

GCC: Promoting Blockchain Technology Adoption in the Financial Services Sector: Insights from Bahrain's Experience

BLOCK CHAIN

A digital visualization of blockchain technology. It features a dark blue background with a grid of glowing blue dots and lines, representing a network. In the center, there is a map of the Middle East region, with several glowing blue dots and lines connecting them, symbolizing a distributed ledger or network. The text 'BLOCK CHAIN' is displayed in a light blue, sans-serif font above the visualization.

Author:

Dr. Fatima Alsebaie

1. Introduction

Distributed Ledger Technology (DLT) and blockchain are described as a breakthrough for the improvement of infrastructure and services of the financial sector. But at the same time, these technologies impose some challenges and concerns that attract the attention of governments, regulators and financial bodies; in which all stakeholders need appropriate knowledge and comprehension of these issues, and the ability to react to them. This has raised the need over the past few years to study how these technologies work, and the effects of the widespread use of DLT and blockchain applications on the efficiency of the services and systems of banks and financial companies, and the activities and work methods of individuals and institutions at all levels. Accordingly, this study aims to: **first**, understand and describe the status of the adoption of DLT and blockchain in the financial sector; **second**, analyze the present activities and views of governments and international financial bodies, in respect to the current wave of blockchain which spread through most countries in the financial sphere; **third**, explore how to plan for promoting and accelerating blockchain adoption in the financial services sector in the GCC region, drawing on insights from the analysis of the status quo of blockchain adoption in the GCC region, experience of Bahrain in blockchain adoption and interviews with a group of experts, from the financial services sector, who worked on blockchain-based projects in Bahrain.

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1.1 The Status Quo of Blockchain Adoption in the GCC Region.

Blockchain and other FinTech solutions are an important opportunity for GCC countries to further develop the financial services sector and support economic growth. Blockchain and Distributed Ledger Technology (DLT) suggest a new type of economics, and facilitate contracting and economic cooperation (Berg, Davidson & Potts, 2019). By taking advantage of new FinTech solutions, GCC countries can accelerate automation of business processes and services, raise the efficiency of financial operations, decentralize financial services and networks, establish modern banks and payment systems, introduce new asset markets, and offer new financial tools to institutions and businesses.

The FinTech industry and blockchain adoption in the GCC region has grown in recent years. However, the pace of progress has been slow. FinTech recently became the focus of substantial attention in the GCC region, but blockchain applications, artificial intelligence and cloud computing have attracted the most attention (Lukonga, 2018). Most central banks and commercial financial institutions have high awareness of blockchain potential benefits to the sector, but few of them have launched pilot projects. The speed of FinTech adoption and areas of blockchain adoption in the regional financial services sector is addressed below, respectively.

1.1.1 Speed of FinTech Adoption in the GCC Region.

Generally, FinTech adoption has increased in many countries over the last few years. The Global FinTech Adoption Index (2019) report showed that the adoption of FinTech services across the world has moved steadily upward from 16% in 2015 to 33% in 2017, and up to 64% in 2019 (EY global financial services, 2019). The total value of FinTech investments in the global economy reported has increased from US\$9 billion in 2010 to over US\$28 billion in 2016 (He, Leckow, Haksar, Griffoli, Jenkinso, Kashima, Khiaonarong, Rochon & Tourpe), and is projected to be around US\$43 billion in 2019 (Santosdiaz, 2019).

However, investments in the MENAP region account for less than 1 percent of total global Fintech investments between 2013-2018, which reflect slow FinTech adoption in the region (IMF, 2019). Most FinTech investments in the MENAP region are concentrated in four countries (Egypt, Jordan, Lebanon,

and the UAE), which account for 75 percent of total startups. The UAE alone received the bulk of venture capital investments, and accounts for more than 30 percent of all activities (IMF, 2019; Mueller & Piwowar, 2019). However, the industry has also grown rapidly in the last five years in the Kingdoms of Bahrain and Saudi Arabia, characterized by an expansion in the number of FinTech startups, digitization of operations by certain financial institutions, and the expansion of mobile money services (IMF, 2019).

1.1.2 Areas of Blockchain Adoption in the GCC Region.

Today, blockchain and distributed ledger technologies are changing the way of banking, and are challenging the financial services sector. Global blockchain spending is expected to increase from US\$1.5 billion in 2018 to nearly US\$2.9 billion in 2019, led by the financial services sector (more than \$1.1 billion), where most investments would be made in two blockchain areas of applications; namely, cross border payments and settlements, and trade finance and post-trade/transaction settlements (US\$453 million and US\$285 million, respectively), according to the Worldwide Semi-annual Blockchain Spending Guide from the International Data Corporation (Framingham, 2019).

In the GCC region, noticeable progress occurred in three areas of blockchain applications in the financial services sector; namely, cross border payments and bank settlements, know your customer, and cryptocurrencies (Alsebaie, 2019). Some central and commercial banks and financial services companies in the GCC region have partnered with blockchain and Fintech companies, like Ripple, Fenergo and others, in pilot blockchain-based programs of various sorts, such as improving the cross-border payments system between limited banks in both KSA and UAE; using joint cryptocurrency, improving cross-border remittances and the bank settlements system in KSA and Kuwait; and improving the process of Know Your Customer (KYC) for commercial banks and intermediaries in Bahrain.

In the area of cryptocurrencies, the MENA region was estimated to account for about 4% of global cryptocurrency exchanges in 2017, while Gulf investors were estimated to account for 1.5% of the total value of cryptocurrencies according to Cambridge (2017) (as cited in Lukonga, 2018). Notably, Bahrain

and the UAE are more interested in attracting investments and bringing cryptocurrencies to the Middle East, and defined them as crypto assets that are subject to licensing requirements and KYC/AML compliance. Bahrain and Abu Dhabi are racing to become the Gulf region's leading hub for cryptocurrencies; both have issued their own regulations on services of crypto-asset platforms, both have licensed cryptocurrency exchanges (like Rain, BitOasis, MidChains, and Arabian Bourse), and both have also invested in cryptocurrency-related startups (Mogielnicki, 2019). However, GCC countries differ regarding the adoption and legal status of cryptocurrencies. Financial regulators in other GCC countries (Saudi Arabia, Kuwait, Qatar and Oman) warned financial institutions about the potential risks, and discouraged the use of cryptocurrencies as they have not been regulated yet.

1.2 The Purpose and Structure of this Study.

Given the importance of the adoption of blockchain and its initiatives in the GCC region, the purpose of this study is to explore how to promote blockchain adoption, based on perceptions of a group of experts working in the financial sector in Bahrain. This study attempts to give financial service providers, policy makers, and other stakeholders in Bahrain and other GCC states an overall picture of what DLT and blockchain can change in the financial services sector, and clarify its considerable issues and risks. The study also helps all stakeholders understand how to adapt to the blockchain wave, and identify the requirements to capture its advantages and diminish its associated risks in the financial sector. Moreover, this study provides advice to banks, financial service providers, firms and entrepreneurs on how to improve their business or work efficiency by using blockchain and DLT. All of the above could enable the digital transformation moving forward, and pave the way to excellent and innovative future financial services in Bahrain and other GCC states.

To achieve the purpose of this study, **first**, relevant literatures and research were reviewed to identify DLT's potential applications, main advantages, challenges and risks in the financial services sector. **Second**, the researcher also reviewed present activities and attitudes of governments, regulators and international financial bodies regarding blockchain applications in the financial sphere. **Third**, the researcher investigated the status of blockchain adoption in the financial services sector in Bahrain.

Fourth, face-to-face interviews were conducted with a group of experts from the financial sector who have a relative background, and/or who have actually worked in certain blockchain-based projects in Bahrain; in order to explore their perceptions on the barriers of shifting to blockchain applications, and what it takes to promote and accelerate blockchain adoption in the financial services sector. **Fifth**, the researcher investigated the status of blockchain adoption in the GCC region, as well as analyzing Bahrain's experience in blockchain adoption and interviews conducted for this study, in order to build better understanding on how to promote blockchain adoption in the financial services sector in the GCC region.

The upcoming part of this booklet is structured into five sections. The first section gives a general overview of the motivations for DLT and blockchain adoption, and their uses in the financial services industry, along with their potential applications, operational challenges and risks in the financial sector. The second section analyzes present activities and the views of governments, regulators and international financial bodies regarding the current wave of blockchain that invaded most countries in the financial sphere. The third section presents factors affecting blockchain adoption, based on interviews with a group of experts from the financial sector who have a relative background, and/or have actually worked in certain blockchain-based projects. The fourth section focuses on the status of blockchain adoption in the financial services sector in Bahrain, and provides insights gained from Bahrain's experience. The fifth section concludes this study by providing insights on how to promote and accelerate blockchain adoption in the financial services sector in the GCC region, based on analyzing the status quo of blockchain adoption in the GCC region, and the critical factors affecting blockchain adoption identified in the interviews conducted for this study.

