HAMAD BIN KHALIFA UNIVERSITY

COLLEGE OF ISLAMIC STUDIES

PROMOTING RETAIL SUKUK USING BLOCKCHAIN TECHNOLOGY

BY

DALAL ALMAHMOOD

A Thesis Submitted to the Faculty of

Islamic Studies

In Partial Fulfillment

of the Requirements

for the Degree of

Master of Science in Islamic Finance

June 2019

COMMITTEE

The members of the Committee approve the thesis of Dalal AlMahmood defended on 10th April, 2019.

Dr. Dalal Aassouli
Thesis Supervisor

Prof. Dr. Tariqullah Khan
Committee Member

Dr. Amin Mohseni-Cheraghlou
Committee Member

Approved:

Prof. Dr. Emad Eldin Shahin, Dean, College of Islamic Studies

ABSTRACT

Access to financial services is just one of the challenges faced by the poor, but if achieved it can help address some of the other development challenges they face. Addressing the challenges to financial inclusion requires innovative approaches. This paper studies two innovative concepts which are retail sukuk and blockchain and explores how they can be used together to promote Islamic finance and financial inclusion. The objective of the paper is to provide an overview of sukuk and how it can address financial inclusion and provide an overview of Blockchain technology. The paper also presents blockchain use cases in the financial sector and Sharia perspective on using the technology. Indonesia experience in retail sukuk is reviewed to understand the required framework and process of issuance. The study also suggests a blockchain platform for retail sukuk subscription. The study concluded that for the presented solution to succeed in addressing financial inclusion, efforts need to be exerted to raise the retail customer financial and technology literacy. Moreover, the blockchain platform proposed has the potential to eliminate intermediaries but with minimum cost reduction.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 Background

Financial inclusion is considered as one of the tools that encourage economic development. It is an enabler to 11 of the 17 Sustainable Development Goals (SDG) (Leora Klapper, 2016). Financial inclusion "*means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way*" (World Bank Group, 2019b).

In 2011 the World Bank launched the Global Findex database which collects data about how individuals save, borrow, make payments and manage risk. The database has been used widely to measure financial inclusion. In 2017 the data showed that only 515 million adults have an account in a financial institution or with a mobile money provider. The individuals excluded are referred to as the "unbanked" and are estimated at 1.7 billion adults. It is worth noting that one of the aims of financial inclusion is to get the unbanked and underbanked to have better access to financial services. Additionally, the report identified that half of them live in seven developing countries: Bangladesh, China, India, Indonesia, Mexico, Nigeria, and Pakistan. (Demirgüç-Kunt, et al., 2018). The Global Findex survey asked the unbanked adults why they do not have an account. Figure 1 illustrates the result of the survey, listing the cited barriers.

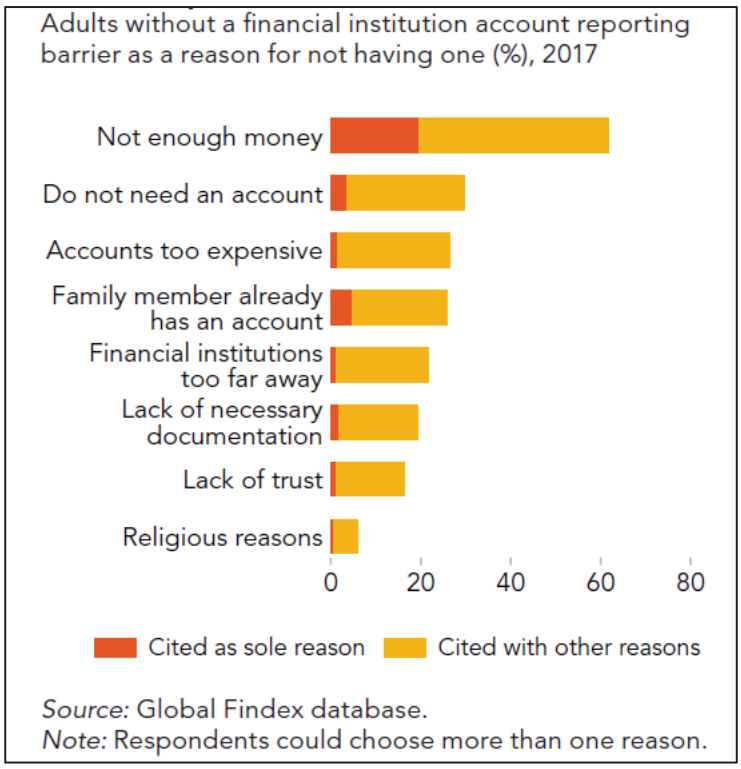


Figure 1 Adults cited barrier for not having an account in a financial institution account (%)[1] (Demirgüç-Kunt, et al., 2018, p. 40)

The Independent Evaluation Group (IEG) in their evaluation of the World Bank's support for financial inclusion noted that from the financial institutions' perspective, the barrier to extending their services to the unbanked individuals is the high transaction cost and risk of unprofitability. The report demonstrated that barriers like financial literacy and consumer protections are significant barriers that rarely get cited in reports and surveys and that needs to be also addressed (IEG World Bank Group, 2015).

The IEG acknowledged that there had been a focus on microcredit services to address financial inclusion. The assumption is that this service will pull out individuals from poverty by offering them funds to invest and build wealth. Unfortunately, this assumption

[1] "*Account (%): Refers to the percentage of respondents who reported having an account (by themselves or together with someone else) at a bank or another type of financial institution or reported personally using a mobile money service in the past 12 months (see definition for mobile money account).*" (Global Findex database, 2019)

did not always address the poverty issue. Instead, it caused another issue which is over-indebtedness. The IEG further explains that the development of savings instruments to address financial inclusion and poverty is potentially a better approach in comparison to credit instruments (IEG World Bank Group, 2015).

In 2017, the IEG hosted a panel discussion about the role of capital markets in financing the SDGs. The panel identified that in order to address the financial needs of the poor, capital markets need to be developed to provide additional sources of funds. Also, they need to be more open to retail and low-value transactions. The panel noted that offering instruments in smaller denominations could help develop capital markets and enhance financial inclusion by providing saving opportunities to the poor (IEG World Bank Group, 2017). ABN AMRO Bank identified opening the capital market for a wider audience as an opportunity where '*Many drops make a shower*' specifically towards providing capital to achieve the SDGs (ABN AMRO and Triodos Investment Management, 2016).

Bonds are one of the instruments used to raise funds in the capital markets. They represent fixed income investments where the investor loans money to an entity against financial security for a fixed rate of return in a defined period. Bonds, in general, have been out of reach even for the average individual. If retail bonds can be considered as a capital markets instrument to promote financial inclusion, its Sharia-compliant equivalent should be Retail sukuk. The Organization of Islamic Cooperation (OIC) in 1988 has legitimized the concept of sukuk to address the demand for Sharia-compliant financial instrument in the capital markets. Sukuk are defined as "*certificates of equal value representing undivided shares in the ownership of tangible assets, usufructs and services or (in the ownership of) the assets of particular projects or special investment activity*." (AAOIFI, 2015, p. 468)

In 2017 the global issuance of sukuk amounted to USD 116.7 billion (IIFM, 2018). Sukuk issuers are usually large corporates in need of funds to finance their projects, sovereigns

raising money to finance the country's infrastructure projects like building roads, train stations or airports or quasi-sovereign entities. The subscribers or buyers of the sukuk are usually financial institutions and institutional investors seeking to diversify their investment portfolios. Retail sukuk can support widening the sukuk investor base, which can help create a liquid market in addition to having the potential to address financial inclusion (World Bank and Islamic Development Bank Group, 2016).

Indonesia has been one of the main issuers of retail sukuk since 2009, whereby financial inclusion is listed as one of its objectives. In 2016, Dr. Robert Pakpahan, the director general of budget financing and risk management in the Ministry of Finance of the Republic of Indonesia presented the Indonesian experience and listed financial inclusion as one of the sukuk issuance objectives. He indicated that housewives form 12.26% of the retail sukuk investors (Pakpahan, 2016).

Another tool to promote financial inclusion is financial technology. The Findex report noted that technology could address some of the barriers to financial inclusion. Technology developments have significantly reduced the cost of financial transactions, addressing the high cost of a financial account barrier. Mobile money is another technology that addressed the long distance to financial institutions barrier in certain regions (Demirgüç-Kunt, et al., 2018). The launch of mobile money which is an electronic wallet where individuals can store their financial assets has increased account ownership in the Sub-Saharan countries. The number of adults having a mobile money account in Sub-Saharan countries increased to 21% in 2017 compared to 12% in 2014 (Demirgüç-Kunt, et al., 2018). In Kenya, mobile phones have been used as a tool to subscribe to retail bonds.

In recent years the Distributed Ledger Technology (DLT) or Blockchain[2] has emerged as a technology that can address several issues that the current financial technologies face. The DLT/Blockchain is a secure ledger/database that is replicated with no central control (Natarajan, et al., 2017). The World Economic Forum has identified several use cases for DLT/Blockchain in financial services. The use cases covered applications in payments, trade finance, syndication loans, and contingent convertible bonds. (World Economic Forum, 2016).

The World Bank group noted that some of the DLT/Blockchain applications could be in the identity systems, remittances, clearing and settlements, electronic Know Your Customer (KYC) and property registration. (Natarajan, et al., 2017).

Upon mapping the offerings of the DLT/Blockchain and the significant barriers to financial inclusion specifically the valid identification, the DLT/Blockchain has been identified as a mean to address this by offering a digital identity verified by biometrics. (Natarajan, et al., 2017).

1.2 Research Problem

It is clear that financial inclusion as an enabler to achieving the SDGs is a key focus area for several international organizations and countries. Retail sukuk could offer an opportunity to enhance financial inclusion. However, there is a need to understand further the Retail Sukuk instrument and how it can benefit the unbanked. Moreover, as technology has been identified as an essential factor in overcoming several financial inclusion barriers, it is important to understand how it can be leveraged to promote Retail Sukuk, specifically a new technology like DLT/Blockchain.

[2] As the DLT and Blockchain are evolving technologies, in my research I faced the challenge of not having a standard terminology to refer to each. Thus, since this is not a technical research, I decided to use both terms in the format DLT/Blockchain.

1.3 Research Objectives

The research has the following objectives:

1. Provide an overview of the sukuk instrument structure and issuance process and discuss how can retail sukuk address financial inclusion
2. Provide an overview of DLT/Blockchain concepts and use cases of the technology in the financial sector in addition to reviewing the Sharia perspective on the technology
3. Understand the framework Indonesia adopted to enable retail sukuk issuance and review its issuance experience
4. Develop a framework and suggestions that can be adopted to use distributed ledger technology to promote retail sukuk

1.4 Research Question

The research aims to answer two key questions: (1) How can retail sukuk be used as a tool to address financial inclusion in Muslim societies? Also, (2) how can technology such as DLT/Blockchain support the usage of retail sukuk?

1.5 Research Methodology

As the research responds to a problem that has not been clearly defined yet, it adopts an exploratory research design. The research attempts to understand how retail sukuk can be promoted using DLT/Blockchain technology and assess their role as tools in addressing financial inclusion, thus laying the groundwork for future research on the topic. To do so, use cases have been studied and open-ended interviews with key experts in blockchain technology, retail sukuk and shariah have been conducted. The interviews are presented in the appendices and their results discussed in chapters three, four and five.

The research is structured as follows:

Chapter 2 examines financial inclusion and retail sukuk. The data required to explore the financial inclusion in Muslim societies were collected from secondary sources mainly the World Bank reports and the Global Findex database. The data required to explore retail sukuk was primarily collected from the International Islamic Financial Market (IIFM) reports.

Chapter 3 provides an overview of the DLT/Blockchain and use cases in the financial industry. As the DLT/Blockchain technology is a new concept, the information was gathered from research papers and articles. The use cases selected were used to draw an analogy on how it can be used in the financial sector in general and in promoting retail sukuk to address financial inclusion in specific. An interview with Dr. Abdulazeem Abozaid an Associate Professor of Islamic Finance at HBKU was conducted to understand the Sharia perspective on the DLT/Blockchain. Another interview with Blossom Finance CEO Matthew Martin was conducted to understand how technology was used by the company to develop Sharia-compliant financial instruments.

Chapter 4 presents a case study on the experience of Indonesia in issuing retail sukuk. The choice of Indonesia is justified because of its leading role as regular retail sukuk issuer. An interview was conducted with Dr. Suminto Sastrosuwito who is the Assistant Minister for Government Expenditure in the Ministry of Finance of the Republic of Indonesia to support the case study.

Chapter 5 suggests a potential use case on how to promote retail sukuk on a DLT/Blockchain platform to address barriers to financial inclusion.

Chapter 6 concludes the research by highlighting key findings, recommendations and future research topics

1.6 Significance of the study

This study presents a model for retail sukuk issuance leveraging DLT/Blockchain technology. The model can help governments address issues of financial inclusion and promote an investment culture through sukuk and technology.

1.7 Limitations of the study

The findings of this research have to be seen in light of some limitations. The main limitations are the limited available data on retail sukuk and the saving trends of the unbanked. Another limitation is the lack of empirical research on the role of DLT/blockchain in financial services.

CHAPTER 2: FINANCIAL INCLUSION AND RETAIL SUKUK: OPPORTUNITIES AND CHALLENGES

2.1 Economic Development and Sustainability Objectives

On 25 September 2015, the UN issued the sustainable development goals (SDGs) with 17 goals that need to be achieved by 2030. The goals and targets showcase the evolution of the world's mindset on how to improve human wellbeing and their development (United Nations , 2015).

Historically, the measurements used to monitor development focused on the economic factors which are mainly the average per capita income and the gross national product (GNP). It was in 1990 that the UN introduced the Human Development Index as a way to measure economic development. The UN in an attempt to encourage development issued the Millennium Development Goals (MDGs) in the year 2000 that comprised of eight goals each with specific indicators that needed to be achieved by 2015. The goals focused on poverty eradication, education and health. The 2015 MDG report noted that there had been uneven progress in the MDG targets particularly as 800 million people remain in extreme poverty and suffer from hunger (United Nations, 2015). The UN in introducing the 17 SDGs with their associated targets adopted a broader concept of sustainable development with more objectives in economics, social and environmental development.

The World Bank Group (WBG) through its partnership with the United Nations also adopted a different approach to financial development and identified twin goals which are ending extreme poverty and boosting shared prosperity by 2030 as its mission (World Bank Group, 2019c).

2.2 Financial Inclusion Overview

Financial inclusion "*means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way*" (World Bank Group, 2019b).

Although the SDGs do not specifically target financial inclusion, research has identified that access to financial services is a key enabler to 11 of the SDGs specifically SDG 1 (Eliminating extreme poverty) and SDG 2 (Reducing hunger and promoting food security) (Leora Klapper, 2016).

In 2017 the Global Findex data reported 1.7 billion adults are 'unbanked' and an estimated half live in seven developing countries: China (225 million), India (190 million), Pakistan (100 million), and Indonesia (95 million), Nigeria (63 million), Mexico (59 million), and Bangladesh (58 million) (Demirgüç-Kunt, et al., 2018).

A wide range of resources has been deployed to address financial inclusion by international organizations and countries. In January 2019, the Consultative Group to Assist the Poor (CGAP) Funder Survey reported that international funders committed $42 billion to financial inclusion in 2017 (CGAP, 2017). The funding data were collected from 54 international funders. The funders ranged from public multilateral development agencies to private institutional investors. The funders fund financial service providers, microfinance investment vehicles, governments and other intermediaries across an estimated 95 countries. The CGAP 2017 trends displayed in Figure 2 shows that most of the financial inclusion funds were focused on debt instruments.

