THE BEHAVIOURAL INTENTION OF THE UNITED ARAB EMIRATES (UAE) INVESTORS TO ADOPT BLOCKCHAIN TECHNOLOGY IN STOCK MARKET

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by

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LIST OF ABBREVIATIONS

BcT	Blockchain Technology
DFM	Dubai Financial Market
ADX	Abu Dhabi Securities Exchange Market
DLT	Digital Ledger Technology
ICO	Initial Coin Offering
IPO	Initial Public Offering
UTAUT	The Unified Theory of Acceptance and use of Technology
TAM	Technology Acceptance Model
TPB	The Planned Behavior
PE	Performance Expectancy
EE	Effort Expectancy
FC	Facilitating Conditions
SI	Social Influence
TR	Trust
BCTexperience	Blockchain Technology Experience
BI	Behavioral Intention
DFM	Dubai Financial Market
VA	Virtual Assets

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NIAT TINGKAH LAKU PELABUR DI EMIRIAH ARAB BERSATU (UAE) UNTUK MENGADAPTASI TEKNOLOGI BLOCKCHAIN DALAM PASARAN SAHAM

ABSTRAK

Teknologi Blockchain benar-benar boleh mengubah sektor kewangan dengan meningkatkan keselamatan, ketelusan, dan produktiviti. Emiriah Arab Bersatu (UAE) telah menunjukkan minat yang besar dalam teknologi blockchain dan bergerak untuk melaksanakannya dalam beberapa industri. Keputusan untuk mengguna pakai teknologi blockchain di pasaran saham memerlukan kesediaan pelabur UAE untuk menggunakan teknologi blockchain kerana mereka dianggap pihak berkepentingan utama pasaran. Oleh itu, kajian ini menggunakan model Teori Penerimaan dan Penggunaan Teknologi Bersepadu (UTAUT) yang disepadukan dengan kepercayaan yang berubah-ubah untuk menyiasat niat tingkah laku pelabur UAE untuk menggunakan teknologi blockchain di pasaran saham. Tinjauan soal selidik digunakan untuk mengumpulkan maklumat daripada pelabur di UAE. Menggunakan kaedah penyelidikan kuantitatif, sampel 274 soal selidik diedarkan dalam kalangan responden sasaran pelabur pasaran saham di UAE. Untuk menganalisis data, Partial Lest Square (PLS)- pemodelan persamaan struktur (SEM) telah digunakan untuk menganalisis data. Dapatan kajian menunjukkan bahawa faktor-faktor seperti jangkaan prestasi, pengaruh sosial, dan kepercayaan adalah positif dan memberi kesan yang ketara terhadap niat tingkah laku pelabur. Di samping itu, diperhatikan bahawa kesan sederhana umur pelabur antara memudahkan keadaan dan niat tingkah laku untuk menggunakan teknologi blockchain. Selain itu, dilihat bahawa kesan sederhana jantina pelabur antara pengaruh sosial dan niat tingkah laku untuk menggunakan teknologi

blockchain. Tambahan pula, kajian menunjukkan bahawa terdapat kesan sederhana pengalaman teknologi blockchain para pelabur antara pengaruh sosial dan niat tingkah laku untuk menggunakan teknologi blockchain, dan antara memudahkan keadaan dan niat tingkah laku untuk menggunakan teknologi blockchain. Penyelidikan ini telah menyumbang ke arah badan kesusasteraan dengan mencadangkan pengaruh kepercayaan berubah-ubah terhadap niat tingkah laku untuk mengadopsi teknologi blockchain dengan mengintegrasikannya ke model UTAUT. Tambahan pula, dicadangkan bahawa untuk menyokong penggunaan teknologi blockchain di pasaran saham UAE, penemuan ini akan menjadi sokongan yang besar kepada pembuat keputusan dalam bidang pasaran saham di UAE.

THE BEHAVIOURAL INTENTION OF THE UNITED ARAB EMIRATES (UAE) INVESTORS TO ADOPT BLOCKCHAIN TECHNOLOGY IN STOCK MARKET

ABSTRACT

Blockchain technology can completely transform the financial sector by increasing security, transparency, and productivity. The United Arab Emirates (UAE) has demonstrated a significant interest in blockchain technology and is moving to implement it in several industries. The decision to adopt blockchain technology in the stock market necessitates the readiness of UAE investors, who are considered the primary stakeholders in the market. Therefore, this study investigated the behavioural intention of UAE investors to use blockchain technology in the stock market, integrating the Unified Theory of Acceptance and Use of Technology (UTAUT) model with variable trust. A questionnaire survey was used to gather information from investors in the UAE. The sample's study consisted of individuals who have experience investing in the UAE stock market and are familiar with blockchain technology. Using a quantitative research method, a sample of 274 questionnaires was distributed among the targeted respondents of stock market investors in the UAE. To analyse the data, the partial least square (PLS) structural equation modelling (SEM) approach was employed. The findings of the study showed that factors like performance expectancy, social influence, and trust positively and significantly impact the behavioural intentions of investors. Additionally, the study observed a moderating effect of the investors' age on the facilitating conditions and their behavioural intention to use blockchain technology. The study also perceived a moderating effect of the investors' gender on the relationship between social influence and their behavioural

