Journal of Islamic Business and Management

2025, 15(01), xx-xx

QUALITATIVE RESEARCH

Smart Participation Contract Matrix for Islamic Banks: An Institutional Theory Perspective

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Keywords

Islamic Contract;
Smart Contract;
Institutional theory;
Design Science Research Method;
Financial Inclusion.

Received: 23 October 2024

Accepted: 27 January 2025

Available Online: 28 January 2025

Abstract

Purpose: This study aims to explore how smart contract (SC) technology can be integrated into the Islamic Banking (IB) system to improve its overall functionality, particularly in terms of operational efficiency and adherence to Shariah principles.

Method: This paper has used design science research method in order to produce an artifact of Islamic smart contract.

Results: The study argues that traditional paper-based Islamic participation contracts (Musharikah) can be digitized into blockchain-based smart contracts for greater efficiency. The matrix synthesizes elements of Islamic contracts and blockchain technology into sixteen constructs, combining the principles of Islamic banking (parties, offer and acceptance, subject matter, and profit/loss sharing) with those of blockchain technology (transparency, immutability, security, and consensus). This integration offers new insights into building core banking structures on blockchain and Islamic banking principles to enhance efficiency, financial inclusion, and institutional legitimacy. Key findings indicate that Islamic smart contracts (ISC) save costs and time while improving efficiency and financial inclusion. However, challenges include Shariah compliance, technological complexity, regulatory fragmentation, and scalability issues.

Implication: This study has implications for Islamic banking industry, banking regulatory authorities and FinTech literature.

KAUJIE Classification: I1, J42, K3

JEL Classification: G21, L51, O33

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INTRODUCTION

Islamic finance (IF) has become an integral part of the global financial system, rooted in Shariah law, which prohibits riba, gharar, maysir, and unethical dealings (Ayub, 2007). Shariah encourages asset-backed financing, social justice, and risk-sharing. Key contracts in IF include Musharikah, Mudaribah, and sale-based contracts like Murabahah, Ijarah, and Salam inter alia (Usmani, 1998; Ayub, 2007). These contracts face challenges due to their reliance on conventional, paper-based systems, which can cause conflicts and inefficiencies. To enhance their competitiveness, innovative techniques like blockchain integration are necessary. Standardization issues across jurisdictions (As-Salafiyah, 2023) and risks of asymmetric information and moral hazards (Nouman et al., 2019) can be mitigated with Islamic smart contracts (ISC). According to Wiwoho (2023), ISC's autonomous characteristics also guarantee observance of Shariah, promote openness, and eliminate potential controversies. Smart contract technologies can both automate transactions, reducing costs and improve performance (Rejeb, 2022). Trust is of utmost importance in any business context among inter-related parties and the solid and open characteristics of blockchain provide this trust (Antova et al., 2020), which calls for its embrace to revolutionize the Islamic Banking (IB) sector (Panjwani & Shili, 2020). Within Islamic Banking, smart contracts provide solutions to traditional Shariah contracts which are expensive and a draw on time because of legal and administrative processes (Hilal & Jamaludin, 2019). Smart contracts are, therefore, able to promote a digital setting wherein operational costs are lower and transaction speed and reliability are higher whilst being Shariah compliant with most aspects of trust being automated.

Islamic banks (IBs) have suffered due to their dependency on the traditional partnership contracts which result in excessive legal costs, administrative hassles, operational delays, and rampant documentation problems (Hilal & Jamaludin, 2019). This results in ineffective operations and puts IBs at a disadvantage in relation to other players in the financial sector. IBs face high inefficiencies in conventional participation contracts, however there is paucity of studies documenting how smart contract can address these challenges. In addition, the limited adoption of SC in IBs environment raises questions over their alignment with Shariah stipulations of justice, transparency, equity along with their ability to eliminate riba, gharar and maysir elements. These calls for further studies to explore the adoption of SC in the context of IBs. Smart contracts have an ability to address these problems by simplifying the contracting processes without violating the principles of Shariah. However, their use in IBs is considerably low which raises important concerns: How can the

principles of Shariah compliant contracts be converted into electronic form? Would the use of smart contracts be consistent with Islamic moral values of justice, equity, and transparency while eliminating riba, gharar and maysir? These questions necessitate examining whether smart contracts align with Maqasid-e-Shariah (objectives of Shariah) to eliminate mafasid (evils) and enhance maslahah (social welfare) (Muneeza & Mustapha, 2019). This conceptual paper seeks to address these issues by advocating for Shariah-compliant smart contracts in Islamic banking. The research question is: How can Islamic Banks effectively innovate smart contracts in their operations and ensure Shariah compliance in digitizing contract details and adhering to ethical standards?

Scott's (2014) institutional theory elucidates how institutions influence behavior through three pillars: regulatory, normative, and cultural-cognitive. The regulatory pillar includes formal rules and regulations, with non-compliance resulting in penalties. For IB, this involves adhering to Shariah law as both a legal and ethical framework. Central bank regulations and Shariah laws can be enforced using smart contracts to automate terms and conditions (Alam & Miah, 2024). Smart contracts ensure alignment with regulatory standards and Islamic finance (IF) principles, enhancing compliance, operational efficiency, and transparency. Regulatory bodies and Shariah boards will ensure smart contracts adhere to Shariah law and national banking regulations (Karbhari, Alam & Rahman, 2020). The normative pillar encompasses values and norms, such as prohibitions of riba, gharar, and maysir, along with risk-sharing and ethical conduct. Islamic banks are anticipated to adhere to and implement robust Shariah-compliant and ethical principles in their operations (Zulkepli, Mohamad & Azzuhri, 2023). Smart contracts can uphold these norms by embedding Shariah-compliant clauses within their code, ensuring all transactions are compliant by default (Alwi et al., 2022). This fosters trust, fairness, and justice among parties. In the context of IBs, the cultural-cognitive pillar is about stakeholders accepting the principles of IF. The cultural perceptions determine the social artifacts that underpin the adoption of smart contracts. In Islamic banking, the trust in the system, the awareness of society and the culture play an important role in the success of deploying smart contracts. The deployment of these measures is expected to contribute to the legitimacy and effectiveness of Islamic banking, a perspective that has been widely recognized by various stakeholders (Usman et al., 2017).

