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Integrating Blockchain Smart Contracts into Project Management: A Qualitative Study on Financial Security and Regulatory Frameworks

Fatmah Abdulla Alsereidi, Hamad Alshemsi, Alya Matar AlSuwaidi, Mounir El Khatib*

School of Business & Quality Management, Hamdan Bin Mohammad Smart University. Dubai, UAE

**Corresponding Author*

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A B S T R A C T

This research examines the role of blockchain technology in various aspects and areas of smart contracts in finance and project management. Specifically, it analyses and understands how, in the UAE, blockchain can be used in those areas of finance, IT, and construction across various companies to boost their efficiency and benefit from the positives of the technology. Through a qualitative study design wherein semi-structured interviews were included with various experts who hailed from different areas such as blockchain law, financial blockchain analysts, project managers, etc., with 15 interviewees, the study collects research data which is the manually analyzed using thematic analysis. Findings highlight that the need for clear legal and regulatory frameworks, pilot implementations of blockchain technology, and higher levels of cohesive training between the companies and their employees may all help reduce the implementation challenges of blockchain in the UAE. This study contributes to the steadily growing body of academic research that focuses on blockchain relevant topics including its proliferation and integration in the UAE's industries and offers valuable insights regarding the same.

1. INTRODUCTION

The world of blockchain technology has become a fast-growing disruptive technology in every industry with its decentralized, transparent, and secure system proposing innovative methods to transact business transactions and project management. It has one of its most striking uses in the use of smart contracts which can be used to automate and enforce agreements without intermediaries necessary (Razmak et al., 2018; Murtaza et al., 2024; Yasir et al., 2024). This technological change is of special interest to finance, information technology, and construction industries whose efficiency, accountability and trust are a must. Within the framework of the United Arab Emirates (UAE), the country that aims to become a digital transformation center of the world, blockchain implementation is a chance and a challenge that organizations that wish to become better competitors and perform more effectively (Sihag et al., 2024; Treacy et al., 2025; El Khatib et al., 2023).

Although blockchain technology has tremendous potential, the diffusion of the new technology into mainstream business activities is hindered by major obstacles. Problems like lack of clear legal frameworks, regulation ambiguity, and organizational preparedness are obstacles to large scale adoption. The alignment of blockchain systems with the existing processes is an issue that

companies face frequently, the targeted training might be necessary to enable employees to adjust to new digital settings (Shwedeh et al., 2023; AlQassem, 2022; Kofinas et al., 2016). These issues are especially obvious in the fast-growing market of the UAE, where bold government plans that encourage the use of blockchain should strike a balance between innovation and realistic aspects of execution. It is thus very important to understand what factors can support or limit the implementation of blockchain in such industries as finance and construction in order to make sure that it can be effectively used (AlMidfa et al., 2024; Naim et al., 2024; Khan et al., 2023).

This study attempts to mitigate these issues by discussing the use of blockchain in smart contracts in the fields of finance and project management in the UAE. By conducting a qualitative study based on the semi-structured interviews with the blockchain law, financial analysis, and project management experts, the research would aim to obtain a variety of views regarding the potentials and restrictions of the blockchain implementation. The results add to both scholarly and practical knowledge by illuminating the important needs including clarity of regulation, pilot implementation measures, and organizational training. Through this, this study contributes to the emerging literature on blockchain in the UAE as well as providing practical information to policymakers, businesses, and other industry stakeholders who believe in digital innovation.

2. LITERATURE REVIEW

The literature review discuss the existing research on the subject as well as a variety of relevant and associated areas pertaining to blockchain smart contracts as well as their proposed financial security benefits in project management. The first sub-section focus on the concept of blockchain's relevance in financial security and project management; the second subsection analyze the latest knowledge and trends on blockchain technology in those areas while also focusing on the UAE's approach to blockchain tech and project management as well as financial security as those would also be among the latest knowledge areas. The third subsection would focus on the operational skills which would include the best practices in blockchain-based project management technology which include the global best practices in blockchain adoption, applicability of smart contracts for project costing, risk mitigation strategies, etc. The last subsection would discuss the emerging trends in blockchain for project finance including tokenization of assets as well as DeFi or decentralized finance as well as how the concept would impact financial agreements. Lastly, this information would be analyzed to determine the gaps in the literature review, including how the current body of knowledge would benefit from this paper's contribution to the same.

2.1. Blockchain Technology in Financial Security & Project Management

2.1.1. Relevance of Blockchain Technology

Blockchain technology has emerged as a transformational element in both project management and financial security, particularly when it comes to project agreements and financial contracts (AlShawabkeh et al., 2016; AlKatheeri et al., 2025; Naim et al., 2025). There are several factors that make it valuable and relevant to contract management for both finance and project(s) including (1) decentralization, (2) immutability, and (3) transparency. Those enable blockchain to create contracts that can overcome bureaucratic inefficiencies and augment their effectiveness using automation (Alzoubi et al., 2024; El Khatib et al., 2023; Joghee et al., 2024).

To begin with, for project management, blockchain technology ensures that all project-related data is stored in decentralized ledgers which makes it tamper-proof and transparent (Alshurideh et al., 2022; AlNajdawi et al., 2024; Ma'asor et al., 2023). As such, all the stakeholders in the project would have access to the data in real-time and no unauthorized parties would be able to edit or tamper with the information (AlHamadi et al., 2024; El Khatib et al., 2023; Khan et al., 2024). Additionally, this would ensure that in any project, the parties would see the real-time updates on the work and also know the rates as connected by the internet or WWW sources (AlShawabkeh et al., 2017; Maydybura et al., 2024; Karthika et al., 2024). One of the sources of corruption in projects happens from the pricing discrepancies in the market price of the products and their order price in the tender; blockchain technology can eradicate such loopholes that many project stakeholders may use to exploit for their own benefits (Alkatheeri, Alhosani, El Khatib, & Alteneji, 2023). Specifically, the concepts to be used for this are the proof-of-work protocol which could be used in the contracts

to ensure that the deliverables are being provided by each party which are compulsorily subject to the progression of the contract (Shwedeh & F., 2021; Shao et al., 2025; Kabiraj et al., 2009). Similarly, costs can also be allocated such as seen in a research by (Amoah & Oh, 2021) wherein the resource allocation was automatically conducted only once the parties had submitted their promised deliverables in the project.