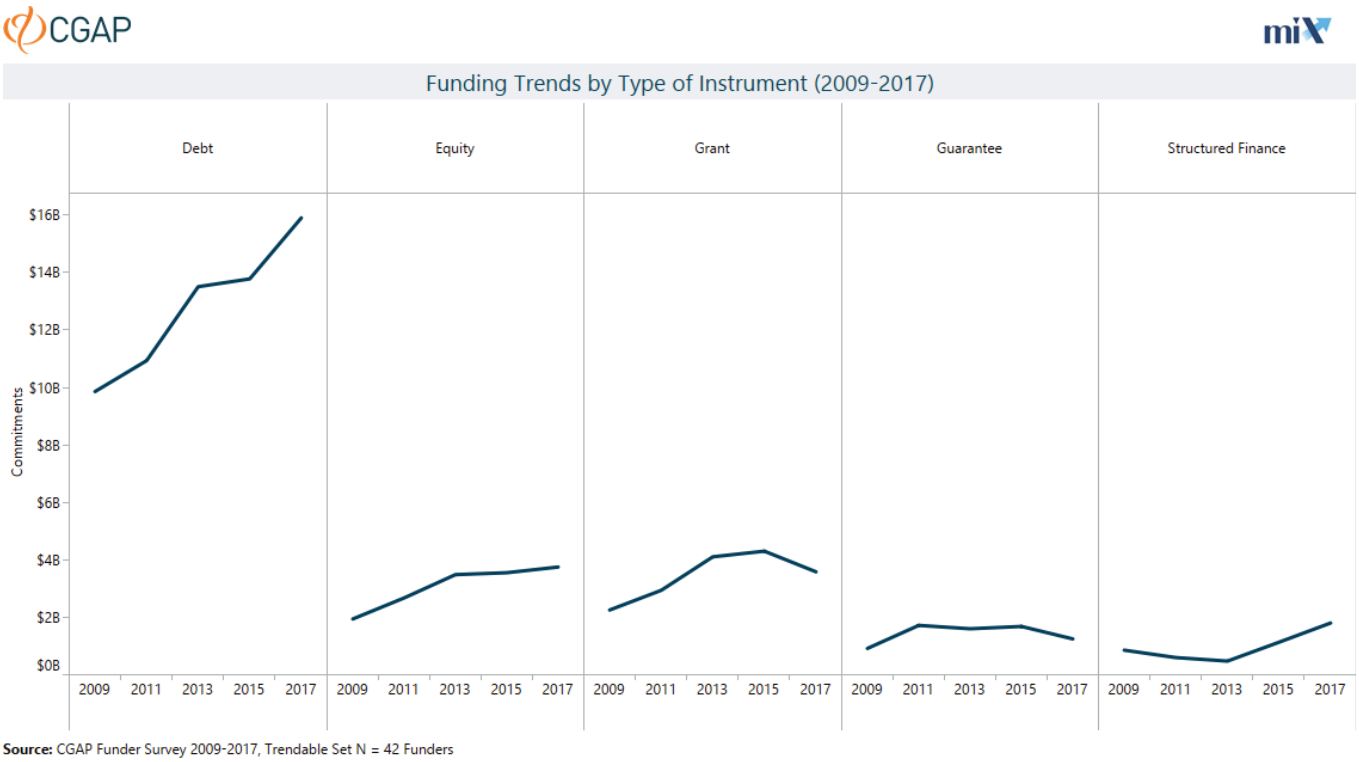


Figure 2 Funding Trend by Instruments (CGAP, 2017)

The IEG reported that two to three percent of the World Bank annual commitments had been spent on financial inclusion projects. The projects varied but the main ones focused on advisory services to the countries. The services include supporting the country in policy reforms to create an environment for financial inclusion which may include setting specific frameworks. Another type of support that is extended to countries with the lowest levels of financial inclusion is through offering lending facilities, investments or guarantees directly to the financial intermediaries.

On the country level, Table 1 lists sample projects aimed towards enhancing financial inclusion selected from the countries with a high unbanked population.

Table 1 Country Level Projects Addressing Financial Inclusion

Entity/Country	Project – Year of Implementation	Instrument	Project Brief
Asian Development Bank (ADB) - India	Microfinance Risk Participation and Guarantee Program - 2010	Credit	ADB works with microfinance institutions through the Program to extend credit to rural women borrowers to start their small business
Department of Financial Services – Ministry of Finance Government of India	Pradhan Mantri Jan Dhan Yojana (PMJDY) - 2014	Deposit Account	PMJDY is a scheme promoted by the Ministry under which an individual can open a bank account with zero balance and with minimum documentation. The account can be opened based on a self-attested picture and a signature or a thumbprint in the presence of the bank employee.
Bank of Bangladesh (BB)	No-Frill Accounts (NFA) - 2010	Deposit Account	BB has issued the regulation to banks in Bangladesh to enable segments of customers (Initially farmers then extended to freedom fighters and beneficiaries under social security programs and other segments) to open deposit accounts with zero balance. The benefits of the account include interest on the deposit and life insurance.
Central Bank of Nigeria (CBN)	Shared Agency Network - 2018	All	CBN issued a regulation to allow banks to appoint agents and super agents (large corporate agent who appoints small subagents). The agents may include mobile money operators. The agents can offer basic financial services, such as cash-in, cash out and funds transfer.
Chinese government	Digitization of Government-to-Person Transfers (G2B) - 2010	Deposit Account/Payments	The Chines government identified that 40% of all households and 68% of rural households receive a type of subsidy in cash. The government shifted to paying

			the beneficiaries in an account linked to a debit card. This project was enabled through agent-based service points and settlement systems to support the disbursement.

Financial inclusion needs to be addressed at the country level. The process starts with the country having the right development policies and the first step would be to understand the barriers to financial inclusion. Some barriers can be considered voluntary and others involuntary. The 2014 Financial Inclusion report (World Bank, 2014) has segregated the barriers and recommended that the policymakers focus on involuntary barriers. The report has placed exclusion due to faith as a voluntary barrier, a position that implies the lack of understanding of the reality of the Muslim community which is driven by faith.

As mentioned earlier, half of the 1.7 billion unbanked adults live in seven countries. Four out of the seven countries are Muslim countries: Pakistan, Indonesia, Nigeria and Bangladesh. The policymakers in these countries need to align the International Organizations' recommendations to address financial inclusion with their communities' local realities.

Policymakers need to understand that a Muslim's behavior is governed by balancing the material needs and non-material needs. This balance and needs have been addressed in Islam under the broader concept of Maqasid al-Shariah. Hence one can claim that by further understanding Maqasid al-Shariah and aligning them to the SDGs through the national vision, the well-being of the Muslim individual can be achieved.

2.3 Promote Saving to address financial inclusion

Financial inclusion focuses on four essential services, which are payments, savings, credit and insurance. The IEG noted that in the past years the focus was on developing the credit

service and specifically microcredit. The assumption is that this service will pull out individuals from poverty by offering them funds to invest and build wealth. Unfortunately, this assumption did not always address the poverty issue. Instead, it caused another issue which is over-indebtedness as in several cases the credit was used for consumption instead of an investment. Moreover, not all individuals have entrepreneurship skills to use the credit to generate income.

The IEG highlighted that development of saving instruments to address financial inclusion and poverty is potentially a better approach in comparison to credit instruments as studies assessing the impact of savings on average are more positive than microcredit (IEG World Bank Group, 2015). It further explains that the challenge with the saving instruments is the constraints related to low-income individuals which seek small short terms rewards instead of large long-term ones. The need for innovative design of saving products is required in addition to changing people's behavior towards it.

Financial intermediaries also play a significant role in promoting credit and not saving instruments. The IEG report noted that credit is easier to regulate and more profitable in comparison to the small saving accounts mobilization which has high transaction cost and risk.

It should be highlighted that having access to an account does not necessarily lead to inclusion. For example, in India, the Ministry of Finance has launched a scheme to address financial inclusion under the name *Pradhan Mantri Jan Dhan Yojana* where an individual can open an account with banks at zero balance. The account comes with certain benefits like insurance and access to mobile banking services. The IEG noted that the World Bank reported that 72 percent of accounts still have zero balances (implying dormancy) (IEG World Bank Group, 2015).

Thus, the focus shall not only be to ensure that an individual has an account, but it should also address the central challenge of the poor which is transforming irregular income flow into a regular one to address daily needs (IEG World Bank Group, 2015).

Individuals may save informally by keeping the money with them or giving it to another individual or group to keep for with them. Formal saving can be done via deposit saving accounts, pension account and investment in bonds. In the formal saving scheme, a rate of return is expected. In the conventional banking system, the rate of return is in the form of interest paid as a percentage from the funds in the account.

Another form of saving is the investment in the capital markets in the form of bonds. Bonds are a fixed-income investment where the investor loans money to an entity and can expect a fixed rate of return in a defined period. Bonds are one of the instruments used to raise funds in the capital markets. The saving accounts have been more accessible to individuals in comparison to bonds; however, this has started to change in recent years.

Promoting bonds to address financial inclusion can serve sustainable development in multiple ways. They can be offered as a saving instrument to the unbanked to increase their regular income. They can be a stable source of fund for projects aimed towards sustainable development like building the infrastructure required for the health sector, educational sector, financial sector and the technology sector. These funds can also be utilized to foster small to medium business.

From a Sharia perspective, there are specific practices in conventional finance that are prohibited. Table 2 summarizes these practices.

Table 2 Prohibited vs. Permissible Practices/Transactions in Finance

Prohibited Practices/Transactions	Permissible Practices/Transactions
Riba (Interest, Usury)	Trade (Buy/Sell)
Sale of Debt	Sale of usufruct of property (Rent)
Gharar (Fraud)	Sale of usufruct of services
Excessive Gharar (Uncertainty)/ Gambling	Investment
Dealing with Non-Halal commodities/products	Wakala (Agency)

Thus, interest on saving accounts is a prohibited practice in Islam. This should not imply that the hoarding of savings is recommended. In fact, it is discouraged "*And those who hoard gold and silver and spend it not in the way of Allah - give them tidings of a painful punishment*" (Quran 9: 34). Moreover, if one chooses to hoard the funds for over a year, Zakat payment will have to be deducted from the saved money and will be given to the poor and needy as per the Sharia laws.

The alternative approach to conventional interest-bearing saving account in Islamic finance are saving accounts based on investment contracts where the depositor and the bank get into a type of partnership contract referred to as Mudarabah where the bank will invest the capital provided by the depositor. The profit will be shared between the depositor and the bank in a pre-agreed ratio. The depositor will bear any loss in the investment. The alternative to bonds is sukuk which are considered an investment instrument.

2.4 Overview of Sukuk and their structures

It is important to understand the sukuk concept and how are they structured before exploring how it can support increasing financial inclusion. Sukuk are investment instruments used in the Islamic Capital Market (ICM) to raise funds for the issuing entity. As per the International Islamic Financial Market (IIFM) which is a standard setting body aimed to standardize the Islamic capital and money market sukuk 2018 report, the global sukuk issuance amounted to $116.7 billion in 2017 at an increasing trend. Malaysia

continues to be the market leader in terms of global sukuk issuance for the period from 2001 till 2017 with a market share of 62.5%. Figure 3 indicates the issuance of the top seven countries.

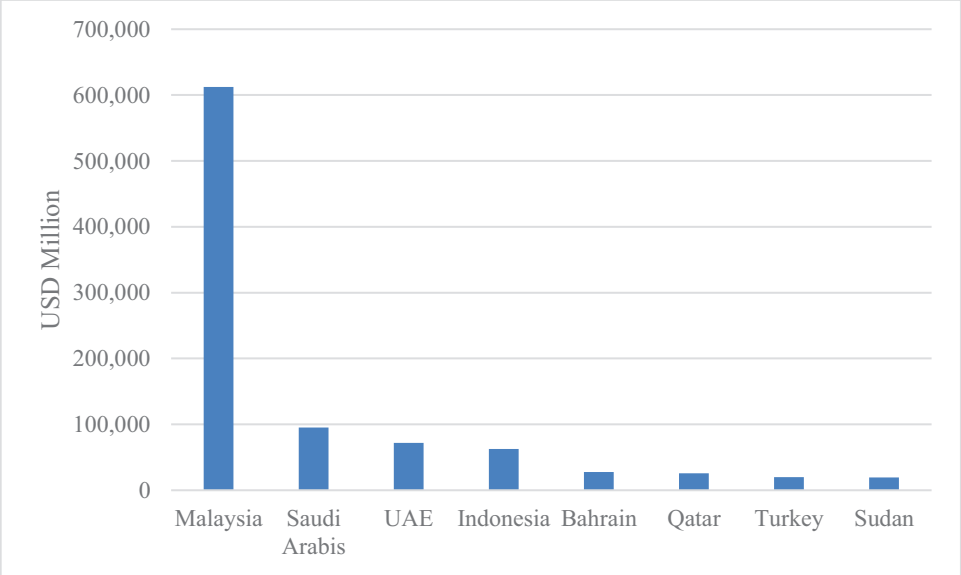


Figure 3 Global Sukuk Issuance (2001-2017) (IIFM, 2018)

In 1988 the OIC legitimized the concept of sukuk to address the demand of Sharia-compliant financial institutions in the capital markets. The Accounting and Auditing Organization for Islamic Financial Institutions (AAOFI) defined sukuk as '*certificates of equal value representing undivided shares in the ownership of tangible assets, usufructs and services or (in the ownership of) the assets of particular projects or special investment activity*' (AAOIFI, 2015, p. 468).

Table 3 highlights the main differences between Sukuk and Bonds.

Table 3 Differences between Sukuk and Bond Features

Feature	Sukuk	Bond
Financing instrument	Sharia-compliant financing contract/investment contract	Debit
Ownership	Ownership of an underlying asset is required	No ownership of assets is required
Rate of Return	Based on the underlying contract (i.e., profit loss sharing concept, rent, agency fee)	Interest rate (Fixed or Floating)
Risk	Inherit the underlying contract risks which can be: • Credit Risk • Market Risk • Liquidity Risk • Rate of Return Risk • Operational Risk	Credit Risk
Tradability	Restricted as it depends on the underlying contract[3]	Not Restricted
Structure process/Documentation	Varies as it depends on the underlying contract and/or asset	Standard

[3] The sale of debt is not permissible in Sharia; thus if the sukuk represents ownership of debt, it is not permissible to sell/trade the sukuk. If sukuk represent ownership of tangible assets, then it is permissible to sell/trade. If sukuk represent ownership of a pool of tangible and intangible assets, the permissibility of selling/trading will depend on the percentage of the tangible asset in the pool. There are different Sharia rulings on the percentage of tangible asset required for the sukuk to be traded. The required percentage of tangible assets range from 30% (AAOIFI) to 51%.

Figure 4 illustrates common Sharia contracts that are used to structure Sukuk:

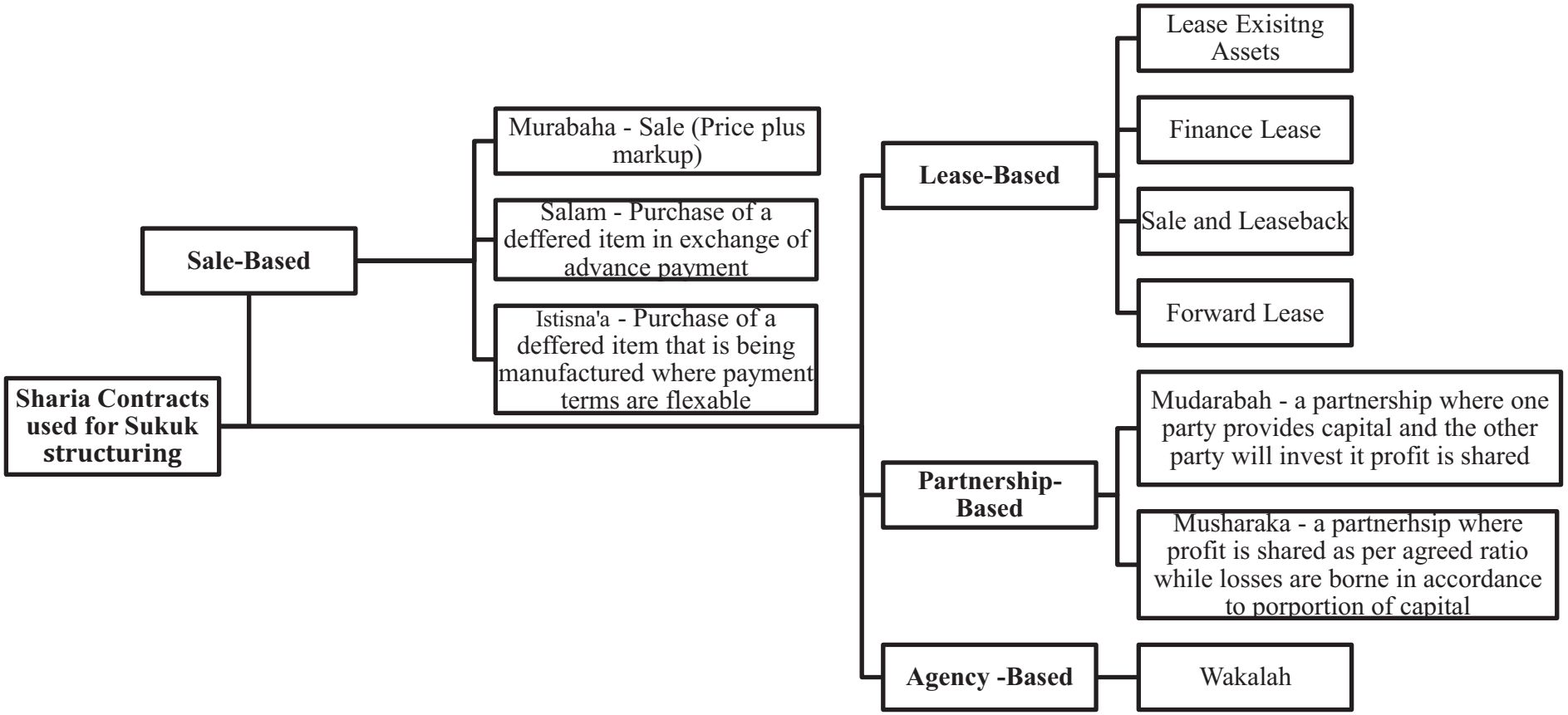


Figure 4 Sharia Contracts Used to Structure Sukuk

The sukuk can be structured using one of the Sharia contracts listed in Figure 4 and are mostly classified based on the contract. The most common sukuk are[4]:

- Sukuk Al Ijarah
- Sukuk Al Wakalah
- Sukuk Al Mudaraba
- Sukuk Al Salam
- Sukuk Al Istisna
- Sukuk Al Murabaha

It should be noted that in addition to the above common sukuk, there are sukuk that are structured using two or more contracts and, in this case, they are referred to as Hybrid.