intention to use blockchain technology. The study, too, demonstrated a moderating effect of the investors' blockchain technology experience on the relationship between social influence and behavioural intention to use blockchain technology, as well as between facilitating conditions and behavioural intention to use blockchain technology. This study has made a significant contribution to the body of literature by highlighting the influence of the trust variable on the behavioural intention to adopt blockchain technology through its integration into the UTAUT model. The present findings suggest that the decision-makers in the UAE stock market would greatly benefit from the adoption of blockchain technology.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The stock market is where shares of a particular business are traded. The public can buy or sell shares that the organisations have divided and traded. After each trade, the investors gain or lose based on how many shares they own from the company and how much profit or loss the company has made (Team, 2023). The UAE stock exchange operates similarly to all other stock exchanges worldwide. More than 200 renowned national public companies, including First Abu Dhabi Bank (FAB), Gulf Finance House, and Emaar Properties, have registered at the UAE exchange centres (Team, 2023). The UAE stock market also permits international companies to register and list their shares. There are three stock exchange centres in the UAE: Dubai Financial Market (DFM), Abu Dhabi Securities Exchange (ADX), and NASDAQ Dubai (Team, 2023).

Established in 2000, Dubai Financial Market (DFM) is the first stock exchange facility in the United Arab Emirates (UAE), listing approximately 170 businesses (Market, n.d.). It abides by the laws mandated by the Securities and Commodities Authority (SCA) in the United Arab Emirates. There are more than 1 million investors —representing 209 nationalities—investing in DFM (Market, n.d.).

Abu Dhabi Securities Exchange (ADX) was founded in November 2000 (ADX Market overview, n.d.). Companies from a variety of industries, including banking, insurance, services, businesses, and hotels, are registered with ADX (ADX Market overview, n.d.). It adheres to the principles of the Securities and Commodities Authority (SCA), including openness, honesty, and efficiency (ADX Market overview, n.d.). Foreign investors who do not live in the country are permitted to trade through ADX.

The government of the country welcomes everyone to invest in stocks at their exchange centres (Team, 2023). Everybody from any country can invest in UAE stock markets. However, the government has established certain eligibility requirements, including the possession of a current passport, registration with an investor number (NIN), and ownership of a trading account. Applications are accepted from people of all ages, but those under 21 need their guardian's signature to qualify (Team, 2023).

1.2 Background of the Study

1.2.1 Fintech

Fintech describes technological innovation that affects the planning and provision of financial services (Kissell & Mack, Fintech in Investment Management, 2018). Fintech covers a wide range of financial applications and services, including the analysis of large datasets and the use of analytical tools. Artificial intelligence (AI), automated trading, robo-advisor, and financial record-keeping services are among the services offered. A new technology that is involved in financial record-keeping services is the Distributed Ledger Technology (DLT). DLT provides peer-to-peer (P2P) safe ways to generate, exchange, and monitor ownership of financial assets. DLT makes it possible for people or businesses to engage with one another without the need of a middleman, which reduces the necessity for an intermediary in financial transactions (Kissell & Mack, Fintech in Investment Management, 2018).

Other potential advantages of the DLT include its programmability, high security due to encryption of all records, anonymity of participant identities, and its ability to contribute to and accept the legitimacy of each record in the blockchain. In addition, DLT maintains transparency as each member of the network maintains a copy of the ledger, ensuring irreversible and unalterable records. DLT networks include a

digital ledger, which is a consensus mechanism to confirm newly entered data, and a network with multiple participants (Kissell & Mack, Fintech in Investment Management, 2018). Participants in a distributed ledger will each have a matching copy of the electronic database. This is because all network members receive entries, which they then record, store, and distribute. The network's computer nodes employ a consensus mechanism procedure to determine and confirm a shared ledger state. The procedure involves validating the transaction and getting network users' consent for any ledger updates (Koeppl & Chiu, 2018). These properties make it possible to produce immutable, transparent, and accessible records for all network users in almost real time.

DLT uses *cryptography* to encrypt data, which makes it unusable if unauthorised parties receive it (Koeppl & Chiu, 2018). Cryptography enables a high level of network security and database integrity. Cryptographic methods are used as a way of proof for the network's participants' identity. Participants also use it for data encryption (Koeppl & Chiu, 2018). Another important potential of the DLT is its ability to accommodate "*smart contracts"* (Kissell & Mack, Fintech in Investment Management, 2018). Computer programs known as "smart contracts" have the ability to autonomously carry out a contract's predetermined terms and conditions. The automated execution of dependent claims for derivatives and the immediate transfer of collateral in the case of default are two instances of smart contract usage.

One of the popular types of Distributed Ledger Technology is Blockchain. A blockchain is a digital log of transactions in which data, such as ownership changes, is recorded progressively in connected blocks that are "chained" together using cryptographic techniques (Hayes, 2023). The information is duplicated and distributed among multiple computer systems in a network. Every block includes a group of

transactions (data) and a secure link or hash of the prior block that is linked. The block also carries its own hash, which is the cryptographic signature of the transactions inside it. A transaction is added to the chain after it has received the consensus of all authorised participants. Each time a new transaction takes place, the network records it in every ledger. Multiple participants manage the decentralised database, which is called Distributed Ledger Technology (DLT) (Mostazo, 2018).

Therefore, nodes on a computer network receive the information when a transaction between a buyer and a seller occurs. The transaction is then joined with other transactions to create a new block of data for the ledger once all parties and specifics of the transaction are confirmed (see Figure 1-1). The new data block is then connected to the earlier blocks using a cryptographic procedure. Once the ledger is updated, the transaction is regarded as completed (Mostazo, 2018).