2. The Use of DLT and Blockchain in the Financial Sector.

2.1 What is Blockchain?

The term 'distributed ledger' refers to a decentralized database, which is consensually shared and synchronized across a network, and it was first used for the transfer of Bitcoin and other digital

currencies (Seretakakis, 2018). The most famous variant and important type of DLT is the blockchain, which is a peer-to-peer, distributed ledger that is cryptographically secure, append-only, immutable, and updateable via consensus among peers (Bashir, 2018).

Today, big organizations and governments are exploring the use of blockchain systems, as they can provide a global platform to store information and perform transactions over the Internet. Therefore, it is a foundational technology that can be used to create new foundations in economic and social areas (Bhamrah, 2018). The blockchain platform and applications can be used for recording transactions of asset exchange or data, such as property, identity, votes, currency, land titles, contracts, etc. This data is accessed, stored and synchronized in multiple nodes of network at the same time, irrespective of their geographic location.

Practically, the underlying principles of blockchain technology or DLT, which are, namely: distributed databases, peer-to-peer transmissions, transparency with pseudonymity, irreversibility of records, and transaction speed (Attaran, 2019), would allow accessing identical databases (which can be encrypted) with immutable user identity from any place at any time, and when changes are entered in one database, all other databases are simultaneously updated. Records of transactions are verified directly without a need for third-party intermediaries, and no single participant controls the data. In a blockchain-based network, communication occurs directly between nodes of the network without the need for central coordination.

All updates to the distributed ledger are monitored and approved by the nodes of the network based on the consensus. Consensus is achieved when all participants in the network agree to a transaction, and if not, the transaction will not be added to the distributed ledger. Transactions are visible to every participant in the system, and cannot enter without the consensus of all participants, and once they are entered in the database, the records cannot be altered, which makes for greater transparency, accuracy and data security. Transactions on the blockchain-based system are automatically verified and completed in seconds (Attaran, 2019).

In recent years, there has been an increasing interest in the potential for the use of Distributed Ledger Technology (DLT) and blockchain by academia and various industries. Presently, the main focus of

research on blockchain is on regulation and standardization of the technology, which will help develop off-the-shelf products and mature the blockchain technology, thus mainstream usage of blockchain and on a day-to-day basis is expected to start by 2025 (Bashir, 2018).

In the financial industry, blockchain as a FinTech tool is now a very active research area, and It should be noted that a *distributed ledger technology* is a term that describes blockchain in the finance industry, and they are used interchangeably (Bashir, 2018). Research has consistently shown that DLTs are having advantages over the traditional central ledger, which can bring fundamental changes and innovations to the financial infrastructure, services and market. These include disintermediation, greater transparency, decentralized trust, traceability, work efficiency, cost reduction, data security, and smart contracts. However, the potential applications of these technologies have major technical, legal and regulatory challenges, and may impose new risks, many of which are yet to be solved.

Blockchains and/or DLT are seen as a transformative technology that provides new tools and models for development of the financial services sector, and the benefit of businesses and people. Over 80% of banks worldwide believe that DLT projects need to be explored and piloted (Welfare, 2019). DLTs can be divided between public and private chains and can potentially be applied to most parts of finance (Varma 2019, pdf). However, trends for their adoption have centered around the utilization of private blockchains, due to the sensitive nature of transaction data in the financial sector (Welfare, 2019). The potential blockchain and DLT applications, motives and challenges of technology adoption in the financial services sector are presented next, respectively.

2.2 Potential Applications.

In general, three categories of potential blockchain and DLT applications can be used in adoption in the financial services sector. Blockchains and distributed ledgers can be utilized for:- (1) **Data**: to register, access and secure records of different departments, subsidiaries, resources, assets, collateral registries or ownership registries; (2) **Processes**: to automate settlements, contracts and payments between service providers in the financial sector and trade groups at local and international levels; (3) **Financial Services and Infrastructure**: to create open (permission-less) or permissioned systems

(with only authorized participants) for crypto-assets (cryptocurrencies, crypto-tokens, and crypto-securities) issuance and exchange, crowdfunding, initial coin offering, and microfinancing, etc.

Table 1 depicts an overview of potential DLT applications (at varying stages of development) in the financial sector according to Harish, Karla & Luskin (2017).

<p>Money and payments</p>	<ul style="list-style-type: none"> • Digital currencies • Payment authorization, clearance and settlement • International remittances and cross-border payments (alternative to correspondent banking) • Foreign exchange • Micropayments
<p>Financial services and infrastructure</p>	<ul style="list-style-type: none"> • Capital markets: digital issuance, trading and settlements of securities. • Commodities trading • Notarization services (e.g. for mortgages) Collateral registries, Movable asset registries. • Syndicated loans • Crowdfunding (as initial coin offerings) • Insurance (in combination with smart contracts) for automating insurance payouts, and validation of occurrence of insured events.
<p>Collateral registries and ownership registries</p>	<ul style="list-style-type: none"> • Land registries, property titles and other collateral registries.
<p>Internal systems of financial service providers</p>	<ul style="list-style-type: none"> • Replacing internal ledgers maintained by large, multinational financial service providers that record information across different departments, subsidiaries, or geographies.

Source: Harish, Karla & Luskin (2017)

Most blockchain solutions are driven by banks/consortia or startups, which are either aimed at improving the functioning of the financial services sector of countries, or bringing innovative services to the market. These solutions fall under two main categories: (1) **Process Efficiency Rationale** and (2) **New Market Creation Rationale**, according to De Luna, Montoro-Rios, Martinez-Fiestas & Casado-Aranda (2019).

The first occurs in countries (like OECD countries) with established financial market leaders, and its projects focus on a gradual application of blockchain, targeting inefficiencies in the existing business models, and utilizing permissioned blockchains, either within the organizations, or through consortia such as R3, Hyperledger (De Luna et al., 2019). In this category, the most promising areas for DLT and blockchain applications are money, cross-border payments and remittances. Blockchain technology offers a direct way and easier systems for transacting fiat or central bank-issued money (dollars, euros, dinars) (Varma, 2019), and cryptocurrencies. Currently, electronic cross-border transactions via conventional banks, mobile accounts or payment cards, still rely on the domestic payments financial infrastructure, and foreign exchange fees continue to be a large portion of remittance fees (around 20%) (World Bank Group, 2017). Digital currencies with DLT or blockchain decentralized models and networks, like Ripple, Fabric (Hyperledger Project, Corda (R3 CE), offer a new infrastructure for P2P money transfer and cross-border payments and settlements between banks, with the potential for higher efficiencies, lower costs of settlement and remittance prices.

The second category brought by new market players, like some new start-up businesses or large non-financial players, utilize blockchains in expanding the value chain of existing business models; for example, global payments, or remittances, and digital wallets (Apple Pay, Google Pay, Amazon Pay, Western Union, AU money transfer) Hyperledger (De Luna et al., 2019).

2.3 Blockchain and DLT: Motives and Challenges.

DLT and blockchain can offer various benefits that can transform and revolutionize the global financial system. The possibilities that blockchain can bring are still evolving, and its advantages are fairly similar to the internet, making them unlimited and unimagined yet. Literatures available on blockchain

advantages in the financial services sector give a picture of why DLT and blockchain technology are needed. Here are four foundational motives for using DLT and blockchain in financial systems, resources, transactions, services and data.

2.3.1 Disintermediation and Decentralization of Financial Services.

The underlying principles of blockchain technology can offer new improved financial infrastructure and internal systems, with greater efficiency and transparency than what is available now, and introduce decentralization and disintermediation into the financial services sector. This could change how banks and service providers operate businesses and manage data, resources and services, and how they communicate with and serve their customers, both locally and globally (e.g. inter-bank settlements). Table 2 lists the main benefits of blockchain technology to the financial industry.

Disintermediation	Transactions are carried out without a third-party intermediary, which reduces or even eliminates counterparty risk.
User enabled	Users have control of all their information and transactions.
High quality data	Blockchain data is complete, consistent, timely, accurate and widely available.
Durability, reliability and longevity	Due to decentralized networks, there is no single weak point, and networks can withstand attacks and hardware failure much better.
Transparency and immutability	Public transactions are visible to all parties, which creates transparency, and all transactions are immutable.
Simplification of Ecosystems	All transactions are added to a single public accounting book, which reduces the clutter and complications of multiple ledgers.
Faster transactions	Reduce transfer time and other transactions to minutes, and the process is 24/7.

Lower transaction costs	By eliminating intermediaries and overhead costs for asset swaps, blockchain has the potential to greatly reduce transactions fees.
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Source: (De Luna et al., 2019, p.36)

In traditional ways, banks maintain centralized data ledgers and registries with full control over the system. Blockchain offers secure decentralized systems, where many involved parties (banks, customers, companies, regulators, governments) have instant access to the system and data without the intermediation of a single bank (Szostek, 2019). Furthermore, in terms of reliability and security, unlike centralized models, there is not one single point on the blockchain network that is vulnerable to attack or hardware failure.

