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**Blockchain Technology - Arsenal for a  
Shariah-Compliant Financial Ecosystem?**

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**Abstract:** The authors' first challenge is to decipher the complexity of Islamic Finance despite the opacity of the sector. A second focal point is the agent's agenda; in the Islamic Finance industry, contributors mandate intermediaries (agents) to transfer their contributions to social causes according to the Shariah; in principle, Islamic financial institutions must create value for their stakeholders by offering Shariah-compliant products and services. An underlying assumption of agency theory is that agents attempt to maximize their personal welfare and compensation, but such behaviour may not always be in the best interests of other stakeholders, and an analysis of the agent's agenda can help explain how agents can fall off the pedestal of altruism. Relationships between Islamic banks and three key stakeholders (contributors, beneficiaries and regulators) are also explored via a complexity-aware monitoring process. Contributors provide funds to an Islamic bank (agent), and in return, the agent should be accountable to the contributors, but the form and degree of accountability can vary depending on the organization's mission. There are many unanswered questions regarding the monitoring process. One objective of the article is to consider whether agents act in the best interests of the stakeholders. Finally, the authors explore the following question: Can blockchain technology and smart contracts support and enhance the transparency feature, which is the core underlying principle of all transactions in the Islamic Finance industry? A qualitative research framework was adopted because of the constraints of the enigmatic, secretive Islamic Finance culture.

**Keywords:** Islamic Finance, Agency Theory, Transparency, Blockchain technology

## 1. Introduction

To illustrate our thesis, let us begin by describing the archetype of Islamic banking opacity. Islami Bank Bangladesh Ltd. (IBBL) was the first bank in South Asia to provide banking services based on Shariah compliance. In December 2016, IBBL won the Bank of the Year Award conferred by *The Banker* and *Financial Times Group* of London, the most sought-after distinction of its kind, regarded as a sort of Nobel Prize of the banking industry. Mohammad Abdul Mannan, Managing Director of the bank, received the award from Brian Caplen, Editor of '*The Banker*', with some four hundred notables and panjandrums from senior management of over 120 banks across the globe attending the December 7 award ceremony.

Barely a month later, in January 2017, intelligence officers picked up Mr Abdul Mannan along with IBBL's chairman and a vice-chairman and asked for their resignations, and within a few hours the bank's board had selected their replacements and overhauled the audit committee. Throughout the process, IBBL's major shareholders, the Dubai Islami Bank, the Islamic Development Bank (IDB) in Saudi Arabia and Kuwait Finance House, were kept in a state of ignorance and could only complain helplessly. The IDB was given just a few days' notice of a board meeting and was not able to attend. What lay behind the enigma of the fall of *The Banker*'s heroes? Politics? Embezzlement? Shariah compliance? Nepotism? A naïve question: Would *Smart contracts* and a *blockchain* monitoring system have tipped off the majority shareholders and the London editor of *The Banker* to governance irregularities?

Despite the enigmatic governance of IBBL, demand for Islamic finance appears to be strong, and growing: there are currently more than 300 Shariah-compliant banks across the globe, and they are expanding at an annual rate of 19.7%, outpacing the growth of traditional banks (World Finance 2017). Islamic banking industry, operating in over 75 countries, witnessed sustained growth that resulted in its total asset size exceeding \$3trn in 2017. A recent Ernst & Young survey (EY 2017) showed that more than 50% of Islamic banks are currently investing in financial technologies (Fintech). This move to digital presents an opportunity for Islamic banks to address their stakeholders' questions regarding the complexity, and transparency, of the banks' operations.

## 2. Purpose statement

The article's first challenge is to encapsulate key elements of the complexity of Islamic financial institutions, despite the opacity of the sector. A second focal point, the analysis of the agent's agenda, is intended to help demystify agents' behaviour and explain how they can easily fall off the pedestal of altruism. In the Islamic banking industry, contributors mandate intermediaries (agents) to transfer their contributions to social causes according to the Shariah. An underlying assumption of agency theory is that agents attempt to maximize their personal welfare and compensation; this behaviour may not always be in the best interests of other stakeholders.

