitoring, and compliance checking to detect and replace unqualified services. IoT is a second wave that decentralizes and heterogeneizes service delivery. IoT can access and connect devices, sensors, hardware, software, and more. BCT is the third wave that changes business processes by building confidence in untrusted services, eliminating the need for central authorities.

IoT Layer

The Internet of Things (IoT) makes it possible to establish online connections between real-world objects and their digital counterparts. IoT can be broken down into four layers from a functional standpoint. These layers are the (1) Sensing layer, which is where intelligent things can detect and exchange information among different devices; (2) The Network layer, which connects all IoT things and allows data transportation among new and existing IT infrastructure; (3) The Service layer, which encapsulates the functionalities provided by things to be delivered in the form of services on a global scale; and (4) The Interface layer, which simplifies the management and interconnection.

The Internet of Things (IoT) and Blockchain are issues producing much awareness and elation in the technical environment and the broader corporate world (Chen et al., 2019). On the other hand, the concept that combining them could result in something even more impressive

than the sum of its individual components is beginning to get more and more attention. When you combine them, you should theoretically have an empirical approach that is secure and unchangeable for recording data processed by "smart" devices that are part of the Internet of Things. Blockchain-based Internet of Things solutions make it feasible to streamline business operations, provide a superior experience to customers, and achieve greater cost reductions. It is commonly stated that Blockchain is necessary for the Internet of Things and vice versa.

BLOCKCHAIN APPLICATIONS

The financial industry is currently making significant use of blockchain technology. The technology, however, as a component of Industry 4.0, has the potential to change business operations in various industries. Industrial Blockchain and Internet of Things projects have been carried out in a variety of different domains, including banking, insurance, energy management, healthcare, voting, and digital supply chain, amongst other domains. However, the applications of BCT in the modern world are still in the preliminary stages despite their growth continuing to be relatively rapid. Several different sectors are putting blockchain technology to the test right now. The following outlines the potential applications of Blockchain technology inside industries' version 4.0 of business processes.

The Chain of Digital Supply

IoT, Cloud, CPSs, Service-Oriented Architecture, and Blockchain are some cutting-edge technologies that will be included in the intelligent manufacturing supply chain business process in Industry 4.0. This will allow the process to become more dynamic. At the moment, businesses that are working in supply chains build cross-border integration through the use of specialist intermediaries. The role played by these intermediaries is to allow interoperability between different organizations. The lack of critical functionalities, such as standards, timestamps of transactions, monitoring and tracking of information flows, and secure end-to-end delivery of information, often results in lengthy delays and a rise in costs and human errors (Mandapuram, 2017a).

The Financial System and Banking

The business procedures in various financial sectors are frequently centralized and managed by respected third-party organizations. For instance, if you want to make a digital payment or transfer money, you will need a bank, credit card, escrow, or other providers as a central trusted authority to successfully execute the transaction (Dekkati & Thaduri, 2017). These providers will charge you a fee for their services. This procedure is not only costly and time-consuming, but it also calls for a complicated underlying infrastructure. As a result, many of the most prominent financial companies have invested in Blockchain. The use of cryptocurrencies such as Bitcoin

and Ethereum, among others, is a prominent example of an effective technique for the transfer of money.

Insurance Coverage

Compared to the financial sector, the legal industry, which includes insurance, benefits more from the transformative potential of blockchain technology. Trust management is the primary foundation for the global insurance market (Thaduri & Lal, 2020). However, insurance companies need help with several challenges, including fraudulent claims, fragmented data sources, and manual processes such as multiple signatures (Lal, 2015). The management of trust in order to automatically verify many different kinds of data in insurance digital contracts is the use case for Blockchain in the insurance industry. The use of smart contracts has a significant potential to improve a variety of processes. This is because they provide complete control, traceability, and transparency for each claim, enabling automatic payouts. In order to accomplish automation and transparency, numerous aspects of a business process, including the verification of an individual's identification, the administration of claims, and the control of fraud, need to be transformed (Lal et al., 2018). When combined with the Internet of Things, a Blockchain solution can effectively address the issue of dispersed data sources. Aeternity is a project using Blockchain and the Internet of Things to produce tools for the insurance sector.

