How Can Blockchain Revolutionize the Jordanian Banking Sector?

Zaid Saidat a, Mauricio Silva b, Derar Al-Daboubi c, Ahmad A. Al-Naimi a, Rakan Aldomy a

a Applied Science Private University
Amman, Jordan

b Glasgow Caledonian University
G4 0BA Glasgow, United Kingdom

c Al-Ahliyya Amman University
Amman, Jordan

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Abstract
This article aims to explore blockchain, its applications, and its impact on banks in Jordan. The potential applications and improvements that blockchain might bring to the financial industry are astounding. Specifically, this study discussed the importance and possible areas of deploying blockchain technology in the banking sector of an emerging country with a fast-growing economy, namely Jordan, for different reasons. First, due to the shrinking interest-rate spread, Jordan’s financial sector lacks long-term lending and unsecured loans. Second, many economic revolutions, such as the internet and banking innovations, have impacted the Jordanian banking sector. As a result, the banking sector must undergo significant transformation to increase performance and attain new levels of growth. Third, the underlying technology in clearing payment and credit bank information systems could be revolutionized by blockchains. Fourth, blockchain applications facilitate "obtain credit, unsecured loans" scenarios, improving banking efficiency. Finally, while blockchain has much appeal because it allows free and self-governing transfers, overall regulation and security for this decentralized system are still being created and agreed upon. We argue that for blockchain to change Jordan's financial system, legal frameworks must be in place to control banking transactions. This study explores the technology of blockchain, the emerging technology that powers Bitcoin and other cryptocurrencies. It highlights the features of the blockchain and shows why it could profoundly influence the entire banking sector in areas ranging from payments to settlements and identity services.

Keywords: Financial Technology, Financial Services, Banks, Jordan
摘要 本文旨在探讨区块链及其应用及其对约旦银行的潜在影响。区块链可能对金融行业带来潜在的改进和变化。具体而言，本研究讨论了在经济快速增长的新兴国家（即约旦）的银行业中部署区块链技术的重要性和可能的领域，原因各不相同。首先，由于利差缩小，约旦金融部门缺乏长期贷款和无抵押贷款。其次，许多经济革命，如互联网和银行创新，都影响了约旦银行业。因此，银行业必须进行重大转型，以提高效率并达到新的增长水平。第三，区块链可以彻底改变清算支付和信贷银行信息系统的底层技术。第四，区块链应用助力“获得信贷、无抵押贷款”场景，提升银行效率。最后，虽然区块链因其允许自由和自治的转移而具有很大的吸引力，但中心化系统的整体监管和安全性仍在创建和商定中。我们认为，要让区块链改变约旦的金融体系，必须建立法律框架来控制银行交易。本研究探讨了区块链技术，这是一种为比特币和其他加密货币提供动力的新技术。它突出了区块链的特性，并说明了为什么它可以在支付、结算和身份服务等领域对整个银行行业产生深远影响。

关键词：金融科技、金融服务、银行、约旦

I. INTRODUCTION

Digital technology has evolved tremendously over the past few decades, benefiting and altering every business sector. However, it still has time to influence the highly regulated banking sector and get to the point where FinTech (a combination of finance and technology) firms compete with banks. FinTech approaches employ cutting-edge technology in the financial services business and sell it directly to customers. Customers (retail, commercial, and investment), channels (branches, brokers, web, and mobile social), financial service providers (banks and nonbanks), and interbank providers are four groups that have developed along the banking value chain in the banking and financial markets.

All financial services firms are continually looking for new ways to perform financial services more quickly to improve customer service, increase transparency, and lower costs. Physical media that carried information/value were the first technologies that banks and trade organizations relied on (e.g., paper, coins). However, because the only way to transfer value across long distances was by using physical modes of transportation, markets were limited to a regional scope that has changed thanks to information and communication technology (IT) advances. For example, the electrical telegraph deter information from any precise physical representation, allowing it to be delivered over long distances considerably faster.