DSRM is an effective framework for building and assessing created objects targeting the resolution of organizational challenges at hand. Originally designed for Information systems, the scope of

DSRM today spans to educations, medicine and business administration (Peffers et al., 2007; Hacker et al., 2017; Hevner, Brocke & Maedche, 2018). DSRM aims to create practical solutions for real-world issues. Peffers et al. (2007) define DSRM as a six-steps process, which includes: the first stage as problem identification and motivation, second as target objectives definition, third as first designing then developing artifacts, fourth focuses on practical utilization of the artifact, fifth focuses on evaluation of the artifact as to how effective it was, and the last step emphasizes the need to disseminate research recommendations. This makes it possible to know both what is produced and the degree to which it is measured to solve the problems it is intended for and does this efficiently. It is in this backdrop that DSRM framework is adopted in the evaluation of smart contracts in Islamic banking. The first stage pinpoints areas of concern regarding Islamic banks as contract execution limitations or Shariah compliance issues. The second stage is about setting the agreeable concepts focusing on the requirements which smart contracts should fulfill for them to meet the needs of Islamic banks and ensure Shariah compliance while enhancing efficiency. The third focuses on codifying smart contracts which sort Islamic finance aspects from both legal and operational perspectives. The fourth phase introduces the artifact via a pilot implementation in Islamic banking. The fifth step, that is, the Assessment stage, assesses the consequences of the smart contract on specific targets that are, and its perceived utility for the impacted problems, based on performance measures, from the users, as well as, from Shariah compliance perspectives. The last phase helps in forwarding the research results to the Islamic banking practitioners while increasing the interaction between practitioners and scholars and encouraging the application of DSRM findings.

The study suggests that implementation of Islamic smart contract will not only reduce the costs and the time involved in the execution of contracts but also improve the level of efficiency with which operations are carried out and avail better financial solutions to the participants of Islamic finance. Smart contract technology allows for the removal of various overhead costs that come with manual processing of transactions. Moreover, the very features of transparency and traceability offered in smart contracts could add value to Islamic finance services which could result in further improvements in the rates of financial inclusiveness concerning the underbanked communities as the cost of transactions would fall.

The study holds significance in terms of issues and competitiveness for the Islamic banking industry. It can also assist to Shariah compliance by assessing how automated Islamic contractual

provisions and adherence provisions functions to uphold the fundamentals of Islamic finance, rukun and shurut. By studying the environment of Islamic banks and employing smart contracts that are integrated with and automate participation contracts of legal and bureaucratic intricacies, the research can help improve efficiency. Such research would help the Islamic banks to maintain Shariah compliance within the automated contracts which are controlled by providing embedded conditions within the contracts. It can also help automated systems of formalizing contracts adhere to the principles of Islamic finance such as Rukun and Shurut. The research would also examine how automated agreements without the risk of Riba, Gharar, and Maysir can reach the objectives of Shariah which is Maqasid-e-Shariah. The study aims to prove that smart contracts are a game changer in the field of Islamic finance as they can streamline operations and cut down costs. In this context, the adoption of smart contracts is expected to facilitate greater market penetration of Islamic finance products, particularly among economically disadvantaged segments. Such an approach will expand the reach of Shariah compliant products and services thereby contributing greatly towards economic development in regions where such services are in high demand. It is possible that the research would also catalyze the development of smart contracts in a manner that adheres to the Islamic laws as opposed to conventional practices further enhancing Islamic finance and creating new products and services that are Shariah compliant.

Nevertheless, the implementation of smart contract in IBs face several challenges. These include adherence to Shariah stipulation such as riba, gharar and maysir elements. The complex structure of smart contract as well as Musharikah, Mudaribah and other contracts face difficulties on codification of their terms and conditions (Iftihar & Saba, 2020; Roslan et al., 2020). The technological complexity of decentralized blockchain and its integration into the centralized IT (information Technology) infrastructure of Islamic banks is also a challenging task and costly. The speed and scalability of blockchain transaction is also another challenge where the speed of processing transactions via smart contract is slow when compared to prevailing IT systems (Unal & Aysan, 2022; Chen, 2024). The current regulatory framework of various jurisdictions is not compatible with DLT which would require amendments. The development of regulatory sandbox such as introduced by the Bank Negara Malaysia can overcome some of these challenges. The implementation of smart contract involves high costs which initially may reduce the profit margins (Akhtar & Hussain, 2021; Goo & Heo, 2020). The diversity of Islamic finance practices across various jurisdictions has also some potential challenges for SC adoption due to four fiqi (Islamic Jurisprudence) schools of thought, market sizes and customer awareness.

The paper is organized as follows: the next section provides a literature review detailing the concept of smart contracts and Islamic banking. Section three discusses the theoretical framework and design science method. Following the methodology, section four presents and discusses the smart contract matrix. Finally, section five covers the conclusion and implications for future researchers and practitioners.

LITERATURE REVIEW

Smart Contract

Fintech is the leveraging technology utilized by smart contracts to introduce Islamic banks to innovative, efficient solutions that can be Shariah compatible if they adhere to Islamic injunctions (Alam et al., 2019). One key component of FinTech is the blockchain Smart Contract, which could become central to Islamic banking. Defined as "Computer protocols that facilitate, verify, or enforce the negotiation or performance of a contract, or that make a contractual clause unnecessary" (Kakavand, Sevres, & Chilton, 2017, p.17), smart contracts aim to enhance security and reduce transaction costs. Corrales, Jurcys, & Kousiouris (2019) describe them as "self-executing, autonomous computer protocols that facilitate, execute and enforce commercial agreements between two or more parties."

