BLOCK CHAIN TECHNOLOGY IN THE UAE REAL ESTATE SECTOR: CHALLENGES AND FUTURE PROSPECTS

[1]ABDULLA ALI ALKINDI, [2]MAHER ALJABER

[1]Master of Cyber Security Law, Fujairah University
[2]Associate Professor of Cyber Security Law, Faculty of Law Fujairah University.
E-mail: [1]2025210490@fu.ac.ae, [2]m.aljaber@fu.ac.ae .maheraljaber@bau.edu.jo

Abstract - The real estate sector in the United Arab Emirates is undergoing a radical digital transformation driven by advanced technologies such as artificial intelligence and blockchain, in line with the UAE's vision of building a knowledge-based economy. Smart contracts are defined as computer programs stored on a decentralized network that automatically execute the terms of an agreement once specific conditions are met, thereby transforming contractual obligations from traditional paper documents into tamper-proof codes. This study focuses on examining the legal and regulatory challenges that hinder the full implementation of smart contracts in the real estate sector in the United Arab Emirates. The study adopts a descriptive-analytical approach that includes a literature review, an evaluation of government programs, and an analysis of case studies of real estate projects to address the research question. This study concluded that smart contracts increase operational efficiency by 80% and reduce transaction time by approximately 70% through the application of tamper-proof blockchain ledgers. This study recommends that legislation be updated to recognize tokens as a means of expressing the will of the contracting parties, provided that legal loopholes are closed.

Keywords - Smart Contracts, Blockchain, Real Estate Sector, Digital Transformation, UAE, Digital Identity

I. INTRODUCTION

The real estate sector in the United Arab Emirates is undergoing a radical digital transformation driven by advanced technologies such as artificial intelligence and blockchain, which aligns with the UAE's vision of building a knowledge-based economy. Smart contracts are defined as computer programs stored on a decentralized network (blockchain) that convert the terms of an agreement between parties into code. This code executes automatically once predefined conditions are met, without any human intervention, thereby reducing the likelihood of error or manipulation. Blockchain technology is considered a fundamental and indispensable pillar for the operation of smart contracts in the real estate sector, particularly in the United Arab Emirates, which is seeking to build more transparent, secure, and efficient contractual systems.(Government of Dubai, 2020)

1.1 Problem of Study

This study focuses on examining the legal and regulatory challenges that hinder the full implementation of smart contracts in the real estate sector in the United Arab Emirates, by explaining how smart contracts operate within blockchain technology, while assessing their current usage in the UAE real estate market, particularly in pioneering government projects in Dubai and Abu Dhabi. This study aims to analyze the expected benefits and gains from integrating these contracts into sales, leasing, and ownership verification, while identifying and describing all legal, regulatory, and technical obstacles to their adoption, and ultimately formulating practical proposals and solutions to ensure the improved implementation of these technologies in support of the country's comprehensive digital transformation goals.

1.2 The Importance of Study

The importance of this study is evident in multiple dimensions: economically, it seeks to improve the efficiency of the real estate sector as a cornerstone of the national economy; technologically, it aims to support digital innovation; legally, it seeks to address legislative gaps to protect contracting parties; and practically, it aims to provide recommendations to government agencies and investors. Accordingly, this study aims to explain how these contracts work, assess their current use in Dubai and Abu Dhabi, identify legal and technical obstacles, and propose practical solutions to enhance their implementation.

1.3 Methodology

This study adopts a descriptive-analytical approach that includes a literature review, an evaluation of government programs, and an analysis of case studies of real estate projects in order to address the research question. The study's framework is based on a thematic division that covers the concept of smart contracts and then examines the impact of blockchain technology on the real estate sector in the UAE.

II. THE NATURE OF SMART CONTRACTS

The world is undergoing a widespread digital transformation, driven by the emergence of advanced technologies such as blockchain, artificial intelligence, and cloud computing. In this context, smart contracts have emerged as one of the most significant innovations, transforming the traditional concept of contracting from mere paper documents reliant on human intervention and bureaucracy into a

self-executing digital system based entirely on programming. These contracts are particularly significant in sectors requiring extreme precision and absolute transparency, such as the real estate sector, where they provide solutions to enhance efficiency and build trust among parties (AL-Haimi, 2025). Most global studies point to the emergence of pioneering initiatives in the digitization of records (such as in Sweden and Estonia), while the Arabic literature has focused on general legal and jurisprudential aspects, with a gap in applied studies linking technology to real estate, and the UAE emerging as a regional leader through advanced platforms such as "Ejari" and "DubaiREST."