Concepts drawn from complexity theory could offer new ways to monitor the governance of Islamic banks. A new version of Stacey's complexity diagram plots issues according to the level of agreement there is among stakeholders about the solution to social problem versus the amount of certainty there is that a given intervention will have the desired result. If there is a high level of agreement and a lot of certainty about an issue, the problems are simple, i.e., a

right answer exists. When we move away from certainty and agreement, the issues become political, complex and even chaotic; ethical and socio-economic problems usually lie in the zone of complexity or chaos. In the article, the complex relationship between agents and three key stakeholders (contributors, beneficiaries and regulators) is explored via a complexity-aware monitoring process. Contributors provide funds to an Islamic bank (agent), and in return, the agent should be accountable to the contributors and shareholders, but the form and degree of accountability can vary depending on the mission of the organization. There are many unanswered questions regarding the monitoring process; one objective is to observe whether the agent acts in the best interests of the stakeholders. The biggest challenge for the future is the measurement of socio-economic return on investment of an agent's interventions. A critical question: Who is accountable for the traceability of funds and the socio-economic return on investment?

### 3. Research methodology

Academic knowledge on Islamic Finance continues to be relatively limited, and we agree with Mintzberg (1979: 80), who states that: *“It seems far more important to research important topics with soft methodologies than marginal topics with elegant methodologies... most of the real insight has come from studies that used soft methodologies.”* We selected the qualitative approach and phenomenological studies because of the constraints of the enigmatic, secretive Islamic banking culture. From a methodological point of view, it is feasible to use a combination of exploratory and descriptive research to satisfy our objectives. Such a multifaceted approach can, in many cases, transform a routine piece of research into an outstanding one. Cases studies and exploratory research is most useful in the preliminary stages of a research project, when there is a lack of organizational transparency, especially when subsidiaries are invisible in the Bailiwicks of Jersey and Guernsey. This type of research provides a high degree of flexibility and a minimal amount of formal structure, the aim here being to map out the boundaries of the Islamic Finance environment around the world.

### 4. Terms and definitions

**Governance** – Refers to the systems by which organizations are directed, controlled and accountable (Cornforth 2003). The term ‘accountability of an agent’ involves a transfer of information in the sense that the agent is answerable to someone else. (Hyndman and McDonnell 2009)

**Agency theory** – Theory exploring the relationship between principals and agents in business. Agency theory is concerned with resolving problems that can exist in agency relationships due to unaligned goals or different aversion levels to risk. (Lacasse and Lambert 2016a)

**Altruism** – Described by the Merriam-Webster Dictionary as unselfish regard for or devotion to the welfare of others. In contrast, the Stanford Encyclopedia of Philosophy defines egoists as persons having but one ultimate aim: their own welfare. Donors and agents can have an impurely altruistic behaviour; alternatively, they might give in to the temptation to act selfishly, and have an impurely selfish behaviour. (Andreoni 1989; Saito 2013)

**Islamic banking** – According to the *Institute of Islamic Banking and Insurance*, Islamic banking refers to a system of banking or banking activity that is consistent with the principles of the Shariah, which prohibits the payment or acceptance of interest charges (*riba*) for the lending and accepting of money, as well as trade and other activities that provide goods or services considered contrary to its principles. The emphasis is on asset-backed financing transactions in contrast to the conventional money lending system.

**Shariah-compliant** – Describes a financial product or activity that complies with the requirements of the Shariah. Islamic finance derives its principles from the Shariah, which is based on the *Qur'an* and the *Sunnah*. The key defining characteristics in the application of Shariah to financing structures are that transactions should be based on tangible assets, and should not bear interest (*riba*). Shariah principles also forbid uncertainty (*gharar*), speculation or excessive uncertainty (*maysir*) and gambling (*qimar*), and well as activities in certain prohibited areas.