Blockchain-based solutions allow secure payments and online money transfers without the need for a trusted third-party to act as an intermediary (e.g. Bank, PayPal, Visa) on transactions and services (Szostek, 2019). Similarly, the blockchain-based smart contracts eliminate the need for a platform acting as a middleman, and allow automating many processes and procedures in the financial industry. Examples are the documentation, invoicing and payments in trade financing; trading and settlement of derivatives and syndicated loans; origination of mortgages; and claim processing in insurance (Oseni & Ali, 2019). Thus, the burden and fees of using a conventional financial institution can be eliminated by using blockchain platforms (Szostek, 2019).

The World Bank's (2017) report on distributed ledger technology and blockchain notes that the most important potential advantages of DLTs and blockchain in the financial services sector are: **(1) Decentralization and Disintermediation**, which enable transferring tokens and/or digital values between two counterparts without a central authority or intermediary that controls the ledger; **(2) Greater Transparency and Easier Auditability**, automation and programmability, referred to as "smart contract", such as automatic invoices, payments, automatic share certificates or owners dividends, or cash-for-work programs; **(3) Immutability and Verifiability, gains in speed and efficiency**, cost reduction, and enhanced cybersecurity resilience of ledger data (Harish, Karla & Luskin, 2017).

2.3.2 The Driving Force of the Industry 4.0 Environment.

DLT and blockchains are driving forces of the 4th industrial revolution, as they help in meeting financial requirements of the digital economy and its modern markets. The 4th industrial revolution, with its significant technological innovations, has generated a new digital economy associated with values of digitalization, disintermediation, democratization and decentralization (Akdogan, Kurular & Geuik, 2019). Blockchain technology enables building new business models and making the financial process democratic, secure, transparent and efficient (De Luna et al., 2019).

Also, entities in the financial services industry will be required to integrate new technologies and Industry 4.0 trends into their strategies, processes and production approaches, in order to remain competitive and gain effectiveness. The Internet of Things (IOT) and Industry 4.0 trends that rely on digitalization and automation will transform the industries into an intelligent environment, where every object generates data, and operates and connects with other objects. Future services and production approaches in every industry will depend on smart objects able (sensors, smart machines/systems, robots and identification technologies) to communicate and exchange data (through blockchain applications) between themselves. Just like people, these solutions will be able to communicate with objects, which will have a significant impact on enterprise functioning, efficiency, and consequently on the economy as a whole (Akdogan, Kurular & Geuik, 2019). In addition, adoption of trends from the 4th industrial revolution and new technologies or tools, like cloud computing, big data, geolocation applications etc., by non-financial sectors will create a need for financial services and payment systems that are technologically compatible with these trends.

2.3.3 Customer-centric Financial Products and Services.

In the digital financial ecosystem, DLT and Blockchain enable building peer-to-peer customer-centric solutions that allow verification of transactions to be performed over the internet, without the need for middlemen, which might improve and expand services offered through mobile and web-based solutions.

People, especially youth, prefer digital channels to access banking services and products using smartphones, tablets and laptops, regardless of geographical locations or time. Moreover, consumers, especially the new generation of “digital natives”, are expected to have more power, influence and voice in the global trends of payment systems in the coming years (De Luna et al., 2019). Therefore, the industry today is trying to fulfill the needs of these digital mindsets by using FinTech platforms that can provide customer-centric services (Mohamed & Ali, 2018).

The internet, mobile phones and customers’ behaviors make “the world of payments move away from high-cost physical/retailer activities to a private cyber-world of private purchases over cheaper items” (Schulte, 2017, p.346). For instance, in today’s world, telecom companies and tech giants like Amazon, Google, Apple, Facebook and Alibaba, are becoming quasi-banks, developing their own payment applications (e.g. digital wallets) among their services and products.

About half the world's population access and use the internet, and every year, there are around 195 million new internet users. The number of active mobile-broadband subscriptions has also increased from 268 million in 2007 to 5.3 billion in 2018 (ITU, 2018). Utilization of the internet and smartphones has changed customer behaviors, expectations and needs. Today, people want online access with a single sign-on to all services they need, like e-commerce, banking, insurance, transportation, money transfer, travel, utilities, smart TVs and so on. Blockchain technology can be utilized to build common solutions for payment systems spanning all sectors and industries, and verification of financial identities, which will facilitate interactions and transactions between individuals and businesses.

The rapid growth of internet and mobile penetration across the world pushes banks and service providers towards providing digital services for their customers, including digital banking, mobile payments at points of sale, and money transfers between two individuals through mobile devices (P2P). Many banks over the past years have allowed their customers to access some services, like viewing statements of account, bank details, transaction histories, generate card pin numbers, send or receive payments instantly. However, people still have to go to the bank for some other services, such as opening accounts, applying for loans or finance, depositing cheques, and requesting and receiving

official statements or other documents. With blockchain-based identity verification solutions, such services can be delivered to customers in the future.

2.3.4 Improving Financial Inclusion.

Generally, progress on at least nine Sustainable Development Goals (SDGs), set by the United Nations, could be directly affected by the industrial 4.0 technologies (UNDP, 2018), including blockchain, which has wide applicability to several SDGs, such as the global goals for economic growth, industry and innovation, universal health, universal identification and financial inclusion. Provision of efficient and trusted payment solutions, distributing and tracking funds and identity verification are crucial for supporting the development of countries and delivering international aid. For example, the UN used an (IrisGuard), which is iris recognition technology, in conjunction with Ethereum blockchain, to create the digital identity and deliver financial aid to over 120,000 Syrian refugees in Jordan. IrisGuard's EyePay platform allowed refugees to purchase food and their needs from almost five supermarkets in the camp, by identifying the digital identity of beneficiaries and allowing them to receive food vouchers, withdraw cash, and transfer funds, without requiring a payment card or bank account (Zetzsche, Buckley & Arner, 2019).

Potential blockchain applications in areas, like digital identity, cryptocurrencies, cross-border payments and remittance, could lead to greater access to financial services and inclusion, mainly for unbanked or undocumented populations in some areas of the world.

There is a significant financial exclusion in the world, since more than 60 % of the world's population are still underserved or unserved by the formal financial system, because they are either excluded from the economic, social and financial system, or due to the high cost or limitations of conventional financial systems (Schulte, 2017).

For example, in some countries, the remittance costs on average are significantly higher than the SDG target of 3% (SDG indicator 10.c). In such conditions, a blockchain payments platform could offer new channels for remittances with a lower cost.

2.3.5 Challenges to Adopting Blockchain Applications.

In the area of blockchain technology, regulatory vetting and development of industry standards are still in very early development phases. Although many governments, non-government and international organizations, like the World Bank and IMF, are now exploring multiple cases of blockchain usage, and multiple consortia of big players have been formed, like a bank consortium (R3CEV), Hyperledger (includes IBM, Cisco and Intel), a relatively little real-world practical deployment, can be perceived, because there are challenges that still need to be solved, in order to broaden blockchain adoption (Casey, Crane, Gensler, Johnson & Narula, 2018). The report of Harish, Karla & Luskin (2017) classified these challenges into two types: technological, and legal and regulatory challenges.

As blockchain and DLT are new systems and at an early stage of development, there are several technological challenges related to migrating existing financial and payment infrastructures, such as scalability and transaction speed, interoperability and integration, with the existing financial systems, cybersecurity, and governance or overall infrastructure.

While in terms of regulations, financial regulators are not clear in their regulatory stance on the new technologies in general, and obtaining their clearance is not always easy (Varma, 2019). Like the internet, blockchain continues the regulatory conundrums faced by networked technologies, and further problematizes them by creating decentralized networks that support immutable big data audit trails that enable greater scalability in universal data exchange (Herian, 2018). Also, blockchain has an advantage as a digitized currency or payment system that bypasses the established financial system, thus comprising several concerns related to regulating permission and permissionless DL systems, used for payments, settlements and cross-border transactions, Know-Your-Customer (KYC), Customer Due Diligence (CDD), Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT), compliance of blockchain network participants, recourse mechanisms, and how transaction disputes will be resolved (Harish, Karla & Luskin, 2017).

3.The Blockchain Wave and Financial Regulators and Governments.

Recently, digitizing money, payments, and other financial transactions through DLT and blockchain has become more acknowledged, and is viewed as a critical area that needs to be further explored and regulated. Appropriate management of blockchain providers, and proper regulation and control of digitized money and financial service applications could provide opportunities to develop effective platforms for financial and banking services at local, regional and global levels, as well as providing new financial resources and tools to support financial inclusion and innovations. However, many central banks argued that private cryptocurrencies are vulnerable to crime, (abused for money laundering and financing of terrorism) and have exposed consumers and investors to a high risk of loss (Ward & Rochemont, 2019). Until today, nearly all governments, financial bodies and regulators have multiple and divided regulatory positions on digitizing money and currencies, and sometimes even contradictory positions are put forward. There are two types of digital currencies: (1) **Cryptocurrencies and other private digital tokens**, and (2) **Central Bank Digital Currency (CBDC)**.

