

## **The Importance of Adopting Blockchain Technology in the Financial and Banking Sector: Saudi Arabia as a Model**

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### **Abstract :**

This study illuminates the transformative potential of blockchain technology for the financial and banking sector, detailing its numerous advantages and extensive capabilities. Blockchain offers the potential to deliver innovative financial services at low costs while ensuring high quality, speed, and efficiency in operations. It also enhances transparency, eliminates intermediaries, and strengthens information security.

The study found that the blockchain market has experienced significant growth in recent years, particularly within the financial sector, despite being a relatively new technology. Recognizing its importance, Saudi Arabia swiftly embraced blockchain technology, launching several pioneering initiatives aimed at improving cross-border payment and transfer systems, as well as optimizing bank settlement processes.

**.Keywords:** Blockchain, financial and banking sector, financial services, cryptocurrency .

***Jel Classification Codes : G21, O33, F24***

## **Introduction:**

Blockchain technology has garnered significant global attention in recent years, emerging as a key element of the fourth industrial revolution. Its potential is reshaping the global economy, fostering development, innovation, and enhancing human life. One of the sectors most impacted by blockchain is the financial industry, which has experienced rapid and transformative changes due to this technology. Blockchain has revolutionized the way financial and banking systems operate, particularly in areas such as cryptocurrency and digital asset trading, as well as in the execution of financial transactions, especially cross-border transfers.

"Building upon the aforementioned points, the core research question this study seeks to answer is:"

What are the primary advantages of utilizing blockchain technology in the financial and banking sector?

Thus, the study aims to:

- ✓ This study explores blockchain technology, its key features, development, types, and applications, with a focus on its use in the financial and banking sector, highlighting its benefits and challenges.
- ✓ This study aims to provide an overview of blockchain technology, including its core features, development process, various types, and applications. The primary focus is on its application within the financial and banking sector, examining both the advantages it offers and the challenges it faces.
- ✓ Examining the current state and challenges of blockchain technology within Saudi Arabia's financial and banking sector.

To effectively address the problem, we put forward the following hypotheses:

- ✓ Blockchain technology has revolutionized the working mechanisms of the financial and banking sector.
- ✓ Saudi Arabia has achieved remarkable progress in implementing blockchain technology within the financial and banking sector.

Our study adopted an analytical descriptive approach to gather information on blockchain technology, examining its applications, the benefits it offers, and the challenges it encounters within the financial and banking sector.

Accordingly, the main themes of this study are as follows:

## **I-blockchain Technology overview**

### **II-Blockchain use in the financial and banking sector: applications, Motives and challenges**

### **III-Blockchain in the Saudi financial and banking sector: reality and challenges**

**I-Blockchain Technology overview:** This section encompasses the following aspects:

#### **I-1- Blockchain concept**

"Blockchain technology emerged alongside cryptocurrencies, serving as the underlying foundation for these digital currencies. At its core, blockchain operates as a decentralized and immutable distributed ledger that records all transactions within a network. This immutability ensures the integrity of the data and provides robust protection for recorded information, After a transaction is included in the ledger, it cannot be modified.

The blockchain originates with the "Genesis block," and each subsequent block is cryptographically linked to the previous one. This link is created using a unique "hash," calculated from the Merkle root of the current block and the preceding block's hash. This hashing mechanism underpins blockchain's fundamental security: (hidalgo, 2019)

- **Chain Linkage:** Each block is securely linked to its predecessor through its unique hash, forming an unbreakable chain, This maintains the integrity of the entire blockchain, as altering a block would interfere with the chain's structure and compromise its consistency.
- **Data Modification Indication:** Any modifications to the data within a block would immediately alter its hash, consequently affecting the hashes of all subsequent blocks in the chain. This makes it readily apparent to the network if any tampering or modification has occurred, as the disruption of the hash pattern would be instantly noticeable."

#### **I-2-Blockchain Evolution:**

"Blockchain technology has undergone a dramatic evolution in the last two decades. Starting with Bitcoin, which laid the foundation (Blockchain 1.0), it progressed to Ethereum, enabling programmable contracts (Blockchain 2.0). Today, we are witnessing the emergence of 'Blockchain 3.0,' characterized by enhanced scalability, interoperability, and user experience. This journey has transformed blockchain from a basic digital ledger into a powerful, global computing platform." (Abdel Monem, 2019)

