Journal of Human Sciences
Oum El Bouaghi University
ISSN 1112-9255/E-ISSN 2588-2414
Volume:10 Number 01 – June 2023

OEB Univ. Publish.

Blockchain technology: application, challenges, and future trends: case study of UAE.

تكنولوجيا البلوكتشين: التطبيق، التحديات والاتجاهات المستقبلية: دراسة حالة لدولة الإمارات العربية المتحدة.

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Date of receipt: 1/6/2022 Date of revision: 30/07/2022 Date of acceptation:24/08/2022

Abstract

The blockchain is a system for keeping a common electronic record of encrypted and decentralized financial transactions and contracts, as well as real assets and supply chain information. The verification data related to transaction records are cryptographically secured and stored in blocks to ensure that this data is protected from hacking and piracy, as it has a high level of security data.

The United Arab Emirates is one of the first countries in the world to join the digital race that has applied blockchain to all administrative and economic transactions. This was reflected in announcing paperless government transactions, as well as the largest global gathering of all science countries in Expo Dubai2020 .

Keywords: Financial technology, Cryptocurrency, Blockchain, Bitcoin, The United Arab Emirates UAE.

Jel classification : G19 ; G23.

ملخص

إن البلوك تشين أو سلسلة الكتل عبارة عن نظام لسجل إلكتروني، ومعلومات سلسلة التوريد التي تستخدمها، حيث تكون بيانات التحقق المتصلة بسجلات المعاملات مضمونة بشكل تشفيري ومخزنة في كتل لضمان حماية هاته البيانات من الاختراق والقرصنة.

الإمارات العربية المتحدة قامت بتطبيق بلوكشاين في جميع المعاملات الإدارية والاقتصادية وقد تجلى ذلك في الإعلان عن المعاملات الحكومية بلا أوراق وكذلك في تنظيم أكبر تجمع عالمي رقمي لجميع دول العلم في اكسبو دبي **2020**.

الكلمات المفتاحية: التكنولوجيا المالية، العملات المشفرة، البلوك تشين، البيتكوين، الإمارات العربية المتحدة.

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1. INTRODUCTION

Financial technology has expanded to include all areas through innovative technologies and business models developed by FinTech companies to facilitate access to financial services for all customers. Blockchain is one of the most important products of this information revolution. It is a set of technologies that have been developed over the years and then assembled to make an innovative way to record operations between individuals in a coded and secure way that prevents hacks and piracy. One of its most important advantages is the non-interference of any external parties in currency rates, exchange rates, decentralization, and transparency. It has also put an end to fraud in many areas. Furthermore, one of the first applications that was the result of this application was Bitcoin and various digital currencies.

Blockchain is also considered one of the systems concerned with implementing work procedures, which in turn prevents data manipulation by eliminating intermediaries. Blockchain contributed to developing digital currencies, reducing costs, transferring money, dealing with suppliers through smart contracts, exchanging property, reducing paper use as was in the United Arab Emirates.

Research problem:

The study problem is summarized in the following main question:

Has Blockchain contributed to enhancing financial inclusion?

In order to reach the answer to the main question, the study's imperative was to answer some sub-questions:

- Does Blockchain technology have a high level of security?
- What are the procedures used to gradually move to the blockchain system?
- Has the transition to the blockchain actually taken place in the United Arab Emirates?

Study Hypotheses:

To answer the main question and sub-questions, the following three hypotheses have been adopted:

- Blockchain contributes to the promotion of financial inclusion.
- Blockchain is a system that contains an encrypted database and has a high security
- Dubai is among the first smart cities to use blockchain technology in

all fields

Research methodology:

Given the subject's requirement for knowledge of the aspects of the blockchain system as well as its relationship with financial inclusion, the descriptive analytical approach was followed due to its appropriateness with the subject. The analytical approach was also used to show the importance and advantages of using this technology, as well as various statistics about the blockchain.

