ISSN 1816-6075 (Print), 1818-0523 (Online)
Journal of System and Management Sciences
Vol. 14 (2024) No. 5, pp. 251-267
DOI:10.33168/JSMS.2024.0516

The Role of Blockchain Technology in Managing Efficiency and Cost Reduction in The Banking Sector in Jordan

Bilal Sakarneh, Yanal M. Kilani, Alaa Basheer Nassar

Isra University

bilal_sakarneh@iu.edu.jo, Yanal.alkilani@iu.edu.jo, Alaa-nassar87@outlook.com

Abstract. This study analyzed how blockchain technology can support efficiency improvements and cost reduction in the banking industry in Jordan. A survey of 68 bank managers examined the potential benefits of blockchain features including automation, transparency, improved traceability and security. Results of regression analysis found these blockchain aspects positively influenced efficiency and cost reduction. Improved traceability showed the highest impact, explaining 66.6% of variance in efficiency and cost reduction. The findings imply blockchain can streamline processes, prevent fraud, eliminate intermediaries, and strengthen data integrity to reduce expenses for banks. This provides empirical evidence from Jordan on blockchain's capabilities to strengthen bank performance by reducing transaction costs and improving productivity. The main limitation is the small sample size concentrated only in Jordan. Further research should investigate blockchain adoption across wider banking contexts. This study contributes timely insights on blockchain's promise to support banks in enhancing system efficiency and managing costs.

Keywords: Blockchain BC, Artificial Intelligence AI, Intermediary Elimination, Automation and Smart Contracts, Transparency and Auditability, Streamlined Data Sharing and Verification, Improved Traceability, Improved Data Security and Fraud Prevention, Diffusion of Innovation Theory

1. Introduction

Artificial intelligence (AI) is increasingly being used across various functions in the financial environment. Financial institutions are utilizing AI through machine learning algorithms to analyze large transactional and customer behavioral datasets to better assess creditworthiness, predict defaults, detect fraud patterns, and provide personalized recommendations, this improves operational efficiency (Ohana et al., 2021). According to Kaya et al. (2019) and Rodrigues et al. (2022), advanced analytics with AI enables accurate risk assessments compared to traditional rule-based models. For instance, robo-advisors use machine learning to develop customized investment portfolios based on client risk profiles and market trends.

From another perspective, Indriasari et al. (2019) noted that AI chatbots and virtual assistants deployed by banks and insurers can answer basic customer queries and conduct transactions through natural conversations, freeing up human agents for complex issues. As for Soni (2019), trading algorithms powered by deep learning also help automated trading systems make split-second decisions by analyzing immense market and sentiment data, allowing for lower-cost high-frequency trading.

Emerging technologies like blockchain, computer vision and AI are also being explored for applications such as digital identity verification, automated processing of financial documents, and enhanced anti-money laundering surveillance via behavioral analytics. While AI brings scale, consistency and efficiency, issues around bias, transparency and workforce disruption warrant prudent governance through risk management, oversight and ethical practices (Sadok et al., 2022).

Hassani et al. (2018) argued that blockchain technology fundamentally transform banking and financial services. Its decentralized, distributed ledger offers **enhanced security**, **transparency**, and **automation**. According to the study, blockchain enables banks to gain valuable insights, strengthen risk management, and provide customized services by analyzing large volumes of data. The authors also suggest blockchain technology help banks **detect fraud** through advanced analytics of transactions, enable **smart contracts**, and prevent money laundering by tracking financial flows. Overall, the study highlights the transformative potential of blockchain in banking by enhancing **security, analytics, and automation**. Adopting this technology could provide banks with significant benefits such as improved risk management, deeper customer insights, prevention of financial crimes, and the ability to offer innovative services through smart contracts.

Pal et al. (2021) aimed to explore the potential uses of blockchain technology in business management, identify significant challenges, and discuss how it could generate novel opportunities. To accomplish this, the authors performed an extensive literature review on previous studies examining blockchain applications across different industries such as supply chain, healthcare and finance. Their analysis also covered research discussing the technical and organizational obstacles to blockchain adoption. Results of the review showed blockchain could facilitate applications enabling **transparent and trusted supply chain**, secure medical records administration, decentralized cloud services, digital rights handling, and peer-to-peer sharing economic platforms. However, issues like scalability problems, lack of interoperability, absence of standards, regulatory ambiguity and the energy-intensive nature of cryptocurrencies require resolution.

Marbouh et al. (2020) in their study aimed to stand on the blockchain as one of the AI technologies and its role in facing the challenges of COVID 19. Through a literature review of studies related to Blockchain, the researchers concluded a study that blockchain has an effective role in increasing the level of **privacy and security**, dealing with **transparency** and integrity, and standing up **to fraud attempts**, in addition to ensuring that supply chains are integrated and aligned with basic requirements.

Osmani et al. (2021) argued that there are many areas in which Blockchain can contribute to cost reduction in the banking sector, these areas included **intermediary elimination**, which eliminated the need for intermediaries, but individuals were able to access services directly. In addition, the study found that the blockchain was able to improve efficiency through **improved traceability**, which relied

on **smart contracts**, which helped simplify the flow of financial operations and reduce the overall costs of financial institutions.

Dutta et al. (2020) argued that reliance on the blockchain in the financial services environment had a significant contribution to reducing settlement costs through the **reduced settlement times and costs** feature, which contributed to reducing the required time and labor costs for settlement operations. In addition, the study found that the blockchain simplifies compliance processes and their expenses due to the presence of **transparency and auditability**, which reduces the need for manual oversight.