The concept was initially proposed by computer scientist Nick Szabo, who suggested embedding various contracts in a computer's software and hardware. Szabo illustrated this with a vending machine example, which can be analogized to computer code facilitating the transfer of assets such as shares or intellectual property (Corrales et al., 2019). Unlike traditional contracts, smart contracts are not merely written on paper or online; they are embedded in computer code on a Distributed Ledger Technology (DLT), commonly known as blockchain, and execute upon receiving electronic data input (Unsworth, 2019). According to Alam et al. (2019), blockchain technology possesses certain qualities that include autonomy, security, and immutability which makes contracts more observable to the parties entering into contracts and possibly also to users, be they public, private or hybrid who depend on blockchain. It is analogous to an Excel formula, which makes payments or transfers assets as specified in the programming, which may include C++, JavaScript, Python and Solidity (Unsworth, 2019). Smart contracts provide an alternative to the functions of financial intermediaries through their self-execution ability, which is initiated by external information and the immediacy of accessing value. Catchlove (2018) found that smart contracts align with contract law principles despite some technological applicability issues that

can be resolved. Tai and Eric (2017) suggested that smart contracts could be adapted into regular contracts by modifying their terms. Tulsidas (2018) compared smart contracts with Spanish contract law, noting compatibility but also complications in formation, performance, and breach due to their self-enforceability and immutability. He called for legislative clarity on consequences.

Innovations must comply with Shariah contract rules and Islamic ethics, emphasizing fairness, justice, transparency, and fraud elimination (Laldin & Furqani, 2019; Kamali, 2012). Smart contracts can be coded for Shariah compliance at regulatory and participant nodes within the blockchain system (Muneeza & Mustapha, 2019; Billah, 2019). As a disruptive technology, smart contracts could expand market share to US$300 million by 2023 and enter sectors like healthcare, banking, real estate, and insurance, modernizing the Islamic banking industry (Hilal & Jamaludin, 2019; Alam et al., 2019).

Institutional pressures for financial inclusion, particularly from international agencies like the World Bank, have pushed banks to target the unbanked market segment for competitive advantage. Financial inclusion is linked to increased savings, innovations, women's empowerment, reduced income inequality, and economic growth (Le, Chuc & Hesary, 2019). Technological innovations challenge banks by empowering customers with price comparisons, new services, and increased competition from new financial sector entrants (Mahmood, Shuhui, Aslam & Ahmad, 2022). The World Bank's Global Findex Database (2017) indicates that 1.7 billion adults remain unbanked, lacking financial institution accounts or mobile banking access. Islamic financial institutions can leverage FinTech solutions to reach the unbanked, expanding their clientele and fulfilling social obligations by providing essential financial services to the economically disadvantaged (Kamran et al., 2018; Do-Hyung, Sung-Ho & KyungBae, 2015).

Mobile banking and mobile money, prominent FinTech mechanisms, enable payments, receipts, money storage, transfers, utility payments, school fees, and airtime credit purchases (Lashitew, van Tulder, & Liasse, 2019). Suri and Jack (2016) highlight that Kenya's M-PESA lifted 2% of its population from extreme poverty by reducing transaction costs and shifting economic activities from agriculture to business. Ben Naceur et al. (2015) indicate that religion significantly contributes to financial exclusion in many OIC member states due to riba, gharar and maysir elements, necessitating Shariah-compliant products. This compels Islamic banks to provide Shariah-compliant options, fostering legitimacy among these populations. Islamic banks also support Muslim minorities in non-Muslim countries, promoting inclusive growth (Gerrard &

Cunningham, 1997; Ashfahany, 2023). Integrating normative institutions like religion with technological artifacts creates new institutions in finance, influencing banking practices and technology (Mohan, 2020).

International organizations prioritize FinTech for financial inclusion, as evidenced by the UN's 2015 SDGs, the AFI's (Alliance for Financial Inclusion) 2011 Maya Declaration, the G20's 2010 Seoul Summit, and the IMF and World Bank's 2018 Bali FinTech agenda (Sahay et al., 2020). The World Bank (2017) notes that 'digital financial services' can enhance income, reduce poverty, manage risk, lower costs, increase savings, and reduce corruption (Demirguc-Kunt et al.,-World Bank, 2018). Mobile financial services are expanding faster in poorer countries due to rising mobile money account ownership for remittances (Ozili, 2018; Lai & Samers, 2020). Islamic banks are cautious about the unbanked population's risk profile, often deemed high-risk. Their mention underscores the need to study credit risk management in diverse banking environments, especially in FinTech contexts where technology-induced risk spillovers increase overall risk, necessitating regulation (Li, Li, Zhu, Yao, & Casu, 2020). Effective management of new smart contracts and regulatory frameworks for these transactions require further debate and research (Brownsword, 2019). This research aims to develop a framework integrating participatory banking contracts with blockchain to create a Smart Participation Contract for Islamic banks.

The blockchain technology, though offer numerous benefits, has also some limitations. These include security risks of 51% attack where a single entity achieves control of the majority of network’s computation power to change transaction histories (Islam et al., 2023). Their wallets and exchanges also face phishing attacks. There are also climate concerns due to the mining activities because the consensus mechanism utilizes high energy which results in carbon emissions (Wang et al., 2023). The speed of processing transaction is also slow when compared to traditional IT networks. The cost of deployment of blockchain technology is also very high which become unaffordable for small and medium entities (Ali et al., 2021).

Islamic Banking

Islamic banking, defined as “A banking model that stems from a non-usury approach and makes use of any banking activity in conformity with this approach; that is, funding on the basis of profit and loss sharing and lending through trade, partnership and leasing methods” (Siddiqui, 1994; Karapinar & Dogan, 2015). According to Aysan et al. (2013), it focuses on profit and loss sharing, funds tangible real-sector projects, avoids gharar (risk and uncertainty), ensures transparency, and

prevents unjust business practices. The primary method is the partnership contract (Musharikah), where individuals pool capital, labor, or creditworthiness and share profits or losses proportionally (Ayub, 2007). Valid Musharikah contracts include parties/partners, offer and acceptance, subject matter (capital in assets, labor, or creditworthiness), and profit/loss sharing ratios (Ullah & Al-Karaghouli, 2017; Usmani, 1998; Alam et al., 2017; Ayub, 2007). Partners must be mentally sound, mature, and freely enter the contract (Usmani, 1998; Ayub, 2007).