Financial service companies, particularly banks, have been able to construct proprietary application systems and corporate networks connecting internal departments and offices due to technical advancements in recent decades. Customers’ electronic interfaces (such as ATMs and online banking) and external stakeholders’ electronic interfaces have been established (e.g., other banks and financial exchanges). “Certainly, financial services have become a digital business, dependent on electronic transactions between financial institutions, financial market participants, and customers around the world essentially,” wrote [7]. Other researchers have found that established financial institutions that do not increase their innovation and instead stick to the old ways lose market share to customers in the new generation, primarily emerging economies. As technology’s robustness and accessibility improve, the impact of technology on banking is growing dramatically. Current patterns provide us a glimpse of what might happen in the future.

The application of blockchain in the financial and banking sectors and the discussion of its use is a promising current trend in technology. Blockchain can alter the industry by making transactions more democratic, transparent, safe, and efficient. Blockchain technology combines novel technologies, including distributed data storage, consensus mechanisms, point-to-point communication, and encryption methods. It also has a promising future as a decentralized ledger capable of independently monitoring transactions between two parties.

Around 90% of central banks are currently participating with blockchain, and it is expected that over 80% of banks will implement blockchain as a distributed ledger technology soon. According to [43], most banks are developing blockchain to significantly reorganize their services and signal the end of traditional banking.

This exploratory project aims to learn more about how blockchain works and answer the following question: what influence will
blockchain technology have on the financial and banking industries? In addition, this study suggests possible policy responses for Jordanian policymakers because of the consequences of blockchain on regulatory systems.

II. RESEARCH METHODOLOGY

This article aims to explore blockchain and its applications and impact on banks in Jordan. The method used in this article is categorized as content analysis and involves obtaining information from the literature. The literature provided an overview from an international and national perspective, with academic books, articles, reports, and electronic media being used for this purpose. The authors acknowledge that only limited recent academic literature is available on the Blockchain in Jordan. However, the authors attempted to refer to the most relevant literature from researchers in blockchain and banking industry-related disciplines. This article seeks to contribute to the current literature on blockchain and the banking sector in Jordan and present future studies and research areas.

III. LITERATURE REVIEW AND ANALYSIS

A. What is Blockchain?

The paper "Bitcoin: A Peer to Peer Electronic Cash System" was published in 2008 by Satoshi Nakamoto and established a Blockchain model. Figure 1 shows the structure from which it takes its name, a system consisting of several blocks connecting along a single list or chain. Each block includes transactional "data," with each transaction timed so there cannot be duplication. After a block is full of transactions, it is timestamped and sent through the network to be added into a chain sequence. The timestamp ensures that data is added in the correct order and that all users have access to the latest version.

Blockchain’s primary purpose is the recording and distribution of digital information. [52] suggests that blockchain "allows participants to secure the settlement of transactions, to achieve the transaction, and to transfer the assets at a low cost." Regarding security, blockchain technology uses hashing - an encoding method converting any data into a string of characters. Figure 2 illustrates how the hash value and the earlier block hash value connect with each block in the blockchain.

A blockchain is first formed when some transactions are placed in a first "genesis block," which has a unique hash code cryptographically generated from the data held in the block. The hash code is then copied into the following block in its "previous hash" link, which means each block connects to the previous block only through this unique hash, and so on throughout the chain sequence. Thus, this hash function protects the chain and its blocks from interference [33]. For example, to try and change the block data, one would have to change the block's hash, which would affect the next block as it contains the previous block's hash.

Additionally, multiple copies of the data are held across a network of computers, as all transactional participants hold a copy of this data so each would be able to identify an attempt to alter the blockchain data. However, the blockchain allows users to modify transactions securely through the use of cryptography with the approval of the majority of the network participants [47]. For example, if most participants agree that a transaction is valid, a new block may be added to the chain.

B. Blockchain in the Banking Sector

There is already a wealth of literature attesting to the enormous benefits of Blockchain technology to the financial and banking sector [2], [4], [24], [26], [30], [33], [54]. A major increase in the global demand for blockchain investments in banking services is anticipated in the coming years [55], as blockchain will improve efficiency and security and reduce costs by over 50% by excluding intermediary costs [44]. The applications for blockchain in the banking center include services such as payments, compliance, digital identity management, insurance, smart contracts, and trade finance [34], [38], [45]. An explanation of how blockchain technology can be implemented in different contexts across the
banking sector follows.