2. THE DEFINITION OF BLOCKCHAIN:

The blockchain is an online decentralized public record of all digital transactions that have taken place. It is the digital currency equivalent of a bank ledger that records transactions between two parties. (Sebastian , 2017, p. 10)

The blockchain as a technology suite as used for managing distributed peer-to peer systems of ledgers can have many specific applications such as managing ownership in digital goods or cryptographic currencies. (Daniel , 2017, p. 36)

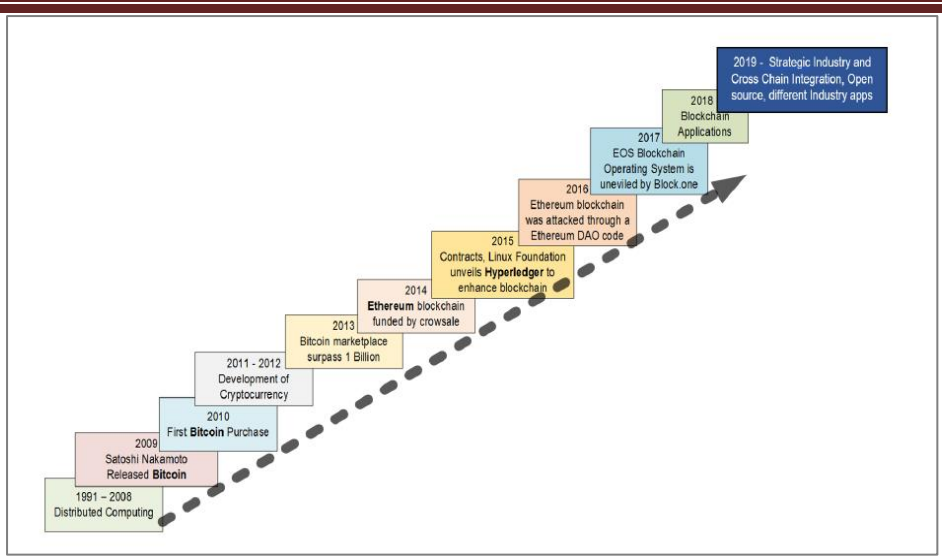
it is difficult to hack a blockchain. The blockchain will still have the original hash code embedded, so for a hacker to restore the chain, he or she would have to recalculate that - and the next hash code.

Blockchain is a ledger of transactions comprising of a peer-to-peer network and a decentralized distributed database. (Javier & others, 2020, p. 11)

we can define blockchain as an open distributed ledger database decentralized public record of transactions, can have many applications as: Remittances, Financial contracts.

the figure below shows the history of Blockchain technology

Fig.1. The history and milestones of Blockchain technology.



Source: (Rawat & others, 2021, p. 06)

The blockchain began with Distributed computing thereafter cryptocurrency appeared, as bitcoin, Ethereum, this technique was used in most transactions.

2.1 The principles and characteristics of blockchain:

Blockchain is a system in which a record of transactions made in bitcoin or another cryptocurrency, it's facilitating transactions:

- Legally speaking, the blockchain validates transactions, replacing previously trusted entities;
- Technical Back-end database that maintains a distributed ledger, openly;
- Business Exchange network for moving value between peers;
- Legal a transaction validation mechanism, not requiring intermediary assistance.
- Blockchain Capabilities = Technical + Business + Legal. (William , 2016, p. 04)

Blockchain technology is the progression of three developments made in the last 20 years: The internet, centralization, and the 'trustless' world. (Antony , 2019, p. 08)