Asante et al. (2021) found in their study that blockchain plays a significant role in reducing costs and increasing efficiency through improving the performance of the IT infrastructure, reducing the costs of migrating core operations without relying on traditional systems, and ensuring a higher level of **streamlined data sharing and data security**. This leads to a further reduction in infrastructure maintenance costs.

Rejeb et al. (2022) researchers have looked at the circular economy and the role of blockchain in facilitating financial practices in it. Among the facilities offered by blockchain is the availability of **interoperable and scalable technology** as well as organizational readiness. The study also found that the characteristics of the blockchain have a role in reducing costs, such as **traceability**, **transparency**, and **data sharing** across supply chains.

Chang et al. (2019) aimed at revealing blockchain and its role in improving trade finance by reducing costs, increasing efficiency and mitigating risks. The researchers focused on the principles of banking, and **smart contracts** by focusing on the benefits and challenges. The study concluded that relying on smart technology, specifically the blockchain, contributes to business validation, time utilization in the most effective way, **enhancing compliance**, and avoiding floating periods and interest costs.

Going through the previous studies it appeared that there are numerous benefits of AI and blockchain in increasing efficiency and reduce costs within financial institutions. However, there appeared no studies that focused on how these factors that are presented by blockchain may facilitate cost reduction within the banking industry. In addition, there weren't studies that aimed at gathering those factors (characteristics of blockchain) and apply them on examining the efficiency and cost reduction within banking industry.

Developing variables and aim of study was done depending on previous studies like (Al-Jaroodi and Mohamed, 2019; Marbouh et al., 2020; Dutta et al., 2020; Asante et al., 2021; Rejeb et al., 2022 and Chang et al., 2022). Researcher gathered the most common benefits of blockchain technology in the field of efficiency and cost reduction including (Intermediary Elimination, Automation and Smart Contracts, Transparency and Auditability, Streamlined Data Sharing and Verification, Improved Traceability, Reduced Settlement Times and Costs, Improved Data Security and Fraud Prevention). In that sense, researcher aimed at examining its role in a Jordanian environment. From that point, current study aim to examine the role of blockchain technology in increasing efficiency and reduce costs within banking industry in Jordan. In other words, purpose of current study was to shed the light on the role of blockchain technology in managing efficiency and cost reduction within the banking industry in Jordan. Highlighting the relationship between variables was formulated by researcher through the following model:

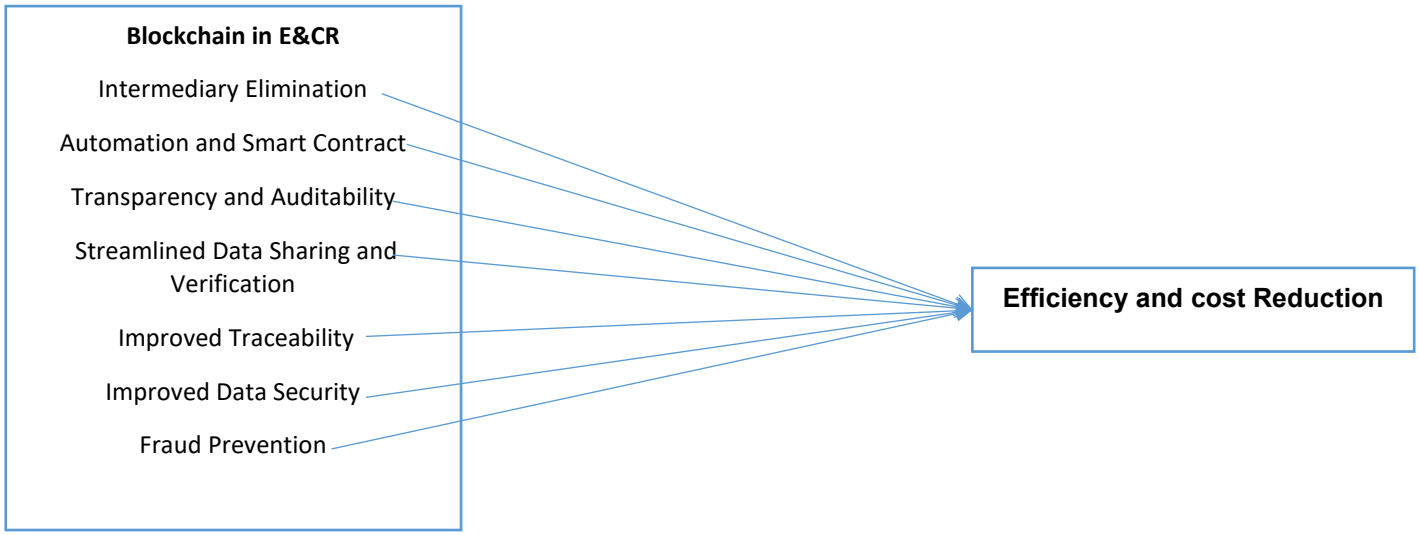

Fig.1: Study Model (Al-Jaroodi and Mohamed, 2019; Marbouh et al., 2020; Dutta et al., 2020; Asante et al., 2021; Rejeb et al., 2022 and Chang et al., 2022)

From model above, researcher was able to formulate the following set of hypotheses:

H: Block chain as an AI technology has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

H1: Intermediary Elimination in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

H2: Automation and smart contract in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

H3: Transparency and auditability in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

H4: Streamlined data sharing and verification in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

H5: Improved tractability in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

H6: Improved data security in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

H7: Fraud prevention in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

It is worth mentioning that the current study was launched from **Transaction Cost Theory (TCT)**, which is an economic theory that focuses on analyzing the efficiency of organizational and financial practices in view of their cost. Ronald Coase developed this theory in 1937, and it suggests that organizations should adopt contracts and governance structures based on low costs, such as technology that reduces the costs of financial and non-financial practices by relying on digitization, smart contracts, and automated governance (Schmidt and Wagner, 2019; Chen et al., 2022; Ahluwalia et al., 2020). In the current study, the researcher proceeds from the transaction cost theory, considering that the adoption of blockchain technology as one aspect of artificial intelligence contributes to reducing costs and increasing efficiency.