Administration of Vouchers

The voucher registration sub-module comprises two fundamental operations: the entry of voucher registration information and the registration of voucher batches. To complete the process of voucher registration, it is necessary to invite upstream suppliers with real names to issue vouchers, fill out the signatory and payment-related information, choose whether or not to upload accompanying trade information, click the "Submit Preview" button, confirm the fundamental information of the voucher, and enter the user payment password. Only then will the operation of voucher registration be considered successful (Gutlapalli, 2017b). According to the timeline diagram of the operation of the voucher registration, once the platform enterprise user has been successfully authorized to enter system homepage, click on "Voucher Management" and then pick "Voucher Registration" in the displayed interface. This is done after the operation of the voucher registration has been completed successfully (Mandapuram et al., 2020). The user can then edit and modify the voucher registration information in the presented template, or they can download the batch registration template if they click the "Add Voucher Information" button that appears after the click. After the operation has been finished, the information regarding the voucher registration is preserved, and the user is then able to submit the voucher, examine the subsequent voucher information, and carry out any other actions that are relevant to the voucher.

The Online Module for Financing

According to the analysis of the system requirements, we have discovered that the primary function of the online financing module is to enable the realization of the receipt of vouchers issued by suppliers (Lal, 2016). This is accomplished by combining the needs of the module itself, selecting various funders who have established themselves on the platform, and financing applications, repayment, and other operations. The three primary subfunctions included in the online financing module include application for financing, approval, viewing of funding, and repayment of financing (Mandapuram, 2017b). The editing of financing applications and the submission of financing applications are both included in the financing application sub-module. After selecting the appropriate financing application module, a business user can update the financing application information in the template while submitting a financing application. This is done throughout the submission process. After making edits per the indicated prompts, the user immediately clicks the "Submit" button and then waits for the approval of the appropriate employees associated with the platform and the funders. The financing repayment sub-module comprises two sub-functions: processing and inquiring about the financing repayment. Platform enterprise users can process the repayment information of platform funders by using this module, and platform funder users can examine all outstanding and closed financing (Lal & Ballamudi, 2017).

Administration of Funds

As a result of the findings of the system requirements analysis, the fund's management module is primarily utilized to enable enterprise users of the platform to carry out account management as well as top-up and withdrawal operations, as well as enable enterprise users of funds to carry out automatic supervision of funds as well as funds flow and clearing operations (Gutlapalli, 2017a). The primary responsibilities of the account management, fund clearing, and recharge and withdrawal tasks are under the purview of the fund management module. The sub-module for account management comprises two sub-functions: management of sub-accounts and administration of bank accounts. After the name has been verified, the sub-account will be automatically formed, and platform enterprise users will be able to examine the fundamental information of the sub-account in addition to the information about the funds (Mandapuram & Hosen, 2018). Additionally, platform enterprise users will be able to combine the sub-account information to bind and unbind the bank account. It is required that the added bank account name match the information provided for the actual name (Mandapuram et al., 2018).

Recruit Employee

Recruitment is another industry that could see significant improvements because of BCT's involvement. Verifying the information that an applicant offers as part of the hiring process is an essential component of the whole process. This procedure relies largely on operations performed by hand, such as reviewing references from previous employers and confirming educational certificates and resumes. BCT contributes to the process by giving information that can be verified, such as a candidate's educational and employment history and qualifications, in a CV, which helps choose whether or not to hire them (Zancul et al., 2016). The information contained in the Blockchain ledger serves as a real-time database of CVs. Here, the credentials and accomplishments listed on the CVs are validated and updated by authorized recruiting organizations in addition to the educational establishment or organization from which the employees graduate. This results in a more cost-effective, automated, productive, and open procedure for employing new employees (Yang & Gabrielsson, 2017). For the purpose of verifying CVs, APPII, in collaboration with Technojobs, is building recruitment and verification platforms based on blockchain technology.

CONCLUSION

Every sector is undergoing a sea change due to the digital transformation. The rate of change is accelerating at an exponential rate. The potential for businesses that expand into this new realm is virtually endless. The use of data analytics is only one of the many opportunities that can arise as a result of digitization. Other possibilities include the creation of brand-new methods for businesses to communicate with their consumers, an increase in the amount of innovation available to employees, the opportunity to attract and keep the most brilliant individuals, and many more. Customers not only profit from the successful delivery of more sales but also can separate themselves from the competition in the market. This study aimed to analyze two new technologies and describe how they might be utilized to enhance business process management. This was accomplished by analyzing each technology's opportunities, difficulties, and critical success factors. Based on an examination of the business demands and system functional requirements of each participant in the supply chain model, we built and constructed a financial platform in this paper that combines the Blockchain and the supply chain. This platform was designed based on the combination of the two concepts. The system offers reliable assistance for the day-to-day financial management of businesses, and it is of utmost significance to enhance financing effectiveness and expand capital flow. The platform for financial management uses the properties of blockchain technology to improve efficiency of the transaction processing process and the system's level of safety.

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