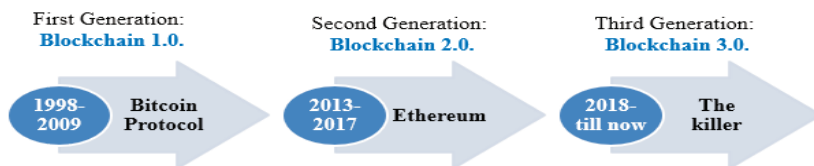
The origins of blockchain technology trace back to 1998 when Chinese engineer Wei Dai introduced a cryptocurrency system called “b-money,” where individuals could earn money by solving complex mathematical puzzles. In 2008, an unknown entity, under the pseudonym "Satoshi Nakamoto," launched the technology now known as "blockchain." Nakamoto detailed the concepts in a white paper titled ""The 2009 launch of Bitcoin, based on the groundbreaking blockchain technology, marked a pivotal moment. Bitcoin, as outlined in the seminal paper 'Bitcoin: A Peer-to-Peer Electronic Cash System,' pioneered the use of blockchain as a public ledger for all cryptocurrency transactions, ushering in the era of Blockchain 1.0". (Blockchain 1.0 or Grandpa Bitcoin).

The year 2013 saw the introduction of Ethereum, often referred to as Blockchain 2.0, a groundbreaking innovation in blockchain technology, Ethereum, created by Vitalik Buterin, a programmer of Russian-Canadian descent, was introduced as an open-source, publicly accessible distributed computing platform.. Its hallmark feature lies in the implementation of smart contracts, self-executing agreements with predefined terms and conditions that automate transactions and interactions across the network..

Launched in 2015, Ethereum quickly gained traction among developers, investors, and specialized organizations. The strength of the Ethereum platform lies in its ability to extend blockchain technology beyond a mere database for cryptocurrencies, enabling the creation and execution of decentralized applications across diverse fields such as financial services and other industries that could benefit from the use of smart contracts. By 2018, Ethereum's market capitalization exceeded \$100 billion. However, a major setback occurred when \$70 million was stolen within a few hours due to a vulnerability in the system..

As a result, Ethereum initiated a process called a "**blockchain fork**", This involves making substantial changes to the blockchain protocol to introduce new features or address critical issues, These challenges included issues like reversing the impact of hacks or fixing critical bugs. Both the first and second generations of blockchain encountered several obstacles that limited their broader adoption. In response, the third generation of blockchain, often referred to as **Blockchain 3.0** or "**killers**," aims to enhance security, lower transaction costs, and reduce transaction times to facilitate broader usage. Consequently, this third generation is being developed to address and eliminate current challenges in the blockchain space.

**Figure n°1: Blockchain Evolution**



**Source :** Heba Abdel Monem, Using Blockchain in Financial Services, Arab Monetary Fund, 2019

### **I-3- Blockchain main features:**

The blockchain has the following key characteristics: (Kibetl & Karume, 2018)

- ✓ **Decentralization:** Blockchain technology has demonstrated its effectiveness as a tool for decentralizing the web. Within a blockchain network, transactions can take place directly between two peers (P2P) without requiring authentication from a central authority. As a result, blockchain significantly reduces the performance bottlenecks typically associated with central servers. It provides users with direct control over their accounts through cryptographic keys associated with those accounts, ensuring secure and autonomous management of their assets and data.
- ✓ **Immutability.** Since every transaction is broadcast across the network, requiring validation and inclusion in blocks distributed throughout the system, tampering becomes virtually impossible. Furthermore, each block is verified by other nodes, ensuring that transactions are authentic and adhere to the network's consensus rules. This ensures that any attempt at forgery is easily detected. Moreover, users can create multiple addresses to avoid identification, and their private information is no longer held by any centralized entity. This mechanism preserves a level of privacy in the transactions embedded within the blockchain, enhancing both security and anonymity.
- ✓ **Auditability:** Blockchain's inherent design ensures that every transaction is validated and recorded with a timestamp, enabling users to easily review and track historical records by accessing any node in the distributed network. This feature, exemplified in the Bitcoin blockchain, significantly enhances transparency, allowing participants to verify transactions and seamlessly audit the history of asset transfers.