2. Literature Review

2.1. Financial Technologies FinTech

Financial Technology (Fintech) was defined as a technology innovation that transformed financial services and practices from traditional to digital technology. It was argued by Ntwiga (2020) that one of the most widespread fintech technologies is digital payments, through which payment is made through a smartphone or smart systems, and the blockchain represents a revolution in this field. As for Lien et al. (2020), it was indicated that Fintech provided organizations with many digital services in the field of the financial environment, including algorithms, big data, in addition to underwriting based on artificial intelligence.

2.2. Blockchain in Fintech

Fadhul and Hamdan (2020) confirms that the blockchain has an important role in the development of fintech, as the blockchain is a means for recording transactions and transferring digital assets between decentralized technological parties on a reliable and reliable basis. On the other hand, fintech has transformed many financial services and practices into technological applications such as bitcoin, which relied on the blockchain to move financial and banking services from the traditional method to the low-cost digital method without mediation and cost (Legowo et al., 2021).

2.3. Dimensions of Blockchain in E&CR

Zveryakov et al. (2019) added that the blockchain is works on creating platforms to provide decentralized banking services, which would automate financial operations through smart contracts, confirm transparency and credibility, in addition to cost efficiency and reduction. Many benefits can be results of adopted a well-built blockchain platform. Such benefits were presented earlier by (Al-Jaroodi and Mohamed, 2019; Marbouh et al., 2020; Dutta et al., 2020; Asante et al., 2021; Rejeb et al., 2022 and Chang et al., 2022) and included:

Intermediary Elimination

In general, there is no need for an intermediary in Blockchain, as interactions are peer-to-peer, which reduces interest, commissions, and operating costs, in addition to reducing costs related to various financial transactions.

Automation and Smart Contract

Reliance on automation and smart contracts has proven its worth in reducing expenses and human errors, in addition to the possibility of tracking resources and exploiting them in the most efficient and effective way.

Transparency and Auditability

The blockchain guarantees permanent transparency of financial transactions and practices. This is sufficient to improve the results of financial operations, facilitate the task of finding and fixing problems, in addition to the possibility of settling various disputes in a smooth manner and avoiding waste in all its forms.

Streamlined Data Sharing and Verification

Blockchain guarantees the validation of shared data and reduces the costs of data entry and storage in traditional ways, and avoids human errors and repeating the same steps all over. It also works to provide high-accuracy information in the required real time, thus reducing costs and providing a coordinated and efficient workflow.

Improved Traceability

The blockchain provides comprehensive tracking of assets, goods or documents, thus simplifying and reducing the cost of supply chain operations and compliance. It also reduces all costs that have the outcomes of regulatory financial practices such as waste, excess inventories, and product returns.

Reduced Settlement Times and Costs

Transaction settlement means that capital is not restricted to pending transactions, thus reducing costs and improving liquidity. Additionally, real-time blockchain settlements eliminate avoidable interest costs.

Improved Data Security

The blockchain contributes to the formation of a strong security shield capable of protecting digital assets. It is also an effective way to access reliable and accurate data away from human errors, which leads to a reduction in expenses.

Fraud Prevention

The blockchain prevents any opportunity for fraud or piracy and hacking, and it alerts in cases where any case of fraud is likely to occur, even in the case of a specific weak and easy-to-hack system, the blockchain gives alerts about the existence of a vulnerability that needs to be addressed.

2.4. Manage Efficiency and Cost Reduction

Efficiency and cost reduction are among the basic key performance indicators that any organization is aspire to reach (Lestari and Rahmanto, 2023). According to Bashayreh and Wadi (2021) and Elsaid (2019), in today's digital era, costs have become a key differentiator for banks to maintain a competitive edge against challengers. Higher efficiency enables optimal resource allocation to maximize outputs and revenues while minimizing expenses, directly improving profitability. Lower costs also allow banks to price services affordably for customers and reallocate saved resources to innovative customer-centric technologies and services for a better experience (Dwivedi et al., 2021). Lee et al. (2021) and Varma et al. (2021) argued that well-managed costs further provide stronger capital buffers to boost resilience and ensure long-term sustainability amid economic shocks. Strict regulations mandate robust risk management and transparency which streamlined processes facilitate at reduced costs. Demonstrating efficient use of capital also reassures shareholders and investors, improves valuations, and aids fundraising for future growth. While Wang et al. (2021) and Le et al. (2021) noted that profits from efficiency can be invested in employee welfare to foster higher satisfaction and retention. Proactive changes further help adapt to emerging FinTech innovations threatening legacy models, sustaining banking sector agility in competitive digital landscapes.

3. Methods and Material

3.1. Methodological Approach

Achieving aim of current research was done depending on adopting the quantitative methodology. It was seen that it is more suitable as it has the ability to gather numerical data and then process these data statistical in order to reach insights regarding results.

