

Article

Studying the mediating role of blockchain on the impact of the use of financial technology (FinTech) on the competitive advantage of banks

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Abstract: The problem of the current study is to study the moderating role of Blockchain technology on the impact of the use of financial technology (FinTech) on the competitive advantage of Jordanian banks. Quantitative analysis is appropriate. The study population consists of (600) employees in three banks at Jordan (Arab Bank, Islamic Bank, Ahli Bank) with its branches in various governorates. A questionnaire was developed to collect study data and distributed electronically. The number of participants was (240) respondents. The study confirms that there is an impact of the mediating role of Blockchain technology in the impact of the use of financial technology (FinTech) on competitive advantage. The study recommends increasing spending on financial technology applications to improve banking services provided to customers, especially through electronic applications and technologies. The study also recommends rebuilding current banking systems using Blockchain technology, which will remove the central database structure and replace it with a decentralized data environment via the blockchain, thus reducing the risk of database hacking. Since transactions via blockchain technology are verified by every node of the chain, it will make transactions more secure which will make the world's banking systems faster and more secure.

Keywords: blockchain; financial technology (FinTech); competitive advantage; banks

1. Introduction

In recent years, the financial technology (FinTech) sector has emerged as a significant driver of innovation within the banking industry. Traditional banks, known for their conservative and risk-averse nature, face increasing pressure to adapt to the digital age (Fang et al., 2022; Xu et al., 2019). Prior studies (Bhuvana and Vasantha, 2017; Dubey, 2019; Degbelo et al., 2016) have highlighted that banks which fail to innovate risk losing market share to more agile, technology-driven competitors. This paper explores the intersection of FinTech and blockchain technology, two pivotal advancements that have the potential to redefine competitive dynamics in the banking sector.

Blockchain technology, initially conceptualized by Satoshi Nakamoto in 2008 as a public ledger for Bitcoin transactions, has grown to be a transformative tool in various industries, including finance (Al-Jaroodi and Mohamed, 2019). Studies (Francisco and Swanson, 2018; Shah and Jani, 2018) emphasize blockchain's capacity to enhance transparency, security, and efficiency in financial transactions. This study builds on this foundation by examining the specific role of blockchain as a mediator in the impact of FinTech on the competitive advantage of banks. (Jawad et al., 2024).

This paper makes several key contributions to the academic literature. First, it

provides empirical evidence on the mediating role of blockchain technology in the relationship between FinTech usage and the competitive advantage of banks. While existing literature extensively covers the individual impacts of FinTech and blockchain, there is a notable gap regarding their combined effect on banking competitiveness (Alshehadeh et al., 2023). This study addresses this gap by presenting data from a quantitative analysis of employees in Jordanian banks.

Second, the paper contributes to the understanding of how FinTech applications can be leveraged to rebuild current banking systems using blockchain technology. By proposing a shift from centralized database structures to decentralized environments, it offers practical recommendations for enhancing security and efficiency in banking operations. This aligns with recent trends towards digital transformation in the banking industry, as highlighted by scholars such as Athari et al. (2022) and Sebastião and Godinho (2021).

The study's findings confirm the significant mediating role of blockchain technology in enhancing the competitive advantage of banks through the use of FinTech. The data collected from 240 respondents across three Jordanian banks indicate that blockchain not only supports the implementation of FinTech solutions but also enhances their effectiveness by providing a secure and transparent transaction environment. The results suggest that banks investing in blockchain technology alongside FinTech are likely to experience improved operational efficiency, customer satisfaction, and competitive positioning. (Alshehadeh et al., 2023).

The remainder of this paper is organized as follows: Section 2 provides a comprehensive literature review, discussing the theoretical underpinnings and previous research relevant to blockchain, FinTech, and competitive advantage. Section 3 outlines the hypotheses development based on the literature review. Section 4 details the methodology used in this study, including data collection and analysis procedures. Section 5 presents the study's results, followed by a discussion in Section 6 that interprets the findings in the context of existing literature. Finally, Section 7 concludes the paper with recommendations for future research and practical implications for the banking industry (Al-Tamimi et al., 2023; Al-Jabra et al., 2023; Alzoubi et al., 2024; Jameaba, 2022; Sankaranarayanan and Rajagopalan, 2020).

2. Literature review

2.1. Blockchain

The blockchain aims to enhance corporate value by resolving issues and ensuring the integrity of records (George et al., 2019), thereby promoting collaboration among stakeholders and facilitating information exchange. This, in turn, accelerates operations and reduces the duration of the supply process (Francisco and Swanson, 2018). The longer a block is, the more challenging it becomes to make alterations to previous blocks, resulting in a heightened level of trust among users. The Blockchain theory was developed by "Satoshi Nakamoto" in 2008 with the purpose of functioning as a public ledger for bitcoin transactions. (Al-Jaroodi and Mohamed, 2019). The term "blockchain" denotes a distributed and decentralized ledger that records time-stamped transactions among multiple computers linked through a peer-to-peer network. To avoid altering records after the fact. Consequently, individuals utilizing the blockchain

have the ability to autonomously and openly examine and authenticate transactions. (Jebril et al., 2024; Soda et al., 2023).

The blockchain can be defined as an ever-expanding compilation of records, known as “blocks,” which are interconnected using cryptographic techniques. According to Zheng et al. (2017), every block should include a timestamp, a hash code for the previous block, and a list of verified transactions. A blockchain is an innovative approach to organizing data in a decentralized manner. The blockchain is designed to mimic a book with an unlimited number of pages, where each page, or block, corresponds to a distinct transaction. The blockchain ledger is autonomously managed through a peer-to-peer network and a public time-stamping server (Hussain et al., 2023; Tapscott and Tapscott, 2016)

2.2. Financial technology (FinTech)

Integrating blockchain and financial technology (FinTech) is essential for the reconstruction of the banking and financial system (Machkour and Abriane, 2020). Fintech is widely regarded as one of the most significant revolutions in the financial industry. The sharing economy, supportive legislation, and advancements in information technology have contributed to its rapid progress (Badran, 2023; Lee, 2018). The integration of finance and technology in the development of FinTech has been facilitated by the adoption of new technologies over an extended period of time (Arner et al., 2016; Elsayed, 2023). Mobile and digital payment platforms remain the primary means of delivering fintech services (Alshehadeh et al., 2023). FinTech companies are rapidly expanding globally, offering a wide range of services in areas such as payment systems, asset management, credit solutions, and insurance services. This technology is adept at assisting companies in promptly and innovatively complying with regulations (Al Houl, 2024; Karaçallık, 2018).

Financial technology aims to accomplish several objectives, with the utmost significance placed on the following: Financial technology aims to decrease the existing expenses, enabling a larger population, particularly underserved companies and individuals, to avail financial services at a more affordable rate (Hjij, 2023; Stulz, 2019); Enhanced privacy: Due to the customization of financial technology services and products to cater to individual customer preferences, each bank has unique requirements that differ from those of other banks. These requirements can be accessed through various channels (Buckley and Webster, 2016); Financial technology products and services frequently utilize advanced technology to carry out procedures and operations, resulting in a faster pace of service (Vučinić, 2016); Financial technology products and services have the ability to operate across borders, allowing them to cater to customers who are not limited to a specific geographical area (Gomber et al., 2018); Financial technology services and products facilitate the comparison of various companies and banks based on their financial services and pricing (Alshehadeh et al., 2023; Hornuf et al., 2021).

2.3. Competitive advantage

The concept of competitive advantage has been a significant focus in the fields of strategic management and business economics (Alshehadeh et al., 2022; Davies and

Ellis, 2000; Simons, 2019; Warr, 1994). It has garnered attention from numerous researchers, particularly after the term gained popularity in the 1980s through the writings of Michael Porter (1980–1985) on competitive strategy and advantage in business organizations. Porter emphasized that a crucial determinant of business success is their competitive position within their respective industries (AlQudah, 2023; Ashour, 2018).