C. Cryptocurrency (Digital Currency)
The cryptocurrency environment has increased dramatically in recent times [20], [46]. Cryptocurrency is a new digital medium for currency exchange [22], exploiting cryptographic practices to protect transactions and manage the creation of additional monetary units [11]. Currently, over 4,000 cryptocurrencies are in circulation worldwide with a market value of up to $2 trillion, 80% of which is in Bitcoin tokens. Bitcoin was the first cryptocurrency employing Blockchain technology operating through a dispersed, decentralized, peer-to-peer network [39]. Cryptocurrency is not subject to specific regulatory entities for verification, regulation, and transfer of value across the network [40]. Therefore, transfers of value with financial transactions between two parties happen directly with no centralized authority being involved [46]. Furthermore, blockchain technology’s power is in its capacity to resolve the obstacle of double-spending [51], which is the probability of a digital token being spent more than once due to the digital file of the digital token being forged or duplicated [14]. As cryptocurrencies utilize the public internet, which provides speed, flexibility, and efficiency [56] and any lack of trust between exchange partners is assuaged by public-key cryptographic mechanisms used to protect financial transactions [35], [53]. [39] confirmed that cryptocurrencies can resolve many weaknesses in current financial systems, e.g., lack of trust, the inefficiency of transactions, and instability.

At the same time, as cryptocurrencies are decentralized and have no regulatory or state oversight, they are now sometimes used for illegal activities such as drug trading and money laundering [37]. Consequently, individuals and organizations in the financial system are deterred from associating themselves with cryptocurrencies. On the other hand, many central banks worldwide wish to promote cryptocurrencies because of their efficiencies; therefore, these banks have started developing a digital version of their fiat currency to reassure customers of their safety. For example, the Central bank of Canada has developed the CAD coin as a digital version of the Canadian dollar. Similarly, the Dutch Central Bank is testing a DNB coin virtual currency. Recently, the Central Bank of the Bahamas introduced the “Sand Dollar” as a digital legal currency equivalent to the traditional Bahamian dollar. Also, the Central Bank of Brazil announced plans for a digital currency by 2022. Table 1 lists the top ten cryptocurrencies by market capitalization.

D. Payments
Blockchain technology has the potential to revolutionize banking payments, which are currently both costly and lengthy optimizing performance with real-time transfers regulated by permission transparency. For example, most interbank payments are currently managed by intermediary clearing firms, which involve complex processes, such as balance settlement, bookkeeping, payment initiation, and transaction settlement, among others [26]. Similarly, cross-border payment processes are complex, with clearing systems changing from country to country, and need intermediaries making payments that take up to 3 days to arrive. All of this highlights poor efficiency with high values of funds being tied up in these processes. However, Blockchain technology can achieve real-time execution, high transparency, and detection, preventing fraudulent transactions at much higher speeds [31].

Additionally, blockchain technology could manage point-to-point payments, eliminating the requirement of a third-party intermediary, significantly reducing bank transaction costs, and enhancing service quality, suggesting that blockchain would enable banks to provide fast and convenient payment clearing services for international trading. There have been numerous industry reports (e.g., Deloitte) predicting that blockchain-supported business-to-business and person-to-person payments systems would create reductions in transaction costs of between 40% to 80% and require just 4-6 seconds to complete, as opposed to the current transfer process average of 2-3 days [19]. Figure 3 below presents similar costs saving predictions for cross-border payments.
E. Know Your Customer (KYC)

It is currently a long and bureaucratic banking procedure, with large amounts of paperwork and a lack of transparency for personal data collected from customers [26], [28], [29]. Complicating this further is the dynamic nature of the process as procedures and customer information change over time, involving laborious updating of personnel. It is currently the norm for customers to present a whole series of documents the first time they engage with any financial institution.

Banks using blockchain technologies can mitigate most of these obstacles with a decentralized and secure KYC process. The distributed ledger means blockchain participants can modify customer information when necessary, and all participants can access this updated information anytime. Further, users must register once, as the one registration within the blockchain network suffices for all service providers. [42] explains how blockchain technology considers security and trust issues. First, decentralization reduces data protection risks and cybercrime compared to centralized storage, improving security and consistency in registering KYC information. Second, enhanced privacy control, as there is no trusted third party monitoring customer data; instead, it can be processed by smart contracts or other decentralized applications. Such contracts manage customer data for the whole financial system. This way, KYC customer information is only accessed with customer consent, creating a strong foundation for stringent privacy control. Third, customer information can be tracked accurately at all times due to data immutability with information available to all financial institutions participating in the blockchain.