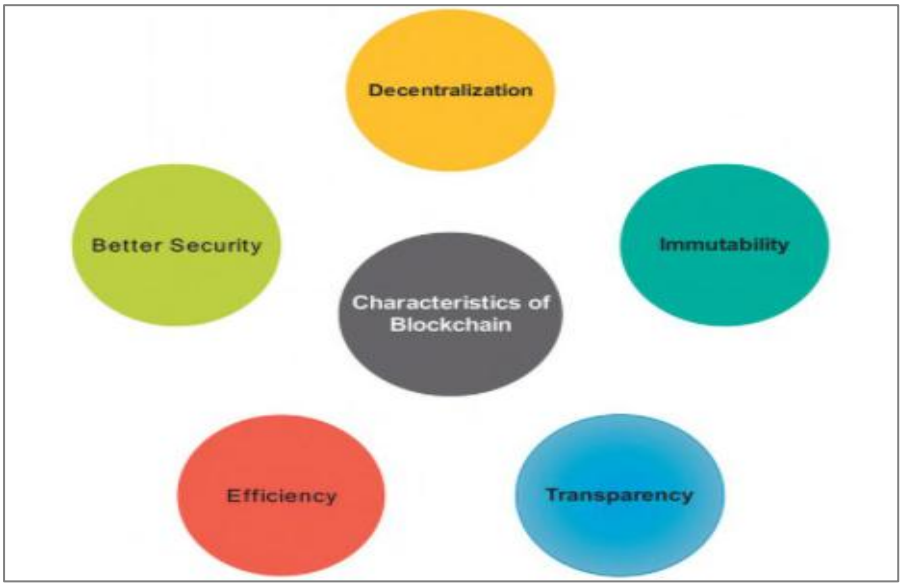
As well as decentralized Consensus Technology consists of decentralized ledger and non-ledger technologies:

- There is no central server, the Bitcoin network is peer-to-peer;
- There is no central repository, the Bitcoin ledger is distributed;

- The registry is public, anyone can store it on the computer;
- There is no administrator, the registry is managed by a network of miners with the same privileges. (Nicolae, 2020, p. 09)

The figure below shows the 5 characteristics of blockchain: security, decentralization, immutability, efficiency, transparency.

Fig.2. characteristics of blockchain



Source: (Peng, 2019, p. 09)

2.2 The principles and characteristics of blockchain:

These Points that Highlight the Importance of blockchain:

- Blockchain is well suited for a number of applications, it's vital to remember that blockchain is most useful when information or other assets need to be exchanged among a number of parties who may be unfamiliar or untrusted. (Peter, 2019, p. 11)
- Although a public blockchain distributes itself in a decentralized peer-to-peer fashion, this isn't necessarily true for a private blockchain, private blockchains are those used by enterprises to record asset transactions within a limited user base (restricted scope), hybrid blockchains can be visualized as very small scale public blockchains, they are decentralized only across a limited participant base. (Karim & others, 2018, p. 53)
- Blockchain technology is finding applications in wide range of areas—both financial and non Financial. (Michael & others, 2015, p.

04)

- Blockchain has automatic execution code stored to facilitate the operation of the transaction that is, smart contract. It can complement or substitute, for legal contracts. It helps in faster completion of the tasks.
- Blockchain has automatic execution code stored to facilitate the operation of the transaction that is, smart contract. It can complement or substitute, for legal contracts. It helps in faster completion of the tasks. (Vartika & others, 2020, p. 19)
- Blockchain uses a unique data structure where verification data related to the transactional records is cryptographically secured against tampering and stored in blocks. Each block contains details of transactions, hash of the previous block. (Government of India , 2021, p. 06)
- Blockchains are used at a fairly basic level, "Notary", as a means of traceability where the blockchain has a role of a highly available safe. (Thomas, 2021, p. 23)

3. TYPES OF BLOCKCHAIN:

There are currently three main types of blockchain: cryptocurrencies, such as Bitcoin, platforms on which decentralized applications (dApps) can run, the best known being Ethereum, and Blockchains with a specific application, such as Siacoin for example., which is a decentralized Dropbox. (janin, 2019, p. 29)

3.1. Cryptocurrencies:

There is considerable debate over the definition of a currency when related to so-called cryptocurrencies. The cryptology community is uncomfortable with the widening and often inaccurate use of the term "crypto" in news headlines and press releases and even financiers are suggesting that the term "currency" in cryptocurrency should be replaced with the word "asset." (Nick, 2018, p. 06)

most popular types of cryptocurrency is bitcoin, created by Atoshi Nakamoto is actually a pseudonym, which hides one or more people, Japanese or not. Indeed, the Japanese nationality is called into question because there is no publication in this language concerning bitcoin and the blockchain. (Numerica, 2020, p. 32)

3.1.1 The definitions of bitcoin:

Since its launch in 2009, Bitcoin has become one of the largest payment systems in the world, and yet its technical underpinnings are, for many, still as mysterious as its founding. (Primavera & Aaron, 2018, p. 20)

There are two separate terms. While Blockchain is a technological concept, Bitcoin is one of the use cases for a particular type of a Blockchain technology. (Srinivas, 2019, p. 30)

Bit: A bit is the basic unit of information in information theory, computing, and digital communications. The name is a portmanteau of binary digit.