**Blockchain technology** – Incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value. (Lacasse and Lambert 2017)

**Smart contracts** – A set of promises, specified in digital form, including protocols within which the parties perform on those promises. Szabo's 1994 description was as follows: "*A smart contract is a computerised transaction protocol that executes the terms of a contract. The general objectives are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, and even enforcement), minimise exceptions both malicious and accidental, and minimise the need for trusted intermediaries. Related economic goals include lowering fraud loss, arbitrations and enforcement costs, and other transaction costs.*"

## 5. Cogitations on agency theory

The principal-agent relationship is defined by Jensen and Meckling (1976) as '*a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent*'. In a company, the board of directors represents the principals and the chief executive officer is the agent. In the Islamic banking sector, contributors mandate an intermediary (the agent) to transfer their funds toward Shariah-compliant financial solutions and services. From an agency theory perspective, the role of the principal, or governing board, is to monitor the chief executive officer in order to ensure that financial resources are directed toward the beneficiaries or users rather than diverted toward management's interests and comfort. The underlying assumption of agency theory is that agents attempt to maximize their personal welfare. These actions may not always be in the best interests of contributors or beneficiaries. One aspect of our exploratory study is concerned with the complex relationship between the principal and the agent (Hyndman and McDonnell 2009). Traditionally, contributors mandate an agent to forward funds to beneficiaries and users, with a regulator monitoring the process, as indicated in Figure 1. A dilemma arises when the two parties have different interests and asymmetric information, such that contributors or shareholders cannot directly ensure that the agent is always acting in their best interests, particularly when activities that are useful to the beneficiaries are costly for the agent, or where elements of the agent's activities are costly or complex for the contributors or shareholders to observe (Hyndman and McDonnell 2009). This type of situation seems evident in the case of the award-winning Islami Bank Bangladesh Ltd.

## 6. Islamic banking institutions, complex organizations

Concepts drawn from complexity theories offer new approaches to monitoring the behaviour of complex organizations. The Stacey diagram (1996) plots issues according to the level of agreement among stakeholders about the solution to a problem versus the degree of certainty that a given intervention will have the desired result. If there is a high degree of both agreement and certainty about an issue, the problems are simple, i.e., a right answer exists. Moving away from certainty and agreement, the issues become political, complicated and even chaotic. The problems of beneficiaries are usually in the zone of complexity or chaos.

Since 2000, Professor Ralph Stacey has taken a different course, moving away from organizations as systems toward patterns of interpersonal relationships, both good and bad (complex processes of interactions, power relations, ideologies, choices and intentions). What emerges is the uncertainty and unpredictability of human life. As an advisor to the *FinTechLab.ca* research team on the utility of our complexity matrix, Professor Stacey had the following comments in 2013: “*I suppose the diagram could be useful depending on just how it would be used. I have more sympathy for instruments like the diagram being used retrospectively to analyse what happened than I am to their use for deciding what to do in the future.*”

As shown in Figure 2, the horizontal axis of the Stacey diagram indicates movement from situations close to certainty to situations far from certainty, while the vertical axis indicates movement from situations in which people are close to agreement with each other to situations in which they are far from agreement with each other. In conditions close to certainty and agreement, it is possible and useful to use the standard monitoring tools. In intermediate situations ‘close to certainty but where there is a high degree of disagreement’ or in conditions ‘close to agreement but some way away from certainty’, innovative monitoring techniques are required (Britt 2013). In conditions ‘very far from certainty and agreement’ (chaos, anarchy and misbehaviour), standard monitoring tools and techniques cannot be used, as complex aspects of a situation cannot be known ahead of time. In general, the socio-economic impacts of Islamic banking interventions tend to contain a mix of complicated and complex aspects. These cause-effect relationships only emerge retrospectively, and monitoring becomes a significant challenge (Lacasse and Lambert 2016b).