In addition to being one of the most important means of survival, continuity, and success in modern business (Abdeljawad, 2022; Fekry and Osama, 2023), competitive advantage has several benefits for organizations, the organization maintains a competitive advantage by continuously improving products and services, fostering innovation and creativity (Reguia, 2014). Margarita (2018) states that organizations gain a continuous comparative advantage by reducing production costs and leading in the field. The organization can use multiple strategies to compete in the market, including differentiation, focus, and cost leadership (Alshehadeh et al., 2022; Ouma and Oloko, 2017).

2.4. Previous work

To provide sufficient justification for the need for this article, we can draw on the existing literature to highlight the gaps that our study aims to fill. Specifically, we will emphasize how the current body of research has not fully addressed the intersection of blockchain, FinTech, and competitive advantage in the banking sector, particularly within the context of Jordan. Here is the justification based on the previous work:

(1) Emerging Technological Advancements:

Sadiq and Aysan (2023) discuss the role of digital currency and blockchain in accelerating financial stability through credit supply. However, their study does not specifically address the competitive advantage of banks through the integration of FinTech and blockchain. Our study aims to fill this gap by focusing on how these technologies can enhance the competitive edge of banks. Kayani (2023) explores blockchain and FinTech prospects but lacks a detailed examination of their combined impact on competitive advantage in banking. Our research contributes by providing empirical evidence on this relationship within the Jordanian banking sector.

(2) Impact of Crises on Financial Systems:

Aysan (2020) and Naveed et al. (2023) investigate the economic impacts of COVID-19, including its effects on inward FDI and unemployment in tourism, respectively. While these studies highlight significant economic disruptions, they do not address how technological adoption in banking can mitigate such impacts and create competitive advantages. Our study provides insights into how blockchain and FinTech can help banks navigate and thrive amid such crises. Khan (2023) examines financial market volatility during the COVID-19 pandemic but does not explore the role of FinTech and blockchain in stabilizing and enhancing the competitive advantage of banks during such periods. Our research aims to bridge this gap.

(3) Comparative and Sectoral Analyses:

Hasan et al. (2024) conduct a comparative analysis between FinTech and traditional stock markets during the Russia-Ukraine war, but they do not focus on the banking sector specifically. Our study zeroes in on the banking industry, providing a

more targeted analysis of competitive advantage through technological adoption. Shaik et al. (2023) study the volatility nexus of FinTech, innovative technology, and cryptocurrency indices, yet their focus is on market indices rather than the operational and strategic benefits for banks. Our research addresses this by focusing on the practical applications and competitive outcomes for banks.

(4) **Interdisciplinary and International Perspectives:**

Hoang (2021) and Shah et al. (2023) discuss corporate diversification and credit risk management in various financial contexts, respectively. While these studies provide valuable insights, they do not specifically address how blockchain and FinTech can create competitive advantages in banking. Our study expands on these perspectives by offering empirical data from the banking sector. Kayani and Hasan (2024) examine cryptocurrency's impact on financial markets and traditional banking, emphasizing interdisciplinary collaborations. Our study complements this by focusing on the competitive advantages gained through blockchain and FinTech within a specific regional context.

(5) **Environmental and Technological Innovations:**

Haseeb et al. (2024) explore the role of green energy, innovation, and technology in mitigating greenhouse gas emissions, indicating a broader trend of technological adoption for sustainable development. While their focus is on environmental sustainability, our study aligns with this trend by exploring technological innovations in banking for sustainable competitive advantage.

2.4.1. Channels and empirical testing

- (1) **Operational Efficiency:** By examining operational metrics such as transaction speed, cost reduction, and error rates, we can empirically test the impact of blockchain and FinTech on banking efficiency. This aligns with the Resource-Based View (RBV) which suggests that these technologies are valuable resources that enhance operational capabilities.
- (2) **Security Enhancements:** Through surveys and case studies, we can measure the reduction in fraud and data breaches, testing the Technology Acceptance Model (TAM) which posits that perceived security influences technology adoption.
- (3) **Customer Experience:** Customer satisfaction and engagement metrics can be used to test how FinTech applications improve customer experience, supporting the Dynamic Capabilities Theory by showing how banks reconfigure their services to meet customer needs.
- (4) **Regulatory Compliance:** Analyzing the cost and ease of regulatory compliance before and after blockchain implementation can provide empirical evidence for the Disruptive Innovation Theory, showing how new technologies disrupt traditional compliance processes.

By addressing these gaps and channels, our study provides a comprehensive analysis of how blockchain and FinTech technologies can create competitive advantages for banks, offering valuable insights for both academia and industry practitioners.

2.4.2. theories explaining the behavior

Technology Acceptance Model (TAM): The Technology Acceptance Model (TAM), developed by Davis (1989), posits that perceived ease of use and perceived

usefulness are critical factors influencing an individual's decision to adopt and use new technology. In the context of this study, TAM explains how bank employees and customers perceive and accept blockchain and FinTech technologies. Banks investing in user-friendly and efficient FinTech solutions are likely to see higher adoption rates, leading to enhanced competitive advantage. This model can be empirically tested by assessing the perceptions of bank employees and customers regarding the usability and usefulness of these technologies.

Resource-Based View (RBV): The Resource-Based View (RBV) of the firm, introduced by Barney (1991), suggests that a firm's competitive advantage stems from its unique resources and capabilities. Blockchain and FinTech can be viewed as valuable, rare, inimitable, and non-substitutable resources that enhance a bank's strategic position. By leveraging these technologies, banks can create unique operational efficiencies, enhance security, and offer innovative customer services that competitors find hard to replicate. Empirical testing of RBV can involve evaluating the specific resources and capabilities that banks develop through the adoption of blockchain and FinTech.

Dynamic Capabilities Theory: Teece, Pisano and Shuen (1997) introduced the concept of dynamic capabilities, which are the firm's abilities to integrate, build, and reconfigure internal and external competences to address rapidly changing environments. This theory is pertinent to understanding how banks adapt to technological advancements such as blockchain and FinTech. It can be empirically tested by examining how banks develop and leverage their capabilities to adopt and implement these technologies effectively.

Disruptive Innovation Theory: Proposed by Christensen (1997), the theory of disruptive innovation explains how smaller companies with fewer resources can successfully challenge established businesses. FinTech startups often introduce disruptive innovations that provide more accessible, affordable, and convenient financial services. This theory can be tested empirically by studying the impact of FinTech startups on traditional banks' market share and their subsequent adoption of blockchain technology as a strategic response.

2.5. Channels of influence

Operational Efficiency: Blockchain and FinTech technologies streamline banking operations by automating processes, reducing transaction times, and lowering costs. These efficiencies can be measured empirically through performance metrics such as transaction speed, cost savings, and error rates.

Security Enhancements: Blockchain's decentralized nature and cryptographic security features significantly enhance transaction security. The impact of these security enhancements can be tested by comparing the incidence of fraud and data breaches before and after blockchain implementation.

Customer Experience: FinTech applications improve customer experience by providing more personalized, accessible, and faster banking services. Customer satisfaction surveys and user engagement metrics can empirically test the improvement in customer experience.

Regulatory Compliance: Blockchain's transparent and immutable ledger helps

banks meet regulatory requirements more efficiently. Empirical studies can assess the reduction in compliance costs and the ease of regulatory reporting facilitated by blockchain technology.