Coin: A coin is a small, flat, (usually, depending on the country, or value) round piece of metal or plastic used primarily as a medium of exchange or legal tender. They are most often issued by a government. (Jain, 2020, p. 02)

Bitcoin was developed with the goal of creating a new kind of monetary unit. (Fabian & Aleksander, 2020, p. 03)

The identity of a person (or machine) using a blockchain is hidden behind a string of code. However, the transactions conducted by that identity are transparent. In this way, you can determine that a transaction occurred, though you might not know exactly who made that transaction. (Stephen, 2019, p. 20)

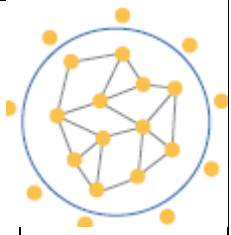
In practice, bitcoins are a bit like money in a bank account with a debit card, except without any sort of safety net - it's all unregulated and uninsured, there's no way to reverse a transaction, and there's no customer service. (David , 2019, p. 12)

The following table shows the blockchain types:

Table 1. Examples of blockchain types

Blockchain type	Explanation	Example	Visualisation

Public permission less blockchains	Bitcoin, Litecoin, Ethereum In these blockchain systems, everyone can participate in the blockchain's consensus mechanism. Also, everyone worldwide with an internet connection can transact and see the full transaction log	Bitcoin, Litecoin, Ethereum	
Public permissioned blockchains	Ripple, private versions of Ethereum These blockchain systems allow everyone with an internet connection to transact and see the blockchain's transaction log, although only a restricted number of nodes can participate in the consensus mechanism	Ripple, private versions of Ethereum	
Private permissioned blockchains.	These blockchain systems restrict both the ability to transact and view the transaction log to only the participating nodes in the system, and the architect or owner of the blockchain system is able to determine who can participate in the blockchain system and which nodes can participate in the	Rubix,Hyperledger	

	consensus mechanism		
Private permissionless blockchains	These blockchain systems are restricted in who can transact and see the transaction log, although the consensus mechanism is open to anyone	(Partially) Exonum	

Source: (EU Science Hub, 2019)

4. FEATURES OF BLOCKCHAIN:

Reduction in KYC "Know Your Customer" costs, Lower risk of fraud and theft of insured property, Automation of tasks with zero added value, better pricing, Emergence of new markets, A wider variety of insurance products and services, Growth in emerging markets (Selsabila & Adam-Kalfon, 2017, pp. 23-27).

Also using block chain in transaction management has the following advantages:

- Increase event and document reliability;
- Build competitive advantage;
- Track orders across multiple touch points;
- Optimize applications and processes;
- Improve productivity per file;
- Manage documents digitally;
- Access new data sources;
- Improve system integrations like IoT, EDI, AI, etc;
- Expand digital collaboration. (Gokhan & Berna, 2021, p. 03)

5. APPLICATIONS OF BLOCKCHAIN:

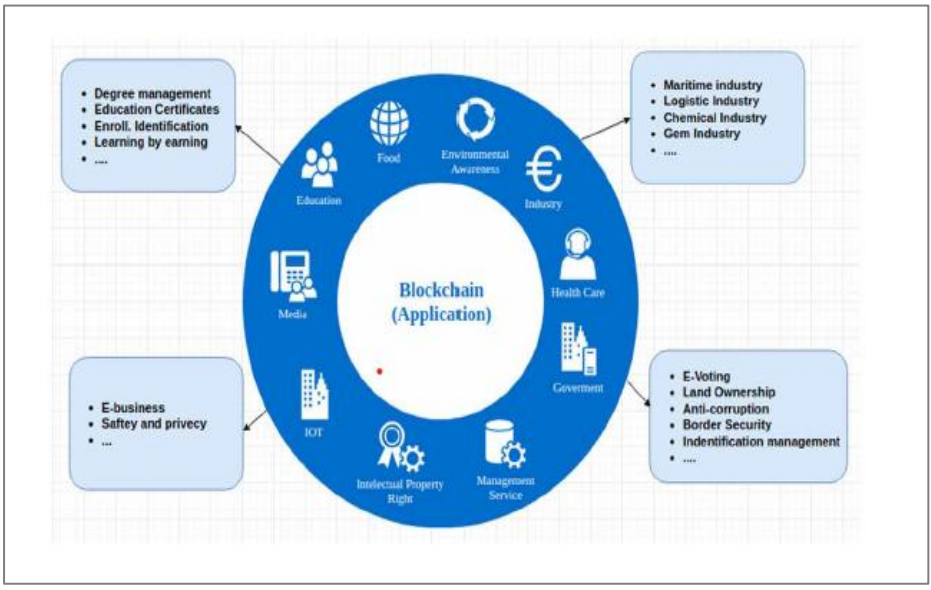
Blockchain applications cut across industries, providing great opportunities and considerable benefits by exploiting blockchain's advantages. (Spyros & others, 2019, p. 266)