3.1 Cryptocurrencies and Other Private Digital Tokens.

Cryptocurrencies are referred to decentralized digital tokens without an issuer, and are not representative of any underlying asset or liability, with zero intrinsic value (Barontini & Holden, 2019). They operate independently of financial institutions through an open system, where all users contribute to validating irreversible payment transactions. As of 2018, there are currently more than 1737 different cryptocurrencies (819 coins and 918 tokens) in the market (Mohamed and Ali, 2018), issued on top of blockchain or other decentralized ledger-based applications, such as Bitcoin, Ripple, Litecoin and others. The differences between cryptocurrencies and central bank-issued money include decentralization, limited supply, pseudonymity, immutability, and divisibility (Emmanouil & Ricardo, 2019). For example, unlike money issued by central banks, the total number of Bitcoins that will ever circulate is limited to 21,000,000 coins distributed to the nodes of public networks in an automatic process, without the need for supervision or control of a centralized authority (Mullan, 2014).

These cryptocurrencies offer efficient ways to simplify payments, and are viewed as the largest innovation in FinTech (Akdogan, Kurular & Geuik, 2019). However, the level of public usage of cryptocurrencies in payments is substantially low compared to reserve currencies like the U.S. Dollar. A 2019 survey by the Bank for International Settlements (BIS) on digital currencies showed a negative sentiment toward the private cryptocurrencies, whereby none of the 63 responding central banks reported any significant public or wide use of cryptocurrencies for payments in their jurisdictions, and most of them think their usage is concentrated in niche groups, and their use in domestic or cross-border payments will remain minor even in the future, because of low retail acceptance, compliance issues, better public understanding of the risks, and – for some jurisdictions – outright bans (Barontini & Holden, 2019).

The high volatility of cryptocurrencies makes them difficult for regulators to perceive as being stable means of payment for future transactions (Ward & Rochemont, 2019). Instead, most financial institutions perceive them as accumulated assets, the value of which is determined by supply and demand, with no intrinsic value (Ward & Rochemont, 2019). The World Bank and Financial Action Task Force (FATF), for example, perceive and define cryptocurrencies as a medium of exchange having a unit of account and a store of value, but without legal tender status in any jurisdiction.

Crypto-assets (cryptocurrencies, crypto-tokens, crypto-securities) have experienced growth and spectacular appreciation over the past years. The market capitalization of Bitcoin, which alone accounts for 47 percent of the crypto assets market, increased from approximately 1.02 billion U.S. Dollars in 2013 to 144.96 billion U.S. Dollars in 2019 (Szmigiera, 2019). Nevertheless, crypto-assets represent only a small share of the global financial system.

Most governments recognize cryptocurrencies as crypto-assets, and their dramatic growth may pose risks to financial stability in the future (IMF, 2018).

Governments and financial bodies are not unified in their attitudes and regulatory stances on cryptocurrencies and Initial Coin Offerings (ICOs). Presently, the positions of countries range from an official recognition to a full ban on private cryptocurrencies (Figure1).

Figure:1 The Legal Status of Cryptocurrencies

Argentina	Neutral	France	Legal	UK	Legal
India	Neutral	Germany	Legal	USA	Legal
Indonesia	Neutral	Italy	Legal	China	Illegal
UAE	Neutral	Japan	Legal	Pakistan	Illegal
Australia	Legal	Netherland	Legal	Saudi Arabia	Restricted
Brazil	Legal	Singapore	Legal	South Korea	Restricted
Canada	Legal	Turkey	Legal	Russia	Restricted

Source: Based on (Mohamed & Ali, 2018)

Attitudes toward cryptocurrencies and ICOs and their legal status vary from one country to another. As of 2019, operating cryptocurrencies (tokens/coins) is allowed if they complied with the monitoring guidelines of digital assets or ICOs set by the regulators in these countries: the USA, Canada, the UK, Switzerland, France, Germany, Italy, Japan, Singapore, Hong Kong, Turkey, Bahrain, UAE, Indonesia and Mauritius (Mohamed & Ali, 2018; Jones, 2019; Ward & Rochemont, 2019).

While some government regulators in Saudi Arabia, Russia, South Korea and Mexico issued a warning announcement or document regarding Initial Coin Offerings (ICOs) and have restricted cryptocurrencies in their countries. Some of these countries have yet to finalize the regulatory framework for cryptocurrency, like Russia and South Africa.

Cryptocurrencies or any other token trade are illegal in these countries: China, South Korea, India, Pakistan, Bangladesh, Nepal, Macedonia, Bolivia, Ecuador, Algeria and Morocco; they all banned ICOs (Mohamed & Ali, 2018; Jones, 2019; Ward & Rochemont, 2019).

The attitudes of governments and financial institutes toward cryptocurrencies are still subject to change, and are influenced by factors such as the status of the national currency, entry of new actors, and size of growth or scale of use. For example, China was one of the largest markets for trading cryptocurrencies, but the government in 2017 viewed cryptocurrencies as a threat to its own national currency CNY, and therefore has blocked ICO exchange websites and banned ICOs in the country (Jones, 2019).

The change in government attitudes was also identified when the plan for Libra cryptocurrency was announced by Facebook in 2019, but rejected by the US Congress and EU finance ministries because they saw it can affect monetary stability. This rejection contradicts earlier assessments by governments and financial bodies on cryptocurrency threats. The European Central Bank stated earlier that the risks crypto-assets posed to the Euro area's financial stability are manageable (Bitcoin.com, 2019), and leaders of the G20, in the Osaka Declaration (1), also noted that crypto-assets do not pose a threat to global financial stability at this point, and reaffirmed their commitment to applying the amended Financial Action Task Force (FATF) guidelines and standards to virtual assets and related providers, for anti-money laundering and countering the financing of terrorism.

However, the Libra plan has complicated more the regulatory issues and risks assessment of cryptocurrencies. The plan is for the libra to be backed by basket of assets and used globally by Facebook users in domestic and cross-border retail payments and remittances through a mobile application (Calibra wallet), thus, this possibility (of libra currency) could alter current assessment that crypto-assets do not pose a material risk to financial stability (FSB, 2019). Bank for International Settlements' (BIS) report on BigTech in finance showed that while the endeavors of BigTech firms into FinTech can enhance the financial inclusion, they could also harm the banking sector and present threats to financial stability, competition and data protection (Barontini & Holden, 2019).

The change of attitudes toward cryptocurrencies indicates that governments fear the rise of private cryptocurrencies issued by non-government bodies (Ward & Rochemont, 2019), and governments want to keep BigTech firms out of cryptocurrency industry, as long as no issued regulation controlling the design, issuance and operations of cryptocurrencies issued by BigTech firms, and protecting governments' control on fiat currencies and the monetary policy set by the central banks in their countries.

3.2 Central Bank Digital Currency (CBDC)

With the advent of cryptocurrencies, today most central banks are exploring or experimenting with the possibility of building sovereign digital currencies that can be universally accessible, and valid for economic and financial transactions and cross-border and domestic payments; these are called Central Bank Digital Currencies (CBDCs). A CBDC is defined as the digital representation of a fiat currency for a particular nation, backed by financial reserves in the country, such as forex and gold, and issued and regulated by a country's central monetary authority (Laurence, 2019). There are at least 40 central banks around the world currently researching or experimenting with CBDCs, according to BIS (BIS, 2019); such as the UAE, Saudi Arabia, the Netherlands, Norway, Sweden, Canada, Brazil, Uruguay, the Bahamas, China, Thailand, Singapore, the East Caribbean, Kazakhstan, Philippines, Russia, South Africa (Willemse, 2019; Ward & Rochemont, 2019).

CBDCs allow central banks to have an alternative to cash, by which individuals and firms can hold accounts with the country's central bank and transact directly (P2P) without the intermediary role of banks. With a CBDC account, everyone is able to deposit money and conduct transactions, even without traditional bank accounts (Laurence, 2019). A CBDC could improve the safety and efficiency of domestic payment systems and facilitate faster interbank payments and settlements (Ward & Rochemont, 2019).

In 2015, Tunisia became the first country in the world to issue a CBDC based on blockchain technology and overviewed by a government body, called "e-Dinar". Senegal, Venezuela and the Marshall Islands were also attracted to the idea and became the earliest adopters of CBDCs (Jagati, 2018). In other countries, most central banks are still in the early stage of exploring CBDCs. A survey published in 2019 by BIS on central banks' current work and thinking on CBDCs, to which 63 responded (represent jurisdictions covering close to 80% of the world population), showed that the majority of central banks are progressing from conceptual work into experimentation, but they appear to be proceeding cautiously, and only a limited number of them are proceeding to the pilot stage with CBDCs (Barontini & Holden, 2019). Moreover, only few of the surveyed banks intended to issue in the short or medium

terms, as most of them are not yet convinced that the benefits will outweigh the costs (Barontini & Holden, 2019).

However, a few countries are an exception, like Venezuela, Turkey and Iran, which have either passed the piloting stage, or have significantly progressed in their efforts to finalize the piloting and issuance plan of CBDC, because they needed an alternative to cash and have a much greater need for CBDC than other countries, where the decision of developing CBDC came after imposing economic sanctions on these countries, as one of the measures to overcome trade restrictions, a currency crisis or financial blockade. For example, Venezuela has launched a CBDC “Petro” in 2018, backed by oil, gas, gold and diamond reserves (Jagati, 2018), and attempted to use it to overcome trade restrictions. Similarly, the government of Turkey has decided to develop its CBDC after the 2018 Lira crisis, and planned to start the first CBDC trials in 2020, according to the governmental program (Anadolu Agency, 2019). Also, the government of Iran in 2018, days after banning local banks from crypto dealings, in addition to the SWIFT system restrictions, had announced that the experimental model of its CBDC was almost ready.