In a paper published in 2008 by Satoshi Nakamoto titled "Bitcoin: A Peer-to-Peer Electronic Cash System," the word "blockchain" was first used. The term describes the system based on digital currencies. Currently, the term “blockchain” is used as a general term for all the systems and applications utilised in the Distributed Public Ledger.

Future financial sector innovation is anticipated to have a strong base in blockchain technology. It enables the creation of irrefutable transaction records that are available to all network users (Neggaz et al., 2021).

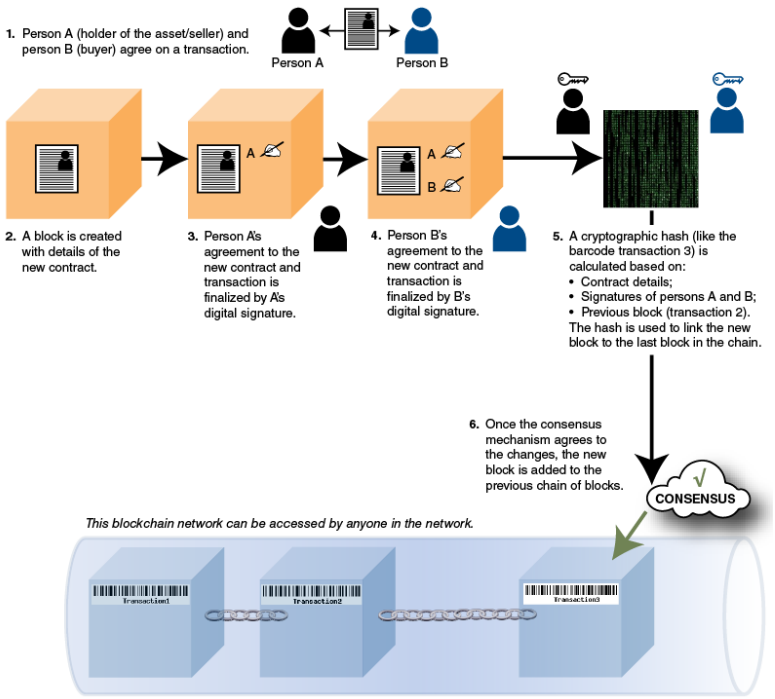

Figure 1.1 Blockchain Network - Example of a transaction.

Source: Financial Markets Group, Federal Reserve Bank of Chicago (2017)

Permissioned or permissionless networks can be used for DLT. In a permissioned network, members may not be allowed to take part in all network activities. There are controls and permissions used to allow and give variable levels of access to the ledger. Participants are given permission to add transactions; regulators can only view transactions, while others can view selective details of the transactions (Kissell & Mack, 2018). Meanwhile, in permissionless networks, any user can make a transaction, as it is open to everyone. Furthermore, all blockchain transactions are visible to all network users. In fact, users in a permissionless or open DLT network can carry out any sort of network operation.

Because the consensus technique is used, the permissionless network does not rely on a centralised authority to approve or disapprove the transactions (Kissell & Mack, 2018). Failure is therefore non-existent since every node in the network has a copy of the single distributed database that contains records of every transaction. A

transaction that has been added to a blockchain cannot be removed, making the distributed ledger an irreversible record of all prior transactions. In the permissionless network, the parties to a transaction do not need to have mutual trust.

1.2.2 Blockchain in the Financial Market

Blockchain is used in many fields, especially for purposes beyond the transfer of virtual and traditional funds. Financial technology and larger financial services societies continue to show a growing interest in this technology. Following are some applications of blockchain technology:

1.2.2.1 Digital Currencies

A cryptocurrency, often known as a digital currency, is a type of digital asset that enables real-time transactions between parties without the use of a middleman like a bank. Cryptocurrencies lack a physical form because they are an electronic medium of trade (Khalifa, 2018). They are privately issued by people, businesses, and other entities. The majority of cryptocurrencies use open permissionless DLT systems, in which all transactions are recorded and verified on a decentralised distributed ledger. Governments around the world do not regulate cryptocurrencies. Nevertheless, central banks all over the world are researching their potential advantages and putting their own versions of cryptocurrencies to the test (Khalifa, 2018).

The use of cryptocurrencies as a means of money raising is thought to be appealing. Companies sell their cryptocurrency tokens to investors during an initial coin offering (ICO) in return for fiat money or another pre-set digital currency. An ICO is often created to provide investors with digital tokens that they can use to purchase upcoming goods or services being produced by the issuer. ICOs are viewed as a substitute for

conventional capital-raising methods like initial public offerings (IPOs). Compared to IPOs, ICO marketplaces may have lower-related issuance costs and quicker capital-raising cycles (Lewis et al., 2019).

Many types of cryptocurrencies were developed and used recently for the purpose of transactions. These cryptocurrencies are generated and transacted using encryption techniques independent of the authority of the central banks. “Some central banks around the world (for example, China, the U.K., South Africa, and the Netherlands) are experimenting with issuing digital state-sponsored fiat currencies backed by the central government” (Lewis et al., 2019). In the financial sector, blockchain technology has a wide range of intriguing applications. The Bitcoin network is regarded as the largest application of blockchain technology to date (Hayes, 2023).