Contracts require a clear, unconditional offer and acceptance in the same session. An offer is a firm's proposal, and acceptance must be communicated through words, gestures, or actions. Contracts are void if the offeror withdraws, a party dies, the session expires without agreement, the subject matter is damaged, or the acceptance period expires. In Islamic contracts, one partner proposes a joint activity, and the other accepts, stipulating terms together (Ayub, 2007; Usmani, 1998). The subject matter includes capital contributions, which can be assets, labor, or creditworthiness, and must be present and Shariah-compliant (Usmani, 1998; Ayub, 2007). Aysan et al. (2013) assert that Islamic banking aligns with Shariah. Alam et al. (2019) argue that smart contracts are Shariah-compliant as they are permissible unless explicitly prohibited and should achieve Maqasid Al-Shariah, realizing benefits (Maslahah) and avoiding harms (Mafsadah and Mashaqqah), thereby contributing to human enrichment and civilization (p.129). Smart contracts can apply in Murabaha, Mudharabah, and Musharakah Mutanaqisah contracts as well. Their Shariah compliance depends on their terms; if they involve gharar (uncertainty), maysir (gambling), or riba (interest), they are non-compliant. Smart contracts are neutral tools facilitating transactions without altering contract principles (Alam et al., 2019; Rahim et al., 2019). This study aims to convert conventional participatory contracts in Islamic banks into Smart Participation Contracts called Islamic Smart Contract (ISC) using blockchain technology, employing design science research to propose a smart participation contract matrix.

Theoretical Framework

Institutional theory, widely used in management and organization research (Scott, 2014), provides valuable insights into organizational behavior. It examines how institutional pressures lead to the diffusion and standardization of practices, products, and processes across organizations and industries. Historically utilized in sociology, political science, and economics, this theory has recently gained traction in management and service marketing research (Vargo & Lusch, 2016). Meyer and Rowan (1977) revitalized interest in institutional theory, defining institutions as "deeply ingrained in, and reflect widespread understanding of social reality enforced by public opinion, by

the views of important constituents, by knowledge legitimated through the educational system, by social prestige, by the laws" (p. 343). Organizations operate within contexts shaped by institutions, which influence routines, processes, and practices. Institutions encompass rules, regulations, symbols, practices, cultural values, governmental agencies, professional norms, and educational systems, and can be formal or informal (North, 1992) or categorized as political and economic (Acemoglu, 2003).

Scott (2014) classifies institutions into regulative, normative, and cultural-cognitive categories, noting that they provide stability, directive force, and meaning to the socio-economic system. Institutions guide organizational behaviour by exerting influence and granting legitimacy to conforming entities (Bunduchi, 2017). Scott (2014) defines institutions as human-designed rules, norms, and meaning systems that promote or hinder human action. Institutions establish the 'rules of the game' (North, 1992) in socio-economic contexts, permeating organizations through institutionalization (Khan, Atiq, and Ullah, 2018). Institutionalization is the process by which activities and units become normatively and cognitively accepted as legitimate (Scott & Meyer, 1994). This process compels organizations to conform to institutional pressures and the changed 'rules of the game.' Without adherence, organizations lack relevance and meaning within their socio-economic context. Social actors play a crucial role in institutionalization by creating institutions through their actions and interactions. Institutional theorists argue that organizations are part of complex social systems and must adhere to societal norms, values, and beliefs to justify their practices and procedures (DiMaggio & Powell, 1991). Contextual beliefs, ideas, and values, derived from regulative, cognitive, and normative conditions, shape organizational behavior, structures, and practices (Marano & Kostova, 2016; Scott, 2014). The current study will be examined from an institutional theory perspective as proposed by Scott (2014) with particular focus on three-pillars i.e., regulative, normative (Shariah) and cultural-cognitive framework.

The above discussion is captured in Figure 1.1, with the help of proposed theoretical framework. The Figure 1.1 explains that regulatory infrastructure affects the enforcement of the terms and conditions of Musharikah contract. Institutions are expected to constrain and standardize behaviours of individuals, society and organizations. Regulatory institutions specify rule-setting, its monitoring and authorizing activities. In order to impact future behaviours, regulatory institutions specify rules, ensure its compliance by others and when required, influence rewards or retributions (Scott, 2014). Normative institutions functions through its prescriptive, evaluative and

obligatory mechanism that are associated with social life. Normative institutions obtain inspiration from values and norms. Values implies the code of proper conducts, while norms imply prescriptions of how behaviours ought to be legitimately performed (Scott, 2014). Islamic teachings shape values and norms in Muslim societies. Islamic principles guide social interactions, family dynamics, and cultural practices.