Blockchain consists of permissioned and permissionless type of data:

- Permissioned is about federated and private blockchain such as: R3, EWF, ripple, Eris.
- Permissionless is public blockchain like digital currencies: bitcoin, Ethereum, Litecoin. (Vartika & others, 2020, p. 20)

The figure below shows the blockchain application in different economic ventures:

Fig.3. The blockchain application in different economic ventures



Source: (Vartika & others, 2020, p. 20)

Blockchain technology can lead to new opportunities and benefit businesses through:

E-business, safety and privacy, anti-corruption, border security, identification management, education certificate…ext.

6. BLOCKCHAIN TECHNOLOGY ISSUES AND CHALLENGES:

The adoption of digital wallets and currencies has been rising exponentially all over the world over the five years they have been widely

available, this growth is mostly in frontier and emerging market. Based on their survey data, these wallets and currencies are used mostly for cross-border payments, not only are more and more people using these digital wallets and currencies, they are using them more often, with transactions doubling in number every 12-18 months, Transaction volumes are increasing even faster.

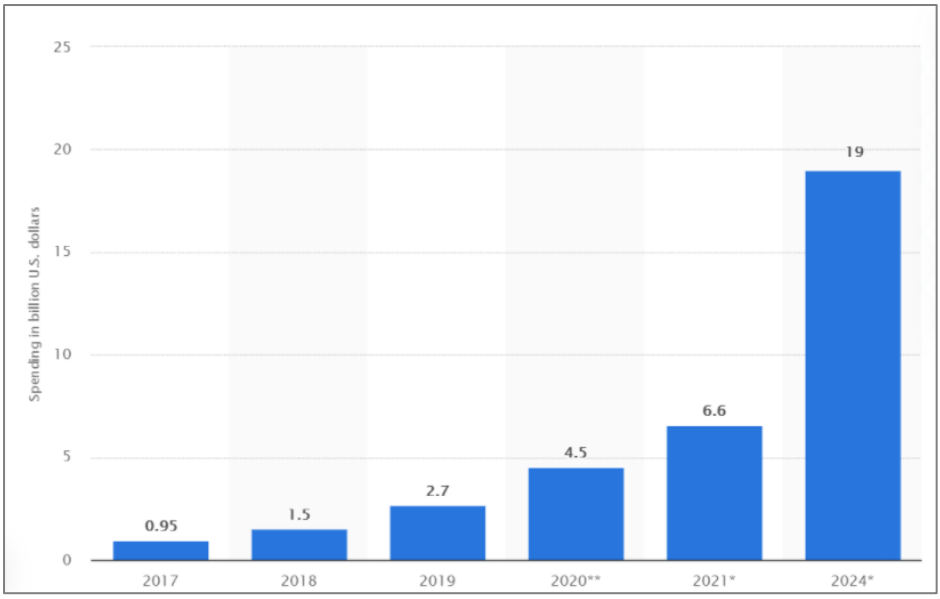
- Financial Risk: Cryptocurrencies and tokens are currently one of the main uses of blockchain, and additional certainty is needed in this space (such as for trading of securities-equivalents, tokenization of assets, taxation of cryptocurrencies, etc.).
- Digital Divide: Current blockchain tools and smart contracts rely heavily on code, which can be risky for non-coders who cannot verify the stated function of the code. Moreover, there is not enough public education about blockchain, resulting in skewed understanding of the technology.
- Platform Self-Regulation: Even more so than centralized platforms, decentralized platforms such as blockchain also face self-regulation challenges with regards to stewardship, corrective actions, data responsibility, user rights, and other areas.
- Technical Implementation: Blockchains still face many technical challenges, including cybersecurity, reversibility of data, and loopholes in the code. (Amritha & Bogdan, 2020, p. 07)