1.2.2.2 Smart Contracts

A smart contract is a written agreement between two parties that automatically executes upon meeting the specified criteria. The terms are written into lines of code, which are added to a blockchain network for self-execution of the process. Smart contracts can be used in distributed ledgers to automatically send assets to contractual conditions when certain events occur, as well as to transfer the specified commitments of individuals to a transaction into the ledger (Seretakis, 2017).

Because of the promise of the blockchain technology, more than 80 of the largest financial institutions in the world have elected to join a group led by the fintech company R3. Codra, an open-source distributed ledger technology, records financial occurrences and carries out smart contracts (Seretakis, 2017).

1.2.2.3 Digital Assets

Blockchain can digitise physical assets for transactional and recordkeeping purposes. This will enable the transfer and trading of assets without requiring verification or examination from a central party. This will make the process easier and quicker. Al Hilal Bank in the UAE implemented an Islamic bond transaction using blockchain technology in 2018 (Al Hilal Bank, 2018). Blockchain technology was used to implement a secondary market transaction for the bank's initial $500 million Islamic bonds that are due in September 2023 (Al Hilal Bank, 2018).

1.2.2.4 Digital Record Keeping

Blockchain provides a way to keep track of all transactions and information for all included parties. The resulting database will be standardised, immutable, and easy to access by participating parties. In 2018, Mohammad bin Rashed, Prime Minister of the UAE launched the "UAE Blockchain Strategy" (WAM News Agency, 2018).

"The blockchain strategy *would help the government prepare for future challenges and contribute to saving AED11 billion spent annually on document transactions and documents, 77 million hours of work, reduce government documents by 389 million, and save 1.6 billion kilometres spent driving" Mohammad bin Rashed Al Maktoum.*

1.2.3 Key Examples of Blockchain Integration in Stock Markets

Blockchain technology, in stock markets around the world, marks a milestone in mainstream transformation; it will make improvements in all aspects of transparency, efficiency, and cost reduction. Countries like the United States, Australia, and Switzerland are among the first to advantage from the new technologies that translate into changing their system of finance. For example, Australia is digitising its equity clearing and settlement

system into one that uses blockchain technology to ensure efficiency with the ASX (McSweeney, 2022). Similarly, Switzerland's SIX Digital Exchange uses blockchain technology in offering end-to-end digital asset trading and settlement (SIX Group, 2022). All these examples clearly demonstrate the global trend within the broader subsector of using blockchain technologies to improve functionality and trustworthiness across financial systems.

Besides their operational efficiencies, however, blockchain also has the capacity to address some of the disadvantages in conventional systems, such as high transaction costs, delays in settlement, and vulnerability of security. On the other hand, consensus mechanisms would eliminate costly centralised intermediaries, while an immutable ledger would provide tamper-proof records. Japan is currently testing blockchain as a multi-party trade settlement difference in terms of interbank reconciliations, which is expected to simplify operational efficiencies process post-trade (Ledger Insights, 2022).

Blockchain adoption in stock markets is also part of the national blockchain strategy introduced by the UAE in 2020 (Abdennadher et al., 2022). Abu Dhabi Exchange Market has introduced electronic voting processes powered by blockchain, which would enable the UAE to be on a more advanced page (Abdennadher et al., 2022). ADX partnered in 2018 with Equichain, a British FinTech company, to find a simpler and safer way for investors to use the blockchain (Abdennadher et al., 2022).

1.2.4 Requirements for Applying Blockchain in the Financial Sector

The blockchain system works based on the following principles. These principles represent the basis of the system and are needed to perform all transactions.

Transaction Ledger (Open Ledger)

Each block should contain a unique block number and some transactions. Every transaction should have a unique ID number. The details of the transaction consist of the public keys of both the sender and the receiver, referred to as the message (Kanyakumari, 2018). The transactions in the blocks are open to all participants. Everyone can learn about other possessions and transactions. However, users can use nicknames to conceal their real identity. This allows all participants to check on the validity of the transactions before they are executed (Kanyakumari, 2018).

Software

The blockchain system needs to acquire software that should perform two main functions: creating a hash function using a cryptographic algorithm for each block in the chain and generating public and private keys for the transactions (Neggaz et al., 2021).

Verifying the Transaction (Mining)

Many devices participate in verifying the transaction before it is executed. No transaction can happen even if the amount of money needed is available until the mining process is completed. “Mining” describes the process implemented by millions of computer devices (miners) to look for the right “hash” for the transaction to be executed (Khalifa, 2018).

The main function of the mining process is to obtain the right “hash” that distinguishes the new transaction and connects it with the previous transactions in the chain. Once the right hash is attained, the transaction can be executed and allowed to enter the chain, and be added to other transactions in the blockchain. The mining process protects the system from manipulation or hacking (Khalifa, 2018).

Distributed Database

The principle of the distributed database is important to eliminate the idea or a centralised part or server to control the blockchain. The database chain is distributed among all participants; therefore, any user can view the blockchain and participate in it. This principle is considered one of the safety elements of the chain. If a hacker wanted to manipulate the chain or the system, he would need to hack all the users within it, which is impossible (Khalifa, 2018).

1.2.5 The Impacts of Implementing Blockchain in Financial Market

The financial industry, particularly the infrastructure of its financial markets, has a lot to gain from the use of blockchain technology. Numerous changes and developments that benefit both clients and financial institutions might be brought about through technology. Khan et al. (2022) conducted a case study on blockchain implementation for Dubai government. The research stated that implementing blockchain technology in governments can have many benefits, like increasing transparency and data**.**

1.2.4.1 No Intermediate Parties

When implementing blockchain technology, transactions and exchanging values could be executed directly from one party to another, eliminating the need for an intermediary party or company. This can lead to a reduced cost of the transactions completed and a shorter settlement period (Neggaz et al., 2021).