Blockchain technology can also help minimize disputes and uncertainty between parties in the event of disagreements or arguments (Alzoubi et al., 2025; El Khatib et al., 2024; Kanwal et al., 2023). Because instructions in smart contracts are coded at the time of their creation, there is no possibility for any party to 'betray' the others or cheat them for their self-benefit (Neyara Radwan et al., 2025; El Khatib et al., 2022; Joghee et al., 2020). Lastly, because those aspects are not being tracked manually, the overall amount of manpower needed to handle them would also be lower – thereby reducing the fixed costs associated with the projects' management and ultimately benefitting the stakeholders (Jadidoleslami & Azizi, 2022).

As for the financial aspect of contracts, blockchain contracts are immutable – meaning that once they are recorded, they cannot be altered (Shwedeh et al., 2024; Khan et al., 2024; El Khatib et al., 2023). This provides considerable protection against data tampering and fraud by various parties in projects; it also enforces responsibility upon all the parties in a contract for them to fulfill their responsibilities (Masud, et al., 2024).

This makes blockchain technology optimal especially for contracts wherein risks are high or the capital involved is considerable, such as for construction businesses (Alshurideh et al., 2025; Sihag et al., 2024; El Khatib et al., 2022). Also, blockchain technology can be combined with newer technologies such as artificial intelligence (AI) and machine learning (ML), thereby making them more versatile and encouraging meaningful collaboration between parties since human errors can be reduced through automation (Nakonnechnyi, Saiko, Pliushch, Lutsenko, & Mordvyntsev, 2024).

2.1.2. Importance of Blockchain in UAE's Digital Economy

Blockchain technology can play an instrumental role in the UAE's digital economy. Primarily, it can be used to boost the efficiency and security of financial transactions, especially for cross-border payments for trade (Joghee et al., 2018; Alzoubi et al., 2025; Som et al., 2023). Emirati banks such as Emirates NBD and Abu Dhabi Commercial Bank (ADCB) have investments in blockchain-based payment solutions which have been developed with the aim to increase transaction speeds and reduce associated costs (Bonafide Research, 2025). The UAE economy is also poised to develop from the integration of blockchain in financial services as well as through smart contract creation in various areas or aspects, which include automation of transactions as well as the reduction in the number of intermediaries through decentralization of finance or DeFi (Kharbat et al., 2017; Anifa et al., 2024; Salloum et al., 2024). This can boost security of contracts as fewer parties involved means a simpler structure leading to more efficiency and transparency in the financial ecosystem (Archway Finance, 2024).

Additionally, the regulatory framework of the UAE is also supportive towards blockchain adoption as well as exploration of applications for the decentralization technology (Al-Qassem et al., 2024; Naim et al., 2024; AlKurdi et al., 2023). This can be noted through the establishment of the Dubai Virtual Assets Regulatory Authority (VARA) as well as the support from the Dubai International Financial Centre (DIFC) (Heaver, 2024).

2.2. Latest Knowledge and Trends on Blockchain Technology in Financial Security & Project Management

Some of the recent and relatively newer trends in blockchain can be discussed in this section, particularly pertaining to financial security, project management, and contracts.

2.2.1. Central Bank Digital Currencies (CBDCs)

Firstly, the concept of CBDCs need to be discussed, including the Central Bank Digital Currencies. This is still an experimental concept that is being examined by the BIS or Bank of International Settlements (Kumar et al., 2024; Ahmed et al., 2024; Alshurideh et al., 2024). The idea here is that financial inclusion still remains a challenge for many countries as well as the current digital payments systems have inherent risks which could compromise the security of individuals involved therein (Yas et al., 2024; El Khatib et al., 2024; Alblooshi et al., 2025). Introduction of currencies that are created and maintained on the blockchain and/or linked to digital assets could potentially

add an extra layer of security to transactions (Auer, et al., 2021). Current systems and research studies are being conducted by major organizations in the IT and tech sector such as IBM on how CBDCs would operate on blockchain networks, thereby providing immutability to transactions (Al-Qassem et al., 2021; Rana et al., 2025; Halder et al., 2024). This would also likely boost public confidence in their respective governments (IBM, 2023).

From the author's perspective, incidents such as the government printing too much money as Zimbabwe did in 2008 and Weimar Republic did so in 1919 – 1933 after WW I, thereby causing hyperinflation, could be avoided.

2.2.2. Blockchain-as-a-Service (BaaS)

Another technology that is currently being explored is the concept of BaaS or Blockchain-as-a-Service; the concept of BaaS is to provide blockchain-based platforms as a service to companies on the basis of contracts or smart contracts (Khatib et al., 2024; Hanaysha et al., 2021; AlNajdawi et al., 2024). In other words, when companies find it too expensive and/or time-consuming for them to create their own blockchain systems, they can approach a BaaS provider and then enter into a smart contract that is facilitated on the blockchain of the BaaS company as per their requirements (Kanwal et al., 2023; AlMidfa et al., 2024; El Khatib et al., 2023). This can be beneficial to companies that need blockchain technology for specific contracts or projects but do not have the funds or the time to build their own system, or even if they do, they may not find it cost-effective in terms of payoff to do so (Onik & Miraz, 2019).