Perpetual sukuk is another term that is currently used to describe sukuk that are issued by banks to raise capital to address the capital adequacy minimum requirement of Basel III. The tenor of the sukuk is five years or more and the structure is usually based on Mudarabah or Musharaka.

As per the International Islamic Financial Market (IIFM) sukuk 2018 report, Sukuk Al Ijarah and Sukuk Al Wakala are widely used in structuring sovereign sukuk specifically in the International sukuk market (IIFM, 2018, p. 48).

[4] List constructed from multiple sources which are (AAOIFI, 2015), (ISRA International Shari'ah Research Academy for Islamic Finance, 2015) (IIFM, 2018)

The Sukuk lifecycle is summarized in Figure 5.

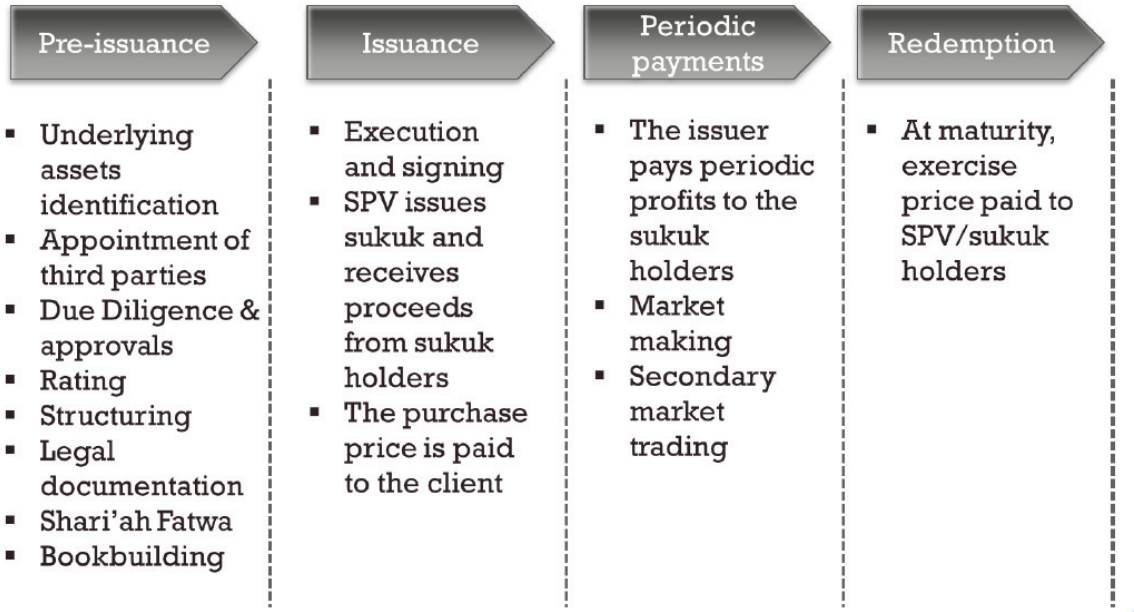


Figure 5 Sukuk Life Cycle Summary (Aassouli, 2019)

Sukuk Al Ijarah are based on leasing the underlying assets which are usually tangible allowing the sukuk to be traded in the secondary market. The assets can be planes, ships, telecommunication equipment's, buildings and lands to list a few. Figure 6 is a simple workflow of Sukuk Al Ijarah structure based on Sale and Lease Back.

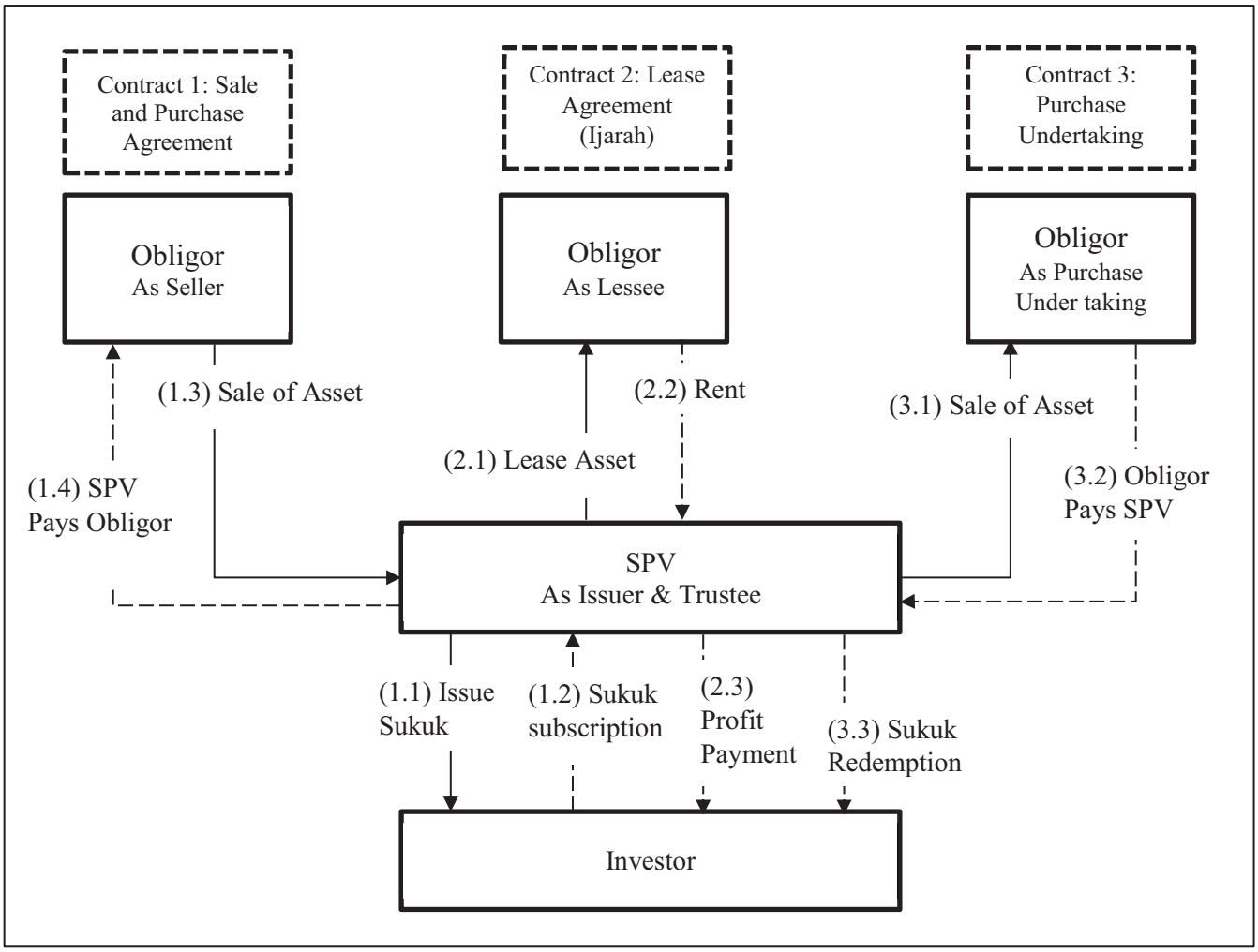


Figure 6 Ijarah (Sale and Lease Back) Sukuk structure

In recent years Sukuk Al Wakalah has gained traction due to the flexibility it offers where the underlying assets can be a pool of tangible and intangible assets. The Sharia contract of Wakala is similar to an agency contract, where the principal (Muwakkil) appoints an agent (Wakil) to invest on his behalf in return of a fixed fee agreed in the Wakalah contract. Figure 7 illustrates the structure of Sukuk Al Wakalah with a pool of tangible and intangible assets.

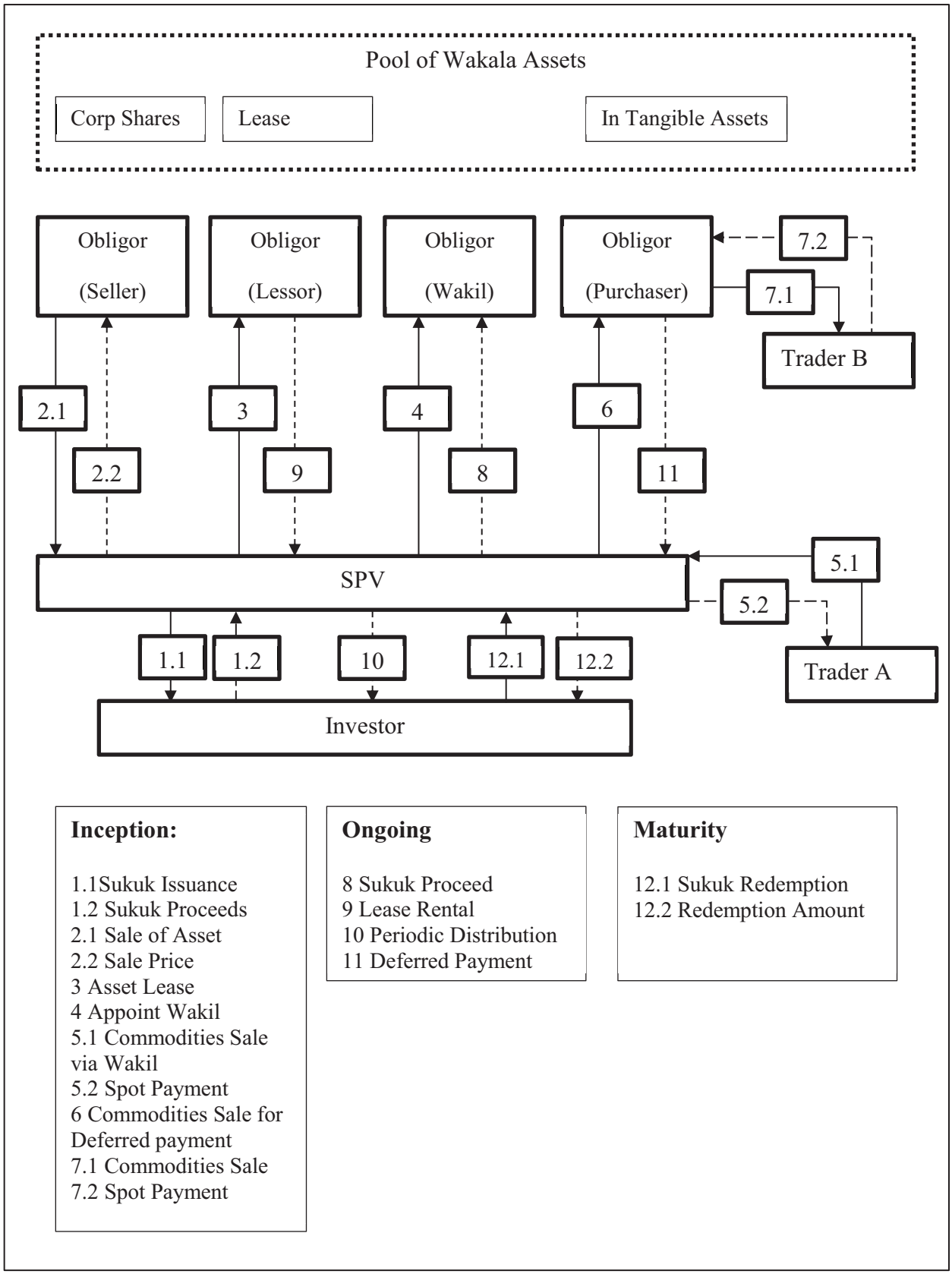


Figure 7 Sukuk Al Wakala Structure

Each sukuk structure will have different intermediaries participating in the issuance process. For example, in Sukuk al Ijara, in addition to the Obligor, SPV and Investor, the following intermediaries are involved each with its own set of agreements:

1. Independent evaluator to evaluate the assets that will be used in the sukuk structure
2. Lead Arranger to manage the whole sukuk issuance process
3. Sharia advisor to review the structure and ensure it complies with Sharia
4. Legal advisor to conduct due diligence
5. Rating Agency to provide credit rating to sukuk

Moreover, each sukuk structure will have different sets of documentation signed between the parties in their different capacities. Table 4 lists the required documentation for Sukuk Al Ijarah.

Table 4 Documentation - Sukuk Al Ijarah (Clifford Chance LLP, 2009, pp. 17-18)

Document	Parties	Summary / Purpose
Sale and Purchase Agreement	Originator (as Seller) and Trustee (as Purchaser)	From Trustee's (and the Investors') perspective, this is the document that gives ownership of revenue generating assets (i.e., the Assets). From Originator's perspective, this is the document under which it receives funding.
Lease (Ijara) Agreement	Trustee (as Lessor) and Originator (as Lessee)	Trustee leases the Assets back to Originator in a manner that: i. gives Originator possession and use of the Assets so that its principal business can continue without interruption; and ii. through Rentals it generates a return for Trustee (and the Investors).
Service Agency Agreement	Trustee (as Lessor / Principal) and Originator (as Servicing Agent)	Allows Trustee to pass responsibility for major maintenance, insurance (or takaful) and payment of taxes (i.e., an owner's obligations) back to Originator. Any reimbursement amounts or service charges payable to Servicing Agent are set off against (i) a corresponding 'supplementary rental' under the Ijara or (ii) an additional amount which is added to the Exercise Price (payable under the Purchase Undertaking or the Sale Undertaking, as applicable).
Purchase Undertaking (Wa'd)	Granted by Originator (as Obligor) in favour of Trustee	Allows Trustee to sell the Assets back to Originator if an event of default occurs or at maturity, in return for which Originator is required to pay all outstanding amounts (through an Exercise Price) so that Trustee can pay the Investors.

Sale Undertaking (Wa'd)	Granted by Trustee in favour of Originator (as Obligor)	Allows Originator to buy the Assets back from Trustee in limited circumstances (e.g., the occurrence of a tax event), in return for which Originator is required to pay all outstanding amounts (through an Exercise Price) so that Trustee can pay the Investors.

As indicated, the Sukuk issuance is a process with several intermediaries and lengthy documentation. Moreover, for an entity to issue sukuk, it needs to adhere to the country's Legal and Regulatory framework, Accounting and Taxation framework and Sharia governance if it is enforced. There are ongoing efforts among organizations like AAOIFI and IIFM to standardize the process.

Thus, entities seeking funds either follow a commonly used structure or develop a new structure that meets their funding terms; in all cases, the structure needs to be reviewed by legal firms and sharia advisors. The differences between structures in different markets impose several challenges to Sharia & Legal scholars and advisors. Among the common issues is that of sukuk ownership of the underlying assets. For example, in Sukuk Al Ijarah structure illustrated in Figure 6, the SPV will own the asset legally once it buys the asset. In the case of sovereign sukuk, the underlying assets will be state-owned and, in some countries, the transfer of ownership requires prior approvals. Both Sharia and Legal bodies settled this issue by accepting the concept of beneficial ownership which has its origin in the English common law.

To promote sukuk, it is vital that countries establish the following frameworks ensuring their synchronization:

1. Legal and Regulatory Framework to ensure the existence of legally binding rules and clearly define the process to enforce or change them if required. It should also identify the institutions that will monitor the execution of the rules.
2. Accounting and Taxation Framework to ensure that investors and issuers are equipped with accurate financial information to make decisions. Moreover,

appropriate taxation framework needs to be implemented to promote the sukuk and give it a similar treatment to conventional instruments.