The reduction in the settlement period can promote the liquidity and the capital usage in current trades with long settlement cycles. In a paper "Blockchain and Financial Market Innovation," the writers suggested that if two blockchain platforms

were created, one for managing money ownership and the other for managing security ownership, then, if there is adequate money with the buyers and sellers had sufficient shares, the trade could be executed at any time on any date in a short time, with legal inevitability and confidence (Lewis et al., 2019).

1.2.4.2 Transparency and Trust

One of the main advantages of applying the blockchain systems is the higher transparency in the transactions. As mentioned before, all devices can view all the changes in the transaction record. In addition, no transaction can be deleted once it is registered unless relevant users approve it. This will increase both the transparency and trust in the recording (Khalifa, 2018).

1.2.4.3 Security

The transactions and the data in the blockchain systems are immutable and unchallengeable once the block is created and added to the chain. Once the parties agree, they can add more blocks to the chain. Additionally, all the connected blocks and their variables can be read and tracked historically, making it simple and quick to inspect, reveal, and follow up on transaction data. This lessens the chance of fraud or tampering with the public transaction history that is accessible to all network devices. The blockchain technology does not permit re-accessing the transaction in the event of fraud or manipulation (Lewis et al., 2019).

1.2.6 Challenges for Applying Blockchain in the Financial Market

There are many challenges related to applying the blockchain technology to the financial market. These challenges can be either technical or regulatory in nature. One

of the technical challenges that can cause issues in the implementation of blockchain systems is the non-availability of standardisation designs (Lewis et al., 2019).

There is also the interoperability challenge that businesses may encounter when they try to integrate the blockchain technology into their systems. Businesses will find it hard to replace systems that were working normally for a long time, like banks and exchange companies, with a new system like the blockchain (Khalifa, 2018).

Permissioned and permissionless blockchains need large storage spaces because all devices will require a copy of the distributed ledger. Therefore, businesses will face the challenge of scalability of computer power to confirm and record new transactions and information (Lewis et al., 2019). This results in an increase in the cost of transactions. The blockchain system itself is not expensive. However, the system requires large numbers of computers with special specifications and power to perform the transactions.

The blockchain technology is still lacking trust. It is still questionable if a computational system that does not depend on a specific party to confirm transactions is more efficient than the current traditional system (Khalifa, 2018). This is mainly due to the absence of a central management to oversee the transactions. In other words, the absence of a centralised body to resolve issues between parties may force them to resort to the courts. It is not clear how regulations and laws will apply to the digital ledger technology in events of defect in the system, network piracy, fraud, bankruptcy, data theft, or other scenarios (Neggaz et al., 2021). For example, if an operational flaw causes a smart contract to malfunction, there might be no identifiable defendant to pursue legal action against.

Some users may have concerns regarding their privacy and confidentiality when transferring information or records. Financial firms consider the data they own and analyse as crucial to their competitive advantage. Any leakage in the information can cost the business. The network's extensive participant base makes this possible. Cybercriminals will have more targets to attack as a result of this (Lewis et al., 2019).

The use of distributed ledger technology in the stock market presents additional regulatory difficulties. The technology should comply with the regulatory framework that is available currently. The rules were established to safeguard market participants, uphold financial stability, and foster open and equitable financial markets (Neggaz et al., 2021). However, these regulations are built depending on the financial market's present architecture, which contains financial institutions performing specific functions and being watched by supervisors.

The organisation of the regulations should be altered to serve the future development and implementation of the technology in the financial market. Dr. Alexandoros Seretakis, an assistant professor at Dublin University, mentioned two examples of changing the regulations regime in his paper "*Blockchain, Securities Markets, and Central Banking*" "which are the Delaware Blockchain Initiative, which is a comprehensive program to provide an enabling regulatory and legal environment for the development of distributed ledger technology, and the initiative of the French government to spur the application of distributed ledger technology in the issuance and trading of mini-bonds" (Seretakis, 2018).

In addition, blockchain technology should guarantee the ability to record and update all transactions in all participating devices to ensure the reliability of the records. Regulators and administrators need to be confident in the legality of financial

instruments recorded on a distributed ledger (Seretakis, 2018). Moreover, there should be rules and regulations set for the smart contracts to consider them as enforceable contractual agreements. According to Dr. Seretakis, the fundamental norms of contract law, including those governing contract formation, must be followed by smart contracts.

1.2.7 Financial Market Stakeholders Blockchain Regulatory Readiness

Andreas Vlachos designed a Blockchain Readiness Index and published it in his paper "An Algorithmic Blockchain Readiness Index" in 2019. He described it as an instrument for helping countries track the amount of blockchain development in accordance with their capability for introducing blockchain-based activities and the success of implementing a regulatory framework for blockchain technology.

The provided BRI includes several indicators of blockchain readiness, which fall into the following categories: (1) Government Regulation, (2) Research, (3) Technology, (4) Industry, and (5) User Engagement (Vlachos et al., 2019). To apply the readiness index on the Financial Market, the indicators will be Government, Business Entities, Solution Providers and Users (Vlachos et al., 2019).