2.2.3. Tokenization of Real-World Assets (RWAs)

Lastly, the tokenization of real-world assets or RWAs is also an experimental concept that is currently being examined in the blockchain technology space (Alzoubi et al., 2024; Pande et al., 2024; AI-Nakeeb et al., 2024). Although there isn't much clarity yet on the widescale implications of tokenization of RWAs, the research conducted by (Baltias, Sondore, Karlsen, & Putnins, 2024) explains that this could yield considerable economic gains through increased efficiencies and reduced transaction costs (Karthika et al., 2024; Naim et al., 2025; Murtaza et al., 2024).

The author's logical rationale of tokenization of RWAs could be considered through examples seen in the case of both real estate and that of works of art (paintings, sculptures, etc.) which are usually illiquid, but they can benefit from fractional ownership (Treacy et al., 2025; AlKatheeri et al., 2025; Shehab et al., 2023). This may boost their liquidity as when their costs is distributed into various parts, those can be purchased and/or sold or traded with ease (AlShawabkeh et al., 2023; Shao et al., 2025; Ilyas et al., 2023). Furthermore, this could potentially be carried to over assets which have high valuations and therefore fractional ownership would help make them more accessible to investors.

2.2.4. Sustainability in Infrastructure & Construction Industries

Another current trend and/or emerging area of study in blockchain technology is its connection to sustainability. A study by (Cheng, Chong, & Xu, 2024) discovered the connections of SCs or smart contracts to sustainability – it suggested that construction projects tend to be quite wasteful sometimes due to their changing nature of requirements and scope of the project (Khan et al., 2023; Rosmadi et al., 2025; Kukunuru et al., 2019). This could be connected to three aspects or areas including (1) economic factors, through cost and savings and improved productivity as the project scope would not changing continually therefore the number of overtime hours would be lower, (2) social factors, as the safety would be ensured for all the stakeholders involved and they would not be cheated or betrayed by the project being dragged on for unreasonable factors, and (3) environmental factors, including energy efficiency and waste reduction which would be ensured by the projects having more of definite factors (Joghee et al., 2024; AlShawabkeh et al., 2021; Joghee et al., 2021).

Other researchers such as (Owotemu & Ibaru, 2025) explained how smart contracts can help reduce corruption and unnecessary costs in projects related to infrastructure and construction especially in the African countries; because with smart contracts the overall scope is fixed, the process has a more defined path and can thus be completed on time or sooner.

2.2.5. Supply Chain Resilience

Furthermore, blockchain has also been connected to supply chain resilience and sustainability; the primary reason for this is that when the supply chain is maintained correctly and periodically, the final result are that the goods are delivered on time to the customers (Vij et al., 2025; Kharabsheh et al., 2024; Kabiraj et al., 2009). Also, apparently,

blockchain can also help reduce the amount of wastage that happens in supply chain as per (Manzoor, Sahay, & Singh, 2022). This could be because no single computer or location stores all the data so in the event of any kind of failure in the supply chain due to technical reasons, the entire SC not be afflicted (Stančić & Bralić, 2021).

2.2.6. Green Blockchain & Sustainability

Lastly, blockchain technology has also been connected to the concept of 'green blockchain' wherein it is believed that decentralization can help support the principles of sustainability (Alzoubi et al., 2025; Ma'asor et al., 2023; Nuseir et al., 2021). In a study conducted by (Kozar & Wodnicka, 2024), more than 205 scientific publications published between 2017 to 2023 were reviewed to determine how blockchain could impact the energy sector and related concepts (including sustainability) (AlQassem et al., 2022; Lee et al., 2024; Khadragy et al., 2022). From the 25 key research areas it identified, blockchain and sustainability were found to be combined. It suggests connections between energy efficiency, traceability, and decentralized energy systems, but also mentions the risks arising from high energy consumption due to overreliance on computing power (AlShawabkeh et al., 2018; Joghee et al., 2023; Sun et al., 2016). One of the potential ways to identify this would be to focus on the concept of decentralization – since records are stored in a decentralized ledger, no single computer or single computing location has to handle all of the data storage (Samer Hamadneh et al., 2023; Alshurideh et al., 2022; Tangri et al., 2023). This could translate to lower power requirement or lower computing requirement per computer logged into the system. However, to make this happen, it is perhaps important that the regulatory frameworks are aligned with the industrial developments (Bada, Damianou, Angelopoulos, & Katos, 2021).

2.3. Operational Skills: Best Practices in Blockchain-Based Project Management

2.3.1. Best Practices in Blockchain Adoption

This section details some of the best practices in the form of case studies from the United Arab Emirates related to adoption of blockchain technology and similar from neighbouring countries. The case studies are sourced from (WEF, 2020).

2.3.1.1. Case #1: DP World's Blockchain-Enabled Verification

DP World is a Dubai-based logistics company that previously faced several inefficiencies and challenges in their trade and logistics business; they were dependent on paper-based correspondence and documentation which made the process cumbersome and time-consuming (AlHamadi et al., 2024; El Khatib et al., 2023; Nuseir et al., 2019). Verification of files and entries was also conducted manually due to which they suffered considerable losses on time and their services were sometimes unable to keep up with the requisite deadlines as set by their clients (Tanveer et al., 2025; Kofinas et al., 2016; El Khatib et al., 2024). Because delays in logistics can be expensive, the company decided to shift to blockchain technology.

Particularly, two use cases of blockchain technology were applied in this situation, including:

1. Development of a unified blockchain platform wherein new free-zone customer registrations would be managed efficiently, including registration, licensing, and memberships – all consolidated in one platform, and
2. Digitalization of trade documents including logistic certificates for both vessel entry and exit(s) from the ports, export authorization(s), and certificates of origin (COO).