3. Sharia Framework to ensure the Sharia compliance of the instruments.

2.5 Retail Sukuk

Similar to retail bonds, retail sukuk remain an untapped instrument in the capital market. Retail sukuk were developed to address the needs of retail customers who are seeking an investment opportunity but have limited funds. Few entities and sovereigns offer these sukuk due to the operational overhead of issuing small denominations of sukuk or due to the absence of legal frameworks to govern the relationship with retail customers. In some cases, the complexity of the sukuk legal documentation drives away the retail customer, which was addressed by few countries who have set the required framework to enable such offering and provide the necessary protection to retail investors. Among these countries are Indonesia (2008) and Malaysia (2012).

In other countries like Oman, the concept is being tested. For example, Meethaq Islamic Banking which is the Islamic window of Bank Muscat issued Meethaq Sukuk - Sukuk Al Musharakah where the minimum order was OMR1,002 ($2,600). The IIFM considered this issuance as the first retail sukuk issuance in Oman with 25% of the subscribers being retail customers (IIFM, 2018). Table 5 summarizes examples of Retail Sukuk Issuances.

Table 5 Retail Sukuk Issuance

Retail Sukuk	Obligor	Underlying Contract	Min Order
Retail Sukuk	Government of Indonesia 2009	Ijarah	IDR 5 million $350
DanaInfra Retail Sukuk	DanaInfra Nasional Berhad Malaysia 2013	Murabaha	RM 1,000 $310

AZM Sukuk	K-Electric Limited Pakistan 2014	Musharaka	PKR 5,000 $48
Saving Sukuk	Government of Indonesia 2016	Wakalah	IDR 1 million $70
Gold Denominated Ijarah Sukuk	Government of Turkey 2017	Ijarah	22K and 24K gold 1000 units = 1 gram of 1000/1000 pure gold
Retail Sukuk Ihsan	Khazanah Nasional Berhad - Sovereign wealth fund of Malaysia 2017	Wakalah	RM 1,000 $310 Crowd Funding option available

From a macro-level retail sukuk has the potential to raise funds required to address local projects aimed for sustainable development. It can support, develop and deepen the sukuk market by increasing the demand-side.

2.6 Retail Sukuk and Financial Inclusion

As mentioned earlier the Findex report indicated that half of the 1.7 billion unbanked adults live in seven countries. Four out of the seven countries are of Muslim majority population: Pakistan, Indonesia, Nigeria and Bangladesh. The report also noted that being unbanked does not necessarily mean that an individual does not save. Figure 8 displays the saving behaviors in the mentioned four Muslim countries.

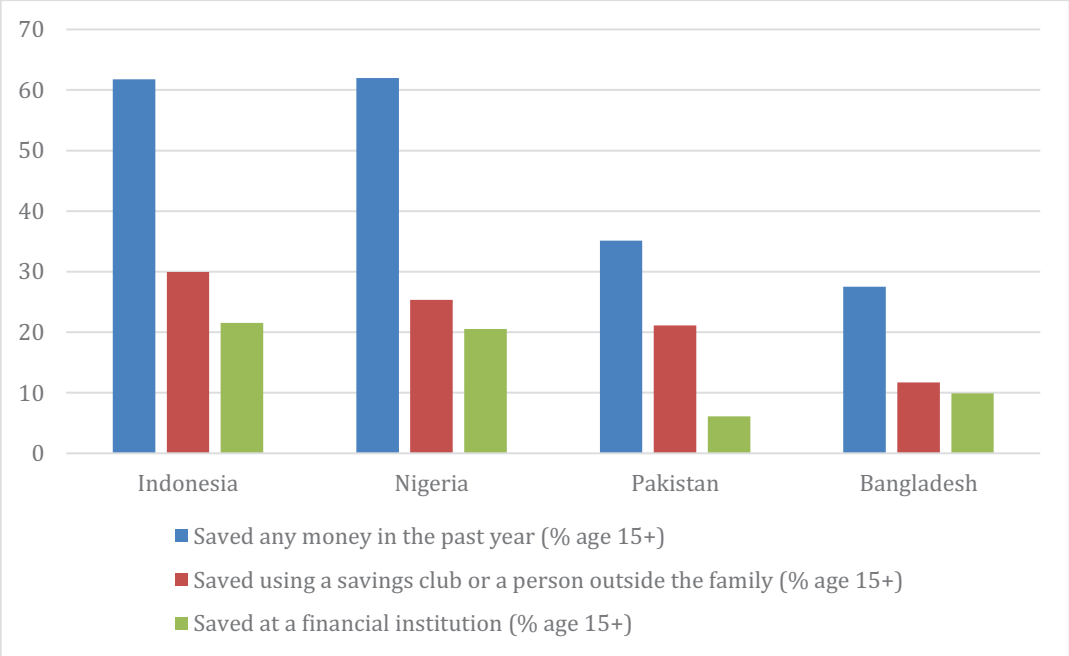


Figure 8 Saving Behavior in selected Muslim Countries (Global Findex database, 2019)[5]

Retail Sukuk can be considered an innovative saving product that has the potential to address financial inclusion while meeting investors' religious beliefs. ABN AMRO Bank identified opening the capital market for a wider audience as an opportunity where 'Many drops make a shower' specifically towards providing capital to achieve SDGs (ABN AMRO and Triodos Investment Management, 2016).

Indonesia is among the countries that currently offer retail sukuk and that have stated financial inclusion as one of the objectives of issuance. Retail sukuk can address the following barriers cited for financial inclusion:

[5] *"Saved any money in the past year (% age 15+) is the percentage of respondents who report personally saving or setting aside any money for any reason and using any mode of saving in the past 12 months."*
"Saved at a financial institution (% age 15+) is the percentage of respondents who report saving or setting aside any money at a bank or another type of financial institution in the past 12 months."
"Saved using a savings club or a person outside the family (% age 15+) The percentage of respondents who report saving or setting aside any money in the past 12 months by using an informal savings club or a person outside the family." (Global Findex database, 2019)

- Not having enough money: The individuals citing this barrier either related it to the high cost of having an account and/or having little money to use an account. The potential with retail sukuk is that it targets individuals with small saving funds. The current available retail sukuk are offered as low as $50. Moreover, in Turkey gold is accepted as the subscription amount.
- Do not need an account: This barrier can be flagged as a voluntary one which policymakers may elect not to address. In the case of sukuk, the need to raise funds comes from the issuer. Thus, it is in the issuer's interest to target the customers who save informally and do not see the need to use a bank account to save formally. The issuers can target these informally saved funds.
- Account too expensive: In financial intermediate, the cost of maintaining small and very liquid funds is high in terms of cost and risk. Thus, financial intermediaries will either force high minimum balances to open accounts or impose high fees on account transactions. With sukuk, the issuer will seek funds for identified projects. The cost of issuing sukuk consists of the initial structuring cost paid to intermediaries, which mainly includes legal advisors, sharia advisors and rating agencies. Another cost element in sukuk is the operational cost resulting from periodic profit payments and principal redemption at maturity. The cost of sukuk can be estimated upfront and spread among the subscribers. Thus, sukuk can be a feasible option in comparison to standard saving accounts.
- Lack of necessary documentation: As sukuk are not a bank account, the sukuk subscribers will not need to go through the banks' lengthy KYC and AML processes which require multiple types of documents. Depending on the sukuk issuer, a valid ID can be all that is required from the sukuk subscriber to present as a document.

- Lack of trust: The lack of trust in financial intermediaries can be resolved specifically with sovereign retail sukuk. The financial intermediaries' business model is to mobilize funds from savers to lenders. The concept of sukuk is owning an asset and generating a profit from it like Sukuk Al Ijarah. The idea of owning an asset can enhance the trust and encourage the individuals to invest in sukuk.
- Religious reasons: The retail sukuk can target customers who seek a sharia-compliant solution to investment and savings.

Retail sukuk have the potential to attract individuals to save formally as:

- It can have a better profit return in comparison to standard saving accounts.
- Issuers are not limited to financial institutions. It can be governments or quasi-sovereign or large corporates depending on the country's regulations.
- The individual may be able to subscribe to the sukuk with minimum documentation and with lower costs in comparison to saving accounts.
- The return on investment is realized periodically providing the individual with a sustainable source of income.

The following are possible challenges that individuals can face and that prevent them from subscribing to this type of sukuk:

- The individual does not have the minimum identification requirements.
- The individual does not have the minimum required amount to subscribe to sukuk.
- Financial literacy and the complexity of the subscription process.
- The need for having some type of account in a financial intermediary such as a bank to credit the sukuk return.
- The individual is unable to reach the sukuk selling/distribution agents due to geographical distance.
- Consumer protection (in comparison to saving accounts).

In 2017, the World Bank worked with Kenya to launch the M-Akiba bond to address the financial inclusion objective. It was in the form of government securities offered in a small denomination where Kenyans can subscribe to it through a mobile device. It was offered at a minimum of Sh3,000 (=$19.5) per transaction for a maximum of Sh140,000 (=$911.5). The bond is tax-free and expected to pay 10% interest biannually for three years (The Government of Kenya, 2017). Individuals interested in investing in the bond can start the investment process by sending a text message to a provided number. The subscription utilizes the mobile wallet offered by a mobile operator.

The bond was initially marketed in 2017, but it was undersubscribed. The survey commissioned by the Financial Sector Development programme (FSD) to understand the reasons behind the under-subscription concluded that poor public education, general elections and investor preference of investment with quick return were among the main reasons for the under-subscription (Tamara Cook, 2018). In 2019, the bond was re-opened and despite the best efforts to market it, the bond only achieved 79% subscription rate. The government did not give reasons for the under-subscription yet, but it can be assumed that it did not adequately address the reasons behind the 2017 under-subscription.

3. CHAPTER 3: DISTRIBUTED LEDGER TECHNOLOGY; TECHNOLOGY REVIEW AND USE CASES

Technology has been identified as key to increasing financial inclusion. Technology developments have significantly reduced the cost of transactions (Demirgüç-Kunt, et al., 2018) addressing one of the financial inclusion barriers.

The launch of mobile money, which is an electronic wallet where individuals can store their assets has increased account ownership in Sub-Saharan countries. The number of adults owning a mobile money account increased to 21% in 2017 compared to 12% in 2014 (Demirgüç-Kunt, et al., 2018).

In recent years the Distributed Ledger Technology (DLT) or blockchain has emerged as a technology that can address several issues that the current financial technologies face.

3.1 Introduction to DLT/Blockchain

The Blockchain concept first emerged in 2008 when a paper was published by a person who identified himself as Satoshi Nakamoto. In an aim to introduce an electronic cash system, the writer developed a framework from well-established technologies/concepts in the IT industry to create an electronic currency that can be exchanged among users of the system without the need of a financial institution to act as an intermediary. He aimed to replace the trust that financial institutions offer with cryptographic proof.

The objectives stated for creating a new electronic cash system is to overcome the following issues in the current centralized payment system:

- The increase of transaction costs due to intermediaries.
- The limit on minimum transaction size and avoidance of small casual transactions due to cost.

- The increasing amount of information required from an individual to process transaction due to the reversible nature of a transaction.

The concepts the paper used are:

- Peer-to-peer (P2P) network: it is the opposite of a centralized network. For example, in a centralized network, there will be one central node (computer) that stores the files (file server). If another node wants to share a file within the network, it will send it to the centralized node. The centralized node will allow access of this file to other nodes and even allow other nodes to copy the file, but the one trusted copy of the file will be stored in the centralized node. In a P2P network, each node will be connected to all other nodes in the network. The files are shared directly between nodes and each node will store a copy of the files rather than having one central node to store the files. Figure 9 illustrates the concept.

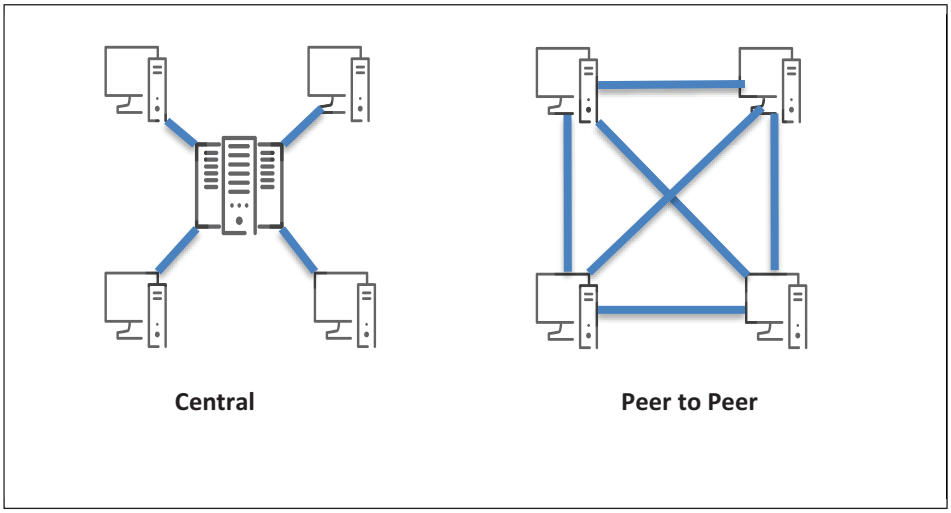


Figure 9 Central vs. Peer-to-Peer network

- Cryptography: The paper proposes the combined use of hash functions, Merkel Tree, digital signatures and nonce:
    - Hash function: is a mathematical function/algorithm that converts a set of data into another and can be used to encrypt messages. The input can be of any length, but the output is always a fixed length. The paper proposes using the hash function SHA-256. The following is an example of hashing the text "Hello, world!" using SHA-256:

      ""*Hello, world!" = > 1312af178c253f84028d480a6adc1e25e81caa44c749ec81976192e2ec934c64"* (Verma, 2018)
    - Digital Signature: is a form of a coded message that uses the Public Key Infrastructure (PKI) protocol to ensure that the content of a message has not been changed during transmission. The purpose behind the technology is to allow two entities who do not know each other to exchange messages over an insecure network. Each node will have a pair of keys, a private key that should be kept secret and a public key that will be shared with the network. The keys are used to encrypt and decrypt messages. The concept is illustrated with the following common example:
        - Alice will have a pair of keys one private which is kept secret and is used to sign the document and a public key which everyone in the network will know[6]

[6] The Public Key is also referred to as Public Address

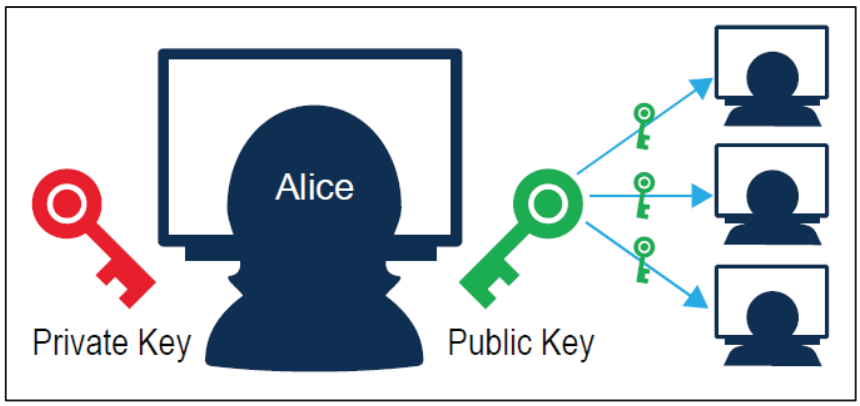


Figure 10 Alice Public and Private Keys (Natarajan, et al., 2017, p. 8)

- Alice wants to send a message to Bob.
- Alice will convert the message to hash format. Then Alice will encrypt the hash using her private key. This action is known as signing the message. The output of this action is referred to as the message digital signature.

Figure 11 Alice Encrypts and Signs message (Natarajan, et al., 2017, p. 8)

- The message with the message digital signature is sent to Bob
- Bob will receive the message and will attempt to authenticate it by comparing it to the message digital signature. Thus, Bob will decrypt the message's digital signature (i.e., the encrypted message) using Alice's public key and compare it to the message. This action is known as verifying the message.

- If the results match then the message is authentic. On the other hand, if the results do not match then the message was compromised or changed during transmission.