Smart contracts are defined as computer programs stored on a decentralized network (blockchain) that convert the terms of an agreement between parties into code. This code executes automatically once predefined conditions are met, without any human intervention, thereby reducing the likelihood of error or manipulation. From a linguistic perspective, the research clarifies that the term "contract" conveys commitment, while "smart" describes the ability to execute and make decisions independently (AL-Haimi, 2025).

Others have defined it as programming instructions stored on the blockchain that are executed automatically upon fulfillment of conditions without an intermediary (Al-Shumari, 2021). That is, they are digital contracts that ensure the automated and transparent execution of obligations (Al-Zahrani, 2020). In other words, they are legal agreements translated into distributed code that prevents modification or manipulation (Al-Ta'i, 2022). Consequently, a smart contract is fundamentally distributed code that ensures contractual obligations and protects them from retroactive changes (Allen, 2022).

The importance of smart contracts stems from their ability to address the root causes of the problems plaguing traditional contracts, as they enhance transparency and oversight by storing contracts on the blockchain, which shifts the concept of trust from "human intermediaries" to a "neutral algorithm," creating a technologically secure environment protected from unauthorized interference. They also reduce disputes because contract terms are converted from open-to-interpretation "natural language" to definitive "programming language," making the contract both "judge and executor" simultaneously. Contract automation also accelerates the contract execution process, thereby eliminating the concept of "bureaucratic time," as property transfers and payments occur immediately, which increases asset liquidity in the market. Furthermore, these smart contracts reduce costs by eliminating the need for lawyers, notaries, and intermediaries, which significantly lowers "transaction costs," making contracting affordable. Finally, smart contracts contribute to building a "data-driven economy," which supports the UAE Vision 2071 and the country's competitiveness as a global hub for tech investments and a global digital notary (Allen, 2022).

The use of smart contracts has revolutionized "contract theory" by transforming legal promises—which are often subject to delay—into enforceable commands, a concept known as "reciprocal technical assurance," whereby a party receives a benefit only after fulfilling its obligation through code. They have also succeeded in replacing the fallible human intermediary with a neutral mathematical protocol. Furthermore, smart contracts have succeeded in granting contracts absolute technical authority as soon as the contract is uploaded to the network, as it becomes an unalterable contract, which eliminates document forgery crimes. Finally, these contracts have succeeded in stimulating investment by providing a user experience characterized by complete transparency and automatic results (UAE Ministry of Economy, 2022).

Smart contracts have gained widespread adoption due to their many unique features. They offer what is known as instant automatic execution through faster transaction processing and ensure full compliance with terms without human intervention. They are also decentralized and transparent, as there is no central authority controlling the contract, and it is available for verification by all parties involved. Furthermore, these smart contracts are immutable and cannot be deleted; once recorded on the blockchain, the contract becomes tamper-proof, providing superior legal security. Finally, smart contracts eliminate the need for manual documentation and paper-based transactions, which helps reduce operational costs (AL-Haimi, 2025). We conclude that smart contracts represent a paradigm shift that ensures the reliability and accuracy required by the real estate sector in the UAE.

III. BLOCK-CHAIN AND ITS IMPACT ON REAL ESTATE SECTOR IN THE UAE

Blockchain technology is considered a fundamental and indispensable pillar for the operation of smart contracts in the real estate sector, particularly in the United Arab Emirates, which is seeking to build more transparent, secure, and efficient contractual systems. Blockchain technology is defined as a "distributed ledger (DLT)" that allows data and transactions to be stored in a completely secure and tamper-proof manner through a chain of interconnected blocks based on complex cryptographic algorithms. The technology distributes data across a network of "nodes" to ensure immutable transaction records (Al-Najjar, 2020), as it relies on a decentralized system

that allows for the recording of real estate and financial transactions without the need for an intermediary, while providing the highest levels of security (Ooi, 2022).