To proceed, the company (DP World) worked on building a permissioned blockchain which enabled secure data sharing and process automation through SCs (smart contracts) and open API(s) (Yasir et al., 2024; AlKatheeri et al., 2025; Rana et al., 2025). The platform was developed via iterative deployment cycles, supported by stakeholder agreements on a step-by-step format along with training workshops conducted periodically. Additionally, the company measured its success through various metrics such as (1) no. of users onboarded on the blockchain system, (2) number of documents record on the blockchain including those of shipments and vessels, (3) reduction in the lead times on key shipping routes, and (4) overall revenue and increased profit earned from cost savings via (1), (2), and (3) (Anifa et al., 2022; Al-Kassem & A. H., 2021; Kurdi et al., 2025).

2.3.1.2. Case #2: Emirates Airlines' Loyalty Program Enhancement

Emirates Airlines partnered with a company

named 'Loyyal' which enabled them to integrate blockchain technology into their loyalty programs. The idea here was to boost customer retention and reduce the associated costs with retaining customers and increasing the number of recurring customers (Alshurideh et al., 2024; Alblooshi et al., 2025; AlQassem et al., 2025).

The program was also targeted at making Emirates more attractive for new travellers who were to choose a carrier for their business flights. It was also important that the blockchain system did not replace the existing systems but rather augment them (Maydybura et al., 2024; AlQassem & A. H., 2024; Khan et al., 2024). This would ensure that the existing or legacy systems would continue to function and their training would not be in waste (meaning that the partners and employees who learned the software would not have to replace that with new knowledge) (AlShawabkeh et al., 2021; El Khatib et al., 2023; Pande et al., 2024).

After the blockchain system was developed and rolled out such that it would work in parallel with the legacy infrastructure, the company eventually completed their rollout in 2019-2020 (AlShawabkeh et al., 2014; Kanwal et al., 2023; Nazeer et al., 2025). This enabled several benefits for the company as well as for its members; for example, there was instant loyalty points earning and redemption for Skywards Miles for all partners; reporting also improved and operational overheads reduced (Alshurideh et al., 2025; Khatib et al., 2024; AlKurdi et al., 2025).

However, some of the challenges that Emirates Airlines had to face included the development issues with the MVP or minimum viable product to production whilst maintaining strict compliance to requirements as well as gaining stakeholders' confidence for the new technology (Alzoubi et al., 2024; Razmak et al., 2018; El Khatib et al., 2022). The UAE government's initiatives that were supportive of blockchain development could also be attributed to this.

2.3.1.3. Case #3: Emirates NBD Fraud Detection Systems

Emirates NBD had an issue with cheque fraud, which also happened to be a problem in many Gulf countries wherein a party would issue a cheque to another, and then right before the date of the cheque being honoured, they would attempt to withdraw their funds and then abscond out of the country and/or simply use advanced techniques to counterfeit cheques (AlNajdawi et al., 2024; AlShawabkeh et al., 2013; Yas et al., 2024). Emirates NBD as a bank issues almost 1 million cheques on a monthly basis, which accounts for nearly 30% of total UAE clearing volumes, and therefore cheque fraud would've costed the bank considerable amounts of money.

To resolve this, they worked on registering cheque-based transactions on a private blockchain ledger. Also, a 20-character alphanumeric string was embedded into the cheques' MICR band to further improve verification (Al-Kassem et al., 2022; Kharbat et al., 2021; Shwedeh et al., 2024). The blockchain's records were connected to the string to help ensure a tamper-proof audit trial for authenticity of cheques whilst also improving traceability and security. The project was launched following a pilot partnership with the UAE Central Bank in 2017-2018; in one month, 1 million cheques were registered while by the end of 2019, about 35 million cheques were mined on the blockchain and cheque fraud dropped by 99% (Joghee et al., 2020; AlQassem, 2022; Karthika et al., 2024). Furthermore, the Emirates NBD has since then begun working on the next instrument, the e-cheque, a digital cheque instrument which could be used to make payments without involving physical cheques.

However, some of the challenges involved lack of confidence of stakeholders on the technology and also finding ways to integrate asynchronous blockchain consensus with the centralized banking systems. Success could be attributed to a proper, clear roadmap, stakeholder engagement, and finally, striking a balance and alignment between business outcomes and technical feasibility.

2.3.1.4. Case #4: Etisalat's Invoice Discounting Blockchain Solution

In recent years, SME trade finance frauds have increased, primarily due to invoice fraud and forgery. To address this, Etisalat Digital worked on launching the UAE Trade Connect (UTC) in June 2019, which was a blockchain-based platform that was designed to help detect fraudulent documents and duplicate invoices across banks (Som et al., 2023; El Khatib et al., 2023; Shwedeh & F., 2022).

Technically, this is made possible through a permissioned blockchain network which enables banking partners to share and validate invoice data securely without compromising the confidentiality of clients (Alzoubi et al., 2024; Shwedeh, 2022;

Ahmed et al., 2024). When launched in June 2019, the UTC network had about 8 major banks including Emirates NBD, FAB, and Mashreq Bank (among others) which then grew to later years. The system integrates artificial intelligence (AI) and machine learning (ML) algorithms for advanced level fraud detection including document manipulation and overpricing or under-pricing; this also includes detection of anomalies (Alshurideh et al., 2022; Joghee et al., 2018; Kumar et al., 2024).

The UTC helped to address a major risk in the country wherein 3.75 million fraudulent transactions yearly could otherwise have resulted in losses of at least $435 million or more. In this digital consortium, Etisalat Digital leads the way across three areas including (1) IT integration, (2) business requirements, and (3) regulatory compliance. The UAE Trade Connect platform is maintained as a joint venture to distribute the risk and resource requirements

The scope of the project was determined to be the biggest challenge in this case as integrating multiple banks or banking partners would have considerable policy and regulatory frameworks and compliance requirements to be fulfilled.