F. Remittances and Peer-to-Peer (P2P) Transfers

Many developing countries contribute significantly to their overall GDP through payments from their citizens working overseas and remittances. According to the World Bank, these remittances account for 0.7% (US$1 trillion) of annual global GDP [10]. Money transfers let individuals move funds from account to account internationally. However, all P2P transfers are currently limited in their capacity to transfer in a given geographic region; systems are prone to transfer failure, high commission payments, and data insecurity [17].

Blockchain technology can solve all these problems and significantly impacts traditional international money transfer providers such as banks and firms like Western Union. International blockchain-based transfer systems like Abra, BitPesa (with B2B payments), and Circle (focused on social payments) already provide peer-to-peer (P2P) transactions that are more securely encrypted. Remittances have always been a large and lucrative income source for financial institutions. Blockchain-based remittances can be a major income stream for banks [50]. Blockchain-based transactions with reduced commission costs in real-time with recipients receiving funds immediately and not having the stress of waiting days or weeks [31].

G. A Credit Information Report

Credit reporting agencies produce credit information reports for use by banks to assess the credit history of borrowers as it includes the creditor's name, the current balance, payment history, age and type of credit, percentage of credit limit used, total balances/debt, recent credit behavior and inquiries, available credit. However, this report is insufficiently effective due to the scarcity of data and poor quality, making it difficult to judge the status of personal credit and the difficulties in exchanging data between institutions. Besides, the unclear ownership of user data leads to trading difficulties due to
privacy and security concerns. On the other hand, the development of Internet finance and big data technology has made a significant leap in the amount of information collected by credit reporting agencies, but accurate credit evaluation also needs to guarantee the data quality. It ensures that the credit data is valid and the data is not leaked or falsified.

Blockchain technology makes credit data transparent and open with sharing and privacy protection. Blockchain technology provides the core technical foundation and supports the credit reporting system construction. The information of participants involved in the financial project is shared to solve the problem of information asymmetry and improve trust. The blockchain-based credit system guarantees that the data can be traced back. The system reduces the participation of intermediaries, weakens the role of intermediaries in the transaction process, realizes real-time confirmation and monitoring, and effectively reduces costs in all aspects of transactions. The credit reporting system based on blockchain technology improves cost structure, profitability, and credit risk. It integrates industry information advantages and blockchain technology features and enhances core competitiveness [6].

Fundamentally, blockchain technology resolves data credibility issues. User information, transaction, and operation data are kept in the blockchain, transmitted, and monitored by the whole network. For example, in financial services, the data of user verification, transaction approval, online publishing, lender information, borrower license, borrower commitment, contract signing, transaction processing, repayment information, clearing, and settlement are stored in a blockchain distributed ledger.

H. Trade Finance

Trade finance is the lifeblood of the global trade in goods and services; it allows buyers and sellers worldwide transactions. The World Trade Organisation (WTO) reports that 80-90% of global trade is sustained with trade finance, as trade finance provides the credit, payment guarantee, and insurance needed to facilitate the transaction on terms that would satisfy all parties. Currently, trade finance requires extensive manual inspections and paper-based transactions between trading parties (the importer, exporter, importer's bank, exporter's bank, shipping company, receiving company, local shippers, insurers, and others). This process has common problems, such as a high risk of illegal transactions, high costs, and low efficiency.

Additionally, the COVID-19 pandemic has negatively impacted trade finance processes, deal creation and distribution, tradable instruments, document transfers, authorized signatures, and shipping. Many banks and financial institutions worldwide are trying to switch to digital initiatives and move towards a world where digitization is central to every interaction. As a result, banks want technologies that will simplify trade by establishing digital ecosystems, decreasing costs, and increasing efficiency in trade finance.

As with other contexts discussed earlier, blockchain technology can help reduce the costs to banks and other entities in trade finance. Blockchains supporters [27], [41] contend that the blockchain, acting as a distributed ledger (database), will empower trade finance by maintaining transparent records of critical transactions among trading stakeholders. The blockchain has the potential to improve transaction transparency and supply chain traceability. Also, blockchain technology allows the use of smart contracts [26], [41], which have great potential in trade finance as they enable parties with no established relationship of trust to collaborate without the need for a trusted intermediary.