4. Understanding Factors Affecting Blockchain Adoption in the Financial Services Sector

Given that one of the goals of this book is to investigate the factors affecting blockchain adoption in the financial services sector, the researcher has interviewed experts who have worked in blockchain-related projects in Bahrain, to explore their perceptions and attitudes towards the adoption of blockchain in the financial services sector.

The researcher conducted in-depth, face-to-face, semi-structured interviews, between May and June 2019, with five participants, each of whom has experience with a certain type of blockchain-related projects, and from three different financial organizations in Bahrain, namely, the Central Bank of Bahrain (CBB), Bahrain FinTech Bay (BFB), and the BENEFIT Company; Bahrain’s national ATM and PoS switch (Table 3).

Table 3: Profile of the Study Participants

	Job Title/Department	Organization	Blockchain-related Project
Participant 1	Head of FinTech Unit	CBB	-Regulations pertaining to a blockchain application. -Research on blockchain-based payment platforms.
Participant 2	Assistant General Manager – Credit Reference Bureau	BENEFIT	-Blockchain-based eKYC.
Participant 3	Manager – Credit Reference Bureau	BENEFIT	
Participant 4	Research Analyst	BFB	-Blockchain adoption survey.
Participant 5	Analyst	BFB	-Blockchain-related conferences, education and knowledge awareness programs.

Source: Based on data provided by participants in this study.

There were broad discussions in the interviews on a number of issues, such as how businesses view blockchain technology; the current status of its adoption in the financial services sector; challenges facing blockchain adoption; and how blockchain adoption can be promoted and accelerated in the financial services sector. The interviews showed that all participants have a positive view of adopting blockchain technology, and they revealed some factors that might affect it. The summary of potential factors affecting blockchain adoption from the viewpoints of the participants is provided in (Table 4), and each of these factors will be presented in detail below.

Table 4: Summary of Potential Factors Affecting the Adoption of Blockchain Applications

Factors affecting blockchain adoption	Challenges	Participants
Novelty of Blockchain Technology and Uncertainty of Success	<ul style="list-style-type: none"> ● Uncertainty of success or failure of the blockchain-based solution or application. ● Fear of the novelty of blockchain technology. 	1,4,5 1,4,5
Technical knowledge	<ul style="list-style-type: none"> ● Lack of understanding and information about: - ● How blockchain technology works: ● Data control and security. ● Scalability. ● Meeting regulatory requirements: what and how to monitor? 	1,4,5 1 1 1
Business cost estimation	<ul style="list-style-type: none"> ● Adoption and implementation of blockchain systems. ● Training. 	2,3,4,5 1,4,5
Meeting business requirements	<ul style="list-style-type: none"> ● Generating innovative technical solutions for complicated problems or issues. ● Creating cost-cutting solutions or generating revenues. 	1,2,3 1,2,3
Research and piloting	<ul style="list-style-type: none"> ● The need to allocate research resources to explore how blockchain technology can best be utilized by businesses and organizations. ● The need for testing and piloting blockchain applications. 	1,4,5 1,4,5
Government support	<ul style="list-style-type: none"> ● Pushing and supporting the adoption of blockchain applications. 	1,2,3,4,5 4.5

	<ul style="list-style-type: none"> • Moving public services to blockchain platforms. • Readiness of IT infrastructures. 	2,3
Regulations and Consistency Across Blockchain Applications	<ul style="list-style-type: none"> • The need for standardized regulations and requirements of blockchain-based services or systems, to achieve consistency and integrations across service providers in the local business market. 	4,5
	<ul style="list-style-type: none"> • The need for consistency with international regulations and standards for blockchain-based applications. 	4,5

Source: Based on analysis of the interviews conducted in this study

4.1 The Novelty of Blockchain Technology and Uncertainty of Success.

The novelty of blockchain applications and uncertainty of the success of blockchain-based solutions are challenges to blockchain adoption. There is a resistance to adoption, because some organizations feel uncertain about achieving the required return and results after shifting to blockchain applications. Although blockchain applications have demonstrated several potential advantages and promises in the financial services sector, there are few successful examples that offer financial services companies a clear picture of the expected outputs from blockchain-based projects, and provide an understanding of the actual gains on the performance, effectiveness or profitability of organizations.

4.2 Technical Knowledge.

Another challenge of adopting blockchain is the lack of fundamental knowledge and full understanding of blockchain technical aspects. Organizations need to understand how blockchain mechanisms work, and how to handle the most documented technical challenges related to the use of blockchain systems such as scalability, compatibility, data control and security. In addition, financial regulators need to understand blockchain applications and have knowledge of how they work, in order

to know what to regulate, what to monitor and how to monitor financial services (e.g. payments, smart contracts, money transfers, etc.) that will be provided through blockchain applications.

4.3 Business Cost Estimation.

Since blockchain applications are new to financial services companies, the cost of implementation and other associated costs (like process reengineering, administration and technical support, special user training) are unknown to the organizations and difficult to be accurately estimated, creating a challenge to shift from existing work methods to new blockchain-based solutions that might be costly and time-consuming for organizations.

4.4 Meeting Business Requirements.

The decision to use blockchain applications is highly dependent on their ability to generate technical solutions for complicated problems or necessary business requirements that are not addressed by existing systems or mechanisms. Financial service companies will very likely use blockchain applications if proven to provide efficient tools to solve complicated issues that cannot be solved with existing solutions, as well as improving productivity, reducing operational costs, or generating new revenues.

4.5 Research and Piloting.

Another challenge of adopting blockchain is that financial services companies will need research and resources on how blockchain tools can be utilized in the development process. In spite of the promising features and benefits of blockchain technology in many services in the financial sector, such as insurance, payments, KYC, remittance; every company needs to develop further research and practical experiments oriented towards its own business needs and requirements, such as investigating the feasibility of using blockchain applications in enhancing work performance, improving service efficiency and quality, increasing productivity and cost reduction, meeting customers' needs, improving the business or creating new competitive advantages.

4.6 Government Support.

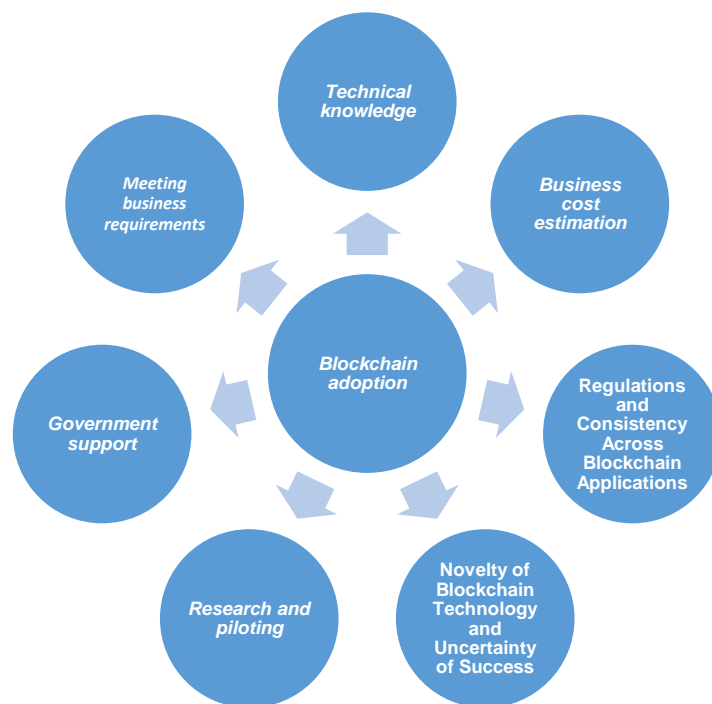
The government's push for and support of using blockchain technology is important to promote and facilitate its adoption by the financial companies. Financial service companies will likely become more confident about using blockchain applications in their work systems and services, when the government develops its own plans to use blockchain applications to deliver financial and non-financial services, and announces the related societal benefits, as well as pursuing a policy of helpfulness and assistance toward those companies planning to use the blockchain in financial services. Some participants in this study believe that the progress of blockchain adoption by financial service companies and the private sector will be slow without the sufficient and active cooperation of the involved government entities, and readiness of their IT infrastructure for operating blockchain systems.