2.3.1.5. Case #5: Maersk and IBM's TradeLens' Failure

In 2018, the global shipping and logistics company, Maersk, decided to form a partnership with IBM, the American IT and tech company to create a blockchain-enabled platform to help Maersk with tracking its shipments and logistics.

One of the biggest challenges that the shipping giant was facing previously was that the company was losing money due to various kinds of fraud taking place across its shipments and routes with packages being stolen, fraudulent receipts, discrepancies and confusions with their data management, issues in communication with the port authorities, etc. Maersk wanted to keep their logistics and supply chain with minimal uncertainty, so they decided to turn to blockchain wherein the records of the shipments and the cargo would be maintained in real-time in the distributed ledgers. Since they lacked the technological know-how for this, they approached IBM.

2.3.1.5.1. Project Goals and Implementation

The primary goal or objective of the TradeLens platform was to work as a unified, secure environment wherein all the authorized stakeholders could see the packages' tracking details in real-time. This would include carriers, port operators, customs authorities, financial institutions, freight forwarders, etc. Because the platform was created for the purpose of surveillance, it was named TradeLens (AlShawabkeh et al., 2023; Shwedeh et al., 2024; El Khatib et al., 2024).

TradeLens was built on the Hyperledger Fabric technology; this allowed for it to seamlessly work with smart contracts on an open-source blockchain that would be supportive for the parties as well as efficient to utilize. As a result, smart contracts could be developed and automated with documentation on the platform with full-support for/towards contractual processes for the stakeholders (Jovanovic, Kostić, Sebastian, & Sedej, 2022).

2.3.1.5.2. Key Features of TradeLens

The TradeLens platform had several features which were quite helpful in minimizing the chances of fraud taking place due to delays and discrepancies in the coordination of the various authorities between ports and the office teams of Maersk. The features have been listed below:

- Real-time data sharing across the parties authorized in the supply chain
- Trade documentation digitalization which includes things like bill of landing, customs certificates, etc.
- Smart contract integration to help build automation of settlements and enforcement of contractual obligations
- End-to-end cargo tracking with real-time digital visibility for understanding condition of package with their respective delivery deadlines.
- Automated verification of documents against their respective DocuSign IDs to reduce the time needed for tracking authentication from parties.

Within 2 years of its inception, the project led by Maersk had several parties and other companies who joined the project and registered on the blockchain. Although exact figures vary, but the venture led by Maersk and IBM stirred up considerable traction and momentum.

For a time being, it seemed that the project was going well; however, this was not the case.

2.3.1.5.3. Failure and Shutdown

However, much to the dismay of Maersk, the project did not succeed. In the Q1 2023, TradeLens

shut down and the venture between Maersk and IBM was considered to be an unsuccessful endeavour.

With that said, it is worth noting that their project did not shut down due to technological reasons, but rather due to organizational and corporate risks (AlAmiri et al., 2024; Hanaysha et al., 2021; AlQassem et al., 2024). For example, many competitors of Maersk were reluctant to onboard upon a platform that was created by their direct rival; reasonably, they feared that their data security was at risk and that it was simply not prudent to trust a rival with one's sensitive details such as financial transactions and cargo based details which would likely have more visibility on the blockchain. This was not acceptable as the rivals feared the leaking of their trade secrets due to which they would've been compromised (Jovanovic, Kostić, Sebastian, & Sedej, 2022).

2.3.1.5.4. Lessons Learned

As a blockchain system, TradeLens did what it was intended for correctly; however, the failure of the venture demonstrates that aside from technical successes, there also needs to be sufficient governance and control. Some more things that may be derived from this are:

- Neutral governance models may be better for ensuring stakeholder trust and ecosystem's scalability; in this case, Maersk had considerable decision-making power due to which its rivals did not trust the system.
- Blockchain integration needs to consider existing infrastructure and ensure that legacy systems can be smoothly transitioned from; in some cases, companies may not want to switch from legacy systems to blockchain if it turns up being too expensive and/or time-consuming.
- Stakeholder engagement needs to be the key from the early stages; TradeLens may have been a success if the company sought a consortium or consensus-based model to developing the platform as opposed to simply working alone.

2.3.2. Barriers to Blockchain Adoption

One of the prominent challenges to blockchain adoption which may hinder the growth and development of the technology and emphasis on best practices is the current global banking governance structures which are deemed inadequate to accommodate newer technologies (Kabiraj et al., 2011; Joghee et al., 2021; Rosmadi et al., 2025).

In the GCC, one of the biggest challenges to blockchain adoption would be the differences in coordination although there appears to be a lot of support from major GCC players like the UAE which have historically been well-focused on blockchain adoption even before their peers did; this was reflected in the UAE's Blockchain Strategy 2021 wherein the UAE Government had aimed to have nearly about 50% of government transactions performed on decentralized ledger technology by 2021 (Alzoubi et al., 2024; Anifa et al., 2024; Shao et al., 2025).

The governmental interest seemed to be common for blockchain tech and decentralization. Although the GCC countries have seen quick developments and implementation in the case of sectors like finance and logistics, blockchain continues to remain a regulatory uncertainty; additionally, high setup costs, regional shortage of deep technical expertise are all geared towards relatively difficult progression to improved adoption. In the study by (Alshhadat, 2023), it was discovered that nearly 60% of the surveyed companies suffered a lack of skilled, technical personnel which was their biggest barrier. This was succeeded by unclear regulations which accounted for 55% of the challenges that prevented companies from moving over to decentralization technology (Joghee et al., 2013; Habbal et al., 2019; Alshurideh et al., 2025). Additionally, there appeared to be lack of public awareness as well as cultural resistance to adopting new technologies. The study emphasized that transparency and operational efficiency have both been high and driving factors of morale, but the lack of a coordinated, cross-border regulatory framework that could achieve at least some level of standardization in both education (training, learning, and development) as well as infrastructure (cloud native systems), further adoption and implementation may continue to suffer.