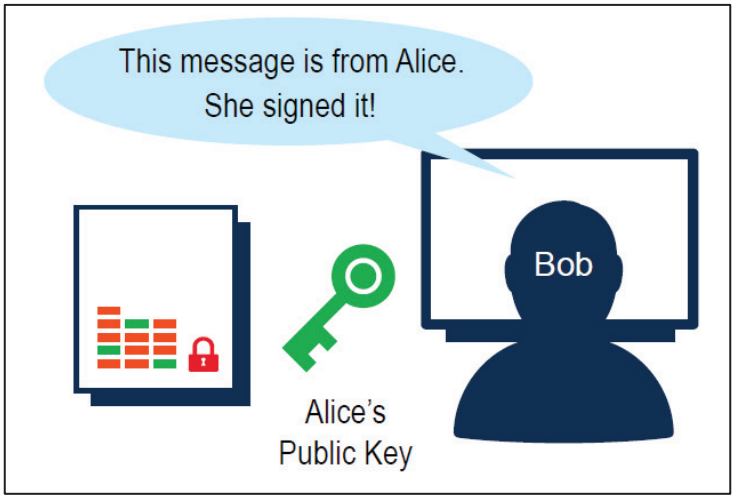


Figure 12 Bob Receives Messages and verifies it **(Natarajan, et al., 2017, p. 8)**

- Nonce: is a random number usually used in programming specifically to make a message unique during encryption. For example, if a nonce is added to the text "Hello, world!", the hash generated using the SHA-256 will be different using different nonce:

  ""Hello, world!**0**" =>

  1312af178c253f84028d480a6adc1e25e81caa44c749ec81976192e2ec934c64

  "Hello, world!**1**" =>

  e9afc424b79e4f6ab42d99c81156d3a17228d6e1eef4139be78e948a9332a7d8" (Verma, 2018)

- Proof-of-work (PoW): is an algorithm which is used as an anti-spam methodology in a network. It can be considered as a mathematical puzzle that requires resources to resolve. The proof of work algorithm is to be set by the creators of the network to ensure that the work of verifying the transaction is done. For example, the

network rules will state that once a transaction is verified, a nonce is added to it and then hashed using the SHA-256 algorithm where the output should start with four zeroes. Let us take the previous example of hashing the text “Hello, world!”. A nonce needs to be added to the text and hashed to generate a hash that begins with four zeros. Thus, one will begin with 0 and continue until it reaches a hash that begins with four zeros which in this case will require 4250 attempts:

““Hello, world!**0**” =>

1312af178c253f84028d480a6adc1e25e81caa44c749ec81976192e2ec934c64

“Hello, world!1” =>

e9afc424b79e4f6ab42d99c81156d3a17228d6e1eef4139be78e948a9332a7d8

“Hello, world!2” =>

ae37343a357a8297591625e7134cbea22f5928be8ca2a32aa475cf05fd4266b7

“Hello, world!4248” =>

6e110d98b388e77e9c6f042ac6b497cec46660deef75a55ebc7cfdf65cc0b965

“Hello, world!4249”=>

c004190b822f1669cac8dc37e761cb73652e7832fb814565702245cf26ebb9e6

“Hello, world!**4250**” =>

0000c3af42fc31103f1fdc0151fa747ff87349a4714df7cc52ea464e12dcd4e9”

(Verma, 2018)

In the paper, the currency was referred to as Bitcoin (BTC). The paper focused on the currency itself and how it can be transferred across a network without the need for a centralized authority. The currency which is an electronic coin is defined to be a chain of digital signatures. When a coin is transferred to another user the hash of the previous transaction and the public key of the next owner are digitally signed and both are added to the end of the coin.

In a centralized system, there will be one node that has the updated balance of each user in the system stored in a ledger. Thus, if a transaction is initiated between two users in a centralized system, the node that stores the ledger will execute the transaction and update the balance of the two users in the centralized ledger.

The absence of a centralized trusted authority that stores the users' balances in a ledger means that each node in the system needs to keep track of the transactions or keep a ledger and this concept was later referred to as a Distributed Ledger Technology (DLT).

This digital coin presented different challenges. The major challenge is how each node can authenticate the transaction. This is important to avoid double spending which is not present in dealing with physical currencies. Double spending is when the same coin is used twice in two independent transactions in a simultaneous manner.

It should be noted that the paper also proposed new concepts which are:

- Block: which is a set of transactions collected in the form of a block
- Chain: which is a connected set of blocks in the form of a chain where each block will have a reference to the previous block in the form of a hash. Figure 13 illustrates how a chain is constructed:

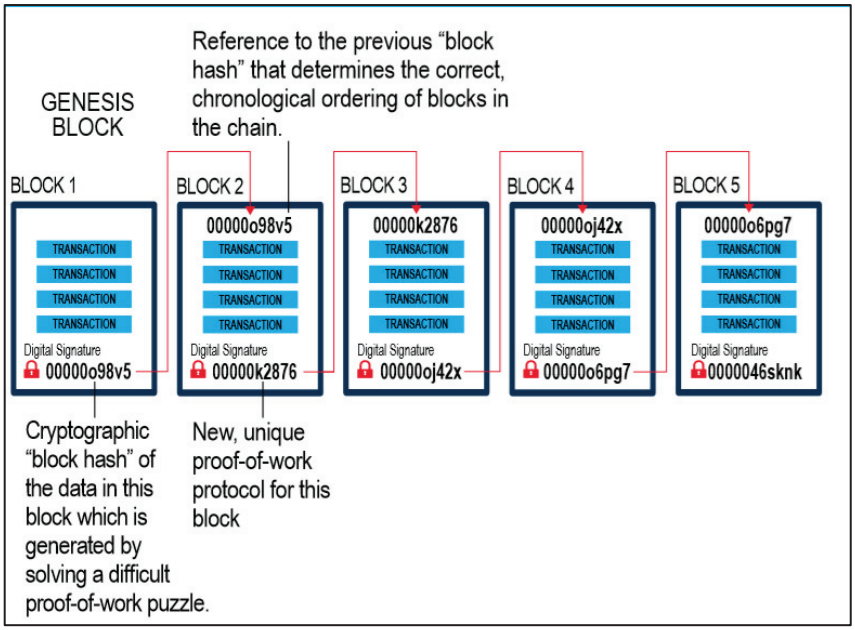


Figure 13 Chain of Blocks **(Natarajan, et al., 2017, p. 9)**

- Miners: which are special nodes in the system that verify and create blocks
- Consensus: which is the mechanism used to accept blocks, create rules or create incentives

The paper suggests the following process in the system that is to be created:

1. A transaction has to be broadcasted to all nodes in the network
2. Each node will collect the transactions
3. Each node will attempt to verify the transaction and create a block from it
4. Each node will attempt to find a PoW for the block it created
5. Once the node finds a PoW, it will broadcast the block to all nodes
6. The nodes will verify the transactions in the block
7. If nodes accept the block, they will express it by starting to create the next block where the next block will contain the hash of the block accepted.

Figure 14 illustrates the workflow.

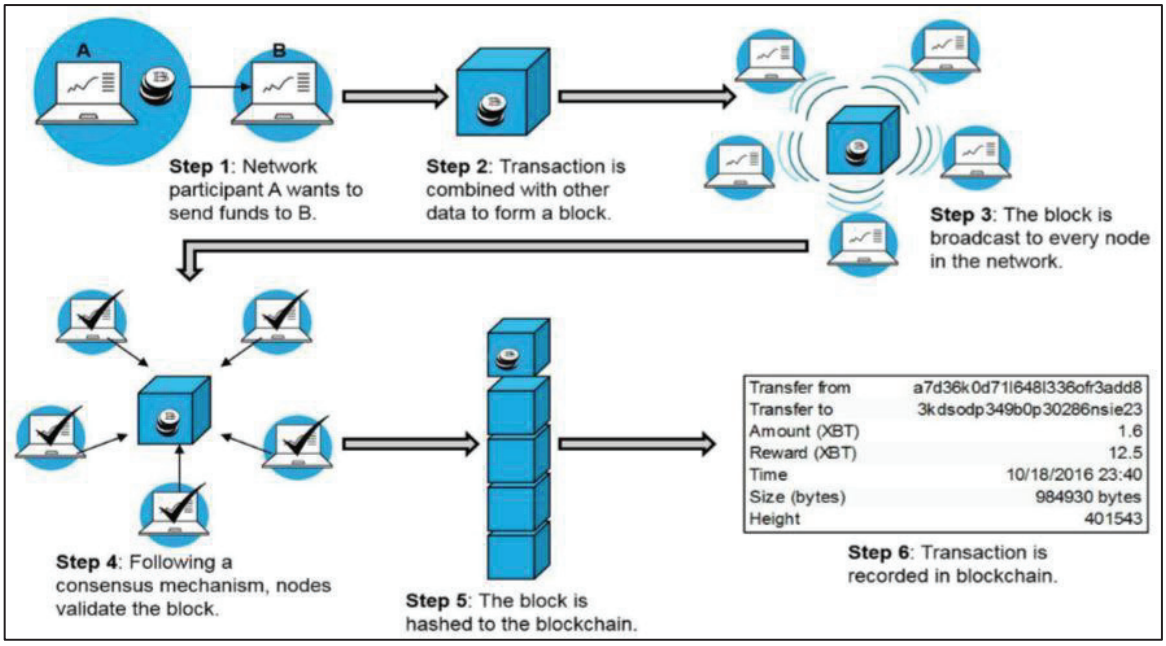


Figure 14 Blockchain transaction workflow (Bloomberg New Energy Finance, 2017)

The following are other rules in the network (Natamoto, 2008):

- The longest chain is the correct one and nodes will work to extend it
- Transactions do not need to reach all nodes but need to reach many nodes
- Nodes will recognize missed blocks when it receives a new block and the previous hash does not match. It will then request the missing block
- The miner who succeeds in creating an accepted block will receive an incentive in the form of a coin

The first bitcoin transaction was sent from Satoshi Nakamoto to a software developer Hal Finney in January 2009 with the amount of 50 BTC. Another significant transaction was in October 2009 when Martti Malmi sold 5,050 BTC for $5.02 and transferred the amount using PayPal.

In May 2010 a software developer Laszlo Hanyecz posted his request to purchase a pizza with bitcoin in a Bitcointalk forum. He exchanged 10,000 BTC with another user for two pizzas (Equivalent to $30).

From a standard customer perspective, to buy bitcoin one needs to subscribe to one of the cryptocurrency exchanges or cryptocurrency wallet providers. A simple way to understand the wallet is to view it as an email inbox. Thus, it is a software that allows one to communicate in the network to send and receive transactions. The wallet will store the private and public keys and the wallet itself will have a public address.

In 2013, Vitalik Buterin (Buterin, 2013) recognized the opportunity of using the blockchain for use cases beyond the decentralized electronic payment system. He wrote a white paper promoting a platform that allows application development and general scripting to enable developers to create their decentralized applications (DApps). The paper proposed the implementation of the smart contracts concept which was introduced in the 1990s. A smart contract can be considered as a software program that presents the clauses of a contract and is self-executed. Thus, a smart contract will have a set of rules that parties will agree on. The rules can be written in the form of pre-requests if achieved, a certain set of actions will be executed automatically without the need for any additional interaction.

In the Ethereum blockchain, bitcoin is replaced with a crypto token referred to as Ether. The Ether is needed by developers who wish to build an application on top of the Ethereum blockchain and users who wish to use smart contracts on the Ethereum blockchain (Buterin, 2013).

While Bitcoin blockchain is used to track transactions, Ethereum blockchain will track the state of an account (Buterin, 2013). There are two types of accounts; externally owned accounts and contract accounts. The externally owned account has; Address, balance. The contract Account which is also referred to as the smart contract has; Address, Balance, State, Code.

In the Ethereum smart contract, the clauses and conditions are translated to specific code format that can be read by the Ethereum platform. The new concept that enabled this is the

Ethereum Virtual Machine (EVM). The EVM's are nodes in the platform similar to mining nodes but do not have access to the ledger. Their primary function is to execute the code of a smart contract. It should be noted that the contracts can also store data.

The Ethereum paper identified three applications that can be developed on the Ethereum platform, the first being financial applications enabling users to enter contracts using their money. The second is semi-financial applications where the money is used in addition to substantial non-financial rules. The third is online voting and decentralized governance.

The paper also proposes specific use cases for its platform and its smart contracts among them are token systems, financial derivatives, identity and reputation systems, decentralized file storage and creating a decentralized autonomous organization (DAO).

It should be highlighted that to execute a smart contract; a transaction needs to be sent to trigger it. The Ethereum paper (Buterin, 2013) showcases the use of the smart contract using a hedging financial transaction. The contract objective is to hedge the Ether against USD. The parties are A and B where A wants to hedge against the Ether fluctuation. The contract will set the following rules:

- Wait for A to input 1000 Ether
- Wait for B to input 1000 Ether
- Record the USD equivalent of 1000 Ether say $x. (Note that this step will require a feed from a third 'trusted' party out of the Ethereum network to provide the USD/Ether exchange rate)
- After 30 days, A or B should be allowed to trigger the contract.
- The contract once triggered, will send $x of Ether to A and the rest to B. (Note again that this step will require a feed to get the exchange USD/Ether exchange rate)

The Ethereum paper also noted that the platform could be used as an "*on-blockchain escrow"* (Buterin, 2013, p. 34). For example, if one wants to buy a unique digital picture,

the smart contract can act as an escrow. The contract will take possession of the digital picture and transfer its ownership to the buyer only once the buyer sends a payment transaction to the smart contract. Once the smart contract receives both valuable items in the form of a transaction, it will execute the terms to transfer the payment to the seller and the digital picture ownership to the buyer. Miners will validate these transactions and publish them to the platform once the remaining nodes provide their consensus. In this example, the seller will be confident that he will receive his funds and the buyer will be confident that he will receive the digital picture without the need to have a trusted intermediary to facilitate the transaction.

In 2014 the Ethereum Foundation was established. It raised funds via Ethereum crowd sale where investors were able to purchase Ether in exchange for Bitcoin (2000 ETH = 1 BTC = $572- $632). It was reported that around 60 million Ethereum tokens were sold raising $18.4 million (Buterin, 2013).

The Ethereum platform allows the developers to create their own tokens to be used in the applications they create. Technically the token is a form of a smart contract. The current standard is ERC-20. It can represent currency, share, bond or gold depending on its purpose.

It should also be noted that the way the consensus is done is currently being discussed among the existing blockchain platform providers. The Proof of Work initially used seems to consume a lot of computer energy which reflects on electricity and eventually money. In 2017 it was estimated that one Bitcoin transaction consumes 277 kWh and one Ethereum transaction consumes 61 kWh (Ohnesorge, n.d.).

The concept of having miners compete to find a PoW increases the energy consumption and in cases waste energy as several miners work in parallel to find a PoW. The fact that the PoW is an expensive process and requires the miners to use a lot of energy is seen to

protect the blockchain from attacks. However, it also risks making the cost of creating blocks in the blockchain very high therefore defying the purposes of its creation. The new approach is referred to as Proof of Stake (PoS). It first emerged in a bitcointalk forum in 2011. It replaces the concept of miners competing to generate a PoW to produce a block with the concept of choosing who will create the block. The creator of the block is referred to as a forger instead of a miner as there is no reward to create a block. The forgers selected are those who have coins minted. There will be a pool of validators where a forger is selected. In order to join the pool, the validator must own a stake in the network and be ready to deposit it as collateral. The more a user stakes the higher the chance of him being selected. In cases, a payout in the form of transaction fees can be offered as opposed to the PoW where a freshly produced currency is offered. Another difference between the PoW and PoS systems is that in a PoW the cryptocurrency is continually created while in a PoS the cryptocurrencies are created at the launch of the system. The challenge in this approach is to ensure a degree of randomizing in selection to avoid that the richest users are always selected to validate blocks. Another theoretical problem emerged which is 'Nothing at Stake'. The Nothing at Stake problem emerges as the selected user to validate transactions can work on multiple forks and build on every fork which will disrupt the consensus and increase the probability of double spending. This does not exist in a PoW system as the miners' cost of building on two forks is high and it will decrease the chances of mining a block. Etherum's Casper proposes a potential solution to this, which is to penalize the validator that builds on multiple forks by reducing their collateral.

Researches, programmers and technology providers continue to come up with new protocols based on the Blockchain and DLT concepts. The DLTs/blockchains created can be grouped into different types. The factors used to define the blockchain type are the

participants allowed to join, the consensus methodology and how the ledger is maintained. Thus, the following are available types: (Natarajan, et al., 2017)

- Permission-less shared ledger: Any internet user can register and be a participant in the system. The participant in the system can read and write the ledger.
- Permissioned shared ledger[7]: The participants are preselected and known. This type is again divided into:
    - Permissioned private ledger: Only permissioned participants can read and write the ledger.
    - Permissioned public ledger: Only permissioned participants can write the ledger, but anyone in the system can read the ledger.

There are several DLTs/blockchain and Table 6 showcases the most popular and their permission module.