### **I-4- Types of blockchain systems:**

Three basic types of blockchains emerged after Bitcoin introduced the technology to the world: **public blockchain**, **private blockchain**, and **federated blockchain.**: (Kibetl & Karume, 2018)

- **Public Blockchain:** In a public blockchain, all records are fully transparent and accessible to the public, allowing anyone to participate in the consensus process. This decentralized structure ensures that no single entity exercises control over the network, enabling any participant to validate transactions, contribute to the ledger, and engage in network activities or simply read and audit the data. These blockchains are inherently open and transparent, which means that anyone can review and verify the blockchain at any time, ensuring high levels of trust and security. The decentralized nature of public blockchains makes them resistant to censorship and tampering, as there is no central authority overseeing or controlling the network, Examples of public blockchains include Bitcoin and Ethereum, where anyone with an internet connection can access the blockchain and engage in activities like sending transactions or participating in consensus mechanisms such as Proof of Work or Proof of Stake.
- **Private Blockchain:** A private blockchain operates under the control of a central administrator who manages critical aspects such as granting or restricting access. The consensus mechanism is dictated by the administrator, who may selectively assign mining rights or choose not to distribute them. While this structure reintroduces a level of centralization, it remains cryptographically secure and can be more cost-effective for the organization, as access and rights are controlled by a trusted entity.
- **Consortium Blockchain:** This type of blockchain is designed to mitigate the centralized control associated with private blockchains by distributing governance across a consortium of predetermined participants, Only a select group of nodes are involved in the consensus process, and decisions are collectively made by a group of organizations or individuals. This collaborative approach ensures that multiple administrators share control, fostering a balance of power and serving the collective interests of the network.

Here is a concise table comparing the different types of blockchain:

**Table n°1: Comparisons among public blockchain, consortium blockchain and private blockchain**

| Feature                 | Private chain                 | Consortium chain              | Public chain |
|-------------------------|-------------------------------|-------------------------------|--------------|
| Efficiency              | High                          | High                          | Low          |
| Consensus determination | One organization              | Selected set of nodes         | All miners   |
| Reading permissions     | Could be public or restricted | Could be public or restricted | Public       |

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|                          |                   |                   |                             |
|--------------------------|-------------------|-------------------|-----------------------------|
| <b>Immutability</b>      | Could be tampered | Could be tampered | Nearly impossible to tamper |
| <b>Centralization</b>    | Yes               | Partial           | No                          |
| <b>Consensus process</b> | Permissioned      | Permissioned      | Permissionless              |

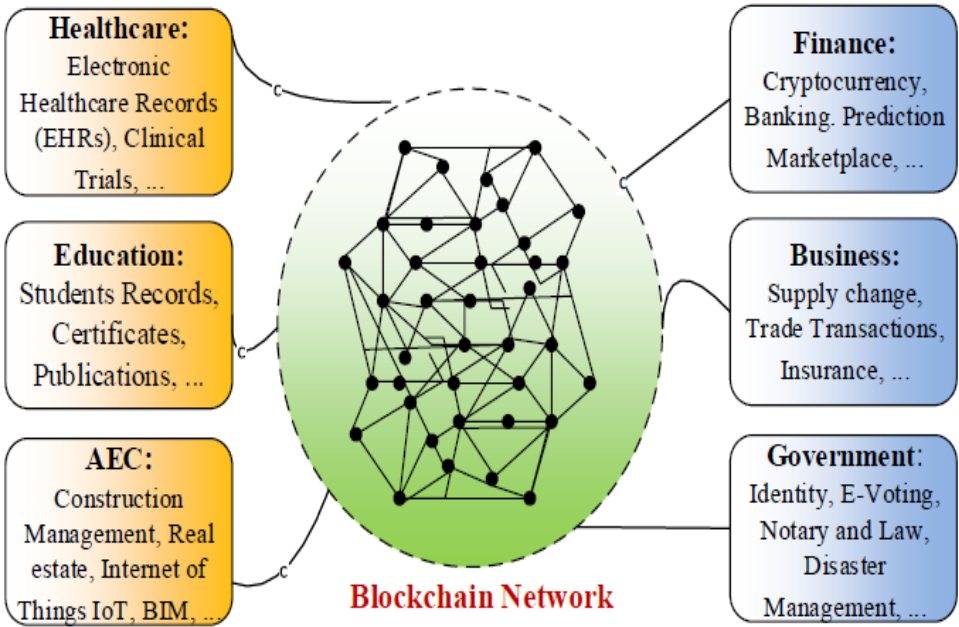
**Source :** Alex Kibet1, Simon Maina Karume, A Synopsis of Blockchain Technology, *International Journal of Advanced Research in Computer Engineering & Technology (IJARCET) Volume 7, Issue 11, November 2018.*

This table highlights the key differences, helping determine the appropriate blockchain type based on specific requirements, and This comparison illustrates the strengths and limitations of each blockchain type, making it easier to identify which is best suited for specific use cases.