2.3.3. Blockchain Applications in GCC Countries

In another paper published by (Alsakhnini & Almoaiad, 2024), the UAE has been identified as the regional leader in blockchain technology and adoption, and rightfully so, as the Dubai Blockchain Strategy initiative which aims to move about 100%

of the government transactions to the blockchain by 2030 to save nearly 25.1 million hours of economic productivity per year is an ambitious administrative goal. Additionally, the Dubai Health Authority (DHA) has both worked on moving patient records to the blockchain and since 2020, the organization has also adopted decentralization technology for issuing licenses and certificates of doctors. The primary benefit here is that because certificates are stored in the blockchain, they can be verified easily via the Sheryan Licensing System which works by generation of unique license number and barcode to help authenticate licenses. In Bahrain, blockchain has been researched extensively for cross-border payments and regulatory reporting (Media Desk, 2020).

At the government and central banking levels, the UAE and the Kingdom of Saudi Arabia have launched a joint pilot project codenamed 'Aber' that utilizes blockchain technology to facilitate interbank payments between Saudi Central Bank (SAMA) and the Central Bank of the UAE (CBUAE) via Distributed Ledger Technology (DLT). Two specific blockchain platforms were utilized including Corda and Hyperledger Fabric which were used to determine the interoperability between the banks. The Aber payment system achieved transaction processing speeds of <2 seconds and completed >150,000 transactions within reasonable timeframes. Additionally, the TPS or transaction per second was recorded to be 100. Aber's full-node operations focused on decentralization, privacy, resilience. Additionally, both central banks tested security, fault tolerance, and latency under high transaction volumes. The system was deemed to be more efficient and privacy-focused compared to existing systems (Saudi Arabia Central Bank, 2020).

2.3.4. Emerging Blockchain Technologies

In 2025, there are some emerging blockchain technologies which are still in their nascent stages. This subsection focuses on those areas.

Firstly, hybrid blockchain solutions are one of the new trends that have come up; they integrate both public and private blockchain networks to benefit from their interoperability and increased scalability and security. Hybrid blockchains currently own 42% of the total blockchain market, amidst which banking and financial services sectors are the second largest end user sectors with 20% market share; infrastructure solutions are the 1st with about 40% market share. Between 2025-2030, Asia is expected to grow about by 61.8% CAGR in this area, including blockchain, IoT, and artificial intelligence (AI) (BusinessWire, 2025).

The second area which appears to have major promise in the upcoming years is the concept of DAI or decentralized AI; this is convergence of blockchain and artificial intelligence and/or the use of AI in decentralized systems to ensure data integrity and privacy. The idea here is that because AI systems need their own knowledge repositories, the same should not be stored in one place. Decentralization ensure that data sharing happens over secured channels and cooperation is incentivized between stakeholders (Salinas, 2025).

2.3.5. Gaps in Literature Review

As has been evident thus far, the current literature on blockchain is certainly substantial. However, the study identifies some limitations or gaps in the literature research. Firstly, the current studies are more focused on the technical dimensions of blockchain technology such as TPS or transactions per second or the system bandwidth, but they do not shed as much light on the overall business perspectives, including how the technical changes impact the business outcomes of companies.

There also appears to be a notable lack of focus on how blockchain adoption translates to tangible business results in real-world project management. Some studies address blockchain adoption challenges, but they do not account much for inter-industry challenges to adoption; what may be a challenge for one industry may not be for another. For example, challenges pertaining to blockchain adoption in contracts in the construction sector may be different from their banking, IT, or financial services counterparts.

Another gap lies in the geographical scope of the existing research, which happens to be predominantly globally focused rather than emphasizing the UAE and Middle Eastern contexts. In particularity, there appears to a dearth or shortage of studies which focus on blockchain adoption in the UAE and GCC countries.

Furthermore, there appears to limited academic focus on how blockchain adoption affects stakeholder relationships, including contract transparency, and their mechanisms of enforcement. Lastly, the regulatory frameworks and existing policies in the UAE related to blockchain adoption have not been discussed

enough.

Those highlighted areas suggest and identify the need for more context-specific research on the subject of blockchain adoption and how it affects contracts in project management and other related industries in the UAE.

3. Research Methodology

3.1. Research Design

The research paper develops a qualitative research design that focuses on understanding the practical implications of blockchain-based smart contracts on project management and financial security in the Emirate context. A semi-structured interview approach was deployed to collect in-depth insights from industry experts across 3 domains, including project management (in construction, IT, and finance sectors), blockchain development, and legal practice.

In the coding, the respondents have been coded as 'R01, R02, R03, R04… R15'.

3.2. Research Framework

The research framework has been illustrated as shown below; semi-structured interviews were conducted with 15 interviewees with varying levels of experience across different sectors chosen via a non-probabilistic method of sampling. Then their responses were collected along with the main statements noted in the details and then thematic analysis was performed; this involved text categorization and sentiment evaluation; this helped understand our study.