2.6. Empirical testing

To empirically test these theories, the following methodologies can be employed:

- **Surveys and Questionnaires:** To gather data on the perceived ease of use, usefulness, and satisfaction with blockchain and FinTech technologies from bank employees and customers.
- **Case Studies:** In-depth case studies of banks that have successfully implemented blockchain and FinTech technologies to analyze their resource development and dynamic capabilities.
- **Performance Metrics Analysis:** Collecting and analyzing data on operational efficiency, security incidents, and customer satisfaction before and after the adoption of these technologies.
- **Comparative Studies:** Comparing banks that have adopted blockchain and FinTech with those that have not, to assess the impact on competitive advantage and market share.

By leveraging these theoretical frameworks and empirical methods, this study provides a robust analysis of the role of blockchain and FinTech in enhancing the competitive advantage of banks.

3. Hypotheses development

Proper innovation and technical management practices are needed and will enable banks to be adequately prepared to be at the forefront of technology that will contribute significantly to their business and operating models in the long term. The results of Rashwan and Qasim (2023) show that there is a statistically significant impact of financial technology on increasing the quality of banking services provided to customers, improving banks' profitability, and operational efficiency, which increases the competitive advantage of banks. As for Atiyat (2023), financial technology has a clear role in creating competitive advantage in Al Rajhi Bank in its four dimensions (quality, delivery, cost, flexibility). This is what leads us to conclude that competitive advantage derives its strength from financial technology, and that there is a direct relationship between financial technology and competitive advantage. When using financial technology, banking services improve and banks gain a competitive advantage (Alrjoob, 2024). Customer satisfaction and loyalty are both increased when financial institutions are nimble enough to respond to new financial innovations (Alshehadeh et al., 2023). Given the worldwide trend towards digital transformation and the intense competition on a global scale, the study suggests that Jordanian banks adopt a financial technology strategy to stay ahead of the competition and keep their customers. According to the above, the following hypothesis can be reached:

H1: "There is a positive impact of using financial technology (FinTech) on competitive advantage".

Blockchain technology can help make the future of financial technology more

secure. Thanks to its decentralized nature and cryptographic security features, the blockchain is almost impossible to hack. This makes it an ideal platform for storing sensitive data and making secure transactions. Rashwan and Qasim (2023) showed that the dimensions of Blockchain technology positively affect support for financial technology services. In addition, with more attention to it, this will reflect more positively on the financial technology services sector. The financial technology (FinTech) elements that influence banking performance were examined by Rjoub et al. (2023). FinTech's multifaceted reach, which is absent from the traditional financial industry, has the potential to alter financial assumptions and global reality. The banking industry has used blockchain-based financial technology to get over these transitional problems. It obtained 91% accuracy, 90% privacy, 96% strength, and 25% cyber risk performance, according to the results. During the changeover time, the suggested approach will be more practical, secure, and efficient than existing approaches. Mori (2016) noted that any organization looking to adopt blockchain technology will need to modernize its business processes and maintain ongoing discussion with stakeholders. Also, only 20% of the barriers to technology adoption are based on technology. It is essential to take the time to leverage blockchain technology and apply it to the financial markets. According to the above, the following hypothesis can be reached:

H2: "There is a positive impact of using financial technology (FinTech) on Blockchain technology".

According to Bin Muhammad and Tubal (2020), blockchain technology has witnessed unprecedented hype in recent years, given that it is considered an advanced technology that can bring enormous benefits to many sectors. The research concluded that blockchain technology has shown great potential for application in various areas of the business sector, and the scope is still open for applying this technology in other areas. Siraj (2024) found a significant direct and indirect effect of the dimensions of Blockchain technology on competitive advantage. Boubedi and Letem (2022) showed that the financial and banking sector is one of the applications on which the smart Blockchain network is expected to have a significant impact, by raising the level of trust in less transparent financial and banking systems. This has led to increased comfort and security for financial consumers and increased competitiveness in financial industry. The results of Bjørnstad et al. (2017) show that blockchain technology is interconnected with other resources. It turns out that important external resources that contribute to achieving competitive advantage are community building and strategic partnerships. According to the above, the following hypotheses can be reached:

H3: "There is a positive impact of using Blockchain technology on competitive advantage".

H4: "There is an impact of the mediating role of Blockchain technology in the impact of the use of financial technology (FinTech) on competitive advantage".

Figure 1 represents the study model.

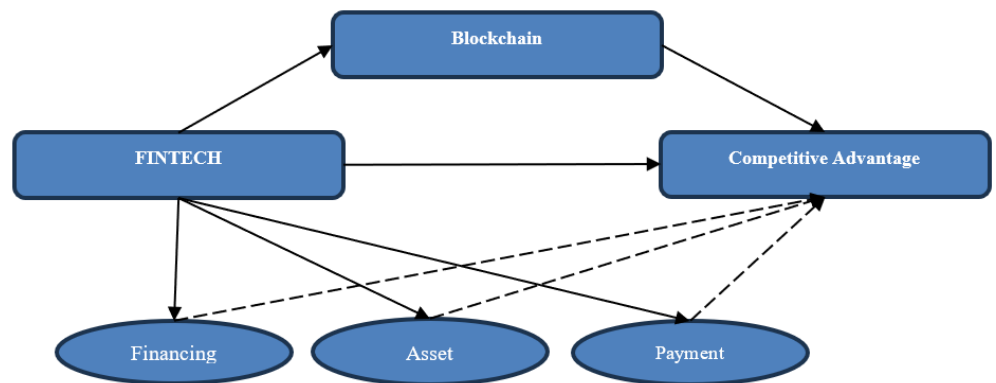


Figure 1. The study model.

4. Methodology

Within the framework of the literature review, the influence of argument quality and source credibility, the factors affecting Blockchain on The Impact of the Use of Financial Technology (FinTech) on the Competitive Advantage of Banks will be investigated. Because this study aims to examine the Moderating Role of Blockchain and The Impact of the Use of Financial Technology (FinTech) on the Competitive Advantage of Banks, quantitative analysis is appropriate. The subsections below explain the details of measuring variables and gathering data. This method involves obtaining an objective depiction of the phenomenon by employing tools and techniques typical in scientific research, as highlighted by Nayeri and Aghajani (2010).

This study aims to know the moderating role of blockchain on the impact of the use of financial technology (FinTech) on the competitive advantage of banks. The study population consists of (600) employees in three banks at Jordan (Arab Bank, Islamic Bank, Ahli Bank) with its branches in various governorates. A questionnaire was developed to collect study data and distributed electronically. The number of participants was (240) respondents.

In this study, the researchers conducted a thorough review of prior research and studies relevant to their research topic, benefiting from previous reformulation studies in the field. They developed a research instrument by carrying out a field survey using a specifically designed questionnaire. A questionnaire is described as a structured list of printed questions provided to participants, who are then asked to complete and return it to the researcher. This method allows for systematic data collection, facilitating the generalization of results to the entire population when a representative sample of the target population is utilized (Rattray and Jones, 2007). The researchers utilized Google Forms to administer and collect the questionnaires from participants. Participants were instructed to provide accurate responses to all questions, whether they were open-ended or closed-ended. The questionnaire encompassed variables such as the Use of Financial Technology (FinTech) as an independent variable, the Competitive Advantage of Banks as a dependent variable, and Blockchain as a moderating variable. A five-point Likert rating was used to evaluate responses to questions.

5. Demographic data for respondents

The following **Table 1** presents descriptive statistics for respondents' demographic data including the frequency and percentage for each them:

Table 1. Descriptive statistics of demographic data for respondents.