**I-5-Blockchain applications:**

Blockchain technology provides secure management of information, leading to its rapid and diverse adoption across various sectors, including: Finance, Business, Government, Healthcare, Education, AEC (Nawari & Ravindran, 2019) , as they can be summarized in the figure below:

**Figure n°2:** Classical and emergent areas of BCT applications.



**Source :**Nawari O. Nawari & Shriraam Ravindran (2019). Blockchain technology and BIM process: review and potential applications. *Journal of Information Technology in Construction (ITcon)*, Vol. 24, pg. 209- 238,

## **II-Blockchain use in the financial and banking sector: applications, Motives and challenges**

Studies Reveal that blockchain technology and Distributed Ledger Technologies (DLTs) offer distinct advantages over traditional centralized ledgers, potentially leading to transformative changes and innovations in financial systems, services, and marketplaces. These benefits include eliminating intermediaries, enhancing transparency and trust, fostering decentralization, improving traceability, boosting efficiency, reducing costs, strengthening data security, and enabling smart contracts. However, the broader application of these technologies brings forth considerable technical, legal, and regulatory challenges, along with new risks that remain to a great extent unresolved,

### **II-1- Potential applications of blockchain in the financial services sector:**

"The sensitive nature of financial data has led to a strong preference for private blockchains within the financial services sector. This focus allows for greater control over data access and network operations, crucial for complying with regulations and ensuring the security of sensitive financial information. The primary areas of application have included money transfers, cryptocurrency exchanges, risk management, cross-border payments, and investment management.. (Macasukit, Bajgoric, & Subramanian, 2022)

Blockchain, as a tool in financial technology (FinTech), has become a highly active area of research. It is anticipated that by 2025, the mainstream adoption of blockchain will begin, becoming a daily fixture in the Financial sector

Overall, blockchain has the potential to be utilized in the financial services sector for: (Alsebaie, 2020)

This excerpt accurately summarizes the potential applications of blockchain technology in the financial services sector, (Alsebaie, 2020):

- **Data Management:** Blockchain can be used to record, access, and secure data across various departments, subsidiaries, resources, assets, collateral registries, or ownership records. This ensures data integrity, transparency, and security.
- **Process Optimization:** Blockchain can streamline settlements, contracts, and payments between service providers in the financial sector and trade organizations, both locally and internationally. By automating processes, blockchain reduces the need for intermediaries and enhances efficiency.
- **Financial Services and Infrastructure:** Blockchain enables the creation of open (permissionless) or permissioned systems (with restricted access for authorized participants) for the issuance and exchange of crypto-assets, including cryptocurrencies, crypto-tokens, and crypto-securities. It also

facilitates crowdfunding, initial coin offerings (ICOs), and microfinancing, thereby opening new avenues for financial innovation.

These applications highlight blockchain's significant role in transforming and optimizing the financial services sector.

## **II-2- Driving Forces Behind Blockchain Adoption in Finance**

Blockchain has the potential To afford numerous benefits that could transform and revolutionize the global financial system. Its capabilities are still developing, and its advantages are comparable to the internet, offering limitless possibilities that have yet to be fully realized or imagined.

The key drivers for adopting blockchain in financial systems are as follows:

### **II-2-1- New improved financial infrastructure and internal systems:**

The main factors driving the adoption of blockchain in financial systems contain: (Alsebaie, BLOCKCHAIN ADOPTION IN THE GULF STATES, 2019)

- **Decentralization and Disintermediation:** This allows the transfer of tokens and digital values directly between two parties, without the need for a central authority or intermediary overseeing the ledger.
- **Enhanced Transparency and Auditability:** Blockchain technology enhances transparency and auditability through automation and programmability, such as "smart contracts." These contracts enable automatic processes, such as invoicing, payments, issuance of share certificates, ownership dividends, and cash-for-work programs. Since every transaction is recorded on the blockchain with a timestamp and cannot be altered, it provides a transparent and immutable record, allowing for easy tracking, verification, and auditing of activities, ensuring greater accountability and reducing the possibility of fraud.
- **Immutability and Verifiability:** Blockchain ensures data integrity enhancement speed and efficiency, reducing costs, and enhancing cybersecurity resilience within the ledger.

### **II-2-2- The Catalyst Force of the Industry 4.0**

"Blockchain technology is a cornerstone of the Fourth Industrial Revolution, as they are key to addressing the financial Requires of the digital economy and modern markets. This technology fosters the development of innovative business models while ensuring that financial processes remain secure, transparent, and Effective.

"To stay competitive and boost their effectiveness, entities in the financial services industry must incorporate new technologies and Industry 4.0 trends into their strategies, operations, and production methods." The

convergence of the Internet of Things (IoT) and Industry 4.0, characterized by digitization and automation, is set to transform industries into intelligent environments where every object generates data, operates, and connects seamlessly with others.. (Mhlanga, 2023)

### **II-2-3- Customer-centric Financial Products and Services.**

"In the digital finance space, blockchain facilitates peer-to-peer transactions, allowing customers to verify transactions directly and eliminating the need for intermediaries. This transformation has several implications for enhancing and expanding services offered through mobile and web platforms.