3.2. Study Tool

A questionnaire was chosen to represent the main tool of study. The questionnaire was built by researcher through the aid of previous studies, it was based in liker 5-point scale ranging between 1 strongly disagree to 5 strongly agree. The questionnaire consisted of two main sections. The first took into perspective demographics of study sample (gender, age, qualification and experience). The other section contained statements related to study sub-variables including (Intermediary Elimination, Automation and Smart Contracts, Transparency and Auditability, Streamlined Data Sharing and Verification, Improved Traceability, Improved Data Security and Fraud Prevention).

The distribution method was chosen to be an online link, the questionnaire was uploaded online through survey-monkey, and then the link leading to the questionnaire was distributed on the sample for response issues.

3.3. Population and Sampling

Population of study was resembled by financial managers within Jordanian banks operating in Jordan through the fiscal year 2021-2022; there was a total of (25) banks in Jordan, including (16) local Jordanian banks, divided into (13) commercial banks and (3) Islamic banks, in addition to (9) foreign banks, including (8) commercial banks, and one Islamic bank. According to the Central Bank of Jordan, banks operate through 818 branches and 76 offices.

A convenient sample was chosen to represent the study population, researcher has chosen total of (75) managers to respond to the online questionnaire on the account of (3) questionnaire for each bank. After application process, researcher was able to retrieve (68) properly filled questionnaires which indicated a response rate of (90.6%) as statistically accepted.

3.4. Statistical Processing of Primary Data

Tackling the gathered primary data was done depending on statistical package for social sciences SPSS. Primary data were withdrawn from the website on which the questionnaire was uploaded and the data were entered on SPSS software. As a start, assessment of the scale's reliability was conducted via the use of Cronbach's alpha. The provided table illustrateed that the alpha values indicated a reliable scale, since they above the commonly acknowledged threshold of 0.70.

Table 1. Cronbach's Alpha

variable	Alpha value
Intermediary Elimination	0.705
Automation and Smart Contract	0.846
Transparency and Auditability	0.70
Streamlined Data Sharing and Verification	0.711
Improved Traceability	0.726
Reduced Settlement Times and Costs	0.792
Improved Data Security	0.71
Fraud Prevention	0.77
Efficiency and cost Reduction	0.807

Other statistical tests employed in current study included frequency and percentage, mean and standard deviation, multicollinearity test, in addition to multiple regression.

4. Results and Discussion

4.1. Demographic Results

Frequency and percentages were calculated for questionnaire respondents. Results indicated that majority of respondents were males forming 80.9% of total sample who held BA degree forming 85.3% and had an experience in the field that was more than 11 years forming 50% of the total sample.

Table 2. Demographic Results

	f	%
Gender		
Male	55	80.9
Female	13	19.1
Education		
BA	58	85.3
Postgraduate Studies	10	14.7
Experience		

Less than 5 years	13	19.1
6-10 years	21	30.9
More than 11 years	34	50.0
Total	**68**	**100.0**

4.2. Questionnaire Analysis

Mean and standard deviation were calculated for questionnaire statements. Results as in table below indicate that respondents had positive attitudes regarding questionnaire items as they all scored higher than mean of scale 3.00. The highest positively received variable was improved traceability with a mean of 4.11/5.00 compared to the lowest mean which was scored by Streamlined Data Sharing and Verification with a mean of 3.91/5.00 but still positive as it was higher than mean of scale.

Table 3. Questionnaire Analysis

	Mean	Std. Deviation
Blockchain eliminates the need for intermediaries	3.750	1.056
Blockchain provides a decentralized and trustless environment	3.721	1.244
Blockchain enables direct peer-to-peer transactions	4.059	.912
Blockchain reduces the reliance on intermediaries.	3.941	.976
Blockchain facilitates faster transactions, streamlined processes, and lower associated fees	4.250	.887
Intermediary Elimination	**3.944**	**.693**
Blockchain support the execution of smart contracts	3.809	1.040
Smart contracts are self-executing agreements with predefined rules and conditions	4.029	.863
Smart contracts automate the execution and enforcement of contractual obligations	4.074	.903
Blockchain remove the need for manual intervention or intermediaries	4.221	.861
Automation reduces administrative tasks	4.074	.903
Automation and Smart Contract	**4.041**	**.721**
Blockchain's transparent nature allows all participants in the network to have visibility into transactional data.	4.162	.940
Transparency enhances accountability and reduces the need for extensive auditing processes. auditing is more efficient and cost-effective	4.324	.984
Through auditability, auditors can directly access the blockchain's immutable records	3.809	1.237
Auditability do not require auditors to rely on separate systems and manual verification.	4.088	1.047
Transparency and Auditability	**4.096**	**.768**
Blockchain enables secure and efficient sharing of data among multiple parties.	3.941	.991
Streamlining doesn’t require relying on disparate databases and manual reconciliation	3.691	.935
Blockchain provides a single source of truth that all participants can access and trust.	3.897	.917
Streamlining and data sharing reduce delays	3.897	.849
Streamlining doesn’t depend on duplication of efforts, and associated costs	4.162	.765
Streamlined Data Sharing and Verification	**3.918**	**.562**
Blockchain enhance supply chain efficiency by providing end-to-end traceability and transparency.	4.147	.833
Each step is recorded on the blockchain, enabling real-time tracking of goods	4.000	.930
Blockchain can verify authenticity, and reduce the risk of fraud or counterfeiting.	4.206	.783
Traceability and Supply Chain Management leads to better inventory management	4.206	.802
Tractability reduces administrative overhead and improve efficiency in logistics and supply chain operations.	4.015	1.015
Improved Traceability	**4.115**	**.606**
Reduced Settlement significantly reduce settlement times and associated costs.	4.103	.813
It avoids traditional financial transactions as they involve multiple intermediaries, complex processes, and lengthy settlement periods.	3.794	.971