	Frequency	Percent
Education		
Intermediate Diploma	90	37.5
Bachelor's	101	42.1
Master	39	16.3
PhD	10	4.2
Job title		
Manager	46	19.2
Head of the Department	43	17.9
Administrative Employee	151	62.9
Year experience		
Less than 5 years	21	8.8
From 5 to less than 10 years	165	68.75
From 10 to less than 15 years	37	15.4
More than 15 years	17	7.08
Total	240	100

The results presented in the above **Table 1** show that, with regard to the Job title of respondents, the large percent of study sample were the Administrative Employee as they reached (62.9%) of total study sample, 17.9% of respondents were head of the department and 19.2% of respondents were Manager. With regard to the Year experience of respondents, the large percent of study sample were in the Year experience group (From 5 to less than 10 years) as they reached (68.75%) of total study sample. Most of the respondents hold a university degree (42.1%) and 4.2% have PHD.

Internal consistency of reliability refers to the degree to which all components of a given scale measure the concept of that scale (Sun et al., 2007). In organizational research, Cronbach's alpha and composite reliability coefficients are commonly used indicators in order to estimate the composite reliability and internal consistency of a scale, especially for a scale on multiple items (Peterson and Kim, 2013). In this study, the reliability coefficient based on Cronbach's alpha was found to evaluate the internal consistency of the adapted scales for several reasons. Scholars such as DuPont (2018) argue that the composite reliability coefficient provides a less biased estimate of reliability than Cronbach's alpha. This is because Cronbach's alpha assumes that all indicators contribute simultaneously to the parent construct, without considering the individual contributions of each component. Moreover, unlike Cronbach's alpha, which may lead to underestimation or overestimation of scale reliability, composite reliability acknowledges differences in item loadings in the model, similar to Cronbach's alpha but with a more nuanced interpretation.

As shown in **Table 2** and **Figure 2** the composite reliability coefficients for the study constructs indicate the internal consistency of the latent variables was satisfactory, as all of them exceeded the acceptable minimum of 0.70.

Discriminant validity is a form of validity that signifies the measurement model of a construct is devoid of redundant items, demonstrating that a construct is distinct from other constructs by empirical standards (Fornell and Larcker, 1981). To assess discriminant validity in Smart-PLS, various criteria are employed, with Fornell and Larcker being one of the widely used methods. The details of this method will be discussed in the following section.

Table 2. Reliability and internal consistency results.

Factor	Item Name	Factor Loading > 0.6	Cronbach's alpha > 0.7	Composite reliability > 0.6	Average variance extracted (AVE) > 0.5
Blockchain	block1	0.80	0.930	0.931	0.613
	block10	0.75			
	block2	0.71			
	block3	0.76			
	block4	0.77			
	block5	0.81			
	block6	0.81			
	block7	0.82			
	block8	0.81			
	block9	0.79			
Competitive	comp1	0.71	0.902	0.911	0.535
	comp10	0.74			
	comp2	0.80			
	comp3	0.64			
	comp4	0.73			
	comp5	0.68			
	comp6	0.65			
	comp7	0.78			
	comp8	0.83			
	comp9	0.79			
FinTech	fint1	0.61	0.914	0.920	0.566
	fint10	0.77			
	fint2	0.77			
	fint3	0.70			
	fint4	0.74			
	fint5	0.78			
	fint6	0.79			
	fint7	0.81			
	fint8	0.77			
	fint9	0.77			

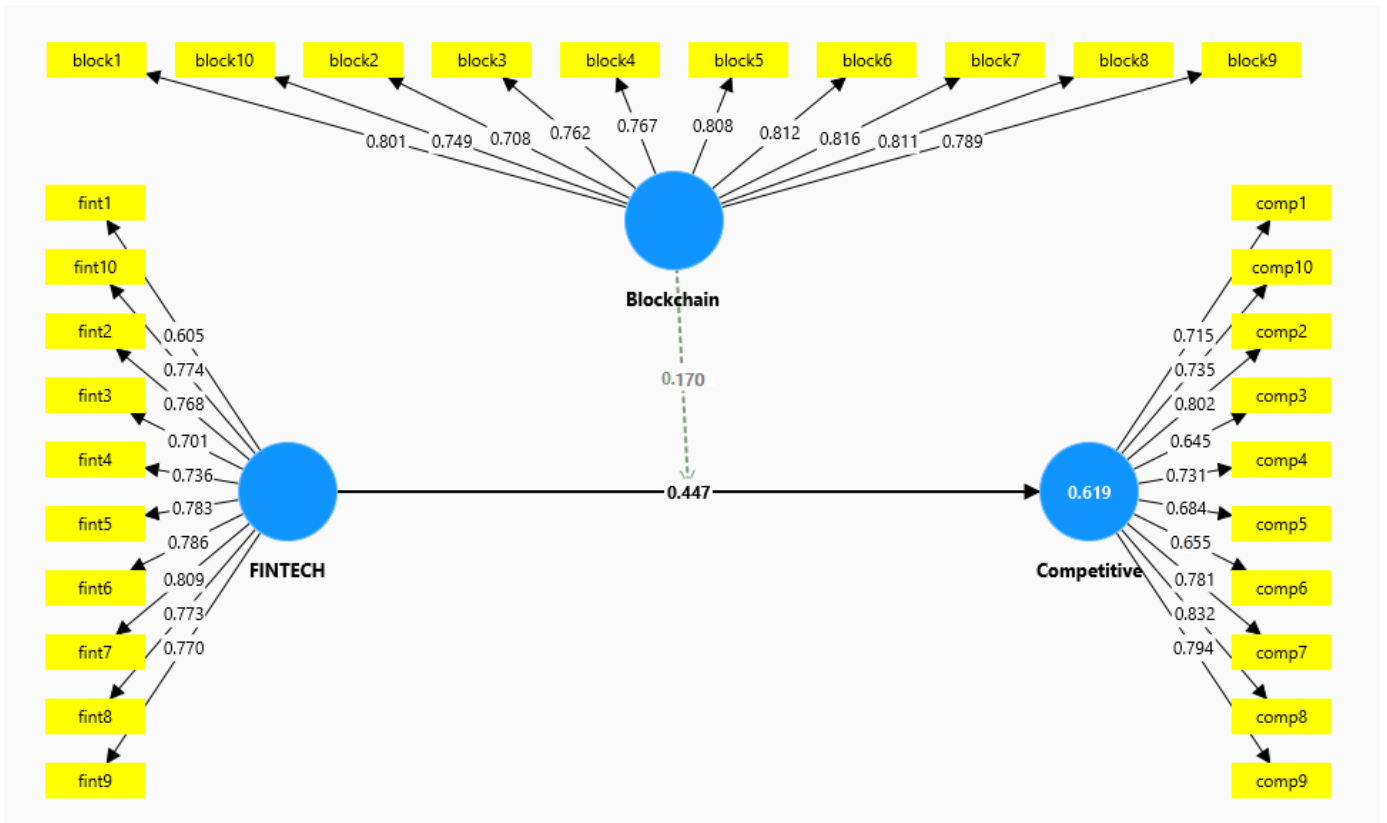


Figure 2. Research measurement model.

Table 3 presents the results of the multivariable correlation analysis using the (Fornell-Larcker, 1981) approach to evaluate the discriminant validity of the measurement model. According to the method defined by Fornell and Bookstein (1982), discriminant validity is determined when the square root of the average variance extracted (AVE) is greater than the correlation between the factors that comprise each pair. Put another way, the AVE values should exceed other off-diagonal relationships in the rows and columns, which is what the correlation matrix represents in this study. This confirmation indicates discriminant validity of the terms of the predictor variables.

Table 3. Reliability and internal consistency results (continuation).

	Blockchain	Competitive	FinTech
Blockchain	0.783		
Competitive	0.698	0.732	
FinTech	0.595	0.699	0.753

6. Hypotheses testing (Path coefficient)

The hypothesis testing in this paper involves evaluating *t* statistics (*T*), probability values (*P*), and original value sample estimates (*O*). When values are near +1, it suggests a positive relationship, whereas values close to -1 indicate a negative relationship between the variables. The subsequent depiction of these metrics in Figure 3 and Table 4 provides a detailed analysis of the hypothesis testing results. This presentation aids in understanding the correlations among variables, facilitating

researchers in drawing meaningful conclusions backed by statistical evidence.