McKinsey has estimated that blockchain technology will help banks decrease operational costs by USD 13.5-15 billion annually and cost of risk by USD 1.1-1.6 billion annually. Both trading parties will also be able to reduce their cost of capital by USD 1.1–1.3 billion annually and operational costs by USD 1.6–2.1 billion annually. Additionally, improving transaction efficiency makes a smoother flow of overall trade financing channels, which massively improves the income of the overall trade chain.

I. Financial Markets

Financial markets are characterized by laborious and lengthy procedures involving numerous brokers, credit agencies, and investors. All of these actors maintain their ledger and carry out their alterations which is costly and time-consuming [27]. In addition, a major obstacle in the current financial market is the existence of many diverse clearing and settlement systems; with many actors, it is slow and inefficient and carries an elevated counterparty risk [41].

Efficiency in trade and custody securities services can be significantly enhanced by using a distributed ledger made possible by blockchain [36]. Every online transaction involving blockchain assets can be verified at any time without compromising the privacy of the digital assets or
the parties involved [16]. As a result, intermediaries are eliminated from the system, making markets fast and accessible. Smart contracts can replace intermediaries such as lawyers and banks currently responsible for managing contracts for asset deals. Additionally, blockchain technology could greatly enhance the efficiency and cost-effectiveness of Initial Public Offerings (IPO) that have already been tested successfully by the National Association of Securities Dealers Automated Quotations (NASDAQ), with the 'Linq' blockchain expediting the concerns of regulators and customers on trading and transparency [27]. According to research by Goldman Sachs Investment, it has been estimated that blockchain can save $6 billion annually in capital market costs.

Figure 4. Blockchain framework and financial market

J. Banks in Jordan

The Jordanian banking system has been in a "new normal" since 2009, with a decelerating economic growth. Jordan has few natural resources and is energy- and food-dependent, causing significant trade deficits. Jordan's imports are three times larger than its exports [49]. Furthermore, official unemployment is now 24.7% (2020), though the actual unemployment level is estimated to be even greater. In particular, youth unemployment stands at 50% [58].

The banking sector in Jordan, as the primary source of financing, is a key contributor to economic growth [59], accounting for 20.8% of the country's GDP in 2020 and the insurance and real estate sectors [6]. Twenty-four banks operate in Jordanian territory, three of our Islamic and eight branches of foreign banks. In addition, a network of 844 branches and 83 representative offices operates throughout the Kingdom, representing a sizeable national infrastructure and offering significant direct and indirect employment opportunities. Figure 5 shows the spread of credit facilities offered for the year 2020, highlighting the importance of banks to the various Jordanian economic sectors. The majority of credit facilities went to the construction (25%), general trade (16%), and industry (12%) sectors.

Figure 5. Distribution of credit facilities to economic sectors (2020)

Currency, credit, interest rate, and liquidity are just some of the serious risks facing banks in the age of globalization. Over the past two decades, poor practices in the banking sector have led to job losses, corporate bankruptcies, and significant economic loss generally. One of the weakest points in Jordan's financial sector is the lack of long-term lending and unsecured loans. As a result, there are major delays in the system, and investors and borrowers are offered poor protection [23]. It is in the current context of a severe economic crisis in Jordan, witnessing
increases in unemployment rates, public debt, and the public budget deficit, increasing risks and damaging the bank performance in Jordan [3].

Unsurprisingly, within the above context, the financial services market in Jordan is uncompetitive [5], although we have seen acceleration in the marketization of the financial sector recently thanks to technological innovation. Great deals of household savings have been drawn to emergent financial technology products, increasing bank debt costs. Internet finance companies, aware that finance is not an independent entity but embedded within numerous real-life scenarios, are seeking the best methods to expand the market, establishing platforms on mobile terminals and applications to meet various scenarios and gain the attention and time of potential customers. Additionally, the internet finance sector is constantly creating new online-to-offline (OTO) scenarios to attract customers and enhance user viscosity. Banks now face a major threat to their dominant position as the online finance ecosystem continues to grow and penetrates deeper into its clients’ day-to-day scenarios.