## 7. Cracking the code of an Islamic bank business model

The eradication of poverty, socio-economic justice, fair distribution of wealth and transparency are among Islam’s most pressing objectives, and according to Chapra (1997), the Islamic financial system must work towards achieving them. Chapra explains that the objectives of the Islamic financial system must be based on spiritual values and human brotherhood. They must work together with the aims of the Shariah, *maqasid*, as defined by Abu Hamid Al-Ghazali (1058-1111). The very objective of the Shariah is to promote the well-being of the people, which lies in safeguarding their faith (*deen*), their souls (*nafs*), their intellect (*aql*), their posterity (*nasl*), and their wealth (*mal*). Whatever ensures the safeguarding of these five elements serves the public interest and is desirable, and whatever hurts them is against the public interest and its removal is desirable. Chapra highlights the interaction and codependency that exist between these five *maqasid* objectives, which from an Islamic standpoint are the rules for societies to follow if they are to become prosperous and socially responsible.

Economic growth and the increase of material wealth are entirely compatible with the Islamic worldview. However, the search for greater material wealth must be aligned with Islamic ethics and consistent with both the norms of the Shariah and the ultimate ends of the Islamic *maqasid* (Chapra, 2000 and Saadallah, 2012). The Islamic financial system must conform to those ultimate ends. Khan (1997) explains that for a financial system to be properly Islamic, it must “*take care of those who cannot be supported by the market, those who cannot face economic forces, and those who do not have access to the financial means that would allow them to make the best out of the economic opportunities that exist around them*” (Khan, 1997, p. 12-13). In theory, Islamic banks were created to meet those ends. They were defined at the 1979 Congress of Islamic Banks, organized by the International Association of Islamic Banks, as follows: “*The Islamic bank is a financial institution that raises funds and uses them in accordance with the Islamic Sharia, in order to establish a supportive society and to work towards the fair distribution of wealth.*”

Islamic banking is dependent upon a number of rules that include prohibitions against *Riba* (interest), *Maysir* (uncertainty), *Gharar* (speculation), and *Haram* (illicit activities). Islamic banking cannot, however, be summed up by such prohibitions. Islam puts forward a financial system that is based on such principles as profit-sharing but also loss-sharing; tangibility through asset backing; transparency through the prohibition of uncertainty; merit and utility through the creation of added value; and ethics. (Amzi and Berrachid 2013)

## **8. Towards an effective monitoring process**

There are a number of avenues that the Islamic Finance industry could take to improve the monitoring of the complex relationship between the agent (managers of Islamic banks) and its three key stakeholders (contributors, beneficiaries and regulators). Blockchain technology and smart contracts, for instance, could be harnessed to that end. As Nida Khan (2017) states, “*Blockchain is a technological evolution that can support and enhance the transparency feature, which is the core underlying principle of all transactions in the Islamic Finance industry.*” Smart contracts are coded contracts within the blockchain platform employed by an organization. The computer code in a smart contract removes all the sources of ambiguity that can be found in textual contractual documents. Once the smart contract is deployed in the blockchain there can be no further modifications to the code, leading to irrevocability and transparency.

The Islamic banking industry could benefit greatly from blockchain technology and smart contracts in its efforts to provide services in the true spirit of Shariah-compliance. Contributors could provide funds to the bank (agents) via smart contracts, and the bank could in turn fulfil its accountability responsibilities to its contributors and beneficiaries by using smart contracts, although it is under no obligation to do so (Figure 3). The conditions of the Shariah and the contractual agreement could be coded into smart contracts that perform as per written guidelines to adhere to the tenets of Islamic principles in transacting.

An Islamic bank could also solicit user feedback on the level and quality of service provision. As beneficiaries receive services and have the right to be involved in decisions that affect their daily lives, their involvement might provide management with valuable knowledge on the effectiveness of service provision. Many board and management members, however, resist any suggestion of beneficiary feedback. Islamic banks are also obliged to comply with government legislation that often involves reports to a special regulator, with the regulator’s power varying from one jurisdiction to the next. Usually, Islamic banks must produce annual

reports and other information, as well as being subject to further investigation if the regulator deems it necessary.

Many unanswered questions remain regarding the monitoring process, but one objective would be to determine whether management (the agent) acts in the best interests of the contributors and beneficiaries. One of the biggest challenges of the future is to measure the social return on investment (SROI) of an agent's interventions.