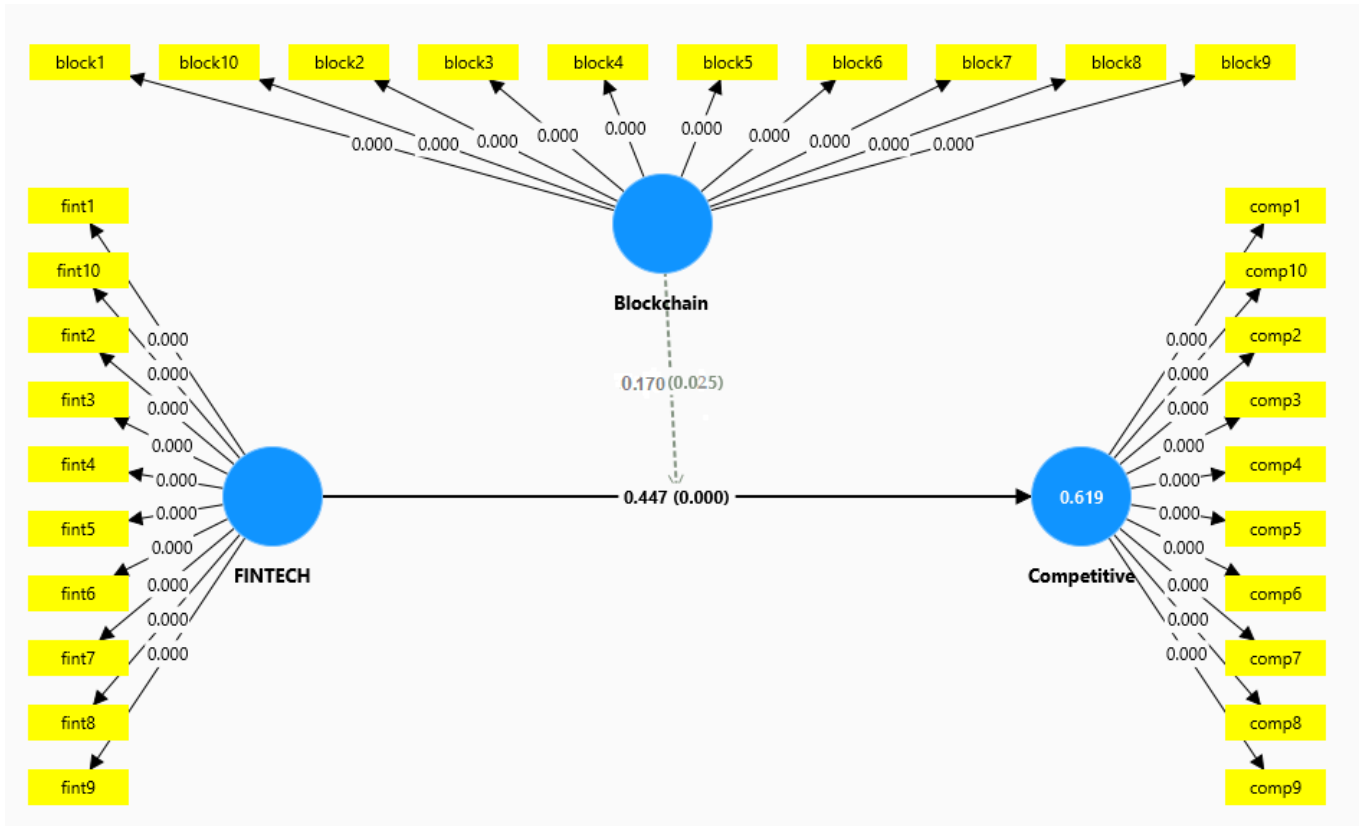


Figure 3. Structural model.

Table 4. Hypothesis testing of model.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
Blockchain → Competitive	0.446	0.448	0.062	7.238	0.000
FinTech → Competitive	0.447	0.448	0.061	7.283	0.000
Blockchain × FinTech → Competitive	0.170	0.171	0.035	4.858	0.025

Notes: Significant level at $\alpha = 0.05$.

Table 4 shows the assessment of the full model. The result of the study confirms the hypotheses which are; H1 which is related to the impact of the FinTech on the Competitive Advantage (beta = 0.447, $P = 0.000$), H2 which formalized to examine the impact of blockchain on the impact of the (FinTech) on the competitive advantage (beta = 0.170, $P = 0.025$).

7. Results and discussion

The results show that there is a positive impact of the use of financial technology (FinTech) on competitive advantage. FinTech can be viewed as a subset of digital transformation in the financial sector, as it focuses on specific applications and innovations that have the potential to transform the provision of finance, for example. Digital transformation helps enable financial institutions to improve their efficiency, effectiveness, innovation and competitiveness. This finding was supported by

Rashwan and Qasim (2023), Atiyat (2023), Alshehadeh et al., (2023). There is also a positive impact of the use of financial technology (FinTech) on Blockchain technology. As the integration of legacy systems to work with blockchain technology; It requires significant investments in information technology, including financial technology. This was supported by Rashwan and Qasim (2023), Rjoub et al. (2023) and Mori (2016) confirmed this result. They also found that there is a positive impact of using Blockchain technology on competitive advantage, especially after society went through the transition from the industrial economy to the technology economy, the forefront of which is Blockchain technology. This has become the technology is modern around the entire world, and according to many specialists, this technology has redefined transparency, trust and inclusion throughout the world, despite its relative immaturity. Thus, the study confirms that there is an impact of the mediating role of Blockchain technology in the impact of the use of financial technology (FinTech) on competitive advantage.

7.1. Practical implications

(1) Adoption of Blockchain Technology: Banks should prioritize the integration of blockchain technology into their existing systems to enhance security and efficiency. The decentralized nature of blockchain reduces the risk of data breaches and fraud, thereby protecting both the banks and their customers. Implementing blockchain can streamline operations, reduce costs associated with traditional transaction verification methods, and improve overall trust in the banking system.

(2) Enhanced Customer Services through FinTech: By leveraging FinTech solutions, banks can offer more personalized and efficient services to their customers. Mobile banking apps, automated customer service platforms, and AI-driven financial advice can significantly improve customer satisfaction and loyalty. Banks should invest in user-friendly and secure FinTech applications to stay competitive in the digital age.

(3) Training and Development: To fully capitalize on the benefits of FinTech and blockchain, banks need to invest in the continuous training and development of their employees. This includes educating staff about new technologies, cybersecurity practices, and innovative service delivery models. A knowledgeable workforce is essential for effectively implementing and managing these advanced technologies.

(4) Collaboration with FinTech Startups: Traditional banks should explore partnerships with FinTech startups to foster innovation and agility. Such collaborations can provide banks with access to cutting-edge technologies and innovative business models, enabling them to quickly adapt to changing market conditions and customer expectations.

(5) Customer Education: Banks should also focus on educating their customers about the benefits and security features of blockchain and FinTech solutions. This can help build trust and encourage wider adoption of digital banking services, ultimately enhancing customer engagement and loyalty.

7.2. Policy implications

(1) Regulatory Frameworks: Policymakers need to develop and implement robust

regulatory frameworks that support the adoption of blockchain and FinTech in the banking sector. These regulations should ensure the security, privacy, and integrity of financial transactions while fostering innovation and competition. Clear guidelines on the use of blockchain and FinTech can help mitigate risks and provide a stable environment for growth.