Production lines and professional, even personal data, threats from cybercrime are increasing drastically. (Géraud, 2017, p. 12)

From the initial phase of exploration of possibilities, to the development of the structure and content, to a state of maturity in which the market helps to define its practical usefulness. Today blockchain has reached a stage of technological maturity and therefore developers are beginning to strengthen its use to tackle new technological and organizational challenges. (Rodrigo & Valdés , 2021, p. 06)

The figure below shows the blockchain development services and solutions:

Fig.4. blockchain development services and solutions



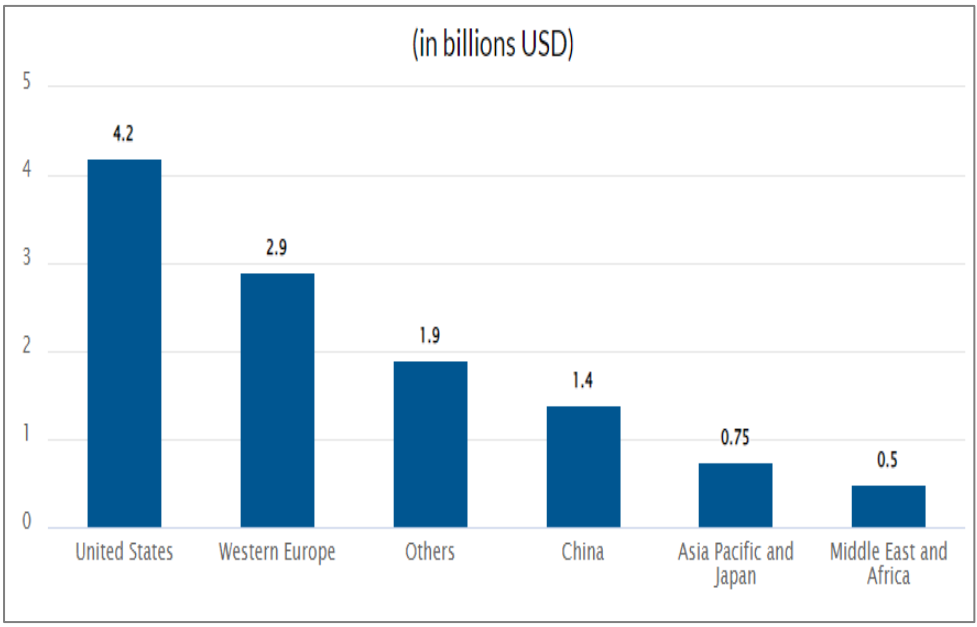
Source: (DPSR, 2022)

Total spending on various blockchain solutions across the globe in 2021 reach $6.6 billion. And, if the Statista forecasts are accurate, global spending will reach nearly $19 billion by 2024. But the business value-add of the technology will be far higher, reaching $176 billion by 2025 and passing $3.1 trillion by 2030, according to Gartner estimates. (Adam, 2021)

This statistic presents the regional spending on blockchain solutions worldwide from 2016 to 2022.

The figure below shows the projected biggest regional spender on blockchain technology by 2022.

Fig.5. Projected biggest regional spender on blockchain technology by 2022



Source: (DPSR, 2022)

from the curve given in figure, In 2022 USA spending on blockchain solutions is projected to reach about 4.2 billion U.S. dollars, making it the largest regional spender on blockchain solutions, western Europe about 2.9 billion U.S. dollars, China 1.4 billion U.S. dollars, Asia pacific and japan 0.75 billion U.S. dollars, middle east and Africa 0.5 billion U.S. dollars.