Table 6 DLT/Blockchain Examples

	Type		**Currency**	**Consensus**
Bitcoin	Permission less	Public	Bitcoin	Mining PoW
Ethereum	Permission less	Public	Ether/Smart Contract	Mining PoW
HyperLedger	Permissioned	Private	Currency & Token via chaincode	Multiple approaches
Corda	Permissioned	Private	None	Specific
Ripple	Permissioned	Private	XPR	Specific

The following is a high-level overview of the permissioned DLT/Blockchains:

[7] It is also referred to as Federated blockchain or Consortium blockchain

- Ripple: The platform focuses on payments. Unlike the traditional inter-bank payments based on the concept of corresponding banks, it adopts a dynamic approach to transfer funds. In the case of a transfer, it identifies the most effective 'path' from the sender to the beneficiary that involves participant institutions. Unlike the PoW consensus approach, a participant in the network will choose a group of validators whereby it will write in its ledger only once a certain percentage of the group validates the transaction.
- Hyperledger: The platform is hosted by Linux Foundation and its members continue to increase and include financial intermediaries, technology providers and large corporates. Accenture, Airbus and American Express are among the premier members. The nodes on the platform have different roles in the process of validating transactions, unlike Bitcoin and Ethereum where all nodes can validate transactions.
- R3's Corda: Corda platform is developed by R3 which is a consortium of financial intermediaries. The platform focuses on financial sector applications. Agreements are created among the nodes on the platform and nodes will only receive the verified transactions that are part of the agreement.

3.2 Sharia Perspective on DLT/Blockchain

The Sharia perspective on DLT/blockchain arises due to the need to understand how to define the cryptocurrency. The current discussion among Sharia scholars is focused on how to categorize the cryptocurrency. Is it money? Should it be treated as a currency? Can it replace the fiat money?

Before discussing the sharia views with regards to cryptocurrencies, it is important to distinguish two types of blockchains; public and private. The main difference is that the public blockchain is not owned by a single entity and requires miners for it to continue operating. For this to happen, the miners need to be encouraged (by giving them incentives) to continue verifying and creating blocks. If blocks are not created, then transactions will not be stored in ledgers and smart contracts will not be published and thus the concept of blockchain system will no longer be valid and the network may collapse. Thus, one can argue that a public blockchain will always need a mechanism to incentivise the miners for the network to continue operating. As the strength of the blockchain is that it is decentralized and public, it is essential to address the sharia perspective on the permissibility of paying the subscription in cryptocurrency to utilize these blockchain platforms and to publish smart contracts and fund their execution.

It should be noted that the importance of clear categorization of cryptocurrency as money or not is required for Muslims in order to know if the Sharia rules related to money exchange need to be observed in transactions that involve the cryptocurrency. In Sharia, money is not a commodity. A commodity has an intrinsic utility while money does not. Thus, today's money is not expected to have a higher value tomorrow or in the future. Accordingly, it is required that a currency exchange is executed at spot. For example, if $100 is to be exchanged for QAR at a rate of 3.64, the exchange of currencies needs to be

at spot. Thus, one cannot agree to take the 364 QAR today and pay the USD amount in a month time or agree on the exchange today and both amounts to be exchanged in a month. Sharia scholars agree that money functions as a medium of exchange, a store of value and a measure of value. The multiple opinions represent the differences in scholars' views on how cryptocurrency fulfills all of the money functions.

Nakamoto noted that "*We define an electronic coin as a chain of digital signatures*" (Natamoto, 2008, p. 2). He also noted "*there is no central authority to issue them. The steady addition of a constant of amount of new coins is analogous to gold miners expending resources to add gold to circulation. In our case, it is CPU time and electricity that is expended*" (Natamoto, 2008, p. 4).

The Sharia opinions depend on the blockchain use cases rather than the technology itself. Most of the Sharia scholars focused on cryptocurrency, mainly bitcoin. The commonly asked questions revolve around the following concepts:

1. Bitcoin and similar cryptocurrency as a currency or money
2. Bitcoin and similar cryptocurrency as an investment
3. Bitcoin and Cryptocurrency as a digital asset and not money

The majority of enquires to scholars focused on the first two questions by individuals who wanted to trade in cryptocurrency for investment. Few scholars have published an official resolution on cryptocurrency and bitcoin be it permissible or not. Among them, Dr. Ali Quradaghi, a renowned Sharia scholar who sits in several financial institutions' Sharia committees, has issued a detailed fatwa in this regard (Al-Qaradaghi, 2016). In a conference organized at Hamad Bin Khalifa University (HBKU) on the 19th of March 2018, he referred to bitcoin and declared that it is not money and thus it is not permissible to use bitcoin and similar cryptocurrency as a medium of exchange. He also noted that it is not permissible to trade them for investing. He noted that among the reasons behind his ruling is the fact that

it is not backed by any legal authority. Moreover, the high volatility of the bitcoin and the sharp price fluctuations have led to huge losses. Accepting the occurrence of such unjustifiable losses is against the principle of Sharia to preserve wealth.

Dr. Monzer Khaf, a professor of Islamic economics and finance, has published a series of fatwas on his website on this subject. The latest on 18th December 2017, where he noted that cryptocurrency and specifically bitcoin is not money and it is not permissible to own, buy, sell and trade (Kahf, 2007). It should be noted that both Dr. Quradaghi and Dr. Kahf are not against the cryptocurrency concept but are against its current form.

Mufti Faraz Adam[8] has published a paper on Bitcoin Sharia compliance. Again, he concluded that bitcoin could not be considered as money. He also expressed major concerns on investing in bitcoin as it does not benefit the real economy, but he ruled the return on such investment as Sharia complaint (Adam, 2017).

Dr. Haitham Al Haddad[9] is another Sharia scholars who declared that dealing with bitcoin is not permissible. He adopted different reasoning for his ruling where he argues that only God has the authority to distribute wealth; thus it is vital for a currency to be backed by a physical asset like gold. Dr. Haitham referred to the concept of 'creation of money' defining it as the process of issuing money not backed by a physical asset which in his opinion is prohibited by Sharia. He mentioned that Sharia ruling in exchange of gold and silver being at spot was meant to control it against money creation. Thus, it was the norm to issue currencies backed by gold. It was only in the 1970s that money creation emerged where the USA started to issue currencies not backed by gold and he considered this as an economic

[8] Mufit Faraz Adam completed Islamic Studies in Alimiyyah degree at Darul Uloom Leicester. He also specialized in Islamic law and Islamic finance at Darul Iftaa Mahmudiyyah, Durban, South Africa where he graduated as a juriconsult (Mufti) in 2012. He established Amanah Finance Consultancy which provides Sharia advisory services. In 2016 he joined National Zakat foundation in UK as Zakat advisor and researcher.

[9] Dr. Haitham Al Haddad is a jurist and serves as a judge for the Islamic Council of Europe. He is UK based and also served as a judge for the Islamic Sharia Council in UK. He obtained his doctorate on the jurisprudence of Muslim Minorities from SOAS University of London

disaster that the Muslims due to the strength of the USA economy had no choice but to accept. Accordingly, he concluded that as bitcoin and similar cryptocurrencies are not backed by gold and are not yet regulated by governments, it is prohibited to deal with them (Al-Haddad, 2018).

In November 2017, the Turkish media reported that Turkey's Directorate of Religious Affairs (Diyanet) declared that it is not permissible to purchase virtual coins such as Bitcoin and Ethereum (Hürriyet Daily News, 2017). In January 2018, Egypt grand mufti Dr. Shawki Allam declared that dealing with bitcoin is not permissible (Dar-alifta , 2018)

Table 7 summarizes the cited reasons used by the scholars mentioned above in their rulings.

Table 7 Scholars rulings on Cryptocurrencies and Cited Reasons

		Dr. Ali Quradaghi	Dr. Monzer Kahf	Egyptian Grand Mufti	Turkish - Diyanet	Mufti Faraz Adam	Dr. Haitham Al Haddad
	Ruling						
	Bitcoin and similar cryptocurrency as a currency or money	Not Permissible	Not Permissible	Not Permissible	Not Permissible	Not Permissible	Not Permissible
	Bitcoin and similar cryptocurrency as an investment	Not Permissible	Not Permissible	Not Permissible	Not Permissible	Although it does not benefit society, the ROI is Sharia compliant	Not Permissible
	Cited Prohibition Reasons						
1	Not issued by a known/central authority	✔	✔	✔	✔		
2	Not guaranteed by an authority or regulated/Not legal tender	✔	✔	✔	✔	✔	✔
3	Not backed up by gold/silver						✔
4	Does not Meet Currency conditions (medium of exchange, a store of value and a measure of value)	✔	✔			✔	
5	Intangible in its form	✔		✔			
6	Not widely Accepted			✔			
7	No real economic benefit/Used mainly for speculation	✔	✔	✔	✔	✔	
8	High Risk/Cause major loses/Highly volatile	✔		✔		✔	✔
9	Major Gharar	✔		✔			
10	Mainly used in Illegal activities			✔	✔		

Muhammad Abu Baker who is the Sharia advisor in Blossom Finance in a paper on Shariah Analysis of Bitcoin, Cryptocurrency, and Blockchain concluded that cryptocurrency and in specific bitcoin is meant to serve as an alternative currency. It is permissible to deal with bitcoin in jurisdictions where regulators accept cryptocurrency or are silent about it, in other words not explicitly prohibiting the cryptocurrency (AbuBaker, 2018).

Table 8 summarizes Muhammed arguments to address the reasons behind the scholars' prohibition.

Table 8 Muhammed AbuBaker arguments against cryptocurrencies prohibition

Cited Reason for Prohibition by Scholars	**Mufti Muhammad Abu Baker argument against it**
Not a Legal Tender	In jurisdictions where regulators accepted cryptocurrency, this reason is not valid In jurisdictions where regulators are silent then wide acceptability by the people is sufficient
Lack of Central Issuer/Authority	The scholars citing this as a reason assumed that the authority would protect the currency and support preserving its value. This is not a valid assumption as there are instances in history where authorities have caused inflation leading to currencies to lose their value. Examples are Indonesia 1999 and Zimbabwe 2008
Volatility/Price Stability	The price stability is impacted by supply and demand and market speculations can affect it. Speculations are an external factor and one cannot declare that bitcoin is not permissible because of the extreme level of speculations.

Illegal Use	This is another external factor which should not the Sharia ruling of the bitcoin. Currently, USD is also used for illegal activities and this does not impact its permissibility

It should be noted that Mufti Muhammad Abu Baker advice against trading in bitcoin as an investment. He mentioned that in principle even with fiat currency it is not advisable to treat them as an investment asset as this is not their primary objective (AbuBaker, 2018).

In another article published in Islamic Finance News (IFN) in 2018, Muhammad Abu Baker together with Dr. Farrukh Habib has addressed the cryptocurrency topic differently (AbuBaker & Habib, 2018). They first highlighted that the terminology used which is cryptocurrency had limited the Sharia scholars' discussions to exploring the concepts of currency and money. Instead, they widened the discussion and explored the concept of crypto-assets where they referred to cryptocurrencies as currency tokens. They argue that although the currency-tokens do not have an intrinsic utility, it can be used as a medium of exchange because it can store and transfer value. The crypto-assets can also be utility tokens, equity token, commodity token and hybrid token. The question raised in the paper enquires about the permissibility of crypto-assets. They concluded that for crypt-assets to be Sharia compliant first, they are to be developed avoiding impermissible practices such as Riba and Gharrar. Second, the legal contracts and transactions involving the assets should not violate Sharia principals. Third, the underlying utility/equity/commodity of the crypt-asset should be Sharia compliant.

We interviewed Dr. Abdulazeem Abozaid who is an Associate Professor in Islamic Studies at HBKU (Refer to Appendix 3), to have his opinion on the Sharia aspects related to the DLT/Blockchain as he is writing a paper on the Sharia aspects of cryptocurrency. In the interview, he noted that since cryptocurrency is a new concept, it is difficult to form a solid judgment. He confirmed the scholars' position noting that as of today the cryptocurrency

cannot be considered as money. He explained that for a currency to be considered as money, it should meet certain conditions such as being publicly accepted in the sense that everyone agrees to use it as a medium of exchange and this is a condition not yet met by cryptocurrencies as their usage is still limited to a considerably small group of people. Moreover, it should store its value and for this to take place, it should be guaranteed by an authority, just like the existing practice with paper currency. This condition is also not met by the cryptocurrency and this is observed in the sharp fluctuations in the bitcoin, where even its creators cannot control its volatility. This condition is key in Sharia since the stability of money is essential to the stability and growth of any economy and the Sharia principals enforce the need to preserve one's wealth.

Moreover, Dr. AbdulAzeem clarified that the cryptocurrency as of today does not function as money since it cannot be used as a medium of exchange, cannot store value and cannot be considered a unit of measure. He stated that "*the cryptocurrency in its present form is not accepted by the Sharia as money, but if the above concerns are addressed it might be accepted*."

As for using the cryptocurrency to pay for the subscription on the DLT/Blockchain platform, he noted that there is no harm in this from the Sharia perspective. He noted that "*if an individual requires payment against a service only in the form of cryptocurrency and not in any other currency such as dollars or riyals then this is fine. The Sharia would not have a specific ruling in this scenario; thus, it is permissible. This acceptance should not justify the substitution of money by cryptocurrency as this is a particular situation where cryptocurrency is the only accepted payment mean to use the service. For example, one can ask to be paid against a service he offers in liters of milk; this does not qualify milk as a currency. The payment of Ether in the Ethereum network should be looked at in the same manner.*"

We asked Dr. AbdulAzeem about the permissibility of cryptocurrency from a Sharia perspective if it becomes legally accepted and allowed by regulators. He noted that this is highly unexpected, but if it is done, then the governments objective in regulating the use of cryptocurrencies is mainly to impose taxes. He also mentioned that the increase in the number of governments that legalize the usage of the cryptocurrency would help in stabilizing it, which may eventually lead Sharia scholars to revisit their position and accept it as money.

It is interesting that in 2018, International Bank of Settlements (BIS) in its 2018 Annual report noted that the issues of cryptocurrency "*lie in three areas: scalability, stability of value and trust in the finality of payment"* (Bank for International Settlements , 2018, p. 99). The report concluded that "*while cryptocurrencies do not work as money"* (Bank for International Settlements , 2018, p. 104)*,* the DLT/Blockchain technology can be utilized. The report introduced the concept of cryptopayment where a cryptocurrency is created on the blockchain as a payment unit, but the unit of account and the actual payment is done using sovereign currency. The BIS position is very similar to that of Sharia scholars.

3.3 DLT/BlockChain in the Financial Sector:

It is widely recognized that although the DLT/Blockchain technology is new, it has the potential to create several opportunities that can enrich the financial sector. The main advantage of using the technology is the fact that it enables the participants of a system to verify transactions/information independently without the need for a trusted third party.

The World Economic Forum has identified several use cases for DLT/Blockchain in financial services. The use cases covered applications in payments, trade finance, syndication loans and contingent convertible bonds (World Economic Forum, 2016).

The World Bank group noted that some of the DLT/Blockchain applications could be in the identity systems, remittances, clearing and settlements, electronic know your customer and property registration. (Natarajan, et al., 2017)

Several companies and projects have started utilizing the DLT/Blockchain technology. The following are some examples:

- Ripple: it is a company that leverages the blockchain technology for global payments. From a technology perspective, Ripple uses specific consensus method where a set of identified independent nodes validate the common ledger. RippleNet is the name of the network being built to connect banks and payment providers and xCurrent is the solution. One of their published case studies is the implementation of the solution to connect between SBI Remit[10] and Siam Commercial Bank (SCB) where Thai nationals working in Japan can transfer money in JPY using ATMs to an SCB saving account in Thailand in 2-5 seconds (Ripple, 2019b). It should be noted that Ripple is considered in some research papers as a DLT and not a blockchain (Ohnesorge, n.d.)