(2) **Standardization of Blockchain Technology:** To facilitate the widespread adoption of blockchain, there should be efforts towards standardizing the technology across the banking industry. This includes establishing common protocols and practices that ensure interoperability between different blockchain platforms. Standardization can help reduce implementation costs and complexity, making it easier for banks to integrate blockchain into their operations.

(3) **Incentives for Innovation:** Governments and regulatory bodies should consider providing incentives for banks and FinTech companies to innovate and adopt new technologies. This could include tax breaks, grants, or subsidies for research and development in blockchain and FinTech applications. Encouraging innovation can drive the development of more efficient and secure banking solutions.

(4) **Cybersecurity Policies:** As the banking sector increasingly relies on digital technologies, robust cybersecurity policies are essential to protect against cyber threats. Policymakers should enforce stringent cybersecurity standards and practices for banks and FinTech companies. This includes regular security audits, mandatory data encryption, and protocols for incident response and recovery.

(5) **Consumer Protection Laws:** With the rise of digital banking, there is a need for updated consumer protection laws that address the specific risks associated with FinTech and blockchain. These laws should safeguard consumer rights, ensure transparency in digital transactions, and provide mechanisms for dispute resolution. Protecting consumers will build trust in digital financial services and promote their widespread adoption.

By implementing these practical and policy recommendations, banks and policymakers can create a conducive environment for the growth and success of blockchain and FinTech technologies in the banking sector. This, in turn, will enhance the competitive advantage of banks and contribute to the overall stability and efficiency of the financial system.

8. Conclusion

The adoption of Fintech greatly impacts the competitiveness and performance of the banking industry as it helps create a friendly environment in the country to encourage innovations and technological adoption in various different sectors and industries of the economy, including the banking industry. Appropriate innovation and technology management practices are also needed, and banks will be enabled to be adequately prepared to be at the forefront of technology that will contribute significantly to their business and operating models in the long term. Popular Fintech services are; Automated teller machine (ATM), mobile banking, online banking, credit and debit cards, video teller, robot-enabled services, self-service receipt printing, foreign currency exchange, and cashiering. Therefore, some banks have taken the initiative and partnered with Fintech to comprehensively enhance the competitiveness

of the industry, and the use of financial technology in banks makes an important contribution to the performance and competitiveness of banks. The competitive strategy in banks focuses on improving the quality of banking services to consumers. Fortunately, Blockchain offers a very high level of security for all banking transactions – including data and money transfers. These benefits make Blockchain technology the most promising solution in the field of banking institutions. Blockchain technology helps banks improve remittance services. When fraud is reduced, the costs paid by the bank to complete operations will decrease, which may reflect positively on the bank's clients and customers, thus enhancing competitive advantage. According to the above, the study recommends the importance of encouraging banks to keep pace with financial technology and the process of banks' transformation from the stage of the traditional economy to the stage of the digital economy, coinciding with containing the risks and repercussions of this transformation. It also recommends increasing spending on financial technology applications to improve banking services provided to customers, especially through electronic applications and technologies. The study also recommends rebuilding current banking systems using Blockchain technology, which will remove the central database structure and replace it with a decentralized data environment via the blockchain, thus reducing the risk of database hacking. Since transactions via blockchain technology are verified by every node of the chain, it will make transactions more secure which will make the world's banking systems faster and more secure.

8.1. Study's limitations

(1) **Sample Size and Scope:** The study was conducted with a sample size of 240 respondents from three banks in Jordan. While this provides valuable insights, the findings may not be generalizable to other regions or banking sectors with different regulatory environments, technological infrastructures, and customer behaviors. Future studies should consider larger and more diverse samples to validate the findings across various contexts.

(2) **Data Collection Method:** The study relied on self-reported data collected through questionnaires, which can be subject to biases such as social desirability bias or inaccurate self-assessment. Additionally, the cross-sectional nature of the data limits the ability to observe changes over time. Longitudinal studies and the use of multiple data collection methods (e.g., interviews, observations) could provide a more comprehensive understanding of the phenomena studied.

(3) **Focus on Specific Technologies:** This study primarily focused on the impact of blockchain and FinTech on competitive advantage. While these technologies are significant, there are other emerging technologies, such as artificial intelligence, machine learning, and big data analytics that also play crucial roles in transforming the banking industry. Future research should explore the combined impact of multiple technologies on banking performance.

(4) **Limited Geographic Context:** The study was conducted within the Jordanian banking sector, which may have specific characteristics that differ from those in other countries. Cultural, economic, and regulatory differences can influence the adoption and impact of FinTech and blockchain technologies. Comparative studies across

different countries and regions are necessary to understand the broader applicability of the findings.

8.2. Future research avenues

(1) Longitudinal Studies: To better understand the long-term impact of blockchain and FinTech on competitive advantage, future research should employ longitudinal designs. Such studies can track changes over time and provide insights into how these technologies evolve and influence the banking sector's competitive dynamics.

(2) Comparative Studies: Comparative research across different countries, banking sectors, and technological ecosystems can offer a more comprehensive view of how blockchain and FinTech impact competitive advantage. Investigating differences and similarities can help identify best practices and factors that contribute to successful technology adoption.

(3) Integration of Multiple Technologies: Future research should explore the combined effects of various emerging technologies, such as artificial intelligence, machine learning, and big data analytics, on the banking sector. Understanding how these technologies interact and complement each other can provide deeper insights into creating competitive advantage.

(4) Customer Perspectives: While this study focused on the organizational impact of blockchain and FinTech, future research should also consider customer perspectives. Examining how customers perceive and interact with these technologies can provide valuable information for banks to enhance customer satisfaction and loyalty.

(5) Regulatory and Policy Impact: Investigating the role of regulatory frameworks and policies in shaping the adoption and impact of blockchain and FinTech is crucial. Future research should examine how different regulatory approaches influence the success and challenges of implementing these technologies in the banking sector.

(6) Impact on Small and Medium-Sized Banks: While larger banks often have more resources to invest in new technologies, small and medium-sized banks may face unique challenges. Future research should explore how these banks can leverage blockchain and FinTech to enhance their competitive advantage and what specific strategies or support they might need.

(7) Security and Privacy Concerns: Given the increasing importance of cybersecurity in digital banking, future studies should delve deeper into the security and privacy implications of adopting blockchain and FinTech. Research can focus on developing and evaluating effective security measures and protocols to protect against emerging threats.

By addressing these limitations and exploring these future research avenues, scholars and practitioners can gain a more nuanced understanding of the transformative potential of blockchain and FinTech in the banking industry. This, in turn, will aid in developing more effective strategies and policies to harness these technologies for sustainable competitive advantage.