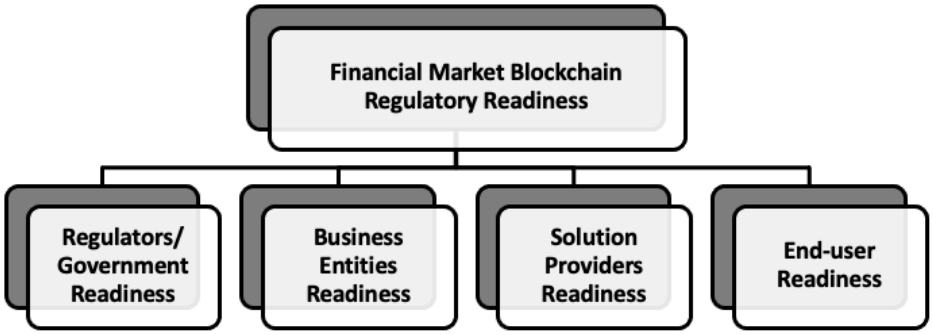

Figure 1.2 Regulatory Readiness Index for applying blockchain in financial market

1.2.6.1 Regulators or Government Readiness

Regulators may be regarded the most significant blockchain stakeholder due to their direct influence on the ecosystem. Regulators are empowered to choose how simple it will be for other stakeholders to use blockchain technologies. Regulators are at the forefront of developing laws and guidelines for those utilising blockchain systems (Sanda et al., 2022).

Central banks around the world are still reluctant to authorise cryptocurrencies. The reasons behind their reluctance are the high volatility of the cryptocurrencies, their abstract nature, and regulatory inaccuracy (Al Muhairi et al., 2020). Cryptocurrencies are not recognised as legal money by the Central Bank of the United Arab Emirates.

However, the Dubai Financial Services Authority (DFSA) has issued a regulatory framework to oversee cryptocurrencies for public discussion in March 2022 (Al Muhairi et al., 2020). The intention of this framework is to protect investors, and according to the DFSA's paper, the regulations are going to apply to firms interested

in working with crypto tokens or assets, whether in marketing, issuing, trading, or creating them (Al Muhairi et al., 2020).

In April 2022, Vice President and Prime Minister Mohammed bin Rashid Al Maktoum issued the Dubai Virtual Asset Regulation Law, which aims to establish a cutting-edge legal framework to safeguard investors and highly-guaranteed international standards for the virtual asset (VA) industry authority that will enhance ethical business growth (wam.ae, 2022).

"The emirate of Dubai will offer the highest advanced crypto asset system in terms of organization, governance and security" (Mohammed Bin Rashed, 2022)

To carry out the objectives of the aforementioned law, Authority (VARA) was founded. It is associated with the Dubai World Trade Centre Authority, possesses a legal identity, yet it is financially independent (Al-Salah, 2022). In the emirate of Dubai, VARA will be in charge of licensing and regulating the virtual asset and market industry.

According to their official website, www.vara.ae, VARA's responsibilities include coordinating the creation, exchange, and authorisation of virtual assets and virtual tokens. It also works to provide the greatest levels of data privacy for beneficiaries. Additionally, it coordinates the management of platforms and portfolios for virtual assets, monitors transactions, and guards against price manipulation of the assets.

According to Chainalysis, the cryptocurrency market in the Middle East is among the fastest growing globally. Moreover, a report by CNBC stated that the UAE's share in the crypto global market is approximately US$25 billion in transactions. The

report has specified that the UAE's shares had increased 500% between 2020 and 2021. Reuters explained that the friendly regulatory system is catalysing growth. There were more than 30 licenses issued for crypto exchanges to run in the emirate of Dubai and the emirate of Abu Dhabi in 2022 (wam.ae, 2022). In March 2022, VARA granted Binance, the largest cryptocurrency exchange in the world, the permission to operate. It also provided approval for FTX, which has decided to open a regional head office in Dubai (wam.ae, 2022).

1.2.6.2 Business Entities

This refers to the elements and procedures that make up an organisation (Sanda et al., 2022). In the stock market, listed companies, depositary participants, brokers, and stock exchanges will be the business entities that make up the organisation.

The Dubai Multicommodity Centre (DMCC) established the DMCC Crypto Centre in 2022, which is a comprehensive ecosystem for organisations adopting cryptography and blockchain in their operations (Abbas, 2022). There are already thousands of digital asset exchanges and cryptocurrency companies that registered in the centre (Abbas, 2022). Hussain and Papastathopoulos (2022) have conducted research on the organisation's readiness for digital financial innovation and financial resilience in the UAE. The findings of their online questionnaire with 680 respondents showed that firms in the UAE are ready to change and adopt blockchain technology to service their customers.

1.2.6.3 Solution Providers

Solution providers are the businesses that supply the infrastructure required to develop blockchain applications and solutions. The number of blockchain solution

providers is gradually increasing, which is creating healthy competition among them (Sanda et al., 2022). Clutch.com, an online platform for worldwide IT companies, reported that there are more than 2,700 blockchain provider companies worldwide (Clutch.co, 2023). In fact, there are more than 40 blockchain solution providers situated in the UAE such as Blockchain Technologies and Infograins (Clutch.co, 2023). Blockchain technology offers limitless opportunities for a wide range of industries and businesses. However, it also has many challenges, such as specialised technological techniques, knowledge, and skills (Crypto APIs, 2023).