With blockchain, transactions can be settled directly between participants	4.059	.929
Reduced Settlement eliminate the need for intermediaries and reducing settlement times and associated fees.	4.221	.808
Reduced Settlement Times and Costs	**4.044**	**.636**
Blockchain's robust cryptographic techniques and decentralized architecture enhance data security	4.147	.833
It has the ability to reduce the risk of fraud or tampering.	3.941	.991
It can eliminate a single point of failure and relying on consensus mechanisms	4.118	.939
Blockchain technology ensures the integrity and immutability of data.	4.103	.964
IT helps prevent costly data breaches, fraud, and unauthorized access, resulting in potential cost savings for businesses.	4.015	1.015
Improved Data Security	**4.065**	**.647**
Through blockchain organizations can achieve greater operational efficiency	4.059	.896
It is more able to reduce costs associated with intermediaries and manual processes	3.735	1.017
It is able to improve data transparency and security	4.015	1.000
It facilitates streamlining various business operations.	4.162	.891
Fraud Prevention	**3.993**	**.733**
Cost reduction has the ability to increase operational efficiency	4.103	.917
Cost reduction on banking sector is associated with cost savings and maintaining competitive pricing	3.985	.922
Efficiency and cost Reduction is able to enhance customer experience	4.176	.772
Cost reduction encourages the organization to adopt digital transformation	4.191	.797
Efficiency is critical for banks to meet regulatory requirements effectively	4.000	1.022
Efficient banks can respond quickly to these changes, adapt their operations, and introduce new products and services with reduced time-to-market	4.088	.824
Efficiency and cost reduction are fundamental pillars that enable banks to improve profitability	3.779	.960
By reducing operational bottlenecks and enhancing service delivery, banks can attract and retain customers, leading to increased loyalty and profitability.	4.074	.935
Efficiency and cost reduction contribute to the long-term sustainability of banks.	4.235	.813
Efficiency and cost Reduction	**4.070**	**.557**

4.3. Multicollinearity Test

To evaluate the presence of multicollinearity among the independent variables, the Variance Inflation Factor (VIF) and Tolerance were calculated for each variable. The findings that were uncovered are as follows. The data shown in the table above indicates that the Variance Inflation Factor (VIF) values are below 10, but the Tolerance values exceed 0.10.

Table 4. Multicollinearity Test

variable	Tolerance	VIF
Intermediary Elimination	.339	2.950
Automation and Smart Contract	.191	5.246
Transparency and Auditability	.265	3.769
Streamlined Data Sharing and Verification	.453	2.206
Improved Traceability	.242	4.133
Reduced Settlement Times and Costs	.167	5.992
Improved Data Security	.187	5.336
Fraud Prevention	.158	6.329

4.4. Hypotheses Testing

Multiple regression was used to test the main hypothesis. R= 0.988 and indicated a robust association between the independent and dependent variables. Furthermore, it has been shown that the independent

variables explained **97.7%** of the variance seen in the dependent variable under investigation. Additionally, the analysis revealed that the F value was statistically significant at a significance level of 0.05. This finding implied that "Blockchain as an AI technology has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Table 5. Main Hypotheses Testing

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			R	R Square
		B	Std. Error	Beta	t	Sig.		
1	(Constant)	-.012	.090		-.136	.893	.988[a]	.977
	Intermediary Elimination	.043	.027	.053	1.568	.122		
	Automation and Smart Contract	-.018	.035	-.023	-.503	.617		
	Transparency and Auditability	.021	.028	.029	.758	.451		
	Streamlined Data Sharing and Verification	-.014	.029	-.014	-.480	.633		
	Improved Traceability	.279	.037	.303	7.574	.000		
	Reduced Settlement Times and Costs	.529	.042	.604	12.525	.000		
	Improved Data Security	.151	.039	.176	3.866	.000		
	Fraud Prevention	.013	.038	.017	.353	.726		
	H: Block chain as an AI technology has a positively significant influence on efficiency and cost reduction with banking sector in Jordan							

As it was mentioned earlier, the study was based in a set of sub-variables that constituted the overall influence of Blockchain on efficiency and cost reduction. Those sub-variables were transformed into sub-hypotheses, and linear regression was used in order to test their acceptance or rejection in relation to the main aim of study. Table 6 indicated the following results:

Hypothesis 1: r = 0.635, indicated a robust association between the independent and dependent variables. Furthermore, it has been shown that the independent variable explained **40.4%** of the variance seen in the dependent variable under investigation. Additionally, the analysis revealed that the F value was statistically significant at a significance level of 0.05. This finding implied that "Intermediary Elimination in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Hypothesis 2: r = 0.618 indicated a robust association between the independent and dependent variables. Furthermore, independent variable explained **38.2%** of the variance seen in the dependent variable under investigation. F value was statistically significant at a significance level of 0.05. This meant that "Automation and smart contract in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Hypothesis 3: r = 0.646 indicated a robust association between the independent and dependent variables. The independent variable explained **41.7%** of the variance seen in the dependent variable under investigation. F value was statistically significant at a significance level of 0.05. This finding implied that "Transparency and auditability in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Hypothesis 4: r = 0.633 indicated a robust association between the independent and dependent variables. The independent variable explained **44%** of the variance seen in the dependent variable under investigation. F value was statistically significant at a significance level of 0.05. This finding implied that "Streamlined data sharing and verification in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Hypothesis 5: r = 0.816 indicated a robust association between the independent and dependent variables. The independent variable explained **66.6%** of the variance seen in the dependent variable under investigation. F value was statistically significant at a significance level of 0.05. This finding implied that "Improved tractability in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Hypothesis 6: r = 0.778 indicated a robust association between the independent and dependent variables. The independent variable explained **60.5%** of the variance seen in the dependent variable under investigation. This meant that "Improved data security in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Hypothesis 7: r = 0.771 indicates a robust association between the independent and dependent variables. The independent variable explained **59.4%** of the variance seen in the dependent variable under investigation. Overall, "Fraud prevention in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan".

Table 6. Sub-Hypotheses Testing

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			R	R Square
		B	Std. Error	Beta	t	Sig.		
1	(Constant)	2.055	.306		6.716	.000	.635[a]	.404
	Intermediary Elimination	.511	.076	.635	6.683	.000		

H1: Intermediary Elimination in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	R	R Square
1	(Constant)	2.142	.307		6.981	.000	.618[a]	.382
	Automation and Smart Contract	.477	.075	.618	6.382	.000		

H2: Automation and smart contract in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	R	R Square
1	(Constant)	2.151	.284		7.575	.000	.646[a]	.417
	Transparency and Auditability	.469	.068	.646	6.877	.000		

H3: Transparency and auditability in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	R	R Square
1	(Constant)	1.613	.374		4.311	.000	.633[a]	.400
	Streamlined Data Sharing and Verification	.627	.095	.633	6.635	.000		

H4: Streamlined data sharing and verification in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

Coefficients

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.		

		B	Std. Error	Beta			R	R Square
1	(Constant)	.982	.272		3.611	.001	.816[a]	.666
	Improved Traceability	.751	.065	.816	11.477	.000		

H5: Improved tractability in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	R	R Square
1	(Constant)	1.347	.274		4.916	.000	.778[a]	.605
	Improved Data Security	.670	.067	.778	10.058	.000		

H6: Improved data security in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

Coefficients

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	R	R Suare
1	(Constant)	1.731	.242		7.160	.000	.771[a]	.594
	Fraud Prevention	.586	.060	.771	9.836	.000		

H7: Fraud prevention in Blockchain has a positively significant influence on efficiency and cost reduction with banking sector in Jordan

4.5. Discussion

Current study had a purpose of shedding the light on the role of blockchain technology in managing efficiency and cost reduction within the banking industry in Jordan. Achieving this aim was done depending on quantitative methodology through adopting a questionnaire. (68) managers within banks in Jordan represented the population of study and responded to an online questionnaire. Managing primary data was done through SPSS and results indicated the acceptance of the main hypothesis which argued that *Block chain as an AI technology has a positively significant influence on efficiency and cost reduction with banking sector in* Jordan . Testing sub-variables indicated that all sub-hypotheses were accepted and it appeared that all the sub-variables (Intermediary Elimination, Automation and Smart Contracts, Transparency and Auditability, Streamlined Data Sharing and Verification, Improved Traceability, Reduced Settlement Times and Costs, Improved Data Security and Fraud Prevention) had an influence in managing efficiency and reducing cost within banking sector in Jordan.

Going deeper into analysis, it was found that the highest impact among sub-variables was thrown by the variable of **"improved traceability"** which scored an R-value of 0.816 and explained **66.6%** of the variance seen in the dependent variable under investigation. The study found that traceability was effective in supporting operational efficiency and reducing costs by recording, transferring, and tracking existing assets and authorizing access to these movements by authorized persons. This agrees with both Osmani et al. (2021) and Rejeb et al. (2022) when they assert that traceability provides a good and robust type of traceability within internal systems, thus avoiding unnecessary costs. In addition, improved traceability is able to reduce disputes over records since there is only one record, and it is immutable.

In the second rank, analysis indicated that **"improved data security"** facilitated an influence on efficiency and cost reduction through scoring an R-value of 0.778 and explained **60.5%** of the variance seen in the dependent variable under investigation. Improved data security appeared to be a major positive influence as it facilitated a secured data entry and processing. This agreed with Hassani et al. (2018) and Asante et al. (2021) who confirmed that encryption and the high level of security were able to deal with transactions and records in a secure manner, and simplify daily operations and tasks through coordination between decision makers, which positively affected efficiency and reduced cost requirements for these operations.

Third rank was scored by variable of **"fraud prevention"** with an R = 0.771 and explained **59.4%** of the variance seen in the dependent variable under investigation. On that result, it was seen that blockchain technology has the ability to significantly boost efficiency and reduce costs for businesses and financial institutions by preventing fraud. With every transaction securely recorded on an immutable ledger visible to all parties, it becomes almost impossible for fraudulent activities like double spending or fake transactions to go unnoticed. This agreed with Hassani et al. (2018) and Marbouh et al. (2020) who noted that the level of transparency deters would-be perpetrators and greatly reduces the incidence of fraud from the outset. Since fraud prevention directly affects the bottom line, minimizing it through blockchain eliminates extra expenses associated with losses, chargebacks, investigations and refunds.