7. CASE STUDY OF THE UNITED ARAB EMIRATES:

7.1. Blockchain Powering the City of the Future:

Smart Dubai seeks to make Dubai the happiest city on earth. Participation from all city stakeholders — residents, visitors, business owners, parents, and families — is a cornerstone of the strategy. This goal will be carried out by leveraging a wide range of technologies including blockchain, AI, IoT, and by focusing on three strategic pillars: government efficiency, industry creation, and international leadership.

Collaborating with private sector and government partners, Smart Dubai was established to empower, deliver and promote an efficient, seamless, safe and impactful city experience for residents and visitors.

To achieve its strategic pillars, Smart Dubai aims to introduce initiatives and develop partnerships to contribute to its Smart Economy, Smart Living, Smart Governance, Smart Environment, Smart People and Smart Mobility dimensions. (consensys, 2020)

7.2. The Enterprise Ethereum Solution:

The 5th Future Blockchain Summit, the MENA region's first and largest Blockchain conference and exhibition, will return to Dubai World Trade Centre (DWTC) from 10-13 Oct 2022, serving as a meeting point for the world's most disruptive business technology trends.

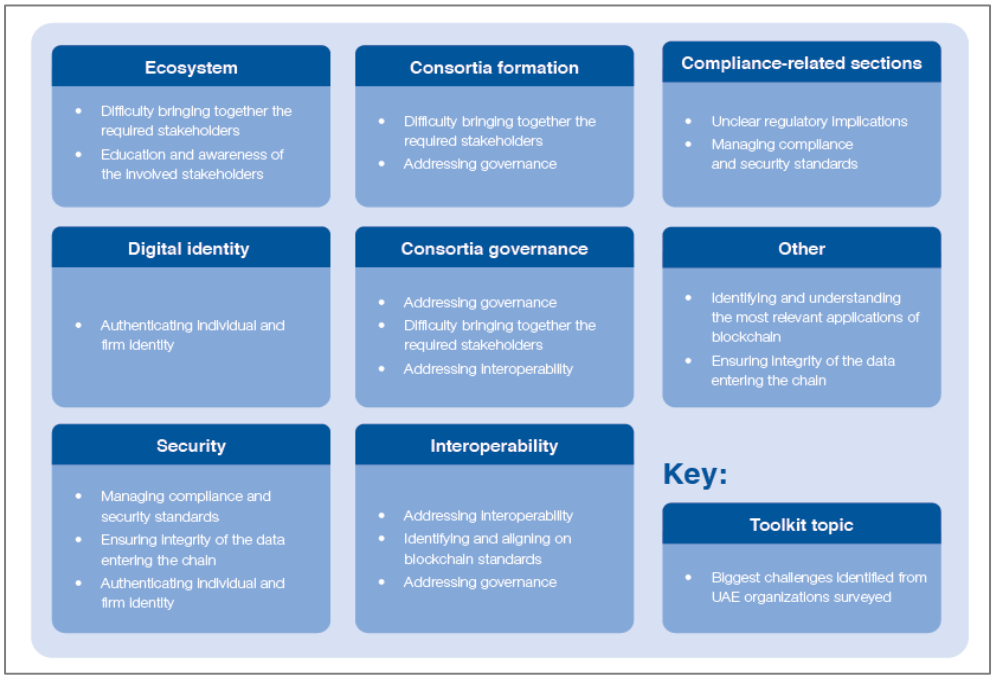
Over four days at the Future Blockchain Summit, industry experts will leverage countless networking opportunities, an expert conference programme and transformational workshops to explore distinct themes including:

- UAE poised to be a Global Hub for Cryptocurrency as Market Capitalization hits $1.4 trillion up 86% year to date.
- Future Blockchain Summit forms part of GITEX GLOBAL, the world's most complete, experiential technology event at Dubai World Trade Centre, uniting international innovators in artificial intelligence, 5G, cloud, big data, cybersecurity, Blockchain, quantum computing, fintech and immersive marketing across six events – GITEX GLOBAL, Ai Everything, North Star Dubai the Future Blockchain Summit, Fintech Surge and Marketing Mania. (future blockchain summit, 2021)

The UAE's adoption of blockchain, FinTech and crypto technologies is continuously growing with Dubai implementing frameworks to help it become an attractive jurisdiction for companies in these sectors.