## **9. Implementing a smart contract monitoring process**

Smart contracts are usable for all financial dealings between agents and stakeholders. They would provide both a mechanism to enforce adherence to the Shariah and an auditable record of all financial transactions taking place through the smart contract. The process of regulation and monitoring would be reduced to writing a smart contract that executes in line with the desired principles. Verifiable annual reports could be produced at any stage of the banking process or time of the year, and any form of investigation could easily be conducted through a review of the ledger in the blockchain.

However, a few issues need to be tackled before smart contracts can be used to revolutionise and revamp the banking industry to provide users with trustworthy Shariah-compliant products and services. The primary issue is legal recognition: smart contracts are not presently legally binding, hence any redressal of complaints would not be handled in a court of law. Legal enforcement of a smart contract is also different. As stated in Raskin (2017) in the Georgetown Law Technology Review: *“The typical legal action for breach of contract involves an aggrieved party going to a court of law or equity to demand money damages, restitution, or specific performance. With a smart contract, the aggrieved party will need to go to the court to remedy a contract that has already been executed or is in the process of being performed. This is because, by definition, a strong smart contract is already executed or in the process of being executed by the time the court hears the case. So the remedy must come after the fact to undo or alter the agreement in some way.”* However, the State of Arizona recently passed a bill that gives legal status to smart contracts and blockchain-based signatures, setting a precedent for others to follow. The implications of the bill is that Ethereum (an open-source, blockchain-based platform) will be treated as a beneficial invention for mainstream usage by legislators and regulators, where both the Ethereum-based smart contracts and blockchain-based signatures will be treated the same way as any ordinary contract or signature.

Smart contracts can be implemented in the banking industry in various ways depending on the requirement of the organisation in question. A bank such as IBBL, for instance, could protect itself from grievances by having a smart contract implement a voting mechanism for the election of any board member. The person voting would not need to be physically present in that situation, and the votes submitted by all shareholders through the smart contract could be produced to resolve any potential disputes regarding the election. A Capgemini Consulting paper entitled *“Smart Contracts in Financial Services: Getting from Hype to Reality”* (October 2016) states that: *“Smart contracts, enabled by blockchain or distributed ledgers, have been held up as a cure for many of the problems associated with traditional financial contracts, which are simply not geared up for the digital age. Reliance on physical documents leads to delays, inefficiencies and increases exposures to errors and fraud. Financial intermediaries, while providing interoperability for the finance system and reducing risk, create overhead costs for and increase compliance requirements.”* In view of the many

advantages offered by smart contracts, other governments can be expected to follow Arizona's example and legalise them.

In addition to the issue of legal recognition, another equally important issue is that neither the agents nor the stakeholders understand the code in the smart contract, and both rely on the programmers' interpretation. From a legal and Shariah point of view, however, this blind reliance on the programmer is not wise for either party. One solution would be to have a programmer for each transacting party act as the interpreter for the legal representative before the agent and stakeholder mutually agree to deploy the smart contract. This interim approach could be used to provide direct encoding of written legal contractual agreements into smart contract code until such time as the technology has matured.

Another legal adherence issue relates to the legal validity of the smart contracts in all the transacting regions. Laws differ from one country to another and as such, an agent would need to customize the smart contract to the laws of the land, and have different versions of the smart contract in the blockchain, much as a bank has different branches in different countries. The process might seem complicated, but it is much simpler than the existing infrastructure. Each agent (bank) could have a single smart contract reflecting the laws of the country in question rather than having multiple branches in that country. This would lead to a reduction in office space requirements, number of employees, electricity consumption and other associated resources related to operational and maintenance expenses. In order to resolve the issue of conflicts between contractual agreements in the Islamic finance industry, an international organisation like the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) could be set up to provide standard templates of smart contracts catering to different Shariah-compliant contracts, namely ISIFSC (International Standards for Islamic Financial Smart Contracts), as conceptualised in Figure 4.