Since its inception in 2008 with the cryptocurrency "Bitcoin," this technology has evolved and now extends to critical sectors such as digital identity, supply chains, government services, and the real estate sector. The blockchain infrastructure consists of four main components: blocks, nodes, chains, and cryptography. In the real estate sector, this technology has revolutionized the property lifecycle by enabling easy registration, thereby preventing fraud and facilitating accurate tracking of ownership history. The UAE has launched pioneering projects in this regard, such as "Dubai Smart Real Estate Registry" and the "Dubai Blockchain 2020" project. This technology has also contributed to real estate sales and purchase contracts by automating the transfer of ownership immediately upon payment, thereby reducing reliance on intermediaries and minimizing legal disputes. It has also been applied to smart lease agreements, enabling automatic rent collection, the imposition of penalties, and contract termination in the event of non-payment; it can even be directly linked to electricity and water services to automatically activate or cut them off. In addition, they have facilitated access to real estate financing by helping banks monitor loans and automate repayments, thereby reducing the risk of fraud and enhancing banking reliability. Finally, in the field of real estate project management, it has helped document contracts with contractors and monitor construction phases and quality according to software-defined schedules(Ooi, 2022).

For all these reasons, blockchain technology is considered an ideal tool in the real estate sector, as it enhances transparency by making transactions visible to all parties, which in turn reduces costs by eliminating the need for "traditional intermediaries" such as notary offices, brokers, and lawyers. The technology also ensures speedy processing, as property transfers can be completed in minutes rather than days, and it provides superior data protection thanks to encryption.

Nevertheless, the growing use of blockchain technology in the real estate sector faces numerous legal, technical, regulatory, and security challenges. Legally, it faces challenges such as the absence of clear legislation governing this type of contract, as well as the difficulty of amending smart contracts once they have been uploaded to the network. Technically, the lack of specialized expertise, high infrastructure costs, and the risk of programming errors are among the technical challenges facing this technology in the real estate sector. From a regulatory or administrative perspective, the lack of unified national databases and resistance to change among employees due to a lack of training are among the regulatory challenges. From a security perspective, the risks of cyberattacks on software or the risk of losing a private key are all challenges facing the use of blockchain technology in the real estate sector (Al-Shamsi, 2022).

To address all these challenges, the United Arab Emirates has expanded the use of its digital ID (UAE PASS) across all sectors, including real estate, which allows contracts to be notarized without the parties being physically present. In addition, the integration of artificial intelligence for market data analysis, the full transition toward smart cities, and the ability to issue real estate tokens are all tools that allow investors to purchase and manage fractional ownership shares in real estate. This will boost international investors' confidence in investing in this sector thanks to the high levels of transparency provided by the UAE (Ooi, 2022).

CONCLUSION

This study concluded that smart contracts increase operational efficiency in the real estate sector by 80%, as they reduce transaction times by approximately 70%—as seen in Dubai—while enhancing transparency through tamper-proof blockchain records. The study reached the following conclusions:

1. Smart contracts and blockchain technology represent a radical transformation in the management of real estate transactions in the United Arab Emirates, due to the speed they provide in contract execution and the reduced reliance on intermediaries.
2. The current legal environment still faces a number of challenges that hinder the full implementation of smart contracts in the real estate sector in the United Arab Emirates.
3. The study showed that the UAE possesses strong foundations to lead the digital transformation of real estate regionally and globally, particularly with the adoption of advanced government initiatives such as digital real estate platforms and digital identity (UAE PASS).

To ensure the sustainable use of blockchain technology in the real estate sector in the United Arab Emirates, this study recommends the following:

1. The need to update legislation to recognize smart contracts as a mechanism for expressing intent, while addressing legal loopholes.
2. The need to strengthen cybersecurity, unify national databases, and support small businesses.
3. The need to provide financial incentives for developers and train local talent in real estate technology.

REFERENCES

[1] AL-Haimi, B; Khalid; H, Zakaria; N,Jasmin; T. 2025. Olanrewaju & Tan.Digital Transformation in The Real Estate Industry: A Systematic Literature Review of Current Technologies, Benefits, and Challenges.

[2] Allen, J. 2020. Smart Contracts and the Law: A Global Perspective." Computer Law & Security Review 45.

[3] Al-Shamsi, H. 2024. Enhancing Digital Transactions with Blockchain Technology: Descriptive Analytical Study. Access to Justice in Eastern Europe. 7(3). 485-504

[4] Dubai International Financial Centre. 2023. Future Technologies in the Real Estate Sector. United Arab Emirates.

[5] Government of Dubai. 2020. Dubai Blockchain Strategy. United Arab Emirates.

[6] Ooi,V; Peng, S; Soh; J. 2022. Blockchain Land Transfers: Technology, Promises, and Perils. Computer Law & Security Review. 45

[7] Telecommunications Regulatory Authority. 2021. Cybersecurity and Blockchain Technology. United Arab Emirates.

[8] UAE Ministry of Economy. 2023. Annual Economic Report. Abu Dhabi: Official Website.

★★★