Blockchain cryptography ensures the security of shared data, enabling the creation of a central, shared "repository" of up-to-date customer identity information among banks. This advancement enhances the KYC (Know Your Customer) process, subsequently improving the AML (Anti-Money Laundering) process, increasing interoperability across banks in different countries, and reducing administrative costs. Most importantly, it minimizes data duplication, thereby lowering infrastructure costs. According to Reuters, the annual cost of maintaining the KYC process is estimated to range between 60-500 million USD. (Kawasmi, Akwasi Gyasi, & Dadd, 2020)

The advent of the Internet and smartphones has profoundly reshaped customer behaviors, elevated expectations, and redefined their needs. Today, consumers demand seamless online access to a wide range of services through a single login, including e-commerce, banking, insurance, transportation, money transfers, travel, utilities, and even smart TVs. Blockchain technology can play a crucial role in addressing these demands by providing common solutions for payment systems and verifying financial identities across various sectors and industries.

### **II-2-4- Improving digital financial inclusion**

Blockchain use cases, notably in fields such as digital identity, cryptocurrency, cross-border transactions, and remittances, have the potential to substantially enhance access to financial services, especially for populations without access to traditional financial institutions. By providing low-cost financial services, blockchain technology can play a pivotal role in advancing digital financial inclusion.

"Financial inclusion signifies the availability of available and Reasonable financial products and services Like transactions, payments, savings, credit, and insurance, that meet the needs of individuals and businesses in a responsible and sustainable manner."

"Digital financial inclusion focuses on using cost-effective digital solutions to provide underserved populations with accessible and affordable

financial services, ensuring both customer satisfaction and the long-term sustainability of service providers."

Considerable progress has been made toward financial inclusion. From 2011 to 2017, 1.2 billion adults gained access to an account. By 2017, 69% of the world's adults had an account. Digital financial services, including mobile-based ones, With availability in over 80 countries and significant scale achieved in many, digital financial services are empowering millions of previously excluded and underserved individuals by enabling them To shift from cash-based transactions to formal financial services through the use of mobile phones and other digital technologies. (THE WORLD BANK, 2022)

### **II-2-5- Cryptocurrency growth.**

The digital currency landscape is diverse, comprising cryptocurrencies, various private digital tokens, and Central Bank Digital Currencies (CBDCs): (Alsebaie, GCC : Promoting Blockchain Technology Adoption in Financial Services Sector : insights from Bahrain's Experience, 2020)

#### **Cryptocurrencies and other private digital tokens:**

Cryptocurrencies function independently of conventional financial institutions, leveraging an open system where all users play a role in verifying irreversible payment transactions. As of 2018, there were over 1,737 different cryptocurrencies in circulation (including 819 coins and 918 tokens), issued on blockchain or other decentralized ledger-based platforms. Prominent examples include Bitcoin, Ripple, and Litecoin, among others.

Crypto assets, including cryptocurrencies, crypto tokens, and crypto securities, have witnessed significant growth and value appreciation in recent years. For example, Bitcoin, which constitutes 47% of the crypto-asset market, saw its market capitalization rise from around \$1.02 billion in 2013 to \$144.96 billion by 2019. However, despite this rapid expansion, crypto assets remain a relatively small segment of the global financial system.

Cryptocurrencies have gained recognition from many governments as crypto assets, reflecting their growing importance in the global financial landscape. However, the exponential growth of these digital currencies also raises concerns about potential risks to financial stability in the future.

Attitudes towards cryptocurrencies, Initial Coin Offerings (ICOs), and their legal status differ across countries. As of 2019, cryptocurrencies (tokens/coins) are permitted to operate in various countries, provided they adhere to the digital asset or ICO regulatory frameworks set by the respective authorities. These countries include the USA, Canada, the UK, Switzerland, France, Germany, Italy, Japan, Singapore, Hong Kong, Turkey, Bahrain, the United Arab Emirates, Indonesia, and Mauritius.

Numerous governments, including those of Saudi Arabia, Russia, South Korea, and Mexico, have issued warnings or regulatory guidelines concerning initial coin offerings (ICOs) and imposed restrictions on the use of cryptocurrencies within their borders.