4.7 Regulations and Consistency Across Blockchain Applications.

Setting regulations and technical standards for blockchain applications is important to support the growth of blockchain adoption. Different types of blockchain structures are currently being developed for different uses in the financial services sector, and they lack standards for different measures and requirements, such as blockchain consensus mechanisms, technical requirements, interaction and exchange of data, security controls etc., making most of the applications incompatible. However, each government has its own technical standards and financial regulation system. Thus, setting technical standards at the local level, and issuing official guidance notes or toolkits would help financial services companies clearly understand the requirements and how to comply; increase collaboration within blockchain applications development; spread the sharing of blockchain solutions; plus contributing to the integration and consistency of requirements and operations among financial services providers; and developing the blockchain ecosystem at the local level. At the same time, national standards should be consistent with international standards or guidelines for using blockchain in financial services, ensuring that blockchain projects are consistent with international standards, which allows for easier integration of domestic companies into international markets in the future.

To summarize, participants in this study described seven factors that they believe influence blockchain adoption in the financial services sector. Figure (2) set out a framework of these factors, which are: (1) the uncertainty of success of blockchain-based solutions, (2) the lack of technical knowledge by financial services companies and regulators, (3) the cost estimation challenge, (4) blockchain ability to meet business requirements, (5) the need to conduct research and blockchain applications piloting by financial services companies and regulators, (6) the government’s push for and support of blockchain adoption, and (7) the need for setting regulations and standards for blockchain applications, to ensure internal and external consistency. Among these factors, government support towards blockchain adoption and the cost estimation challenge (Table 4) are the most influential factors.

Figure (2) Framework of the Factors Influencing Blockchain Adoption in the Financial Services Sector.



Source: Based on data analysis in this study.

This framework gives some key insights about what factors might influence the financial institutions’ ability to adopt blockchain solutions, and what actions are needed by governments and regulators to support the growth of blockchain adoption in the sector. It also provides useful insights to researchers and stakeholders on what to do to promote the adoption of blockchain technology in the financial services sector in the GCC region, which will be discussed in section 6.

5. Bahrain's Experience in Blockchain Adoption in the Financial Services Sector.

In recent years, Bahrain has embraced the FinTech industry and started to pay more attention to its trends and impact on the markets. It has also actively encouraged innovation in the field of FinTech and supported Fintech startup companies. In 2018, the Bahrain Development Bank (BDB) and Economic Development Board (EDB) had launched a venture capital fund of \$100m to support FinTech, innovative and technology-driven startups in Bahrain and across the Middle East (EDB, 2018; Alkesh, 2019).

The government had begun planning to build a FinTech ecosystem in Bahrain since 2016, relying on its well-established banking infrastructure and services, and the sophisticated ICT infrastructure and services deployed in the country. Bahrain has been a successful center for financial services for several decades (more than 40 years). It was among the first GCC countries to undertake initiatives aimed at diversifying its economy, and developing itself as a center for financial services in the Gulf region (Molyneux & Iqbal, 2005). Today, the financial sector has become the largest non-oil contributor to the Bahraini economy, comprising about 16.7% of the country's GDP as of 2018, and employs more than 15,292 people, with a 59% Bahrainisation rate according to Bahrain's EDB (2019). Bahrain is home to nearly 400 licensed financial institutions (Mueller & Piwowar, 2019), including 104 licensed banks boasting assets of USD 188.2 billion (CBB, 2018). As of June 2018, retail banking total assets reached BD 32.1 billion (USD 85.4 billion), with GCC assets at 23.6% and European and American assets at 8.3%, according to the financial stability report from the Central Bank of Bahrain (CBB, 2018). The same report also showed that the wholesale banking sector assets have reached USD 102.8 billion, with concentrations in GCC (30.5%) and Europe (34.8%) (CBB, 2018).

Bahrain has already proved its high level of readiness and reliability in ICT infrastructure and services, which is essential for the growth of investments and the FinTech market. According to the World Economic Forum's 2019 Global Competitiveness Report, Bahrain has a high level of ICT adoption, ranking 46th out of 141 countries (Schwab, 2019). Mobile-cellular telephone and mobile-broadband subscriptions in the country have reached the 35th place and 14th place, respectively. As a percent of the population, Internet users now stand at 98.6 percent (4th place) in the same report.

Focusing on blockchain technology, there are several kinds of initiatives found today that are valuable to the financial services sector. In order to analyze the status of blockchain adoption in the financial services sector in Bahrain, these initiatives are categorized under three different levels: (1) **FinTech ecosystem formation**, (2) **knowledge and education**, and (3) **blockchain-based applications** (Table 4).

Table 4: Blockchain-related Initiatives in the Financial Services Sector in Bahrain

Levels	Initiatives	Organization(s)
FinTech ecosystem formation	-Launched the electronic fund transfer system and private network for inter-bank payment settlements. -Standardized merchant presented QR code specifications used by retail payment systems. -Launched Regulatory Sandbox deal with FinTech and blockchain-related products and services. -Forming a FinTech unit. -Issuance of open banking rules. -Issuance of rules pertaining to Crypto-Asset platform operator (CPO) - Crypto-Asset Module (CRA).	Central Bank of Bahrain (CBB)
	-Fintech incubation platform, innovation labs and FinTech advisory services.	Bahrain FinTech Bay (BFB)
Knowledge and skills	-Launched educational and training programs for FinTech and blockchain in partnership with global universities.	BFB Bahrain Institute for Banking and Finance (BIBF) Tamkeen

Blockchain applications	<ul style="list-style-type: none"> -Launched a Know Your Customer (eKYC) solution based on blockchain or DLT. - Licensed Cryptocurrencies exchange. -Used blockchain-based cross-border payments. -Launched eGift vouchers within a private blockchain network. 	<p>BENEFIT Company in collaboration with CBB and Information and e-Government Authority (IGA)</p> <p>Rain –Crypto assets brokerage</p> <p>SADAD</p>

Source: Based on information from IBS (2020), Bridge (2019), CBB (2018, 2019), BFB (2018, 2019), BENEFIT (2016, 2019), SADAD (2019) and Tokenpost (2018).

5.1 FinTech Ecosystem Formation.

In line with the global Fintech industry, which has been actively developing since 2018 (Pantielieieva, Khutorna, Lytvynenko & Potapenko, 2020), various steps and initiatives have been taken by the Central Bank of Bahrain (CBB) and Bahrain FinTech Bay (BFB) to help create the ecosystem needed for blockchain adoption in financial and banking services:

CBB’s Regulations and Initiatives.

Most of Bahrain’s Fintech efforts are largely driven by the regulations and initiatives launched by the Central Bank of Bahrain (CBB), aiming to provide an ideal environment for a FinTech ecosystem, and strengthen the capacities of FinTech startups.

Since 2016, the CBB started to launch various electronic systems and regulations pertaining to technology adoption in the financial services sector. For instance, it launched the electronic fund transfer system in conjunction with the BENEFIT company in 2016 (CBB, 2018); introduced a secure

private network for all retail banks to connect with the CBB as the primary hub for real-time Inter-bank payment settlements in 2018 (Mueller & Piwovar, 2019); and standardized merchant presented QR code specifications used by retail payment systems in the Kingdom (Mueller & Piwovar, 2019).

As digital innovation is transforming the financial services sector, pushing aside older methods and infrastructure, and leading to the creation of new business models, the CBB established in 2017 a dedicated FinTech unit (CBB, 2018), to ensure providing the best services in the financial sector, and help service providers adapt to the evolving expectations of their customers. It also formally launched its regulatory “Sandbox” that aims to provide a safe virtual space for testing or developing digital banking and financial services and FinTech innovative solutions, including blockchain or DLT-based solutions (CBB, 2018).

Furthermore, in order to create an open innovation ecosystem, the CBB issued in 2018 the “open banking” rules that mandate the adoption of open banking by all banks in the Kingdom (CBB, 2018). The goal of open banking is to shift from closed banking models and utilize the positive impact of digital transformation in the financial services sector. Open banking frees customers’ financial data and allows secure access to all customer bank accounts and data, through business-to-business ‘Application Program Interfaces’ (APIs) (e.g. Tarabut gateway’s open banking services in Bahrain). APIs also allow licensed third-party providers to initiate payments on behalf of customers, and allow transfers between different customer accounts through a mobile application (e.g. mobile wallets) (CBB, 2018).

Open banking and businesses’ APIs have encouraged electronic fund transfers and mobile payments and led to promoting a cashless society and culture in Bahrain. As seen recently in Bahrain, telecommunication companies have entered the FinTech market and provided mobile payment services to their customers, partnering with retailers, using QR codes and digital wallets. Financial services providers are also offering the same services, allowing users to transfer money or pay for their purchases using mobile applications.

In order prepare the financial services sector for blockchain adoption and private investments, the CBB issued in 2019 the final rules on a range of activities relevant to crypto-assets, running through

blockchain or other distributed ledger technologies. The rules and Crypto-Asset Module (CRA) supports blockchain adoption in financial services, and helps all stakeholders know the guidelines for licensing, governance, minimum capital, control environment, risk management, AML/CFT, standards of business conduct, avoiding conflicts of interest, reporting, and cyber security for crypto-asset services (CBB, 2019).