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References

- Abdeljawad, N. (2022). Role of Corporate Social Responsibility for Achieving Sustainable Competitive Advantage. *Leadership and Management Theory in Practice*, 111.
- Al-Houl, M. A. A., (2024). Navigating Media Regulation in Islamic Societies: Challenges, and Ethical Considerations Pakistan. *Journal of Criminology*, 16(2), 743–760
- Al-Jabra, A., Al-Nuhait, H., Al-Manasra, S., & Al-Khawaja, H. (2023). A vision towards the future of cryptocurrencies Rooting, its financial significance, and legal challenges in its use. *Information Sciences Letters*, 12(8), 2545–2557.
<http://doi.org/10.18576/isl/120811>
- Al-Jaroodi, J., & Mohamed, N. (2019). Blockchain in Industries: A Survey. *IEEE Access*, 7, 36500–36515.
<https://doi.org/10.1109/access.2019.2903554>
- AlQudah, N. F. (2023). Knowledge sharing and innovation in business organization: A literature review. *Human Systems Management*, 42(5), 471-485.
- Alrjoob, E. (2024). Nature of the relationship between the Consumer and the Provider in the electronic contract. *Al-Zaytoonah. University of Jordan Journal for Legal studies*, 5(1), 22–42. <https://doi.org/10.15849/ZJLS.240330.02>
- Alshehadeh, A. R., Alia, M. A., Jaradat, Y., et al. (2023). Big data analytics techniques and their impacts on reducing information asymmetry: Evidence from Jordan. *International Journal of Data and Network Science*, 7(3), 1259–1266.
<https://doi.org/10.5267/j.ijdns.2023.4.012>
- Alshehadeh, A. R., Al-Khawaja, H. A., Yamin, I., et al. (2023). The Impact of Financial Technology on Customer Behavior in the Jordanian Commercial Banks. *Wseas Transactions on Business and Economics*, 20, 2263–2275.
<https://doi.org/10.37394/23207.2023.20.195>
- Alshehadeh, A. R., Al-khawaja, H., Alia, M. A., et al. (2023). The Impact of Operational Characteristics on the Total Risk Management: Evidence from the Industrial Firms. 2023 International Conference on Information Technology (ICIT).
<https://doi.org/10.1109/icit58056.2023.10225809>
- Alshehadeh, A. R., Elrefae, G. A., Al-Khawaja, H. A., et al. (2022). The Role of Data Mining Tools in Commercial Banks' Cyber-Risk Management. In: *Proceedings of the 2022 Ninth International Conference on Social Networks Analysis, Management and Security (SNAMS)*. <https://doi.org/10.1109/snams58071.2022.10062826>
- Alshehadeh, A. R., Elrefae, G. A., Al-Khawaja, H. A., et al. (2022). The Impact of Data Mining Techniques on Information Quality: Insurance Companies as Case. In: *Proceedings of the 2022 International Arab Conference on Information Technology (ACIT)*. <https://doi.org/10.1109/acit57182.2022.9994227>
- Alshehadeh, A. R., Elrefae, G. A., Belarbi, A. K., et al. (2023). The impact of business intelligence tools on sustaining financial report quality in Jordanian commercial banks. *Uncertain Supply Chain Management*, 11(4), 1667–1676.
<https://doi.org/10.5267/j.uscm.2023.7.002>
- AL-Tamimi, K. A. M., Jaradat, M. S., Aityassine, F. L. Y., et al. (2023). Impact of Renewable Energy on the Economy of Saudi Arabia. *International Journal of Energy Economics and Policy*, 13(3), 20–27. <https://doi.org/10.32479/ijeep.14099>
- Alzoubi, S., Aldiabat, K., Al-diabat, M., & Abualigah, L. (2024). An extensive analysis of several methods for classifying unbalanced datasets. *Journal of Autonomous Intelligence*, 7(3).
- Ashour, M. L. (2018). Schools thought of competitive advantage. *International Journal of Business and Management Invention (IJBMI)*, 7(2), 01-07.
- Athari, S. A., Kirikkaleli, D., & Adebayo, T. S. (2023). World pandemic uncertainty and German stock market: evidence from Markov regime-switching and Fourier based approaches. *Quality & quantity*, 57(2), 1923-1936.
- Atiyat, B. O. (2023). The role of financial technology in achieving competitive advantage in Saudi banks, a case study of Al Rajhi Bank. *Roa Iktissadia Review*, 13(1).
- Aysan, A., Kayani, F., & Kayani, U. N. (2020). The Chinese inward FDI and economic prospects amid COVID-19 crisis. *Pakistan Journal of Commerce and Social Sciences*, 14(4), 1088-1105.
- Badran, A. (2023). Artificial Intelligence between Government and Self Regulation Policies: A Theoretical Approach. *Hikama*, 4 (7), 93-110. <http://doi.org/10.31430/IJZH4708>
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management*, 17(1), 99-120.
- Bhuvana, M., & Vasantha, S. (2017). Bhuvana, M., & Vasantha, S. (2017). A Structural Equation Modeling (SEM) Approach for Mobile Banking Adoption-A Strategy for Achieving Financial Inclusion. *Indian Journal of Public Health Research &*

- Development, 8(2), 175. <https://doi.org/10.5958/0976-5506.2017.00106.1>
- Bin Muhammad, H. & Tubal, A. (2020). Blockchain technology and its possible applications in the business sector. *Economic Studies*, 7(1), 41-62.
- Bjørnstad, M. V., Krogh, S., & Harkestad, J. G. (2017). A study on blockchain technology as a resource for competitive advantage [Master's thesis]. Norwegian University of Science and Technology.
- Boubedi, R., Letem, K. H. (2022). Applications of smart contracts for blockchain technology in financial institutions. Study of the South Korean financial market experience. *Journal of Modern Economy and Sustainable Development*, 5(2), 21-39.
- Buckley, R. P., & Webster, S. (2016). FinTech in developing countries: charting new customer journeys. *Journal of Financial Transformation*, 44.
- Christensen, C. M. (1997). Marketing strategy: Learning by doing. *Harvard business review*, 75(6), 141-151.
- Davies, H., & Ellis, P. (2000). Porter's competitive advantage of nations: time for the final judgement? *Journal of management studies*, 37(8), 1189-1214.
- Davis, F. D. (1989). User acceptance of information systems: Technology Acceptance Model (TAM). Available online: <https://quod.lib.umich.edu/b/busadwp/images/b/1/4/b1409190.0001.001.pdf> (accessed on 9 March 2024).
- Degbelo, A., Granell, C., Trilles, S., et al. (2016). Opening up smart cities: citizen-centric challenges and opportunities from GIScience. *ISPRS International Journal of Geo-Information*, 5(2), 16.
- Dubey, V. (2019). FinTech innovations in digital banking. *International Journal of Engineering Research & Technology (IJERT)*, 8(10), 597-601.
- DuPont, T. A. (2018). Effects of LMX and External Environmental Factors on Creativity Among Faculty in Higher Education [PhD thesis]. Clemson University.
- Elsayed, M. G. (2023). Government Size and Economic Growth: The Impact of the Arab Spring. *Hikama*, 3(6), 117-143. <http://doi.org/10.31430/BDIL5499>
- Fang F, Ventre C, Basios M, et al. (2022). Cryptocurrency trading: a comprehensive survey. *Financ Innov*, 8(1), 13. <http://doi.org/10.1186/s40854-021-00321-6>.
- Fekry, M., & Osama, A. (2023). The internet, political culture, and the paradox of collective memory: The case of the Egyptian 25 January 2011 revolution. *Siyasat Arabiya*, 11(63), 22-40. <http://doi.org/10.31430/MSUE5739>
- Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing research*, 19(4), 440-452.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Francisco, K., & Swanson, D. (2018). The supply chain has no clothes: Technology adoption of blockchain for supply chain transparency. *Logistics*, 2(1), 2.
- George, R. P., Peterson, B. L., Yaros, O., et al. (2019). Blockchain for business. *Journal of Investment Compliance*, 20(1), 17-21.
- Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018). On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of management information systems*, 35(1), 220-265.
- Hasan, F., Al-Okaily, M., Choudhury, T. (2024). A comparative analysis between FinTech and traditional stock markets: Using Russia and Ukraine war data. *Electronic Commerce Research*, 24(1), 629-654.
- Haseeb, M., Shuaib, M., Hossain, M. E., et al. (2024). Asymmetric role of green energy, innovation, and technology in mitigating greenhouse gas emissions: evidence from India. *Environmental Science and Pollution Research*, 1-16.
- Hjij, H. (2023). Digital social networks challenges to classical political culture theory. *Siyasat Arabiya*, 11(63), 7-20. <http://doi.org/10.31430/XNVH9747>
- Hoang, K. (2021). Chairman age and corporate diversification: The cases of old and powerful captains in Chinese firms. *Journal of Behavioral and Experimental Finance*, 31, 100534
- Hornuf, L., Klus, M. F., Lohwasser, T. S., & Schwienbacher, A. (2021). How do banks interact with fintech startups? *Small Business Economics*, 57, 1505-1526.
- Hussain, S., Rahman, H., Abdulsahab, G. M., et al. (2023). A Blockchain-Based Approach for Healthcare Data Interoperability. *International Journal of Advances in Soft Computing & Its Applications*, 15(2).
- Jameaba, M.-S. (2022). Digitalization, Emerging Technologies, and Financial Stability: Challenges and Opportunities for the Banking Industry. <https://doi.org/10.32388/csttyq>
- Jawad, N., & Abu Huaij, W., & Alshara, A., Aldwari, T. (2024). The impact of innovation management on creativity value. *AI-*