Cryptocurrency trading and ICOs have faced significant restrictions or outright Prohibitions in several countries, including China, South Korea, India, Pakistan, Bangladesh, Nepal, Macedonia, Bolivia, Ecuador, Algeria, and Morocco.

the Attitude of governments and financial institutions towards cryptocurrencies remains dynamic, shaped by various factors such as the condition of national currencies the emergence of new market participants, and the level of cryptocurrency adoption, For example, China, once one of the largest markets for cryptocurrency trading, altered its position in 2017, considering cryptocurrencies a threat to its national currency, the Chinese Yuan. As a result, the government blocked cryptocurrency exchange websites and banned ICOs within the country.

A similar shift in government perspective occurred when Facebook introduced its Libra cryptocurrency in 2019. The proposal faced strong opposition from the US Congress and the EU finance ministries, who expressed concerns that it could undermine monetary stability. This opposition marked a stark contrast to earlier attitudes from governments and financial institutions, which had once seen cryptocurrency as a potential threat but had also recognized its possible benefits.

### **Central Bank Digital Currency (CBDC)**

With the growing prominence of cryptocurrencies, many central banks are now exploring or testing the feasibility of creating sovereign digital currencies. These digital currencies, known as Central Bank Digital Currencies (CBDCs), are designed to be globally accessible and are intended for use in both cross-border and domestic economic, financial transactions, and payments.

A CBDC is essentially the digital version of a country's fiat currency, backed by the nation's financial reserves, including foreign exchange (forex) and gold. It is issued and regulated by the central monetary authority. Currently, over 40 central banks around the world are researching or testing CBDCs, including those in countries such as the United Arab Emirates, Saudi Arabia, the Netherlands, Norway, Sweden, Canada, Brazil, Uruguay, the Bahamas, China, Thailand, Singapore, the Eastern Caribbean, Kazakhstan, the Philippines, Russia, and South Africa.

### **II-3-Challenges facing blockchain**

Distributed Ledger Technology (DLT), particularly blockchain, represents a significant innovation of our time. However, several critical challenges remain that hinder its widespread adoption. Overcoming these obstacles is crucial for unlocking the full potential of blockchain and realizing its transformative impact across various sectors.

- **Scalability:** Blockchain technologies face challenges in efficiently handling a high volume of users on a single network. As a result, leading blockchain networks, such as Bitcoin and Ethereum, have experienced slow transaction speeds and higher fees per transaction.
- **Criminal Connection:** Cryptocurrency has been exploited by criminals to facilitate the purchase of illegal goods via online marketplaces, serve as a tool for money laundering, and function as a payment method for ransomware. Although these activities are illegal, they are a consequence of people's use of both digital and fiat currencies. For blockchain technology to gain wider acceptance, it must sever this ambiguous connection.
- **Inefficient Technological Design:** A significant portion of smart contracts deployed on blockchain platforms are vulnerable to issues stemming from coding errors. Additionally, the Bitcoin network incorporates a large amount of data with each transaction, some of which is non-essential. This makes the Bitcoin blockchain heavy and slow, highlighting the need to simplify and optimize its design to address these shortcomings and facilitate broader adoption.
- **Energy Consumption of Consensus Mechanisms:** Blockchain technology is highly energy-intensive. Bitcoin miners, responsible for validating transactions, consume around 0.2% of the world's total annual electricity. To make blockchain more sustainable, alternative consensus mechanisms, such as the proof-of-stake algorithm, should be utilized, as they require significantly less power, enabling the technology to remain viable in an increasingly energy-conscious future.
- **Privacy:** The Bitcoin blockchain is inherently public, meaning all transaction-related information is visible to anyone. While transparency is valuable in some contexts, it becomes problematic when used in environments that require confidentiality, such as with sensitive data like private patient information. Blockchain systems must be adapted to restrict access to such data, ensuring that only authorized individuals or entities can view or modify it.
- **Security:** The blockchain is vulnerable to a 51% attack, which occurs when a miner or group of miners control over 50% of the network's mining power. While this poses a security risk, the likelihood of such an attack decreases

as more participants join the network and contribute mining power, thus enhancing the system's overall security.

- **Costs:** Blockchain technology has the potential to significantly reduce costs and fees associated with value transfers, while also improving operational efficiency. However, its integration with existing legacy systems can be complex and expensive, requiring substantial investment in infrastructure and technology. This challenge may deter many companies and governments from embarking on such a costly and intricate transition. (Kibetl & Karume, 2018)

### **III-Blockchain in the Saudi financial and banking sector: reality and challenges**

Before delving into the expansion of the blockchain market in Saudi Arabia and examining the actual application of blockchain technology within the Saudi financial and banking sector, it is essential to first explore the global dynamics of this market. This overview will provide a broader context and understanding of blockchain's influence and trends worldwide, laying the groundwork for a more focused analysis of its specific impact in Saudi Arabia.