[10] A company that offers international remittances

- Fusion LenderComm: It is flagged as the first R3 Corda application that is live. It is a servicing portal built by Finastra[11] on the Corda blockchain platform that aims to digitize and simplify the communication between syndicated loans agents and lenders by sharing the position of the syndicated loan. Some entities require a credit facility or a loan that is of a very high amount that no one bank can offer and take its risk alone, hence the bank offers this facility by arranging with other banks or lenders. The structure of the facility can be very complicated if divided into sub-facilities/loans each with its terms and each having different set of lenders. The sub-facility/loan itself can be divided into further sub-facilities/loans. The agent bank coordinates between the borrower and the multiple lenders. Each loan may involve more than 2,000 lenders and an agent might be managing 3,000 facility/loan. Finastra offers solutions to the agent and lending banks to manage the complexity of the facilities and loans each in its environment. Finastra solution is used widely by most of the banks running syndication books. The challenge that Finastra and the banks have identified is when a lender wants to reconcile its position which is usually done by communicating with the agent on the spot or periodically. This communication to date has been manually done through emails and faxes. This back and forth manual process and communication can amount to millions of faxes and emails which reflects high operational cost and risk. Finastra through its portal is offering the lenders real-time access to its facility that is stored with the agent. This is done by leveraging the blockchain concept of each node having a copy of the ledger, in this case, a copy of the facility with all its details and

[11] Finastra is financial technology company that offers solutions to financial institutions. Its suite of solutions cover Retail Banking, Lending, Transaction Banking, Corporate Banking and Treasury and Capital Markets.

transactions. Thus, any transaction on the facility will be broadcasted to all the nodes that are part of this facility and it will be stored in their ledger copy, eliminating the need to communicate to get the up to date positions thus reducing the operational cost and risk.

- Building Blocks: it is a blockchain platform led by the World Food Program (WFP) based on the Ethereum protocol which was launched in 2017. The platform services the refugees in Azraq camp in Jordan. It replaced the cash-based transfers that the refugee uses to purchase goods from local stores. The solution uses blockchain, digital database and biometrics technologies.

  The refugees create a digital identity via irises and the identity is stored in a database with the refugee entitlement. The stores and vendors providing goods to the refugees will each have a wallet on the blockchain network. Once a refugee goes to buy goods from one of the participant vendors, he will approach the cashier and instead of using cash or credit card to pay, the cashier will scan his iris. In the background, a transaction will be initiated to deduct the refugee entitlement and credit the vendor wallet. The WFP will later reconcile transactions and pay the vendor in local currency. As of October 2018, the program serviced around 100,000 refugees and is reported to reduce an estimated 98% of the financial intermediaries' fee.

- Blossom Finance: is a company that leverages the Ethereum blockchain platform to mobilize funds via Sharia-compliant contracts to fund microfinance corporations in Indonesia. Investors can register on the platform where an account and a wallet are created and investors can invest in specific projects each having its smart contract. Thus, if the smart contract is based on Mudaraba (profit sharing contract), as part of its rules, it will calculate the profit and profit

corresponding to the mudareb share (partnership share). The company latest innovation is 'SmartSukuk'. In an interview with Matthew Martin, Blossom Finance CEO (Refer to Appendix 2) he noted that the sukuk issuance involves a large number of financial intermediaries reaching up to 10 each charging its own fee which can reach up to $100k per year. The aim is to reduce this high cost using the proposed Smartsukuk. The instrument uses the ERC-20 token to record the ownership in the sukuk underlying asset and thus replacing the offline sukuk coupon. As the coupons are digitized on the blockchain, they can be traded peer-to-peer and the ownership can be tracked over the platform without the need of a third party that will charge its own fees to execute this trade. Moreover, as the sukuk are put into a smart contract, the issuer is meant to pay the money into the smart contract and the smart contract will calculate the payment/transfer share of each sukuk coupon holder and will execute the transfer. Blossom also offers its investors the option to pay in cryptocurrency and it takes the risk of converting it to Rupiah. The platform was launched in March 2018 and the first batch of customers are identified as high-net-worth technology enthusiasts who are also interested in social impact related projects. The first public sukuk is planned in 2019 and is focused on foreign investors since the company is a foreign company in Indonesia and thus cannot collect funds from local investors.

There are also several pilots and proof of concepts projects where organizations are testing the use of the technology among those are:

- Project Bond-i: In August 2018, the World Bank (WB) and Commonwealth Bank of Australia (CBA) launched a bond on the blockchain that it referred to as bond-i. The WB issues annually an estimated $60 billion in bonds for projects and seeks to

optimize the process. CBA was the sole arranger of the bond which was part of the A$ Kangaroo bond series. The bond tenor was two years and raised A$ 110 million ($73 million). The investors in the bond were CBA, First State Super, NSW Treasury Corporation, Northern Trust, QBE, SAFA, and Treasury Corporation of Victoria. Bond-i platform is reported to have been developed on a private permissioned Ethereum network (Commonwealth Bank of Australia, 2018). The platform issuance service includes the launch, book building, allocation and management of the bond.

It should be noted that the process of bond issuance is still the same as the traditional bond in terms of the registration process and the payment process using fiat currency[12].

CBA is reported to have explored several blockchain pilots in the span of three years. One of these experiments was the Trade-chain experiment where seventeen tones almonds were shipped and tracked from Sunraysia in Victoria, Australia, to Hamburg in Germany using blockchain, smart contracts and internet of things (IoT) enabled devices.

- Banco Bilbao Vizcaya Argentaria Bank (BBVA) a Spanish bank is another entity that has been experimenting with blockchain. In November 2018, it reported that it signed a € 150 million ($170 million) syndicated loan deal with Red Electrica Corporation using its proprietary platform that is based on DLT/Blockchain technology (Karppinen, 2018). The facility negotiation process steps were recorded in the network which is a private blockchain built on Hyperledger, each step with a user code and timestamp. The participants in the deal which are the three lenders, the borrower and two legal advisors each had access and shared the deal negotiation

[12] https://coincentral.com/world-bank-blockchain-bonds/

process. Once the negotiations were completed and the contract was signed, a unique document identifier was recorded in Ethereum public blockchain to preserve its authenticity. In February 2019 the Bank has reported the issuance of a green structure bond using blockchain (Farina, 2019). BBVA is part of R3, Hyperledger and Enterprise Ethereum Alliance consortiums.

3.4 Potential Risks of DLT/Blockchain:

The DLT/Blockchain technology attempts to address several issues across multiple sectors. However, this new technology comes with new risks that need to be identified, measured and mitigated. The first challenge is identifying and understanding the risks. As the technology is emerging and the use cases are still being developed and tested it is early in the process to claim that the risks can be identified and listed. There will be a journey of experiments and trials and errors before a robust DLT/Blockchain risk framework is achieved.

Nevertheless, research papers and consultancy reports have attempted to highlight the risks related to adopting the technology. The following are selected risks and critical questions that an institution might need to address before adopting the technology: (Add DLT paper, Deloitte paper, BIS paper ITU)

1. Operational Risks arising from:
    a. Lack of experts: The technology is in its early stages and continuously evolving. Thus, to leverage the technology, institutions need to train their technology teams on this new skillset and manage the risk of the technology teams making errors in the newly developed applications. Training needs to be extended to the business teams to create and run a financial operation based on a decentralized concept. The institution will need to consider hiring

experts in the field and this is also a challenge as the available skilled expertise are limited.

b. Lack of standardization in integration: Up to this date there is no agreed upon standard on how to link an existing application with a DLT/Blockchain platform. Each platform has its methodology (i.e., Ethereum, Corda, Hyperledger). Thus, if the technology is to be adopted, financial institutions need to figure how to connect the multiple integrated financial systems it currently operates which can be referred to as the institution infrastructure with a DLT/Blockchain platform. The integration gets even more challenging if there are multiple DLT/Blockchain that the institution needs to connect to, each with its communication protocol. Even if standards are published, there will be the risk of technology compatibility with existing legacy systems. The institutions may need to replace the existing infrastructure to adopt the new technology which will be costly and risky.

c. Scalability: The concern of scalability arises from the concept of the network being decentralized. In theory the higher the number of transactions processed and the higher the number of nodes that need to validate the transactions will slow down the transaction processing time. The technology providers attempt to tackle this issue by proposing different solutions. One solution is by optimizing the consensus methodology. Until the technology is mature and widely adopted and tested, institutions adopting the technology at this stage will need to take the risk of implementing a solution that might not be scalable in the future and will negatively impact their operational efficiency.

2. Security, data privacy and confidentiality: The risk of cyber-attacks and data leakages are common in all financial systems. However, the experience the industry gained in identifying and managing a centralized system enabled them to implement the required frameworks to mitigate the risks. In DLT/Blockchain the methodology adopted ensures the security of the transactions stored in the ledger since once written cannot be changed. These security concerns arise from user accounts. There have been incidents where users reported the loss of their private keys thus losing access to their funds. In other cases, account take overs through malicious attacks have been reported. It seems that the feature of having encrypted keys to increase the security on the ledger level is the same feature causing security breaches on the account level. Another aspect is the privacy of financial transactions. The concept of all nodes in the platform having a copy of the ledger increases transparency in dealings but raises the risk of the data being misused.
3. Legal and Regulatory Risk: This risk is present as the legal and regulatory frameworks for using cryptocurrency and smart contracts are not there yet in most of the jurisdictions. Thus, even if the institutions seek to adopt smart contracts in their dealings unless the jurisdiction recognizes its legitimacy, the current process will continue. As the smart contract is self-executed program code, there will be a risk of writing an invalid code to interpret standard contract articles that might cause financial loss. The question is how will the legal bodies classify such coding errors and who will bear the loss.

CHAPTER 4: CASE STUDY: INDONESIA RETAIL SUKUK EXPERIENCE

4.1 Country Overview:

Table 9 Republic of Indonesia Key Indicators (World Bank Group, 2019a)

Population	
Population growth (annual %)	1.1
Surface area (sq. km) (thousands)	1,913.60
Population density (people per sq. km of land area)	145.7
Poverty	
Poverty headcount ratio at national poverty lines (% of population)	10.6
Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)	5.7
Economy	
GNI per capita, Atlas method (current US$)	3,540
GDP (current US$) (billions)	1,015.54
GDP growth (annual %)	5.1
Inflation, GDP deflator (annual %)	4.2
Mobile cellular subscriptions (per 100 people)	173.8
Individuals using the Internet (% of population)	32.3
Global links	
External debt stocks, total (DOD, current US$) (millions)	354,352
Foreign direct investment, net inflows (BoP, current US$) (millions)	21,465
Net official development assistance received (current US$) (millions)	233.6

Indonesia has a Long-Term National Development Plan (National RPJP) which was formulated on the basis of Article 4 of Law Number 25 of 2004 with a vision to be self-reliant, advanced, just and prosper (Copied by the: State Ministry of National Development Planning/National Development Planning Agency (BAPPENAS), 2017). The plan was divided into four National Medium-Term Development Plans (RPJMN) each with five years period. In 2011, the Masterplan for Acceleration and Expansion of Indonesia's Economic Development (MP3EI) was created to support the National RPJP.

The Indonesian government acknowledged the need to improve and develop its infrastructure as a key in achieving its vision. The MP3EI identified the funding gap as a

challenge in addressing the infrastructure development projects and noted that the private sector participation is crucial.

In 2012, Indonesia had announced its National Strategy for Financial Inclusion Fostering Economic Growth and Accelerating Poverty Reduction. The strategy defined three main target groups which are the low-income poor, working poor and near poor. In addition to three cross section target groups which are people in remote areas, migrant workers and women. It defined indicators that are to be measured by the Bank of Indonesia which are Access and Use. Indonesia continued to enhance its strategy. In 2016 it launched a new strategy with a target to achieve 75% financial inclusion by 2019. The strategy identified key pillars which are; Financial Education, Public property rights, Financial Distribution Channels and Intermediary Facilities, Financial Services at Government Sectors and Consumer Protection. The pillars are to be supported by three foundations which are; favorable policies and regulations, supportive financial information technology and infrastructure and effective implementation organization and mechanism. It should be highlighted that the Indonesian policymakers in their strategy have acknowledged the need to develop the Sharia finance sector as a key driver of financial inclusion. In recognition of the importance of Islamic finance, the strategy sets education programs for Islamic finance under the title 'I Love Sharia Finance'.

The government has led several initiatives among them are:

- No frills account
- Improve Access through promoting agent banking, branchless banking and mobile money
- Financial Identity number
- KYC assessment using outsourcing party

4.2 Islamic Finance

Three main bodies in Indonesia regulate Islamic Finance Industry:

- The Central Bank, Bank of Indonesia (BI): Its role is to create and implement the monetary policy, regulate the payment system and maintain the stability of the financial system.
- The Financial Services Authority referred to as *Otoritas Jasa Keuangan* (OJK): Established in 2011 to regulate and supervise the financial services which include banks, capital markets and non-bank financial industry sectors.
- The National Sharia Board referred to as National Sharia Council - Indonesian Ulema Council (DSN-MUI) is part of the Indonesia Council of Scholars and is the supreme authority to issue fatwa and opinions on all Islamic financial services.

Bank Muamalat established in 1991 was the first Islamic Bank in Indonesia. It began its operations in 1992 after the government issued the Banking Act No. 7/1992. In 1998 the government recognized the dual system of banking and the Islamic business units (UUS). In 2018, OJK reported 14 fully-fledged Islamic Banks, 34 Islamic business units and windows and 167 Sharia rural banks (Otoritas Jasa Keuangan, 2018a). In 2017, OJK reported the growth of the Islamic banking market share, reaching 5.78% of the total national banking industry with 25.82 million deposit accounts and 5.4 million financing accounts (Otoritas Jasa Keuangan, 2018b).

In 2016, the government noted the slow growth of the Islamic financial sector and thus launched a ten years Islamic finance master plan aiming to accelerate the growth of the sector. The plan resulted in the establishment of Badan Pengelola Keuangan Haji (BPKH) an agency to manage the Hajj funds, which was previously managed directly by the Ministry of Religious Affairs. In 2017, Islamic Finance News (IFN) (Islamic Finance News, 2018) reported that the Hajj funds reached IDR 99.4 trillion ($ 7.07 billion). The

BPKH is expected to be the catalyst for the development of both the Banking and Capital Markets sectors.

4.3 Sukuk Market in Indonesia:

In 2008, the Indonesian House of Representatives together with the support of the Indonesian Government passed Law No. 19/2008 that provided the legal framework for sovereign sukuk issuances (SBSN). The law noted that the purpose of the issuance is to provide financing to the State Budget including development projects' financing. The law regulated:

- The forms and types of sukuk
- The issuance process of sukuk which can be done either directly by the government or by the SBSN Issuing Company (Perusahaan Penerbit SBSN) acting as Special Purpose Vehicle
- The use of State owned-assets as underlying assets in Sukuk transactions. The law adopted the concept of beneficial ownership where the State can transfer the beneficiary ownership of the State assets to the sukuk holders and not the legal title.

The law articles included the need for a fatwa to ensure the Sharia compliance of the issuances (Article 25). Thus, the DSN-MUI issued the following fatwas to govern the process:

- Number 69/DSN-MUI/VI/2008 on Sovereign Sharia Securities
- Number 70/DSN-MUI/VI/2008 on Issuing Methods of Sovereign Sharia Securities
- Number 71/DSN-MUI/VI/2008 on Sale and Lease-Back transactions
- Number 72/DSN-MUI/VI/2008 on Sovereign Sharia Securities Ijarah Sale and Lease Back

In addition to the above, the Indonesian government changed its tax regulation to ensure tax neutrality for sukuk with debt securities. The first sukuk series had an Islamic Fixed Rate

(IFR) and were based on an Ijarah contract. The 2017 IIFM Sukuk report noted that the total SBSN Sukuk issuance reached IDR 179.9 trillion ($ 12.7 billion). In February 2018, Indonesia issued its first green Sukuk amounting to $1.25 billion for a tenor of five years based on Wakalah structure. Figure 15 shows the sukuk instruments issued by the Indonesian government and the sukuk structure used for each. The issuance method varies for each instrument; it can be an auction, book building or private placement.