Once the initial base is set, agents could customise it further within the realm of the Shariah to provide the functionality required by their organisational infrastructure. That would provide uniformity, reduce the overhead required for programmers to code a smart contract from scratch each time an agent wants a contract deployed on the blockchain for a particular Shariah-compliant contract, and increase trust, while providing both transparency and a speedy solution for the execution of any transaction. In the above scenario, monitoring would involve checking the smart contract code to verify its functionality, accuracy and adherence to the Shariah. As a post-inspection event, verification of the investigation could be obtained in written form from the blockchain ledger. In the event of non-conformance of any smart contract, the specific smart contract could be 'killed' and the resulting data saved as a template that did not work appropriately, leading to updating of the template in the international organisation, or in the agent if the fault was at that level.

A very good blending of skills from the financial, technological and academic sectors is required to implement a blockchain-based monitoring system at Islamic banks. Continuous inter-sector communication at the time of standardisation and later during customisation of the smart contracts at the bank level would be essential for a successful Shariah-compliant banking platform.

## 10. Conclusion

The research team's first challenge was to encapsulate the ingredients of a theoretical business model despite the opacity of the Islamic banking sector. The model offers a better explanation of the complex structures, processes and practices of organizations in that sector. The article casts new light on the interactions among contributors, agents, regulators and beneficiaries, and offers the researcher a plethora of new research avenues: How do Islamic banks create value and what is their social impact? Who are the principals in an Islamic bank? Are the regulators too indulgent with delinquent banks? Should the state assign forensic accountants a more important role? How will smart contracts and blockchain technology transform Islamic banking? How can smart contracts be made legally binding? How can automatic encoding of human readable legal contracts be put into machine-readable smart contracts? Can blockchain technology be scaled to handle the current transaction rate of a standard Islamic bank? Another important follow-up research question relates to the governance of funds: in-depth organisational case studies based on interviews of boards of directors could be an effective alternative method for assessing field interventions and measuring the social impact of Islamic banking. A candid question: Should beneficiaries or users be involved in the measurement of the efficiency and effectiveness of an agent's performance?

In the Tragedy of Hamlet, Marcellus says to Horatio: '*Something is rotten in the state of Denmark.*' Was something rotten in the Islami Bank of Bangladesh? In the coming decades, poor governance could severely undermine confidence in the sector, which would damage social welfare and economic development. Blockchain technology and smart contracts could be strategic tools for the guidance and monitoring of Islamic banks.