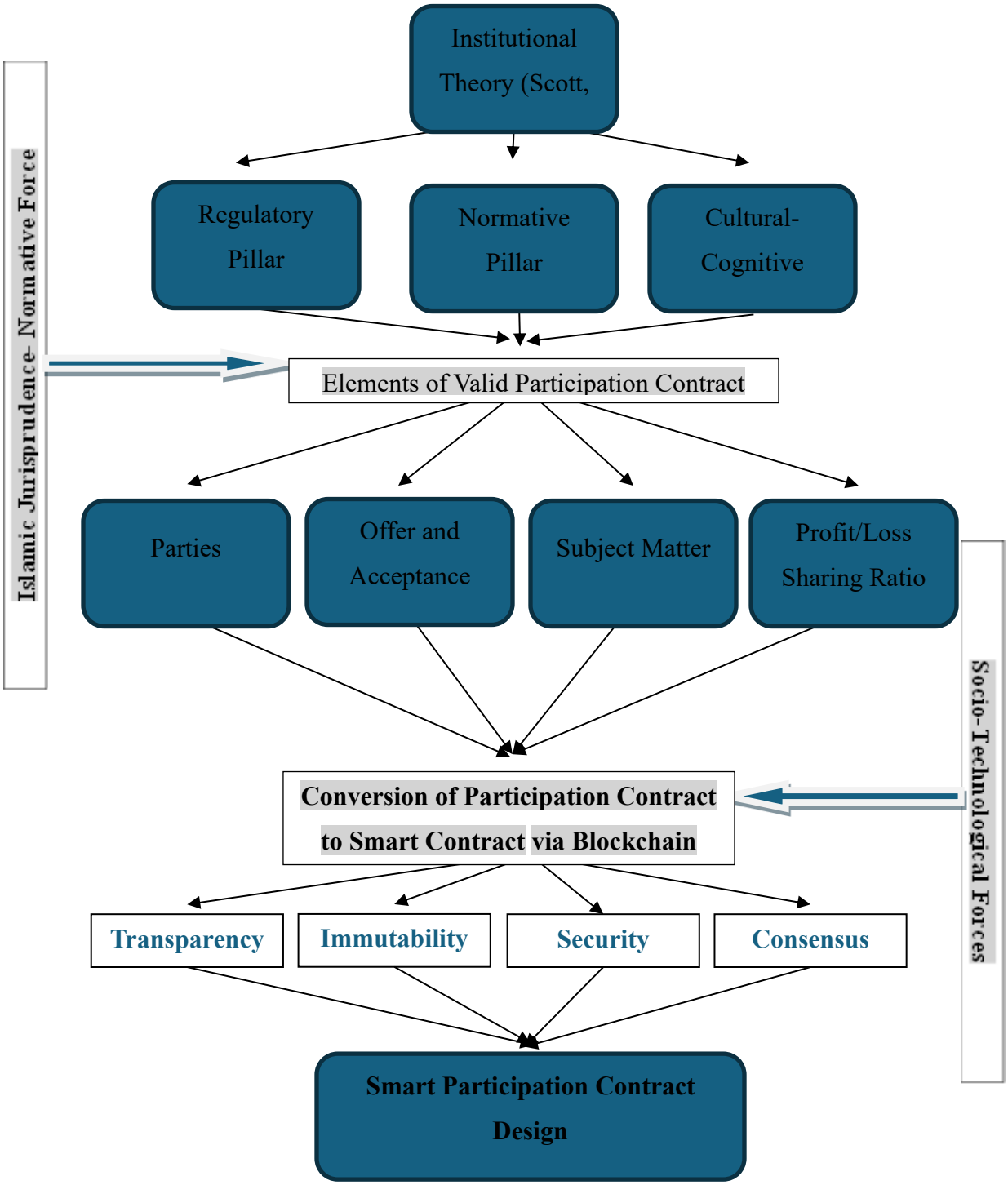
Religion is reflected in rituals such as prayer and Ramadan fasting, modest dress for men and women, and charity towards the needy. Islamic teachings stress justice, compassion, honesty, and respect for elders. These moral principles are essential to Muslim communities, reflecting religious beliefs and historical traditions (Scott 88; 69). The normative institutions of Islam encompass the collective traditions and norms that reflect the values and beliefs held by Muslims. In Muslim societies, Islam holds considerable influence in shaping attitudes, behaviors, and societal constructs as a prominent social norm when conducting financial transactions (Essoo & Dibb, 2010). The diversity of religious normative artifacts in Muslim countries can be attributed to several factors, including cultural differences and the influence of different Fiqhi schools such as Shafi, Hanbali, Maliki, and Hanafi. Adherence to Islamic contract principles in smart contracts involving conversion through blockchain technology is of utmost importance to ensure that the spirit of Shariah is upheld. Additionally, the new institutionalism also recognizes the cognitive aspect of culture as a crucial foundation. Scott (2014) has defined culture cognitive as “shared conceptions that constitute the nature of social reality and create the frames through which meaning is made” (p.67).

The profound impact of external cultural frameworks on the internal cognitive systems of individuals cannot be understated. Culture plays a pivotal role in shaping one's cognitive system, providing a comprehensive framework for thinking, feeling, and acting, which is also termed as “software of the mind” (Hofstede et al., 1991). Islamic cognitive institutions serve as the main cultural establishments in Muslim communities, deeply rooted in their collective comprehension of social and economic matters. Consequently, these institutions significantly influence their financial and economic choices (Dusuki & Abdullah, 2007; Doi & Clarke, 2008). This extends to encompassing decisions related to technology adoption. Furthermore, culture-cognition has important bearing for technology adoption through influencing perceptions, aligning technology with prevailing cultural norms as well as nurturing shared understanding within institutions and cultural set ups. This results in reducing uncertainty and promoting adoption of innovation and

getting legitimacy. Moreover, the socio-technological impact of blockchain technology is a profound social and cultural force. The rapid pace at which this technology is being embraced by society has created a compelling need for Islamic banks to offer FinTech solutions that not only expand the range of options for customers but also promote financial inclusion among individuals from all walks of life. This convergence between societal demands and technological advancements places significant pressure on Islamic banks to adapt and innovate in order to meet the evolving needs of their customer base. The implementation of a smart participation contract can serve as an effective solution to address the complex challenges arising from religious and socio-technological influences. Such a new strategy not just helps to fulfill the needs and expectations of the customers but also helps in successful market entry.

The current scholarly literature suggests that in the changing context of business, the orientation has shifted from the traditional one of owning the assets to one of owning the customers. This shift presents new challenges and demand for innovation in the Islamic intermediation business (Mohan, 2020). In order to meet and surpass customers' expectations, it is crucial for Islamic banks to continuously innovate their products and services. By doing so, they can ensure that their offerings not only align with customers' needs but also exceed them (Mohan, 2020; Scott, 2008; Potra et al., 2018).

Figure 1.1 Theoretical Framework



Source: Developed based on Scott (2014); Arun et al., (2019)

Smart contracts are an innovative solution that can provide businesses with a competitive edge by offering faster, cost-effective, and superior services. Considered as one of the outcomes of financial technology, smart contracts promise to deliver convenience, efficiency, and security; these qualities are highly valued by customers in the banking sector. Given the sensitive nature of this industry which is prone to data breaches and privacy concerns, satisfying these demands from customers becomes crucial for success (Hill, 2019). The banking industry operates under strict regulations, which places continuous pressure on banks to comply with these regulatory requirements. Failure to do so can result in severe consequences such as sanctions, penalties, and even the closure of business operations. Additionally, in today's era of digital banking, it is crucial for banks to prioritize customer data safety.