The need for blockchain infrastructure in our time is increasing rapidly day by day. This is due to the huge volume of operations. The latest statistical data shows that the top three cryptocurrency networks average daily transaction amounts equivalent to approximately 1.5 million processes (Crypto APIs, 2023). In addition, over 10,000 cryptocurrencies are currently available across multiple blockchain networks. Each of these networks has its own protocol, network of nodes, layers, and token standards. Therefore, data cannot be compressed or minimised, meaning memory space must be extended all the time (Crypto APIs, 2023).

1.2.6.4 Blockchain End-Users

These people are the blockchain system's or network's direct clients. Instead of concentrating on the company, customers have always preferred blockchain as a solution. It was made in order to provide people control over their data and how they are utilised.

A market research company, YouGov, conducted a study in 2021, surveying 20,000 respondents across 18 countries. The survey showed that UAE consumers have a strong relationship and trust in crypto (Choubey, 2022). The survey revealed that

during the next five years, (67%) of the UAE people plan to invest in the cryptocurrency industry (2021) (see Figure 1-3). The survey showed that 21% of the UAE consumers intend to invest in the crypto market in the following year. Furthermore, the survey revealed that the UAE has the highest level of trust in the crypto market globally, with 40% of its costumers believing in cryptocurrencies, compared to 33% in Indonesia, 20% in China, and less than 20% in European countries (see Figure 1-4).

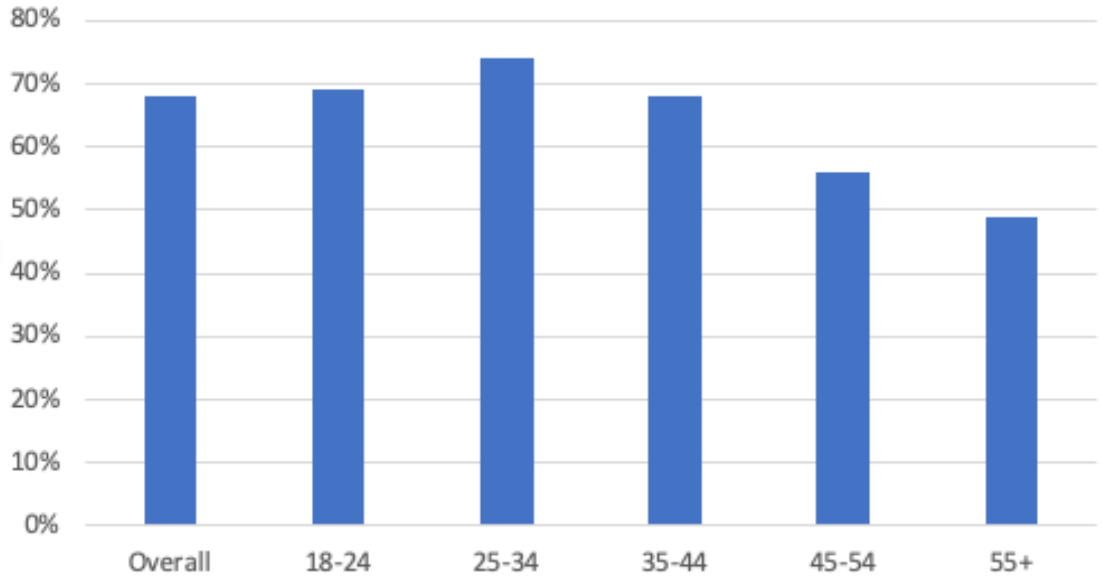

Figure 1.3 Percentage of UAE residents interested in investing in cryptocurrencies within five years