A key problem facing the bank in Jordan is the lack of a credit information system. Limiting business expansion for the commercial banks and causing difficulties for SMEs and individuals to obtain loans, which thus continue to use informal finance markets. Moreover, non-performance of loans is quite common, with poor controls on the quality of loans by commercial banks. In addition, Jordanian banks maintain an outdated bureaucracy of paperwork such as double-entry transactions and, after a long process, are slowly digitizing their processes.

Jordan needs to embrace genuine technological advances to achieve growth. [27] proposed that the financial sector can make significant progress through blockchain technology, which is considered a key future technology along with artificial intelligence, big data, and robotic process automation. Banks, private equity firms, start-ups, and other financial institutions are paying great attention to blockchain. Big names in the banking world, like J.P. Morgan, Bank of America, Merrill Lynch, and HSBC, have already processed transactions with blockchain and are now implementing it in their business model. The key feature of blockchain, the decentralized and immutable ledger, has the potential to revolutionize record-keeping systems, with all records transparent and irreversible. In conjunction with the smart contracts feature for automating payments, blockchain technology can be used in banks and almost every business.

The justifications for banks in Jordan implementing blockchain technology are efficiency, cost reduction, transparency, and elimination of third-party intermediaries. Blockchain increases transaction efficiency by removing almost all the time previously involved in decision-making by automating record keeping. Furthermore, it drastically reduces the cost of transactions and operations, with payments made almost automatically without intermediaries or fees. Trust is ensured through encryption and the transparency of the distributed real-time information on transactions [27]. These dramatic benefits need to be considered alongside potential deficiencies.

K. Is There an Efficiency Issue in the Blockchain?
[26] noted several possible efficiency problems with blockchains. One issue is how complex a single transaction might become within a decentralized, distributed system. As transaction and clearing occur simultaneously, each transaction needs to be verified by all network nodes, which is detrimental to its speed. Such an impact becomes prominent when the nodes of the blockchain increase. At the same time, the decrease in the efficiency of single transactions would improve transaction security, and the simultaneity of transactions and clearing would eliminate the problems of subsequent reconciliation. Taken together, this still means definite improvements to the overall efficiency of banks. Furthermore, in terms of the degree of centralization, the excellent transaction speed of Bitcoin is deeply influenced by its decentralization. As for consortium blockchains, which are more suitable for the banking industry, the lower level of decentralization implies that the loss in speed is not too significant. Current tests have already shown that cross-border transactions require less than ten seconds.

I. How Should Blockchain Be Regulated?
Banks and financial institutions in Jordan remain reluctant to adopt blockchain as the state is yet to provide an adequate national legal framework for its use and operation. There are articles 18-21 of Jordanian E-transactions Law (JEL) 2015 regulating online payments [1], but this is limited in scope. Consequently, further legislation is required to regulate blockchain-supported financial transactions as the Jordanian Commercial Law and Civil Code cannot currently regulate the controversial disputes arising within the transactions supported by
blockchain technology. Specifically, legislators need to set out the basis by which the contractual relationship between parties to financial transactions, concluded via blockchain technology, is settled, detailing and determining rights and obligations, and issues of liability and proof. Such legislative backing will encourage banks, financial institutions, and their customers to trust using blockchain technology for their financial transactions. In this way, banks and their customers can access the advantages of blockchain around security and efficiency, in particular transparency, detection, prevention of fraudulent transactions, speed, cost reduction, and dispensing with intermediaries.

IV. CONCLUSION

Blockchain technology will put several industries, including banking and financial services, to the test, putting the way transactions and intermediaries work in financial markets to the test [12]. Because of the huge influence on all stakeholders, it is critical to study and understand how blockchain is being implemented in the banking industry since blockchain has the potential to transform payment clearing and credit information systems. This study will interest banks and FinTech, as well as their investors, regulators, and other stakeholders, because blockchain technologies foreshadow new “multi-center, weakly intermediated” structures that promote efficiency in the financial sector. While there is much talk about blockchain regulation and security, it is important to remember that these issues, like other innovation concerns, are not new.

The main focus of this study is on the financial industry's potential for using blockchain. It then described how Jordan might revitalize its financial industry’s potential for using blockchain. The state of play of blockchain technology in the financial services sector: A systematic literature review. International Journal of Information Management, 54, 102199.

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