Fourth, fifth and sixth ranks were scored by **"Streamlined data sharing and verification/ Transparency and auditability and Intermediary Elimination"** scoring an R-value of 0.635, 0.646, 0.633 respectively. In addition, the three variables explained **44%, 41.7% and 40.4%** of the variance seen in the dependent variable under investigation also respectively. Blockchain has the potential to enhance efficiency and reduce costs by relying on simplified data sharing, transparency, and the elimination of the need for intermediaries. Whereas, when there is an ability for all parties to view consistent data in real time, it simplifies the processes that require verification and exchange of data. This is consistent with Marbouh et al. (2020); Dutta et al. (2020); Asante et al. (2021) and Osmani et al. (2021) when they point out that duplicate activities are usually canceled and manual multitasking is avoided, which saves time and effort on resource depletion and enhances efficiency.

In the last rank, there appeared the variable of **"Automation and smart contract"** scoring an R=0.618 and explained **38.2%** of the variance seen in the dependent variable under investigation. Eliminating the mediator helps enhance efficiency by facilitating faster resolution of problems and disputes. In addition to creating a high level of transparency and trust, and thus relying on data that has been validated without a doubt. This result was consistent with Hassani et al. (2018); Osmani et al. (2021) and Chang et al. (2019) who confirmed that dispensing with intermediaries, and relying on peer-to-peer services contributes to reducing costs and improves productivity, as it reduces human errors.

In reference to the previously presented theory of transaction cost (TCT). Results of current study indicated that the theory is related to cost reduction in the banking sector through structuring transactions, bargaining costs, monitoring and enforcement, and thus reducing the cost in general. In addition, the theory is related to cost reduction in the banking sector through the ability of distributed

ledger to be the first and last source for customer records, thus reducing duplicate verification processes, and on the other hand, smart contracts and their role in automating the implementation of financial agreements without the need for negotiations.

Study was limited to Jordanian banks operating in Jordan during the fiscal year 2021-2022. Also, the study was limited to the opinions of the adopted convenient sample of study. There was no financial reports, information, data or sources were used in the development of current study.

Possible future studies on the same concept may include carrying out a research study that examine blockchain as an AI technology and its influence on customer behavior through Technology Acceptance Model TAM. In addition to examine the role of smartphone application in increasing usability of online financial services among senior users.

5. Conclusion

This study provides important empirical evidence that blockchain technology can significantly improve efficiency and reduce costs for Jordan's banking sector. Findings indicate features of blockchain like process automation, transparency, traceability, and enhanced security positively influence bank productivity and transaction costs. In particular, improved traceability showed the greatest potential to reduce expenses based on blockchain's ability to transparently track assets and transactions. These results align with previous literature demonstrating blockchain's capabilities to streamline workflows, prevent fraud, share data securely, and eliminate intermediaries across finance. However, more research is needed to assess the feasibility of blockchain adoption across wider banking contexts. Additionally, future studies could examine specific use cases of blockchain implementations to provide fuller insights. This research makes a timely contribution by quantitatively demonstrating the promising role of blockchain technology in managing bank efficiency and costs, particularly in the Jordanian banking environment. The results can guide banks in leveraging blockchain to modernize operations, improve productivity, prevent fraud, and better compete in digital financial markets

The current study has practical and theoretical contributions. From a practical perspective, the study can contribute to access to banking and financial practices that will simplify the workflow and improve the use of resources. It also presents ideas and aspirations that would digitize traditional financial systems and activate management methods at a low cost.

From a theoretical perspective, it is possible that the study provides an examination of the applicability of the blockchain and its impact on consumers within the banking sector, in addition to broadening intellectual horizons about adopting/disseminating financial technology innovations, reducing transaction costs, and non-intermediation within theoretical models.

From results, discussion and conclusion; current study recommended:

- Work to create industry associations to develop common standards and protocols for enterprise-wide interoperability of blockchain networks.
- Benefit from customer data to improve and utilize resources and indicate ways to reduce operational costs
- Work on following up on banking services and application and program interfaces in order to provide value-added services

References

Ahluwalia, S., Mahto, R. V., & Guerrero, M. (2020). Blockchain technology and startup financing: A transaction cost economics perspective. *Technological Forecasting and Social Change*, *151*, 119854.

Al-Jaroodi, J., & Mohamed, N. (2019). Blockchain in industries: A survey. *IEEE Access*, *7*, 36500-36515.

Asante, M., Epiphaniou, G., Maple, C., Al-Khateeb, H., Bottarelli, M., & Ghafoor, K. Z. (2021). Distributed ledger technologies in supply chain security management: A comprehensive survey. *IEEE Transactions on Engineering Management*, *70*(2), 713-739.

Bashayreh, A., & Wadi, R. M. A. (2021). The effect of Fintech on banks' performance: Jordan case. In *The Importance of New Technologies and Entrepreneurship in Business Development: In The Context of Economic Diversity in Developing Countries: The Impact of New Technologies and Entrepreneurship on Business Development* (pp. 812-821). Springer International Publishing.

Chang, S. E., Luo, H. L., & Chen, Y. (2019). Blockchain-enabled trade finance innovation: A potential paradigm shift on using letter of credit. *Sustainability*, *12*(1), 188.

Chen, W., Botchie, D., Braganza, A., & Han, H. (2022). A transaction cost perspective on blockchain governance in global value chains. *Strategic Change*, *31*(1), 75-87.

Dutta, P., Choi, T. M., Somani, S., & Butala, R. (2020). Blockchain technology in supply chain operations: Applications, challenges and research opportunities. *Transportation research part e: Logistics and transportation review*, *142*, 102067.