Smart contracts offer a potential solution by providing an efficient and cost-effective means of ensuring security while also establishing regulatory legitimacy. SC could also benefit Islamic banks given that they seek to gain market share from early movers who are always keenly waiting for new innovative and creative solutions (Muller et al., 2013), the adoption of smart contracts does not only assure the Islamic banks to be relevant but it also fosters innovation within the banking system that can encourage other firms to also seek for the best industry innovation The widespread acceptance of smart contracts among technologically adept customers and Islamic scholars makes their implementation an appealing choice for Islamic banking service users. This technology has the potential to smoothly integrate into various aspects of society (Johnson et al., 2006; Scott, 2008). Organizations that prioritize innovation are more likely to ensure their long-term survival. It is important to note that institutional pressures also play a significant role in driving innovative practices. In the context of the financial industry, continuous development and implementation of cutting-edge financial products that align with emerging economic and financial trends are essential for the sustainability of the overall system (Ozii & Lorember, 2023). Additionally, this study emphasizes that due to being a relatively new industry, constant product and service evolution is crucial for maintaining competitiveness within Islamic banking and finance sector.

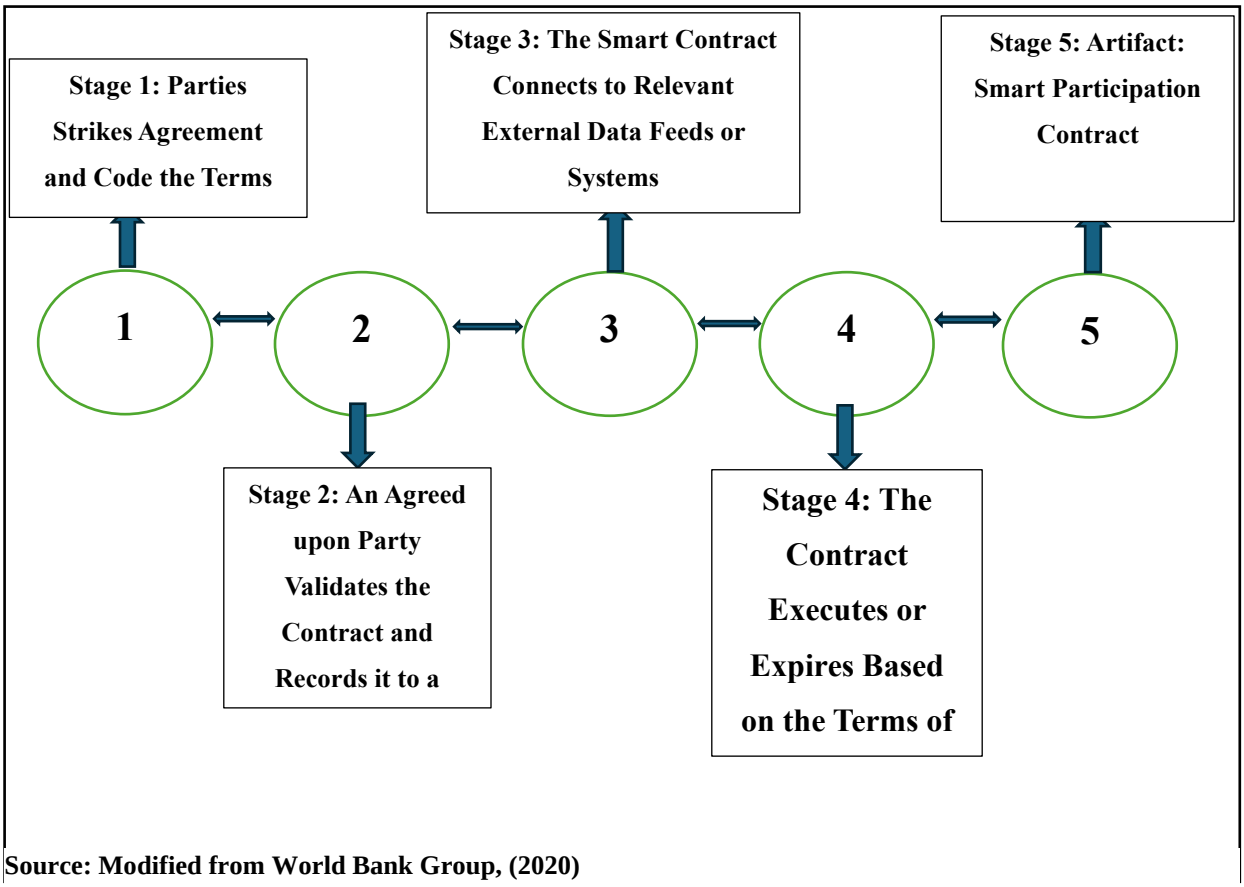
RESEARCH METHOD

Design Science Research Methodology

Interest in design science initially surged within information science (IS) literature but has recently expanded to management information systems, accounting information systems, medical sciences, engineering, and architecture (Geerts, 2011). According to Johannesson & Perjons (2014) “Design science is the scientific study and creation of artifacts as they are developed and used by people with the goal of solving practical problems of general interest” (p.7). Unlike traditional empirical research, which focuses on description, explanation, or prediction, design science aims to create, alter, or improve the world. Design science research (DSR) develops artifacts, such as smart contracts or frameworks, to meet needs, solve problems, and create new opportunities (Johannesson & Perjons, 2014). A design science project should contribute to both global practices and scientific knowledge, even if conducted locally. Artifacts, central to design science, are human-designed objects intended to solve practical problems. They can be physical (e.g., hammers, cars) or intangible (e.g., drawings, methods, guidelines, or smart contracts) (Johannesson & Perjons, 2014). Human activities typically occur in groups, forming practices. There is a relationship between people, practices, problems, and artifacts. People engage in practices, identify problems, and use artifacts to solve them. Artifacts have an inner structure that produces behaviors and offers functions for users. Behaviour refers to what artifacts can do, while function pertains to what they can do for users' benefit (Johannesson & Perjons, 2014). Constructing new artifacts can expand possibilities and enhance the creation of valid knowledge. According to Havner et al. (2004), artifacts can be “a construct, a model, a method or an instantiation” all requiring viability. A viable artifact integrates influences from people, organizations, and technology. Viability is crucial, especially in times of change and complexity, ensuring artifacts can survive and adapt (Johannesson & Perjons, 2014; Rossi et al., 2013). This principle is evident in Islamic banking practices, which cater to halal and ethically conscious stakeholders. Islamic banking can be seen as an outcome of DSR, addressing new issues and demands for innovative products, services, and processes, thus ensuring its survival and success. The history of banking innovations, including ATMs, Internet banking, Mobile banking, and blockchain technology, demonstrates the sector's resilience in adopting new solutions. The

design, implementation, and routine operationalization of smart contracts in Islamic banking could become a new artifact of Design Science Research (DSR), potentially offering a unique perspective to Islamic finance research. Design science framework can be instantiated in the diagram given in Figure 1.2

Figure 1.2 Stages of a Blockchain-Based Smart Participation Contract



Source: Modified from World Bank Group, (2020)

The Figure 1.2 shows the smart participation contract activities flow where parties code their terms after agreement. This is followed by validation and entering the contract on a distributed ledger technology (DLT). In the third stage, the data is fed to database via connecting with external data source. As a last stage, based on agreement terms and conditions, smart contract upon evaluation of the data either self-executes or rejects the contract (World Bank Group, 2020). The overall output results in smart participation contract as an artifact.