The figure below shows the challenges in blockchain deployment.

Fig.6. The challenges in blockchain deployment



Source: (Omar & Murat, 2020, p. 10)

The biggest challenges in blockchain deployment are:

- Educating and awareness of the involved stakeholders;
- Identifying and understanding the most relevant applications of blockchain;
- Addressing governance;
- Addressing interoperability;
- Managing compliance and security standards;
- Ensuring integrity of the data entering the chain;
- Identifying and aligning on blockchain standards;
- Authenticating individual and firm identifying;
- Difficulty bringing together the required stakeholders;
- Unclear regulatory implications. (Omar & Murat, 2020, p. 10)

A smart city uses information technology to integrate and manage physical, social, and business infrastructures in order to provide better services to its dwellers while ensuring efficient and optimal utilization of

available resources. With the proliferation of technologies such as Internet of Things (IoT). (Kamanashis & Vallipuram, 2016)

Blockchain technology is still in the process of roll out stage worldwide, however, due to its sweeping disruption of conventional establishment of trust in value-baring transactions created huge demands in markets. Over 50,000 people are certified already, only on IBM Blockchain solutions. UAE government decided to make strategic investments for the adoption of this very promising technology, by setting ambitious goal to move 50% of government transactions to become fully paperless and Blockchain. (yousuf, 2020, p. 27)

It is clear that the UAE has expertly positioned itself as a leader in the next wave of technological transformation. Its strategy presents a useful blueprint for other countries to follow suit, and may indicate the dangers of being left behind for those who fail to regulate and innovate fast enough. (Guido, 2022).

8. RESULTS AND DISCUSSION:

- The blockchain technology will help save time, effort and resources and facilitate people to process their transactions;
- Total spending on various blockchain solutions across the globe in 2021 reach $6.6 billion;
- In 2022 USA spending on blockchain solutions is projected to reach about 4.2 billion U.S. dollars;
- If the Statista forecasts are accurate, global spending will reach nearly $19 billion by 2024
- The biggest challenges of blockchain is identifying and understanding the most relevant applications, -Managing compliance and security standards;
- The UAE government expects to save: AED 11 billion in transactions and documents processed routinely, 398 million printed documents annually, 77 million work hours annually.
- UAE poised to be a Global Hub for Cryptocurrency as Market Capitalization hits $1.4 trillion up 86% year - Future Blockchain Summit forms part of GITEX GLOBAL, the world's most complete, experiential technology event at Dubai World Trade Centre to date

- Dubai seeks to make Dubai the happiest city on earth
- Dubai aims to introduce initiatives and develop partnerships to contribute to its Smart Economy, Smart Living, Smart Governance, Smart Environment.

9.CONCLUSION:

The block chain has got a big importance in ending many problems that face the customers and investors and may be the reason behind many crises such as the estate mortgage. The latter was caused by the expansion in granting credits and the absence of exact data about the size of the estate loans which sharpened the crisis at that time. The block chain has a data base that is electronically stored and a codified and non-central electronic register to write down and process the financial contracts. Moreover, it is characterized with the inability of modification. This facilitated the various transactions and protected the different economic sides from piracy and systematic risks.

The block chain in UAE contributed to reducing the costs and efforts for the different economic agents. Instead of visiting many governmental sides to extract various files for the transactions, it is possible to get the information electronically. The government of Dubai will shift completely into a free-paper government and, thus, saves more than 1 billion pieces of paper. The block chain technique allowed access to information rapidly due to its structure that is based on a set of contracts that contain many codified information that allow the individual to make distant transactions. Moreover, Dubai became an international center, a model for the smart city, and a pole for the states that are interested in this technique. This is what we witnessed from its organization of Expo Dubai 2022 on this technique.

Depending on the results of the study, we reached a set of recommendations, the most important of which are:

- The use of blockchain reduces costs, especially in developing countries;
- Identifying and understanding the most relevant applications;
- Enforce strong security standards;
- Cryptocurrency can lead to unprecedented risks.

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