Dwivedi, P., Alabdooli, J. I., & Dwivedi, R. (2021). Role of FinTech adoption for competitiveness and performance of the bank: a study of banking industry in UAE. *International Journal of Global Business and Competitiveness*, *16*(2), 130-138.

Elsaid, H. M. (2021). A review of literature directions regarding the impact of fintech firms on the banking industry. *Qualitative Research in Financial Markets*.

Fadhul, S., & Hamdan, A. (2020, September). The role of" fintech" on banking performance. In *European Conference on Innovation and Entrepreneurship* (pp. 911-XVII). Academic Conferences International Limited.

Hassani, H., Huang, X., & Silva, E. (2018). Banking with blockchain-ed big data. *Journal of Management Analytics*, *5*(4), 256-275.

Indriasari, E., Gaol, F. L., & Matsuo, T. (2019, July). Digital banking transformation: Application of artificial intelligence and big data analytics for leveraging customer experience in the Indonesia banking sector. In *2019 8th International Congress on Advanced Applied Informatics (IIAI-AAI)* (pp. 863-868). IEEE.

Kaya, O., Schildbach, J., AG, D. B., & Schneider, S. (2019). Artificial intelligence in banking. *Artificial intelligence*.

Le, T. D., Ho, T. H., Nguyen, D. T., & Ngo, T. (2021). Fintech credit and bank efficiency: International evidence. *International Journal of Financial Studies*, *9*(3), 44.

Lee, C. C., Li, X., Yu, C. H., & Zhao, J. (2021). Does fintech innovation improve bank efficiency? Evidence from China's banking industry. *International Review of Economics & Finance*, *74*, 468-483.

Legowo, M. B., Subanidja, S., & Sorongan, F. A. (2021). Fintech and bank: Past, present, and future. *Jurnal Teknik Komputer AMIK BSI*, *7*(1), 94-99.

Lestari, D., & Rahmanto, B. T. (2023). Fintech and its challenge for banking sector. *Lestari, D., & Rahmanto, BT (2021). Fintech and Its Challenge for Banking Sector. The Management Journal of BINANIAGA*, *6*(01), 55-70.

Lien, N. T. K., Doan, T. T. T., & Bui, T. N. (2020). Fintech and banking: Evidence from Vietnam. *The Journal of Asian Finance, Economics and Business (JAFEB)*, *7*(9), 419-426.

Marbouh, D., Abbasi, T., Maasmi, F., Omar, I. A., Debe, M. S., Salah, K., ... & Ellahham, S. (2020). Blockchain for COVID-19: review, opportunities, and a trusted tracking system. *Arabian journal for science and engineering*, *45*, 9895-9911.

Ntwiga, D. B. (2020). Technical efficiency in the Kenyan banking sector: Influence of fintech and banks collaboration. *Journal of Finance and Economics*, *8*(1), 13-22.

Ohana, J. J., Ohana, S., Benhamou, E., Saltiel, D., & Guez, B. (2021). Explainable AI (XAI) models applied to the multi-agent environment of financial markets. In *Explainable and Transparent AI and Multi-Agent Systems: Third International Workshop, EXTRAAMAS 2021, Virtual Event, May 3–7, 2021, Revised Selected Papers 3* (pp. 189-207). Springer International Publishing.

Osmani, M., El-Haddadeh, R., Hindi, N., Janssen, M., & Weerakkody, V. (2021). Blockchain for next generation services in banking and finance: cost, benefit, risk and opportunity analysis. *Journal of Enterprise Information Management*, 34(3), 884-899

Pal, A., Tiwari, C. K., & Haldar, N. (2021). Blockchain for business management: Applications, challenges and potentials. *The Journal of High Technology Management Research*, *32*(2), 100414.

Rejeb, A., Zailani, S., Rejeb, K., Treiblmaier, H., & Keogh, J. G. (2022). Modeling enablers for blockchain adoption in the circular economy. *Sustainable Futures*, 100095.

Rodrigues, A. R. D., Ferreira, F. A., Teixeira, F. J., & Zopounidis, C. (2022). Artificial intelligence, digital transformation and cybersecurity in the banking sector: A multi-stakeholder cognition-driven framework. *Research in International Business and Finance*, *60*, 101616.

Sadok, H., Sakka, F., & El Maknouzi, M. E. H. (2022). Artificial intelligence and bank credit analysis: A review. *Cogent Economics & Finance*, *10*(1), 2023262.

Schmidt, C. G., & Wagner, S. M. (2019). Blockchain and supply chain relations: A transaction cost theory perspective. *Journal of Purchasing and Supply Management*, *25*(4), 100552.

Soni, V. D. (2019). Role of artificial intelligence in combating cyber threats in banking. *International Engineering Journal For Research & Development*, *4*(1), 7-7.

Varma, P., Nijjer, S., Sood, K., Grima, S., & Rupeika-Apoga, R. (2022). Thematic Analysis of Financial Technology (Fintech) Influence on the Banking Industry. *Risks*, *10*(10), 186.

Wang, Y., Xiuping, S., & Zhang, Q. (2021). Can fintech improve the efficiency of commercial banks?—An analysis based on big data. *Research in international business and finance*, *55*, 101338.

Zveryakov, M., Kovalenko, V., Sheludko, S., & Sharah, E. (2019). FinTech sector and banking business: competition or symbiosis?. *Економічний часопис-XXI*, *175*(1-2), 53-57.