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### Author Biographies

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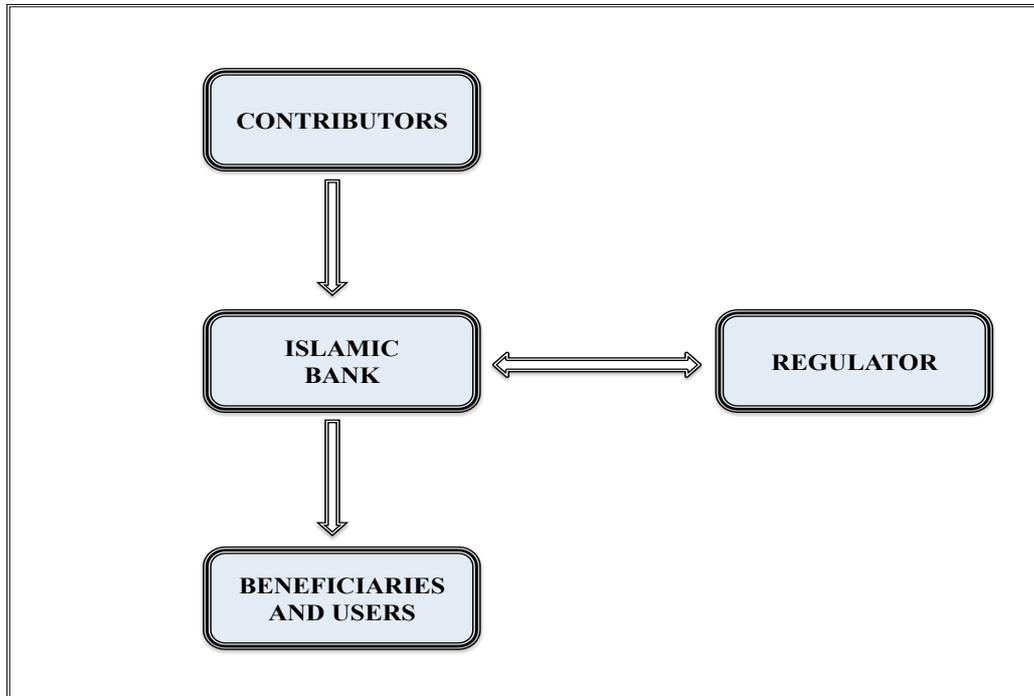
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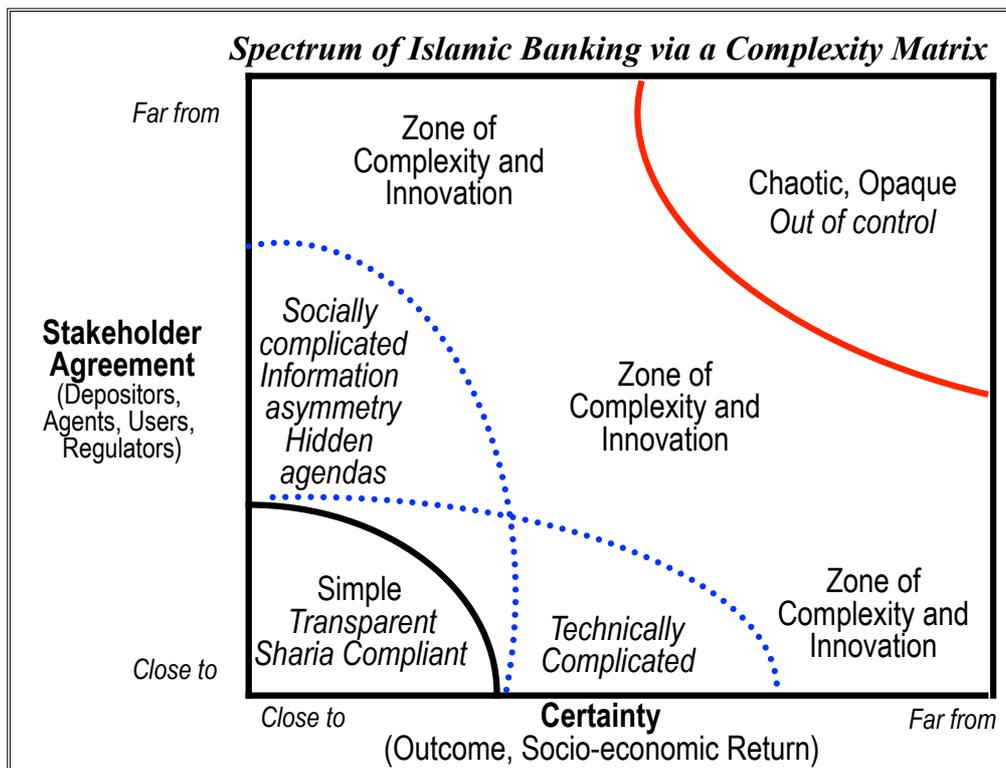
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## ANNEX FIGURES