Launching Bahrain FinTech Bay

One of the biggest steps taken by the government towards developing a FinTech ecosystem was launching Bahrain FinTech Bay (BFB) in 2018, aiming to support the creation of an environment suited for FinTech proliferation and development; accelerating FinTech companies to their next stage of development; attracting foreign FinTech companies to Bahrain, and driving innovation in Bahrain (CBB, 2018). BFB is a public-private partnership between the Bahrain Economic Development Board (EDB) and the FinTech Consortium. It provides a range of services including, digital FinTech incubation platforms, FinTech advisory services for companies, corporate incubation and venture acceleration programs. To date, BFB has attracted more than 75 local and international partners, 8 venture acceleration platform partners, and hosted “BlockOn”, a knowledge-exchange platform where the latest innovations and applications for the blockchain community were shown (BFB, 2019).

Focusing on blockchain technology, BFB conducted a survey in 2018 that covered more than 150 people across 20 industries, to understand the potential of blockchain technology in the Bahraini market and how it is perceived. Survey results showed that the adoption rate of blockchain in Bahrain was 31%, and blockchain has reached only one-third of its market potential in four key factors: 44% regulation support, 33% investment activity, 30% usage of blockchain and 26% talent availability (BFB, 2018). Results also showed that 58% of the survey participants were unaware of blockchain, and those with the lowest level of awareness were in the financial services sector, governmental bodies, and consulting industry. In addition, the results of participant’s perception towards the potential of blockchain across industries were 72% FinTech, 63% retail banking, 62% healthcare, 60% government and 59% investment banking (BFB, 2018).

5.2 Knowledge and Education.

BFB plays an important role in FinTech education and bridging the knowledge gap. It has launched a number of education programs in order to qualify workers and meet the demands of blockchain technology. In February 2019, the Georgetown FinTech program launched by BFB and the Labour Fund 'Tamkeen', in partnership with Georgetown University's McDonough School of Business, addressed the future requirements of Bahrain's financial services, including blockchain, crypto-assets, and payments, etc. (EDB, 2019). In August 2019, the BFB and FinTech Consortium, in partnership with BetaBlocks Academy, a Florida-based blockchain innovation and learning platform, launched on-demand high-quality training courses focused on themes in digital transformation, including Blockchain for Business, Artificial Intelligence (AI), Internet of Things (IOT), cloud infrastructure, and cybersecurity (EDB, 2019). It also organized blockchain-focused panel discussions and workshops for executives and developers, in collaboration with several partners, such as the Blockchain Academy, Global, the University of Oxford's Saïd Business School, and GetSmarter, in order to increase the level of understanding and awareness of the basics and benefits of blockchain technology, and how it can be deployed by companies and organizations (BFB, 2018).

The Bahrain Institute of Banking and Finance (BIBF) also launched its Blockchain Academy in January 2019, which offers blockchain professional qualification programs, aiming to introduce a wider pool of Bahraini talent to the world of blockchain and its benefits, and support the growing demand for skilled blockchain professionals (Alexandre, 2018; EDB, 2018; Tokenpost, 2018).

5.3 Blockchain Applications.

Blockchain and DLT have been already used by some companies in the financial services sector; in improving administrative processes and offering new products and services to their customers. To the date of this publication, three blockchain-based applications were announced by certain financial services companies based in Bahrain.

BENEFIT's Know Your Customer (eKYC)

The BENEFIT company was formed in 1997 with a paid-up capital of BD 3.1 million (US\$ 8.2 million). It provides a range of services including, operating Automated Teller Machines (ATM), Points of Sale (POS), GCCNet (supported by the GCC countries within the region, and connecting all ATMs and POSs in the Gulf), the GCCNet Dispute Management System, the Credit Reference Bureau (CRB) for corporate and individual customers, Telecom Bill Payment (Tele BP), Direct Debit (DD), Payment Gateway (PG), Internet Banking (IB), Bahrain Cheque Truncation System (BCTS), and varieties of outsourcing service offerings to local and regional markets (BENEFIT, 2016).

In February 2019, BENEFIT launched a blockchain-based national Electronic Know Your Customer (eKYC) project, in collaboration with the Information and eGovernment Authority (IGA) and supervised by the CBB. It was the first-of-its-kind in the Arab World, targeting retail banks, financial services providers and money exchange networks (BENEFIT, 2019). The eKYC project aims to provide financial entities in Bahrain with databases and applications to authenticate the identities of their clients, and validate the provided information before granting financial services. This project is a gateway between data available with the IGA, and all financial entities in Bahrain that benefit from its services, instead of conducting wide linking processes with each entity independently (BENEFIT, 2019).

In this project, a blockchain platform is used to digitize the process of clients' identities and information verification, thus improving the processes of KYC, data access, integrity and authenticity in the financial services sector in Bahrain. The easy and secure data access through eKYC will raise the efficiency and productivity of financial services providers, and enable clients to get more online services, and self-enroll and complete transactions with ease (BENEFIT, 2019).

Bahrain's Rain Cryptocurrency Exchange

Bahrain's Rain Cryptocurrency Exchange, which came along with seed funding of US\$2.5 million, was established and licensed by the CBB as a crypto-asset brokerage. In a first for the MENA region, Bahrain's Rain, founded in 2016 by four entrepreneurs, entered the CBB's regulatory sandbox program, and acquired its Crypto-Asset Module (CRA) license in April 2019 (EDB, 2019 [source](#)). Rain's web and

mobile-based platform enable users in the GCC region to buy, sell and store Bitcoin, Ethereum, Litecoin, and Ripple, using their bank accounts, and debit and credit cards (Paracha, 2019).

SADAD's Cross-border Remittances and eGift Vouchers

SADAD, is a FinTech company founded in 2010, and offers payment processing services through a digital payment platform integrated directly with its various partners in telecoms, money transfer, tourism, media, games and other companies, as well as the Electricity and Water Authority (EWA) in Bahrain. Furthermore, SADAD's payment gateway enables its partners to sell their products through a secured and advanced network of 750 plus self-service kiosks in Bahrain (SADAD, 2019).

During the last two years, SADAD announced two work projects based on blockchain technology. In October 2018, SADAD signed up for Ripple's xRapid product for blockchain-based remittance services and cross-border money transfers, and it plans to offer a crypto mobile wallet application to store crypto-assets for its customers (Mezni, 2018). In April 2019, SADAD launched electronic gift vouchers on a private blockchain network, which was used as a distributed ledger to issue, transact and share gift vouchers via SADAD's mobile application or self-service payment kiosks, and enable customers to securely use them for all SADAD's services (SADAD, 2019).

5.4 Insights Gained from Bahrain's Experience

Bahrain's experience can be viewed as a positive example worthy of reflection, and it has shown the high awareness and interest of some financial institutions and government agencies in adopting blockchain technology. Overall insights obtained from examining Bahrain's experience have emphasized the importance of the country's readiness for FinTech development, and the role of the government and regulators in promoting blockchain adoption in the sector through the following three ways:

a) Developing the ecosystem and regulations necessary to enable the blockchain-based projects of FinTech startups and companies, and attracting blockchain businesses.

Bahrain has focused on developing the ecosystem needed to build real-world projects, and integrate the current applications of FinTech in banking and financial services. As shown earlier, the government has launched Bahrain FinTech Bay (BFB) with the aim of developing FinTech companies and services in the Kingdom, which is today a home to more than 100 FinTech firms (Goncalves, 2019).

Also, the Central Bank of Bahrain (CBB) established a dedicated FinTech unit to keep up with emerging FinTech trends and to foster innovation, and has introduced a regulatory sandbox that allows for the testing of new technologies, including blockchain, in a virtual isolated regulatory space. For example, Rain - the crypto-currency exchange - is one of the proposed projects that was tested and approved by this sandbox, after which it accessed the Bahraini market.

Bahrain has its own policy on cryptocurrencies that recognizes them as crypto-assets, and has a regulation issued by the CBB to control the operations of cryptocurrencies in the local market, which has successfully attracted crypto-asset businesses and regional investors in this industry, such as Rain.

The CBB also introduced open banking rules that force banks to open a client's account information to third party providers, like Fintech firms, new entrants or startups located in Bahrain. This will create opportunities to leverage blockchain platforms and tools in building data sharing schemes for open banking.

Promoting awareness and building capacity and human resources are also part of Bahrain's plans in supporting blockchain adoption in the financial services sector. Ongoing knowledge, awareness, training and education programs in blockchain are provided by BFB and BIBF in partnership with Tamkeen and a number of academic organizations, in order to close skill gaps and build future talents.

Bahrain's critical efforts in forming a FinTech ecosystem in recent years have successfully enabled some blockchain projects and attracted its businesses. Blockchain projects launched in Bahrain, to the date of publishing this work, fall into four areas, namely: electronic know your customer (eKYC), cryptocurrencies exchange, cross-border remittances, and electronic gift vouchers, as shown in section

5.3 above. Operational and practical lessons can be transferred from experience in these projects to any entities in the GCC region that are interested in the same kind of projects, especially in crafting guidelines for crypto-asset platforms and planning e-KYC solutions based on blockchain technology.

b) Strengthening government-industry collaboration and providing the operational support and services needed from government agencies, to assist financial institutions in building blockchain-based solutions.