#### **III-1-The dynamics of the blockchain market**

The global blockchain technology market is poised for explosive growth, with projections indicating a market value of \$162.84 billion by 2027, a dramatic increase from its 2018 valuation of \$1.57 billion. In 2022, the market size reached \$11.54 billion, demonstrating significant momentum. This rapid expansion is expected to continue, with a projected compound annual growth rate (CAGR) of 85.9% between 2022 and 2030. The financial services sector currently dominates the blockchain technology market, accounting for over 38% of the revenue generated in 2021. Furthermore, the United States has emerged as a global leader in blockchain adoption, contributing an estimated 36% of the global blockchain revenue from 2017 to 2022.(Mc Cain, 2022)

#### **III-2-The growth of the blockchain technology market in the Kingdom of Saudi Arabia:**

In the Saudi market, the Communications and Information Technology Commission (CITC) highlighted during a 2021 workshop on "Blockchain Technology and its Impacts on Digital Transformation" that the local blockchain technology market is expected to grow rapidly from 2021 to 2025, with an annual growth rate of over 41%. The CITC also emphasized its commitment to fostering the adoption of emerging technologies, particularly blockchain. The information technology and emerging technologies market, which includes blockchain, reached a value of 65 billion riyals in 2020, with

a growth rate of 10% compared to 2019. It is anticipated that this market will continue to expand at a compound annual growth rate (CAGR) of 10%, surpassing 100 billion riyals by 2025. (Small and Medium Enterprises General Authority (monsha'at), 2022)

Blockchain technology is currently in the research and development phase at the local level, with significant potential for the technology to reach a stage of maturity in the near future. Once this occurs, it is expected to experience substantial growth rates, contributing to the broader adoption of blockchain solutions in various sectors, particularly in financial services and beyond

Some of the leading companies offering blockchain technology services in the Kingdom of Saudi Arabia include: (Small and Medium Enterprises General Authority (monsha'at), 2022)

- ✓ **DxMinds Technologies:** Established in 2017 in California, USA, DxMinds Technologies is one of the prominent emerging tech companies offering blockchain services in Saudi Arabia. The company has expanded its reach to the Saudi market, providing a range of services including application development, Internet of Things (IoT), virtual reality, and blockchain technology.
- ✓ **Infratech:** Founded in 2001 in Riyadh, Infratech initially offered consulting services. Over time, it broadened its offerings to include various software solutions, designs, and the creation of infrastructure for large enterprises. The company now provides blockchain services, focusing on the development of public and private blockchain networks to benefit various businesses.

### **III-3-The reality of applying blockchain technology in the Saudi financial and banking sector:**

There has been notable progress in the adoption of blockchain technology within Saudi Arabia's financial services sector. The Central Bank, commercial banks, and financial service providers have collaborated with blockchain and fintech firms, such as Ripple and others, to launch pilot programs using various forms of blockchain. These initiatives aim to enhance payment systems, cross-border transfers, and bank settlement infrastructures, with a focus on streamlining operations and boosting efficiency within the financial sector.

In June 2020, the Saudi Arabian Monetary Authority (SAMA) announced the use of blockchain technology to deposit part of a liquidity package, totaling 50 billion Saudi riyals (\$13.3 billion), into the banking sector. This move was a proactive strategy by the central bank to provide credit support. SAMA remains committed to exploring and adopting

emerging technologies to stay aligned with global trends in central banking. This approach also provides an opportunity to evaluate the impact of these technologies on the financial sector, ensuring that Saudi Arabia's financial infrastructure evolves in sync with international developments. (Argaam, 2020)

Furthermore, the Saudi Central Bank is experimenting with blockchain technology for financial transactions as part of its goal to raise the proportion of e-payments to 70% of total transactions by 2030. The progress of this initiative presents a significant opportunity for stakeholders in the ecosystem to provide services and develop blockchain solutions for banks and other entities involved in currency exchange. In its effort to reduce reliance on cash, SAMA has teamed up with Ripple to enhance the payment infrastructure of Saudi banks. This partnership enables the use of Ripple's xCurrent blockchain technology, ensuring real-time cross-border payments. (Communication, Space & Technology Commission (CST), 2022)

Al-Rajhi Bank successfully completed an experimental international financial transfer using blockchain technology, marking it as the first bank in the Kingdom of Saudi Arabia to implement this cutting-edge technology in the remittance sector. The bank conducted the transaction between its headquarters in Riyadh and one of its branches in Jordan, showcasing the potential of blockchain for enhancing cross-border financial transfers.