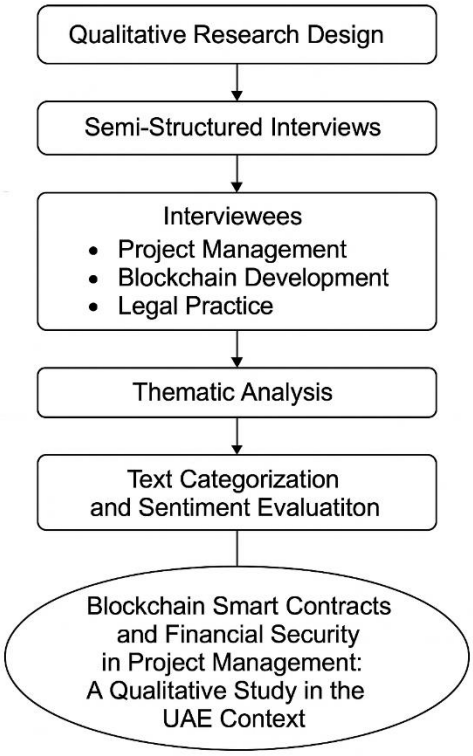

Figure 1: Research framework. Source: Author.

3.3. Data Collection Details

3.3.1. Sampling Technique

The study applied purposive sampling method to select 15 participants who had the relevant expertise in project management, blockchain management, and legal aspects of blockchain contracts. Interviews were conducted online or in-person depending on the availability of the individuals; transcription was not allowed, but notes were taken down with the prior consent of the respondents.

3.3.2. Interview Questions

Table 1: Interview questions could be divided into three categories (Tech, Risk, Trust), as given below:

Sr. No.	Code	Interview Questions
1	Q_Tech1	How can blockchain technology improve financial contract security?
2	Q_Tech2	What blockchain features are most beneficial to cost control in project finance?
3	Q_Tech3	How does blockchain's transparency determine fraud prevention in financial agreements?
4	Q_Risk1	What are the primary risks to be mitigated by blockchain in project finance?
5	Q_Risk2	What are the implementation challenges associated with blockchain in project management?
6	Q_Risk3	What regulatory barriers exist in the UAE for blockchain implementation in the industries?
7	Q_Trust1	How do smart contracts influence trust between project stakeholders?
8	Q_Trust2	How blockchain contracts influence collaboration between project partners and investors?

Next step is the data analysis methods.

3.4. Data Analysis

Interview responses were analyzed through manual thematic analysis supported by IBM SPSS Statistics 27.0; each response was reviewed and coded using predefined themes. The thematic coding structure is given below.

Table 2: Thematic Categories

Variable	Thematic Categories (Codes)
Q_Tech1_Category	Security, Transparency, Blockchain Smart Contracts, Contract Auditability
Q_Tech2_Category	Cost Control, Budget Monitoring, Process Automation, Claim Disbursement
Q_Tech3_Category	Fraud Prevention, Transaction Traceability, Ledger Transparency
Q_Risk1_Category	Technical Risk, Manual Processes, System Incompatibility
Q_Risk2_Category	Implementation Challenge, Resistance, Skills Gap, Legacy Systems
Q_Risk3_Category	Legal Risk, Regulatory Uncertainty, Jurisdictional Variation (in UAE)
Q_Trust1_Category	Trust Building, Automation, Stakeholder Confidence
Q_Trust2_Category	Shareholder Collaboration, Dispute Reduction, Brand Visibility

Furthermore, each response was tagged with a sentiment code dependent on the context and tone using the values given below.

Table 3: Interpretation

Sentiment Code	Interpretation
Positive	Beneficial, confidence-inspiring, trustworthy, and successful
Neutral	Balanced view, pragmatic rather than optimistic or pessimistic, descriptive observations
Negative	Critical perspective, focused on the limitations, risks, concerns

The thematic and sentiment values were stored as the new variables in the dataset used in the study by their code names such as Q_Tech1_Category, Q_Risk2_Category, etc. This was then analyzed in SPSS v27.0 using frequency counts and CROSSTABS (cross-tabulations).

This enabled us to have both qualitative depth and structured, comparative information about blockchain's connection to the issues identified in the study.

4. Findings & Analysis

4.1. Overview

This subsection represents the overview from the interviews conducted with over 15 professionals who hailed from various fields such as IT, construction, and finance. Their roles ranged from blockchain developer to legal expert in blockchain law as well as project manager in construction companies, and more.

Responses were analyzed and categorized thematically including three core areas being identified as – technological benefits, implementation challenges, and stakeholder trust. Furthermore, responses were coded with thematic labels such as Cost Control, Security, Legal Risks, and Transparency with sentiment tags including Positive, Neutral, and Negative. Coding here was manual but the analysis was conducted via IBM SPSS 27.0 via frequency counts and cross-tabulations via role and industry.

4.2. Blockchain's Perceived Benefits in Project Management

In project environments and project management, the main factors that added to the perceived value of blockchain technology included enhancement in financial security, better cost control, and higher levels of transparency. Those were emphasized by project managers across both financial services as well as construction and real estate sectors, as well as blockchain developers and other professionals in the study who had experience working with smart contracts.

4.2.1. Smart Contract Enforcement

Security emerged as a prominent benefit in discussions pertaining to blockchain's ability to automate execution of the contractual terms and conditions on the basis of fulfilment of terms and

conditions to prevent modification or tampering with them as well as enforce payment integrity. Respondents from both industrial and managerial backgrounds referred to SCs or smart contracts as tools to reduce dependency on manual approval processes while minimize chances of fraud.

"Blockchain helps secure payments to contractors through smart contracts." – R01, Project Manager in Construction

"Smart contracts enforce compliance with investment covenants automatically." – R02, Blockchain Engineer in Financial Services

Legal professionals who took part in the interview also mentioned the concept of contract auditability which supported tamper-resistant evidence that would help play an important role in managing financial disputes.

4.2.2. Cost Control and Fiscal Efficiency

Blockchain has also been recognized as an efficient tool in managing cost-related factors by participants in the interviews from different sectors.

Respondents mentioned the capabilities of blockchain to reduce overhead costs, remove non-essential intermediaries, and boost payment processes through connecting them to performance milestones (as in, the payments would be automatically disbursed whenever there is a deliverable completed).