Bahrain's experience has revealed that the collaboration between government agencies and developers is very effective and necessary for the success of blockchain initiatives developed by the financial services sector. This is demonstrated very clearly in the launch and progress of eKYC projects, which would not be possible without the support and collaboration provided by the Central Bank of Bahrain (CBB), and the Information and e-Government Authority (IGA); through project supervision, granting data access and meeting other operational and technical requirements necessary for eKYC applications. The support provided by the CBB and IGA, coupled with its sophisticated ICT infrastructure, data readiness and adequate data structures, made it feasible to plan and build the eKYC application by the BENEFIT company.

c) Designing and building large-scale distributed blockchain application systems that directly serve a wide user network.

Bahrain's experience shows that designing scalable application systems is key to the deployment of blockchain in the financial services sector. Therefore, investors and companies in the GCC region must be encouraged to build scalable blockchain applications that can serve a growing number of private and public agencies. The design of blockchain application systems should be well suited to serve a large network of users with ease and efficiency, for it to end up being widely adopted.

In Bahrain, although few blockchain-based solutions exist at present, blockchain adoption is expected to grow dramatically over the next five years, to serve entities not only in the financial services sector, but perhaps also in the public sector and other sectors. Some of the existing solutions (e.g. KYC) have already been designed to serve a growing network of financial services providers inside Bahrain, and

they could be developed further by building new applications or services on top of the same application platforms, allowing new ways of doing business and serving markets in the future.

BENEFIT's eKYC system is a good example of a scalable blockchain-based application, designed to serve any financial institution in Bahrain (banks and insurance companies) that wants to join the eKYC network and use the application in its business operations and services. Also, since the eKYC application system will be fed by data from the IGA, it is possible to improve some of its components to enable the government to use it in delivering services to citizens (e.g. subsidies and financial support), if desired in the future.

6. How to Promote Blockchain Adoption in the Financial Services Sector in the GCC Region

Subsection 5.4 provided three insights from Bahrain's experience that would help promote blockchain adoption in the financial services sector: (1) Developing the ecosystem and regulations necessary to enable the blockchain-based projects of FinTech startups and companies, and attracting blockchain businesses; (2) Strengthening government-industry collaboration and providing the operational support and services needed from government agencies, to assist financial institutions in building blockchain-based solutions; (3) Designing and building large-scale distributed blockchain application systems that directly serve a wide user network. This section completes the task of drawing insights on how to promote blockchain adoption in the financial services sector in the GCC region. It builds on details given in the previous sections on the status quo of blockchain adoption in the regional financial services sector (section 1), and participants' perceptions on factors affecting blockchain adoption (section 4).

6.1 Insights from the Status Quo of Blockchain Adoption in the GCC Region

Three important insights are derived from examining the status quo of blockchain adoption in the GCC region:

- a) **Speeding up existing blockchain projects, and setting up an initial framework for regulations and standards, as a tool to promote blockchain adoption and improve interoperability at the local level.**

Setting up frameworks for regulations and standards might give a direct push forward for the development of the blockchain ecosystem. It is essential for progress in blockchain adoption that institutions continue to accelerate the completion agenda of blockchain pilot projects that are already launched in areas of cross-border payments, remittance and bank settlements, in some Gulf countries. Proper work and advancement of these projects will assist both regulators and financial services providers in understanding the technical, operational and regulatory requirements, and thus allowing to set up initial frameworks for the standards and guidelines necessary to assure effective and safe use of blockchain under the related financial services areas. Having regulation and standards frameworks are important to ensure the consistency and interoperability across infrastructure systems and blockchain applications used in the financial services sector, and would help financial institutions and companies in deciding what type of blockchain applications should be chosen, and knowing what policies and controls are needed.

- b) **Strengthening strategic cooperative planning for blockchain operations management, and setting up consortium blockchains among local and regional financial entities.**

Blockchain and DLT are economically important, in the sense of creating new sources of values (Berg, Davidson & Potts, 2019), and could be useful tools for promoting economic cooperation among GCC countries. Therefore, good coordination, planning and communication of blockchain projects are required between the financial regulators. For blockchain system operations management to be successful and efficient at the regional level, financial regulators and entities need to work together to set up strategic plans and frameworks for blockchain solutions, ensuring interoperability across

infrastructure systems for cross-border transactions and policies. Once strategic shared plans for blockchain are set up between GCC countries, frameworks for blockchain operations management and consortia blockchains could be established among local and regional financial entities, like financial services companies, banks, insurers and Fintech startups. Cooperative planning among Gulf countries would also help specify what actions every regulator needs to accomplish and support blockchain operations management in the countries, and scale up blockchain projects that are of particular importance to the region, like Saudi Arabia and the UAE's joint cryptocurrency, which is being tested to better understand its requirements and implications for the cross-border transactions between banks in both countries. Scaling up this project through introducing new central banks or institutions from other GCC countries could change the landscape in cross-border payments and bank settlements, and transform regional financial services infrastructure and systems in the future.

c) Investigating the possibility of issuing a central bank digital currency (CBDC).

Although CBDC adoption appears promising in facilitating payments and money transfers, and promoting the financial inclusion within the economy, further research and investigation need to be conducted given the circumstances in each country. Each GCC country needs to investigate the possibility of developing and issuing a CBDC that can be used as a new payment scheme for person-to-person, person-to-business, and/or business-to-business transactions. Financial policy makers should investigate whether the CBDC offers benefits, which type of payment scheme could be developed, and what its impact might be on the financial stability and monetary policy of the country. Also, investigators need to carefully evaluate country-specific circumstances, including a review of technological feasibility and costs (Geva, 2019), and compatibility with economic aspects.

d) Investigating the possibility of participating in consortia blockchains consisting of key players in the industry.

Financial services companies should investigate whether some of the available blockchain applications launched by consortium blockchains meet their own work or business requirements. Several blockchain and DLT solutions are now available for the financial services sector, but each one was primarily developed for defined financial use cases. Examples of popular consortium blockchains used

by different consortia of banks are Ripple, R3, Quorum, and Hyperledger (Molken, 2018). All blockchain or DLT frameworks come with same advantages that blockchains offer, but their architectures were built on different specifications and crafted to suit different business needs in the financial services industry. For example, some of these blockchains were built for smart contracts, capital markets, insurance services, and digital assets or payments. Therefore, financial companies need to check what consortium blockchains are available, and what are the operations and features of their applications, then evaluate the feasibility of participation in some of the consortia.

6.2 Insights from Analyzing Factors Affecting Blockchain Adoption in the Financial Services Sector.

This subsection provides insights derived from participants' perceptions of challenges that face blockchain adoption in the financial services sector, which were presented in section 4. Since the importance of government support and regulation and consistency has been previously addressed in the above subsection (6.1), the discussion here will focus on the other challenges facing financial institutions (companies or regulators) that have been identified from the interviews in this study, including the uncertainty of success of blockchain-based solutions; their ability to meet business requirements; the lack of technical knowledge; the cost-estimation challenge; the need for research; and testing of blockchain systems. Scrutiny into these challenges indicates that they all stem from the fact that financial institutions lack adequate knowledge and practical experience. Hence, in order to promote blockchain adoption in the financial services sector in the GCC region, the coming task is to build up the in-depth knowledge and practical experience necessary for a better understanding of work mechanisms, operations and requirements of blockchain solutions. The following are ways for building knowledge and experience: -

- a) Piloting the projects of consortium blockchains or blockchain applications available in the market to build knowledge.**

Piloting the available blockchain solutions in the market is useful to understand blockchain technology. There are a number of blockchain solutions launched by blockchain consortia, FinTech

startups or other technological companies that could be used in the financial services sector. Testing and experimenting with blockchain applications are essential to evaluate an application's performance, technical requirements, workflow and procedures, cost of implementation and integration, and associated risks. Therefore, a good way to build knowledge and understand how blockchain can provide benefits to the business, is to identify work problems that need to be solved, and then find out how the available blockchain applications can solve these problems or meet work requirements.

b) Conducting research and studies on how blockchain and DL technology can be harnessed to improve business performance and innovate.

Today, financial services companies in many parts of the world use an array of research techniques to guide their decisions, both strategic and tactical (Neelanavil, 2015). It is essential to promote research and studies on how blockchain technology can be harnessed to improve efficiency and profitability, offer innovative tools for financial products and services, or develop new business operational models within the financial services sector. Financial services companies and regulators, in partnership with technical companies or research centers, have to conduct research tailored to their unique needs and work requirements, in order to be in a position to evaluate the feasibility of blockchain projects. Research would help businesses evaluate impacts and benefits resulting from implementation of a blockchain-based project, and identify its requirements and associated challenges and issues.

c) Developing specialized private advisory and training services in blockchain technology and the financial services sector for institutions and enterprises.

Financial incubators and accelerators can play a key role in building knowledge on blockchain practices, and enable information and innovative stories to be shared in the community of blockchain specialists and investors; by performing programs like focused events, meetings and workshops geared toward the needs of local financial services providers; developing educational courses on blockchain; and advisory and training services for FinTech startups, entrepreneurs, financial services companies, regulators, and government agencies that seek to adopt blockchain technology in their work operations and systems.

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