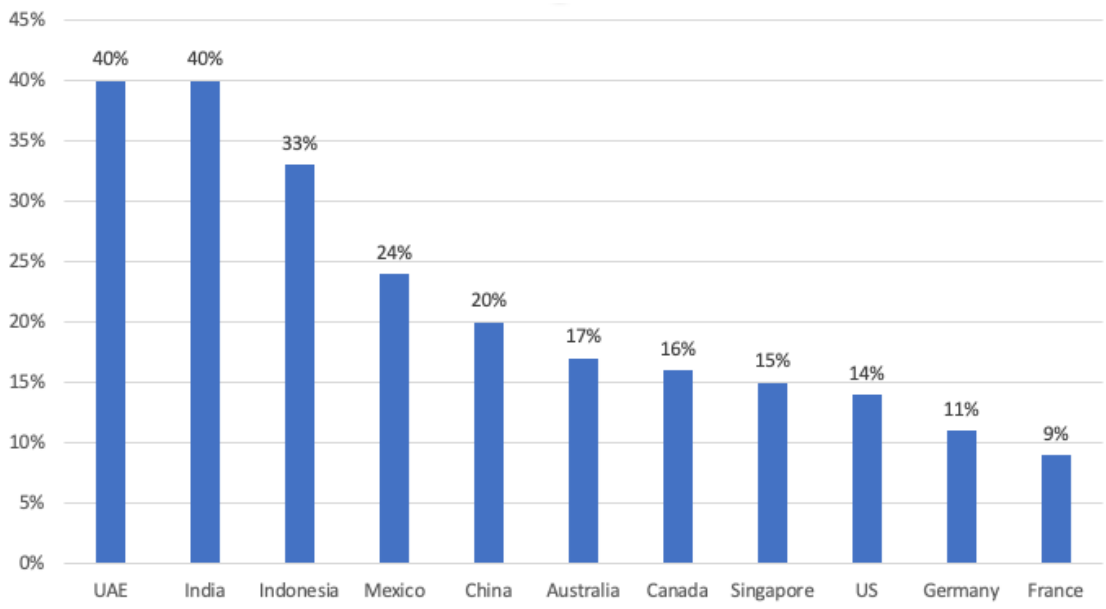

Figure 1.4 Percentage of people who trust cryptocurrencies

According to a Gemini survey conducted in 2022 among 20 countries, the UAE was ranked third globally in terms of crypto adoption, with 35% of the population already owning some form of cryptocurrency. The Gemini survey has also shown that 49% of respondents in the UAE said they are crypto-curious. The reporter defined the term crypto-curious as the customers who do not currently own crypto but are either concerned about learning more or are likely to obtain cryptocurrency during the next year. According to the Gemini survey (2022), 47% of the respondents in the UAE believe that the future of money will be cryptocurrency. The survey also found that 33% of crypto owners in the UAE use it to make in-person procurements at brick-and-mortar stores, compared to only 19% of crypto owners worldwide (Gemini, 2022).

The growing interest in crypto by UAE residents was also highlighted in Expo 2020 Dubai. During the two days marked as Crypto Expo Dubai, from 16-17 March 2022, there was an increase of 50% in exhibitors and a 40% increase in visitors compared to the previous year's edition. According to the "Digital Lifestyle" report published in 2022 by the Telecommunications and Digital Government Regulatory Authority (TDRA), approximately 11.4 % of the residents in the UAE have invested in cryptocurrencies. According to this percentage, the UAE ranked 10th globally in terms of cryptocurrency investments (TDRA, 2022). Even though digital currencies are extremely popular globally, there are still worries about their security and fraud, according to Emma McInnes, global sector head of financial services at YouGov (Choubey, 2022).

The survey conducted by YouGov (2021) revealed that hacker risk is the biggest concern of UAE residents who intend to invest in cryptocurrencies. The survey showed that other concerns include losing access to their money if there is no internet connection; identity theft; difficulty to contact someone for troubleshooting; reduced fraud protection; and insufficient government regulation (Choubey, 2022).

1.2.8 Blockchain Technology in the United Arab Emirates

Blockchain technology has become the most promising in the UAE for digital transformation (Al Muhairi et al., 2020). Many government and private entities have started exploring and applying blockchain. More than 40 government entities have implemented blockchain technology in one or more of their applications, while over 120 blockchain companies in the country are involved in 200-plus initiatives (Al Muhairi et al., 2020). Abdennadher et al. (2022) concluded in their research that the infrastructure of the UAE market is ready to adopt blockchain technology.

There are many trends toward adopting this technology in the UAE. The government has applied it in several areas and institutions. For instance, the project achieved by Dubai Land Department (DLD) in October 2017 by creating a secure database system that included all real estate contracts, including lease registrations, along with Dubai Electricity and Water Authority (DEWA), communication companies, and other related bills. The system incorporates the tenant's personal information, their Emirates ID, and residency visas (Mone'm, 2017). Tenants can make their payments through the system electronically and securely without the need for a paper or check. This process can be done in just a few minutes, eliminating the need to physically visit the government entity.

The second initiative is by the Roads and Transport Authority, which involved developing a blockchain-based system for tracking the lifecycle of cars (Arabianbusiness, 2018). The project's main objective is to provide an accurate history of the car to automakers, dealers, regulators, insurance providers, buyers, sellers, and garages. The vehicle database will include all the information about the car, from its departure from the factory to its entry into a scrap yard. This blockchain-based solution will help reduce servicing costs, increase car transactions' transparency and confidence, and minimise collisions. It keeps track of ownership, sale, and accident history to develop supply chain management systems that are intelligent and more effective. (Arabianbusiness, 2018).

Third, Maryah Community Bank established itself as the first blockchain-powered and cloud-based Emirati bank in 2021. In June 2022, a partnership was established between the digital bank and Abu Dhabi Securities Exchange Market to facilitate IPO subscriptions (Hussein, 2022). According to this agreement, customers

will be able to self-subscribe and invest through ADX. This will ultimately enhance customer centricity and boost market liquidity.

Fourth, a new blockchain-based cross-border e-commerce network launched by Dubai Customs in September 2019 will enable e-commerce export transactions using couriers. In addition, it will simplify declarations, automate refunds, and lower fees and charges for logistics businesses' onboarding (Mansoor, 2020).

Fifth, the Abu Dhabi Digital Authority was founded with the purpose of utilising artificial intelligence technologies to facilitate the provision of a proactive, personalised, collaborative, and secure digital government. It has been developing a platform for the UAE government that will enable all entities in the Abu Dhabi government to exchange data through a trusted and secure mechanism (Al Muhairi et al., 2020). The aim of this project is mainly to allow the stakeholders to share data across the departments in the government entity and with other external participants. ADDA believes that applying blockchain will help the government to deliver high-quality services to the individuals efficiently and improve the data-driven policies (Al Muhairi et al., 2020).

Sixth, the Ministry of Health and Prevention in the UAE is working toward applying advanced technological systems in the healthcare industry (Al Muhairi et al., 2020). The ministry has developed the ‘Hayat’ registry platform, which uses blockchain technology to securely verify individuals’ intention to donate their organs after death. The system will also acquire the patient’s information from the national waiting list. By using blockchain technology, the transplant procedure may be made better for both donors and recipients. Since its initial launch in January 2019, the Hayat blockchain application has received thousands of wills from donors, ensuring the privacy of