Al Rajhi Bank continued to conduct new and secure transfers using "Blockchain" technology with correspondent banks around the world and finally implemented these operations in cooperation with IndusInd Bank in India, using this technology solutions to finance instant transfer payments between Saudi Arabia and India. (Alriyadh, 2018)

- HSBC Bank launched the cross-border instant transfer (rapid transfer) service in cooperation with the famous Ripple platform, and the bank's management stated that this service is part of its strategic plan towards including digital transfer services to improve customer experience.
- **STC Agreements in Blockchain Services:** In line with the role of STC as an enabler of digital transformation in accordance with Vision 2030, the Saudi Telecom Company signed an agreement in blockchain services with ConsenSys, with the aim of accelerating the adoption of blockchain technology in the Kingdom. The agreement will contribute to enabling both companies and government agencies for mass adoption of this technology by reducing the costs of prototyping and testing blockchains. (Small and Medium Enterprises General Authority (monsha'at), 2022)

- **Project Aber:** Launched in 2019 by the central banks of Saudi Arabia and the United Arab Emirates, Project Aber aimed to assess the viability of using a dual-issued digital currency for domestic and cross-border transactions between the two countries. The main objectives of the initiative were (Saudi Central Bank, Central Bank of the UAE, 2019):
- To explore, experiment with, and deepen the understanding of distributed ledger technology (DLT), while evaluating its maturity.
- To investigate a DLT-based solution for cross-border payments that could address the inefficiencies in existing interbank payment systems.
- To experiment with and gain insights into the dual issuance of a central-bank digital currency (CBDC).
- To compare the results with those of other central banks' findings.

### **III-4- opportunities and Challenges of applying blockchain in the Saudi financial and banking sector:**

To begin with, the opportunities available for blockchain technology in the Kingdom can be summarized in the following points:

- Increasing awareness among targeted business sectors about the importance of adopting blockchain technology in internal operations is crucial.
- The market has seen a noticeable rise in the demand for certain blockchain services, particularly in logistics and data management sectors.
- This demand is driving the introduction of blockchain systems as a flexible service tailored to the needs of small and medium-sized enterprises.

As for the challenges it faces, they are as follows:

- The technology is not yet mature enough, both in global and local markets.
- The absence of clear regulations governing the use of this technology in the financial and banking sectors.
- The scarcity of skilled professionals and technicians at the local level to deploy the technology.
- The cost of establishing infrastructure and implementing blockchain technology is relatively high compared to other technological solutions.
- The lack of sufficient awareness regarding the importance of implementing blockchain technology, particularly in the business sector.

### **Conclusion:**

Blockchain, a type of Distributed Ledger Technology (DLT), facilitates the recording of transactions in sequential "blocks," creating an immutable and interconnected chain. This decentralized architecture, where each node maintains a ledger copy and executes smart contracts, enhances transparency, fosters fraud resistance, and enhances privacy. Driven by the increasing demand for financial inclusion globally and the surge in

cryptocurrency interest, blockchain technology is rapidly gaining traction. Its transformative potential across business, society, the economy, and the environment further fuels its adoption.

Within the global financial industry, blockchain has solidified its position, accounting for over 38% of the blockchain market's revenue in 2021. Notably, 90% of major banks in the U.S., Canada, and Europe are either exploring or actively implementing blockchain technology within their operations.

Saudi Arabia's exploration of blockchain technology commenced in 2016. Since then, the Kingdom has prioritized research and actively investigated potential applications across government, finance, and commercial sectors. As blockchain technology continues to evolve, Saudi Arabia is actively fostering its adoption, particularly within the financial and banking sectors.

Thus, it is necessary to work on:

- ✓ Establishing an experimental sandbox under the supervision of central banks to test proposed projects and innovations. This would contribute to facilitating understanding of these new technologies and issuing the necessary legislation at the appropriate times.
- ✓ Learning from pioneering FinTech regulatory experiences requires enhanced international cooperation and coordination frameworks to facilitate the exchange of knowledge and identify both successes and shortcomings.
- ✓ Work on concerted efforts to build the capacities of workers in the regulatory, supervisory and legislative bodies to absorb these technologies and to develop regulatory frameworks to face their risks.
- ✓ Financial awareness regarding blockchain technologies and their role in strengthening the infrastructure of the financial system.

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## **The Importance of Adopting Blockchain Technology in the Financial and Banking Sector: Saudi Arabia as a Model**      **boufelfel sihem selaiaamia drifa benyoub fatma**

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