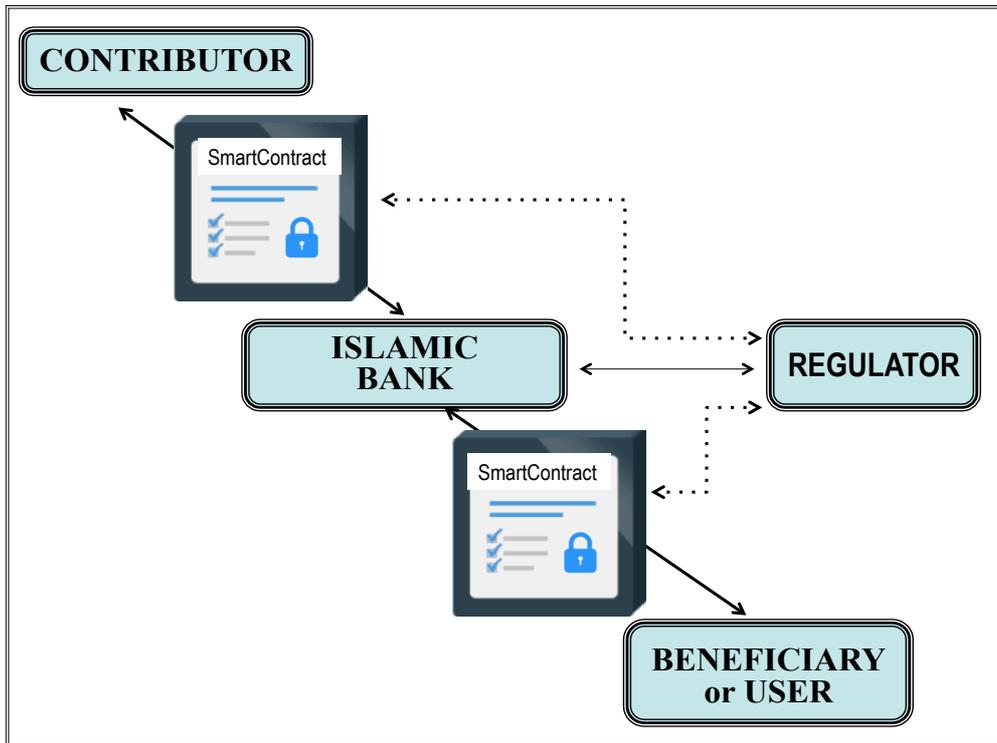
**Figure 1: The Traditional Monitoring Process**



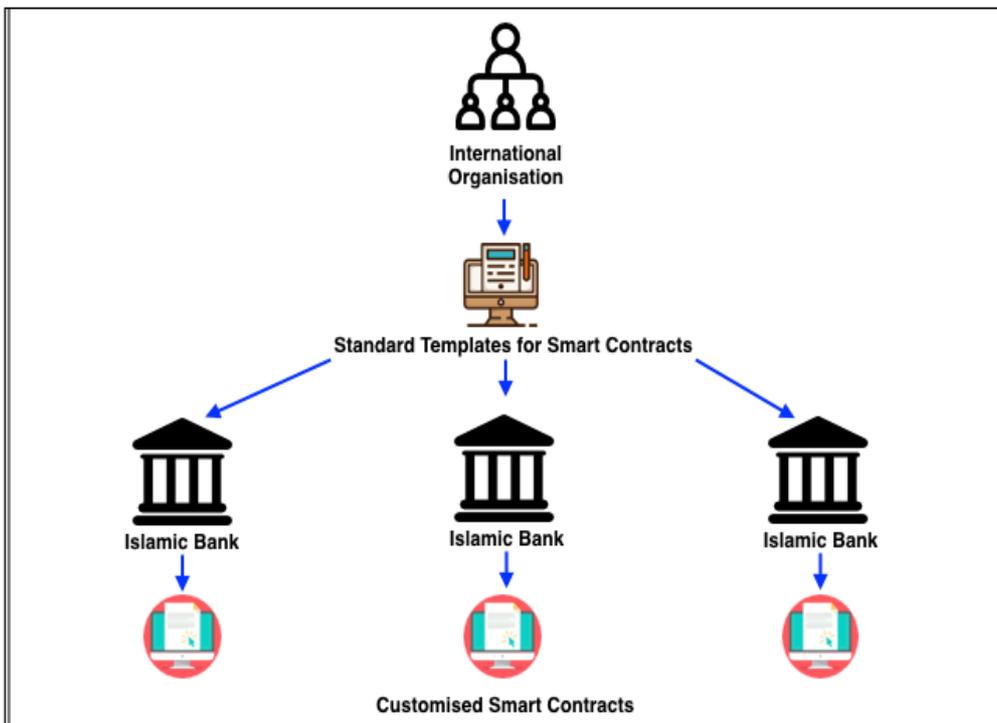
**Figure 2: Exploring Islamic Banking using the Complexity Matrix**



**Figure 3: Towards a Blockchain Monitoring Process**



**Figure 4: Monitoring the Islamic Finance Industry**



*The source of the icons used in the figure is <https://www.flaticon.com/>.*