- Zaytoonah University of Jordan Journal for Legal studies, 5(1), 81-100.
- Jebri, I., Al-Zaqeba, M. A. A., Al-Khawaja, H. A., et al. (2024). Enhancing estate governance using blockchain technology through risk management in estate governance of business sustainability. *International Journal of Data and Network Science*, 8(3), 1649–1658. <https://doi.org/10.5267/j.ijdns.2024.3.002>
- Karaçallık, D. (2018). Effects of Digital Transformation on Fintech Systems. *Open Banking and Card Payment Systems*.
- Kayani, U. N. (2023). Exploring prospects of blockchain and fintech: using SLR approach. *Journal of Science and Technology Policy Management*. <https://doi.org/10.1108/jstpm-01-2023-0005>
- Kayani, U. N., Naveed, K., Aysan, A. F., et al. (2023). Adjustments to unemployment amid COVID-19: Implementation of ABCX model of family stress on Chinese tourism industry. *Cogent Social Sciences*, 9(1). <https://doi.org/10.1080/23311886.2023.2234147>
- Kayani, U., & Hasan, F. (2024). Unveiling Cryptocurrency Impact on Financial Markets and Traditional Banking Systems: Lessons for Sustainable Blockchain and Interdisciplinary Collaborations. *Journal of Risk and Financial Management*, 17(2), 58. <https://doi.org/10.3390/jrfm17020058>
- Khan, M., Kayani, U. N., Khan, M., et al. (2023). COVID-19 Pandemic & Financial Market Volatility; Evidence from GARCH Models. *Journal of Risk and Financial Management*, 16(1), 50. <https://doi.org/10.3390/jrfm16010050>
- Lee, I., & Shin, Y. J. (2018). Fintech: Ecosystem, business models, investment decisions, and challenges. *Business Horizons*, 61(1), 35–46. <https://doi.org/10.1016/j.bushor.2017.09.003>
- Machkour, B., & Abriane, A. (2020). Industry 4.0 and its Implications for the Financial Sector. *Procedia Computer Science*, 177, 496–502. <https://doi.org/10.1016/j.procs.2020.10.068>
- Margarita, I. Å. (2018). The competitive advantages theoretical aspects. *Eco-forum Journal*, 7(1).
- Mori, T. (2016). Financial technology: Blockchain and securities settlement. *Journal of Securities Operations & Custody*, 8(3), 208-227.
- Nayeri, N. D., & Aghajani, M. (2010). Patients' privacy and satisfaction in the emergency department: A descriptive analytical study. *Nursing Ethics*, 17(2), 167–177. <https://doi.org/10.1177/0969733009355377>
- Ouma, G., & Oloko, M. (2017). The Relationship Between Porter's Generic Strategies and Competitive Advantage—A Case Study of Bus Companies Plying the Kisumu-Nairobi Route, Kenya. Available online: <https://ijecm.co.uk/wp-content/uploads/2015/06/3666.pdf> (accessed on 9 March 2024).
- Peterson, R. A., & Kim, Y. (2013). On the relationship between coefficient alpha and composite reliability. *Journal of Applied Psychology*, 98(1), 194–198. <https://doi.org/10.1037/a0030767>
- Rashwan, A. R. M., & Qasim, Z. A. H. (2023). The impact of the use of financial technology (FinTech) on supporting the competitive advantage of banks. *Academic Journal of Social Sciences*, 1(2), 82-96.
- Rattray, J., & Jones, M. C. (2007). Essential elements of questionnaire design and development. *Journal of clinical nursing*, 16(2), 234-243.
- Reguia, C. (2014). Product innovation and the competitive advantage. *European Scientific Journal*, 1(1), 140-157.
- Rjoub, H., Adebayo, T. S., & Kirikkaleli, D. (2023). Blockchain technology-based FinTech banking sector involvement using adaptive neuro-fuzzy-based K-nearest neighbors algorithm. *Financial Innovation*, 9(1), 65.
- Sadiq, M., Aysan, A. F., (2023). Digital currency and blockchain security in accelerating financial stability: A mediating role of credit supply. *Borsa Istanbul Review*, 23(6), 1251-1262.
- Sankaranarayanan, G., & Rajagopalan, K. K. (2020). Usage of blockchain technology in banking sector and its implication on Indian economy. *Alochana Chakra Journal*, 9(5), 7383-7389.
- Sebastião, H., & Godinho, P. (2021). Forecasting and trading cryptocurrencies with machine learning under changing market conditions. *Financial Innovation*, 7, 1-30.
- Shah, S. A. A., Fianto, B. A., Sheikh, A. E., et al. (2023). Role of fintech in credit risk management: an analysis of Islamic banks in Indonesia, Malaysia, UAE and Pakistan. *Journal of Science and Technology Policy Management*. 14(6), 1128-1154. <https://doi.org/10.1108/JSTPM-06-2022-0104>
- Shah, T., & Jani, S. (2018). Applications of blockchain technology in banking & finance. *Parul University*.
- Shaik, M., Rabbani, M. R., Nasef, Y. T., et al. (2023). The dynamic volatility nexus of fintech, innovative technology communication, and cryptocurrency indices during the crises period. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(3), 100129. <https://doi.org/10.1016/j.joitmc.2023.100129>
- Simons, R. (2019). The role of management control systems in creating competitive advantage: new perspectives. In:

- Management Control Theory. Routledge. pp. 173-194.
- Siraj, A. M. (2024). The impact of using blockchain technology on supply chain management to support competitive advantage: an applied study on pharmaceutical companies operating in the Egyptian market. *Scientific Journal of Financial and Commercial Studies and Research*, 5(1), 1487-1533.
- Soda, M., Makhlouf, M., Oroud, Y., et al. (2023). Does the audit quality have any moderating impact on the relationship between ownership structure and dividends? Evidence from Jordan. *Uncertain Supply Chain Management*, 11(4), 1789-1800.
- Stulz, R. M. (2019). Fintech, bigtech, and the future of banks. *Journal of Applied Corporate Finance*, 31(4), 86-97.
- Sun, L. Y., Aryee, S., & Law, K. S. (2007). High-performance human resource practices, citizenship behavior, and organizational performance: A relational perspective. *Academy of management Journal*, 50(3), 558-577.
- Tapscott, D., & Tapscott, A. (2016). Here's why blockchains will change the world. *Fortune*.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic management journal*, 18(7), 509-533.
- Vučinić, M. (2020). Fintech and financial stability potential influence of FinTech on financial stability, risks and benefits. *Journal of Central Banking Theory and Practice*, 9(2), 43-66.
- Warr, P. G. (1994). Comparative and competitive advantage. *Asian-Pacific Economic Literature*, 8(2), 1-14.
- Xu, M., Chen, X., & Kou, G. (2019). A systematic review of blockchain. *Financial innovation*, 5(1), 1-14.
- Zheng, Z., Xie, S., Dai, H., et al. (2017). An overview of blockchain technology: Architecture, consensus, and future trends. In: *Proceedings of the 2017 IEEE international congress on big data*. pp. 557-564