The process of transforming a participation contract into a smart participation contract through the use of blockchain technology involves comparing and matching the contract's elements. If no contradiction exists, the process generates an output, which is an artifact called a smart participation contract. This process is presented in Table 1.1.

Table 1.1 **Smart Participation Contract Matrix**

Elements of Participation Contract / Elements of Blockchain	**Parties/Partners**	**Offer and Acceptance**	**Subject Matter (Capital)**	**Profit &Loss Sharing Ratio**
Transparency	√	√	√	√
Immutability	√	√	√	√
Security	√	√	√	√
Consensus	√	√	√	√

From the Table 1.1, it can be seen that the four elements of transparency, immutability, security and consensus in blockchain technology are related to the four pillars of a contract as follows.

In instances where a participation contract is transposed to the blockchain and recorded, the offer and acceptance elements, as well as the parties involved, the subject matter, and the ratio of distribution of profits and losses become accessible to those utilizing this decentralization technology, resulting in enhanced transparency. Hence, such transparency satisfies the requirement of mutual consent from all parties, which is attested by these respective legal documents signed in the course of dealing on the blockchain network. The introduction of blockchain in an organization allows for all transactions to be done on an open or closed network without involving any third parties and directly on the consumers with whom contracts can be made (Arun et al., 2019). After a participation contract is loaded onto a Distributed Ledger Technology (DLT) system, this document will remain unchanged since no change can be made on a blockchain due to its decentralized nature.

This property as well as relates to the principle of consideration in a contract which basically provides that no information stored on the blockchain including transaction can be changed or destroyed; thus, the security of transactions is raised. Upon inclusion in the blockchain ledger, a transaction cannot be removed, as modifying this consensus requires majority support exceeding 50% of the parties, which is improbable given that every transaction is visible to all network participants. Each transaction is additionally signed, time-stamped, and linked to other transactions along with the current time. Every block time and each participant's transaction occur at a specific temporal point and is therefore linked to preceding and successive transactions (Arun et al, 2022; Zheng et al, 2017). Concerns relating to the aspect of immutability in the blockchain arose as an acceptable contribution in improving the security of the system. Mechanisms for ensuring confidentiality include the use of cryptography, particularly digital signatures, which guarantee the integrity of each transaction considering its sensitive nature. The security offered by blockchain technology is considered and purely pertains to the legal capacity of such contract performance, as every party in the aforementioned blockchain network possesses sufficient forensic precautionary measures, including cryptography, to protect their information and transactions. This entails ensuring that every transaction is documented and updated on all nodes within the distributed ledger system.

Moreover, all members on the network have a private key in order to reduce the chances of any security weakness and also to address and report any potential weak points. This distributed ledger technology is strengthened by its design that allows for all the transactions to be archived in a network, thus making it extremely difficult for a single actor to tamper with the entire network integrity (Zheng et al., 2017; Arun et al., 2022). Consensus is the core principle of Blockchain technology that allows transaction to be authenticated, without the need for a central authority or third party intermediary. The transactions in the Blockchain network are made possible and expected to be performed through consensus mechanisms. Along with this, consensus in this technology adheres to the contract legality of purpose criteria that all participants must confirm the transactions which must be included in the ledger and the order in which they will be included. All these processes guarantee increased security of the blockchain system. Public blockchains are widely used because of cryptocurrency networks in which miners validate currency

transactions through ‘proof of work’ or ‘mining overhead. These processes require substantial energy and computational power, reflecting the intensive resource demands necessary to achieve the desired outcomes.

Permissioned blockchains, on the other hand, tackle the problem of consensus differently. Instead of realizing a full consensus among network members, the design assumes a situation where participants known to each other utilize anonymous transaction validators called “consensus algorithms” with drastically reduced internal working and energy utilization requirements in order to reach consensus. Such approaches allow them to perform validations at lower computational and energy costs (Zheng et al. 2017; Arun et al. 2022). As a result, in addition to co-existing participatory contracts with specific features of Distributed Ledger Technology, a new enhanced Participation Agreement called the Smart Participation Contract was formed. This development yields a complex 4-by-4 matrix with 16 overlapping outputs. By virtue of blockchain technology, this new participatory contract has upgraded the already basic participatory contract to an advanced one known as Smart Participation Contract or Islamic smart contract. This new type of contract has great potential to revolutionize the Islamic banking sector due to its ability to provide an appropriate alternative model for performing banking operations which is more reputable and affordable.

DISCUSSION

Smart contracts represent a significant application of blockchain technology, showcasing its transformative potential in automating digital agreements. These self-executing contracts encode complex sets of commercial terms and conditions within individual transactions, enabling business processes to be executed without reliance on central authorities, intermediaries, or traditional legal frameworks. By leveraging the inherent characteristics of blockchain—such as trust, transparency, immutability, and consensus mechanisms—smart contracts facilitate seamless transactions and agreements among multiple parties. This innovation allows for the automatic execution of intricate business operations, which was previously unattainable using conventional systems (Tai & Eric, 2017; Gates, 2017; Arun et al., 2022). Conversely, Islamic Banks encounter persistent normative and cultural pressures that necessitate the comprehensive resolution of these

challenges to maintain their market relevance and client relationships. To attain social legitimacy and enhance their market share, Islamic banks will need to implement blockchain technology in their operational processes. This strategic initiative not only demonstrates their competitive advantage but also serves as an effective mechanism for reinforcing client trust in these financial institutions.