"Cost control is driven by reducing back-office processing costs." – R05, Digital Banking Project Manager

"Real-time smart contract execution means budgets auto-adjust to resource consumption." – R04, IT Program Manager

4.2.3. Transparency and Fraud Prevention

Lastly, blockchain added a major level of trust to contract management, primarily because of its immutable nature and traceability with solid audit levels. It is nearly impossible to manipulate bills or records because of the immutability which means that because the records are stored on the blockchain, no single party would have as much power to edit them.

Hence, many types or kinds of frauds are virtually impossible to commit by cybercriminals when blockchain technology is used to retain financial records. Also, because the ledgers are shared or decentralized, any attempt to edit any entry would be noticed immediately by the parties with a copy of the ledger – this would help prevent fraud pre-emptively.

"Our contracts include real-time fraud monitoring, now if conditions are violated then the execution halts automatically." – R06, Senior Blockchain Architect, Finance

"Using an open ledger, we can spot irregularities in fund flows instantly." – R09, Legal Consultant, Blockchain Law

4.2.4. Cross-Industry Similarities/Patterns

From the interviews, the following patterns could be identified –

- Project managers focused on the reliability of smart contracts to ensure smooth execution of projects' deliverables
- Blockchain developers focused on automation logic and other technical variables
- Legal professionals focused on the immutability of smart contracts and lower risks of fraud

4.3. Challenges to Adoption and Implementation

Although the potential of blockchain is recognized, many individuals still remain sceptical about the technology. Some of the reasons for this include the technical limitations of blockchain as it is still considered to be a relatively new technology, organizational resistance to adoption due to lack of interest by employees, and regulatory ambiguity. Those challenges appeared to be more pronounced in the interviews given by legal experts and project managers.

4.3.1. Technical Challenges and Implementation Concerns

Perhaps the most problematic thing about smart contracts or blockchain contracts is that it is quite easy to get them wrong; there are smart contract bugs, integration challenges, and problems like chain congestion, all of which can be practical hurdles or hindrances to its adoption. Developers noted that flawed contract logic could cause irreversible errors and this could have major consequences especially in the financial sector.

"If coded wrong, funds can be locked or misrouted permanently." – R06, Blockchain Architect, Finance

"Smart contracts don't account for force majeure unless specifically coded" – R12, Project Director, Construction

Interviewees also reported the challenges with regard to integration of blockchain systems with their current systems and even legacy hardware and infrastructure. Additionally, migration

challenges too were noted.

4.3.2. Organizational Challenges

The main challenge in the organizational context would be the lack of interest in adopting to change; whenever large companies introduce new changes; their employees often do not want to change to newer technologies easily as it means more work for them. Additionally, there is also the lack of responsiveness by various parties involved such as the subcontractors, vendors, etc., who too may have the same mindset.

"Resistance from finance departments who feel blockchain reduces their control." – R01, Senior Project Manager, Construction

"Onboarding partners from traditional ERP systems remains complex due to resistance to change." – R07, Technical Blockchain Consultant, IT

Furthermore, the fear of the loss of control was also one of the driving factors which added to the concerns related to the challenges with organization.

4.3.3. Legal Uncertainties

Finally, legal professionals noted the challenges associated with ambiguity and uncertainty with regards to the enforceability of smart contracts as well as their jurisdictional inconsistencies in the UAE.

"Smart contracts need to be explained carefully to legal teams, and so, they often fear the 'black box' effect." – R09, Legal Consultant, Blockchain Law

"There's a lack of professional certification for smart contracts' legality." – R10, Senior Legal Advisor, Blockchain Law

Although the UAE is a progressive nation, still, regulatory uncertainties need to be dealt with. For this reason, it is important to focus on ensuring that those hurdles are taken care of.

4.3.4. Cross-Industry Similarities/Patterns

- Developers focused on technical risks like bugs and contract flaws.
- Project managers focused on resistance to change.
- Legal experts focused on blockchain regulations and uncertainty.

4.4. Limitations of the Study

The study was conducted within a relatively short span of time; therefore, not much information could be obtained in the quantitative sense. For example, the level of detail in the research would have been different if a mixed-models approach was applied wherein survey was also connected to the interviews connected as they would have likely helped validate them. This was the prime limitation of the study.

4.5. Recommendations

The following recommendations were noted from the case analysis, including –

- Companies must focus on targeted blockchain training to ensure that their employees do not resist changes to the blockchain as much.
- Efforts need to be made to continually bridge the gap between skills of workers and stakeholders against the new paradigms of learning.
- Policymakers must focus on establishing better and clearer guidelines to help boost the benefits of blockchain.
- Pilot projects may be implemented to test the efficiency and viability of projects beforehand.
- Advanced features like automation and smart contracts enforcement may need additional focus and research emphasis before blockchain can be adopted by the masses.

The contributions to the discussion state and suggest that whenever the above-mentioned recommendations are implemented, the result found positive for the overall industry with hopefully more stakeholders being informed enough to take decisions responsibly and viably.

5. CONCLUSION

This study explored and investigated how blockchain-based smart contracts can play a vital role in ensuring and enhancing financial security as well as emphasizing their cost control capabilities in the cases of project management contracts while establishing trust of stakeholders as well in the context of the UAE.

Through a thematic analysis conducted via expert interviews, it could be said that the findings revealed as strong consensus that were mostly in favor of blockchain's capabilities to automate financial contracts, boost transparency, and reduce inter-party disputes. However, challenges still remain – with many of the companies struggling to make their employees accept the adoption of blockchain, for example. Addressing those barriers through correct policymaking, adequate training, and targeted pilot studies may help the UAE

become more familiar with blockchain and also proficient at utilizing its benefits for economic growth and national development.

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