There exists a consensus regarding the characteristics of both blockchain and Islamic contracts. Concurrently, the process of drafting a conventional contract through blockchain technology parallels the digitalization of Islamic contracts, resulting in what is termed a smart Islamic contract. Although Shariah principles do not differentiate between contract forms, whether written, drawn, or computerized such as through blockchain, in a smart participation contract, the prescribed terms and conditions must not contravene the essence of a Shariah contract. The application of blockchain technology in Islamic banking can reduce administrative burdens, improve transparency and accountability among all parties, and provide a secure environment for Shariah-compliant financial transactions (Radzali et al., 2019). Specifically, by adopting blockchain technology and smart contracts, Islamic banks may achieve enhanced internal efficiencies by streamlining their operations, introducing Shariah-compliant financial products and services to the market more effectively, and improving transaction security.

The feasibility of blockchain technology pertains to its practicality and effectiveness within the specific context of Islamic banking, and the banks must ensure that its utilization aligns with their values and principles, without compromising the integrity of Shariah-compliant banking practices (Nawaz, 2017; Zamer, 2018;). While smart contracts must still be integrated into the existing regulatory framework, the strong support from normative and cultural forces for their adoption stems from customers' persistent demand for simplicity, transparency, and security. Consequently, Islamic banks must respond appropriately to these demands and promote financial inclusion.

When comparing the features and elements of blockchain with the elements of a Shariah contract, one can observe the emergence of the smart participation contract matrix, as the characteristics of both systems align and facilitate the conversion of paper-based Shariah contracts into smart contracts without conflicting characteristics. The four elements of a

Shariah contract - parties, offer and acceptance, subject matter, and profit/loss sharing ratio - are transformed into digital contracts that are transparent, immutable, secure, and consensus-based, rendering the smart participation contract more robust and acceptable to technologically proficient users. The digital features of blockchain enhance the security and resistance to fraudulent manipulation of any Islamic contract. There is consensus regarding the common aspects of blockchain technology and Islamic contracts, with smart Islamic contracts essentially being conventional contracts that incorporate the essence of an Islamic contract into blockchain technology.

Both paper and electronic forms can be used to write contracts in Islam and those contracts are not subject to the constraints of Shariah law. However, it is inevitable that clauses that do not go against the principles of Shariah contracts must be included in any smart contract participation agreement made within the blockchain. The use of blockchain technology can reduce workload of employees and increase the level of transparency and accountability of all transacting parties while guaranteeing a safe Shariah-compliant transactional environment (Radzali et al., 2019). With blockchain technology and smart contracts, it can be said that Islamic banks will cut down the processing period and efficiency in the supply of Shariah compliant products and services will heighten, therefore, the security of the transactions will be improved as well. Before attempting to integrate blockchain technology with existing infrastructure in the Shariah-compliant trade finance, it is advisable to undertake comprehensive researches aimed at assessing its potential use. Resources aimed at the improvement of Islamic banking systems through the use of smart contracts and blockchain technology have transformed the sector in many ways including, decreased transaction procedures, enhanced transparency in systems, improved security for all stakeholders, and raised transaction efficiency all in accordance with Shariah law.

All parties involved must make an effort to explore the possibility of use of blockchain technologies and smart contract in order to provide additional level of transparency and accountability in the Shariah compliant transactions. In addition, both blockchain and smart contracts can serve the purpose of assisting the other goals of Islamic finance which include promoting ethical practices, sustainability and building of trust and assurance among the participants. In future, the use of these technologies in Islamic banking and Shariah

transactions will be revolutionary in the industry providing better, transparent and secure ways of conducting Shariah compliant transactions. However, the jurisdictional diversity in Islamic finance presents significant challenges for blockchain-based smart contract implementation, including regulatory fragmentation, varying interpretations of Shariah, and disparate levels of technological readiness. Nonetheless, these challenges can be mitigated through cross-border collaboration, global standardization, and customized regulatory frameworks (Khan et al., 2024).

CONCLUSION

This conceptual paper seeks to look into the viability of transforming conventional participatory contracts that have been paper-based into participatory contracts that have been secured using the use of smart digital contracts within the context of financial inclusion for the Muslims. The outbreak of COVID-19 has brought about difficult situations, for example, physical bank branch visits are handicapped by fear of infection and ongoing lockdowns, hence, the need for smart Islamic contracts cannot be overemphasized. These contracts enable speedy transactions without much cost and enhance overall transaction efficiency while providing a greater level of transparency, immutability, security and consensus among the transacting parties. By incorporating these characteristics with Islamic contract provisions, a new approach referred to as the Islamic Smart Contract Matrix is suggested for verification in terms of its effectiveness in relation to Islamic banks.

The fact that economic activities are becoming more digital oriented obligates Islamic banks to change, as well as keep up with the changes in norms, technology and culture if they are to survive, grow and remain relevant. This paper integrates the idea of smart contract adoption in the Islamic banking literature, thus making an important contribution to practitioners in the banking sector who are willing to adopt this technology in the FinTech sector. Furthermore, it argues for regulatory bodies being open minded enough to adopt changes which enable the use of smart contracts in existing contract law. In this regard, this research does an enormous service to the current understanding of both Islamic finance and FinTech by providing evidence on the strengths of technology incorporation in this discipline. In the course of this investigation, important knowledge has been

obtained which can be useful in future innovations. Additionally, the problem of creation of Islamic smart contracts from the design science perspective has been addressed. The study has implications for Islamic banking industry where their contracting mechanism may be greatly facilitated due to the incorporation of ISC in their operations and can reduce costs and increase efficiency. The study has also implications for Shariah scholars' community to increasing their understanding of blockchain technology and collaborate with blockchain experts to design, verify and supervise implementation of ISC. The study has also implication for regulatory bodies to development clear guidelines for the adoption and implementation of smart contracts.

Limitations of the study is that it is conceptual in nature and the proposed Islamic Smart Contract Matrix has yet to be empirically tested for validation and this may affect its practical relevance. Future research could investigate the practical application of the framework to confirm its relevance across various settings. The matrix may also face alteration in various jurisdictions where different *fiqi* school of thought is in practice.

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