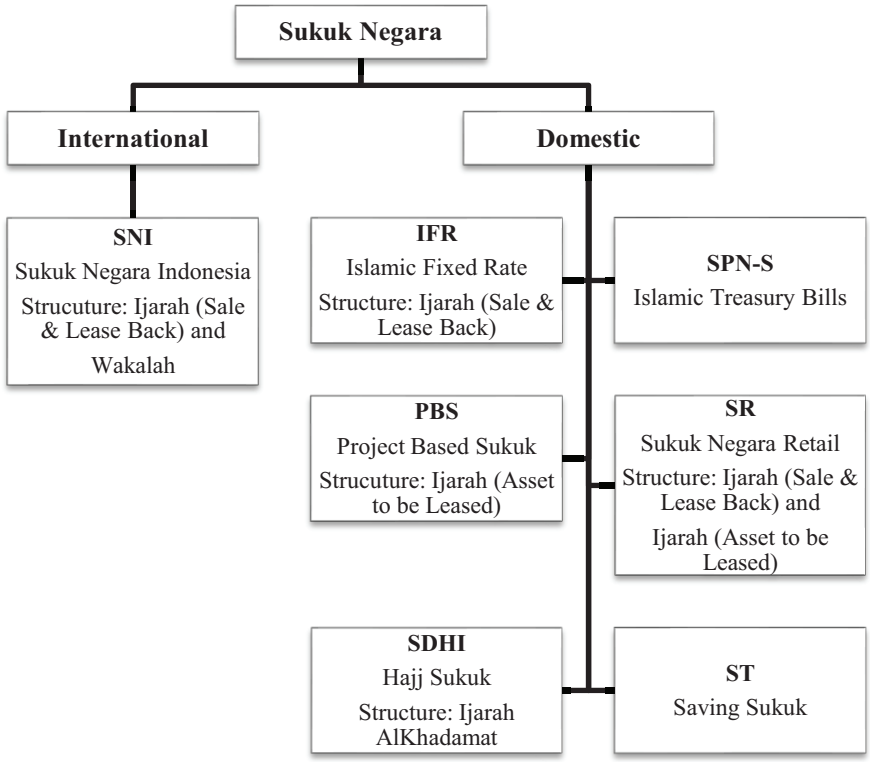


Figure 15 Sukuk Negara Instruments

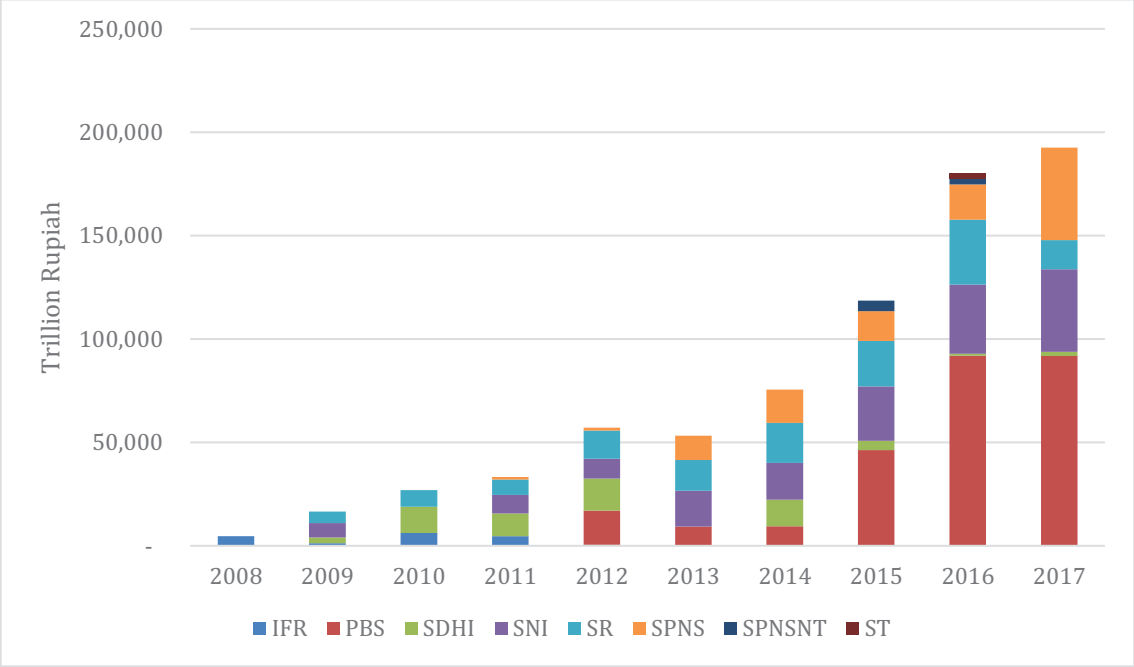


Figure 16 Total Sukuk Issuance (IIFM, 2018)

Although the first sukuk was issued in 2002 by Indosat which is a telecommunication company, the market is dominated by the sovereign and quasi-sovereign sukuk. At the end of 2017, the corporate sukuk issuance in Indonesia amounted to IDR 15.74 trillion forming 3.98% of the total domestic sukuk market (IIFM, 2018, p. 176).

4.4 Retail Sukuk:

The SR-001 issued in 2009 was the first issuance of sukuk to retail customers in Indonesia. The Ministry of Finance issued it with the minimum order set at IDR 5 million ($350) and the maximum order of IDR 5 billion. The sukuk was structured based on sale and leaseback Ijarah contract of State owned-assets to allow tradability. The sukuk tenor was three years with a fixed yield of 12% coupon rate to be paid monthly. The sukuk funds were mainly allocated to finance infrastructure projects in the country. The issuance program was done via book building with predetermined coupons using appointed distribution or selling

agents which can be banks or securities companies. Since then, the Ministry of finance continued to issue sukuk with the latest one being SR-010 issued in March 2018.

Figure 17 shows the SR sukuk structure that is based on Ijara sale and leaseback contract extracted from Dr. Suminto Sastrosuwito document presented in an IIFM event conducted in Indonesia in 2017.

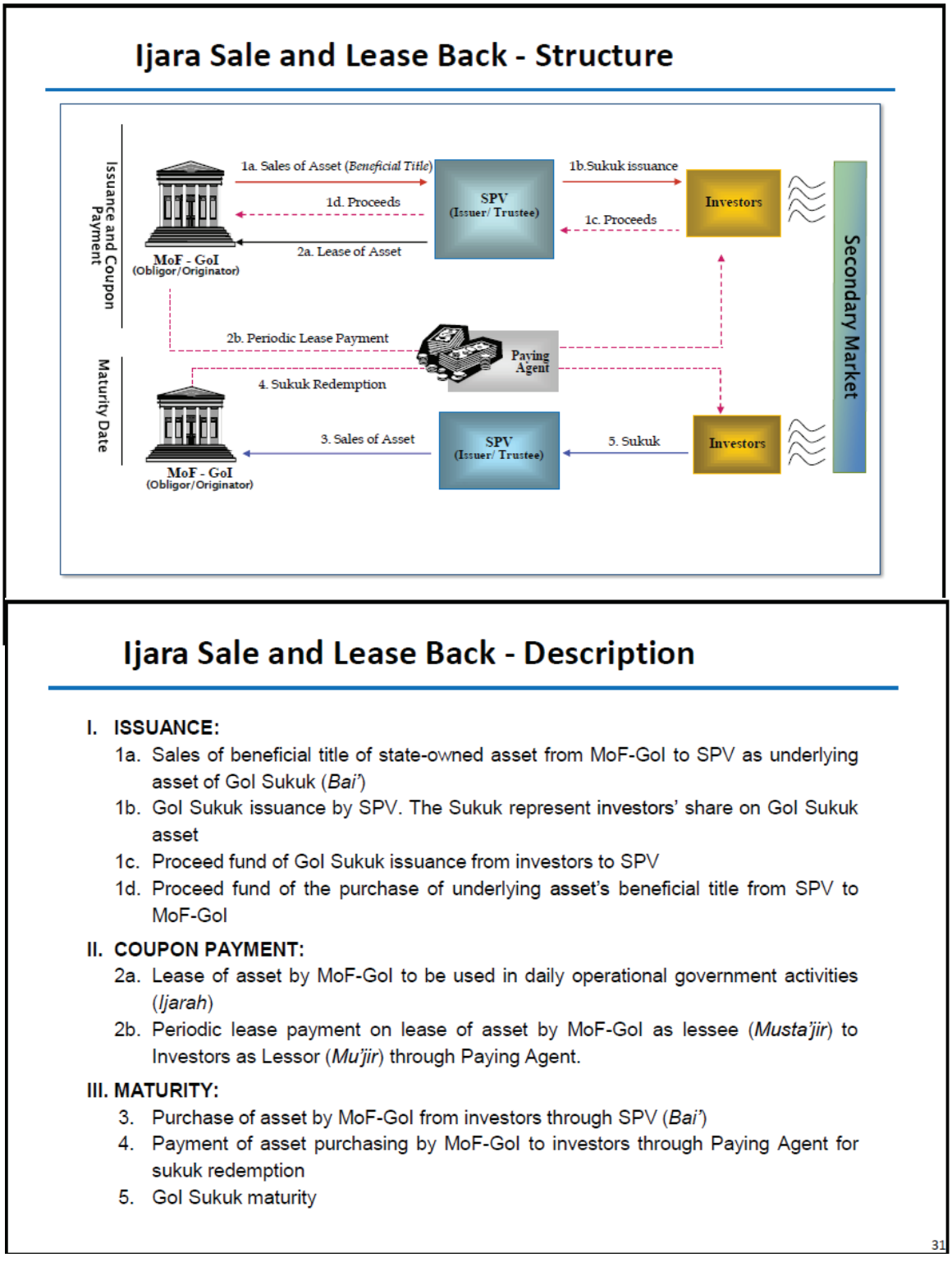


Figure 17 Indonesia SR sukuk structure - Ijara Sale and Leaseback **(Sastrosuwito, 2017)**

We interviewed Dr. Suminto Sastrosuwito, the Assistant Minister for Government Expenditure (Refer to Appendix 3) to gain further insight into the Retail Sukuk issued by

the government of Indonesia. In the interview, he noted that the primary objective of the Retail Sukuk issuance is to "*deepen the domestic market through financial inclusion in which individual investors can participate and get the benefit of the capital market. A deep capital market functions as a cushion for the economy during the crisis.*"

Table 10 shows the different issuances of SR retail sukuk series:

Table 10: Issuance of SR sukuk series (Provided by Dr. Suminto on 21 Feb 2019)

	SR-001	SR-002	SR-003	SR-004	SR-005	SR-006	SR-007	SR-008	SR-009	SR-010
Issuance Date	25 Feb 2009	10 Feb 2010	23 Feb 2011	21 Mar 2012	27 Feb 2013	5 Mar 2014	11 Mar 2015	10 Mar 2016	22 Mar 2017	21 Mar 2018
Tenor	3 years	3 years	3 years	3,5 years	3 years	3 years	3 years	3 years	3 years	3 years
Structure	Ijarah Structure									
Coupon	12,00%	8,70%	8,15%	6,25%	6,00%	8,75%	8,25%	8,30%	6,90%	5,9%
Volume (IDR Billion)	5.556	8.033	7.341	13.613	14.969	19.323	21.965	31.500	14.037	8.437
No. Investor	14,295	17,231	15,847	17,606	17,783	34,692	29,706	48,444	29,838	17,922

In 2016, the Ministry issued another type of Retail sukuk, which is ST-001 sukuk but flagged it as 'Saving Sukuk' to differentiate it from the SR series. The sukuk were targeting retail customers and are based on Wakala contract. Dr. Suminto explained that the Sharia ruling in Indonesia conditions the underlying portion of intangible assets not to exceed 50% of the total underlying assets for sukuk to be traded. The ST sukuk Wakalah structure does not comply with Sharia rule of tradable sukuk. The minimum order is set at IDR 1 million ($70) and the maximum order is set at IDR 3 billion. As per Dr. Suminto, the customer target for this product are beginners in the capital market who want a safe investment product that is easy to invest in. Therefore, the sukuk are available to order via online and mobile applications. Table 11 shows different issuances of ST retail sukuk series.

Table 11 Issuance of ST sukuk series (Provided by Dr. Suminto on 21 Feb 2019)

	ST-001	ST-002
Issuance Date	7 Sept 2016	29 Nov 2018
Tenor	2 years	2 years
Structure	Wakalah Structure	
Coupon	6,90% (fixed coupon)	8,30% (floating with floor)
Volume (IDR Billion)	2.585	4.946
No. Investor	11,338	16,477

Dr. Suminto noted that the first step to promote this type of sukuk to retail customers is to shift their mindset from saving to investing. He noted that attracting retail customers was not a simple process and it took time and effort from different bodies in the country including OJK, Universities, the Stock Exchange and Banks. Moreover, to specifically target the unbanked the government ran campaigns to the public especially the Islamic Schools. Another approach was the use of social media such as Twitter, Facebook, Instagram and Whatsapp applications to educate the people and market the product.

He highlighted that the issue of distance and access is a challenge in all aspects of life in Indonesia due to its geography. Thus, the use of technology, specifically the internet and online applications to place orders for sukuk helped reach investors in remote regions.

It should be noted that the Retail sukuk are offered through appointed Distribution Partners such as banks and securities companies. In 2018, the Ministry of Finance passed regulation (PMK) No.125/2018 which was a provision to the 2008 law. It guided the issuance of the Sukuk and the selection of the Distribution partners. The law added the possibility of having FinTech companies as Distribution Partners. As a result, Fintech companies were able to distribute the ST-002 and ST-003 sukuk through online applications.

Figure 18 and Figure 19 display the number of retail investors and volume in each of the issued sukuk.

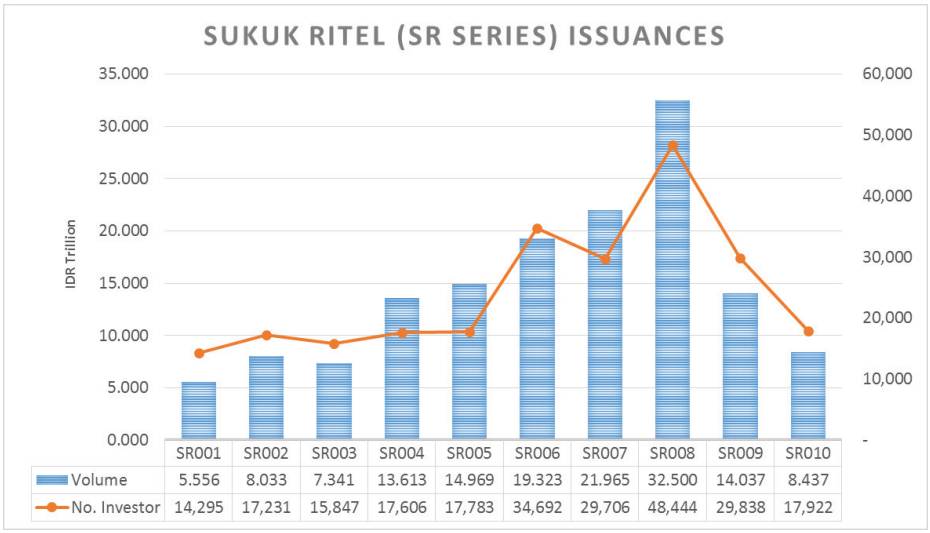


Figure 18 Retail Sukuk (SR) Series Issuance (Provided by Dr. Suminto on 21 Feb 2019)

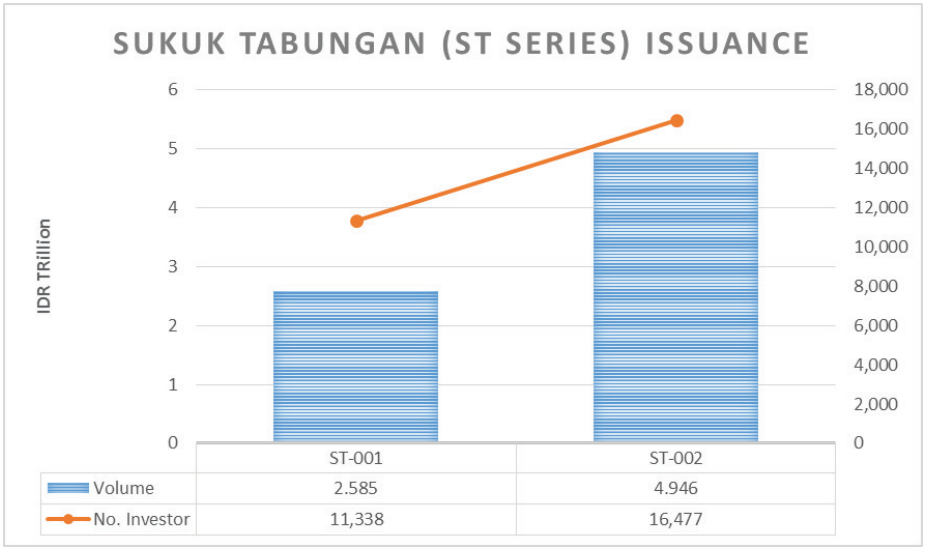


Figure 19 Saving Sukuk (ST) Series Issuance (Provided by Dr. Suminto on 21 Feb 2019)

The SR-008 recorded the largest numbers of investors which as highlighted by Dr. Suminto was a result of the high yield and the maturity of a previous sukuk series (SR-005) during the marketing time of SR-008 which increased the demand for it.

The distribution by investor type illustrated in Figure 20 and Figure 21 showed an interesting segment which is the housewives that are assumed not to have a regular income and depend on savings to invest. On average they have contributed to around 13.4% of the total sukuk amount over the ten series and formed an average of 15.3% from the total number of investors. Another interesting segment is flagged under others which include

artists, students and pensioners. Their percentage increase by amount and number of investors in SR-009 and SR-010 may reflect the beginning of a changed mindset from saving to investing in another sector that is assumed to have no or low regular income.

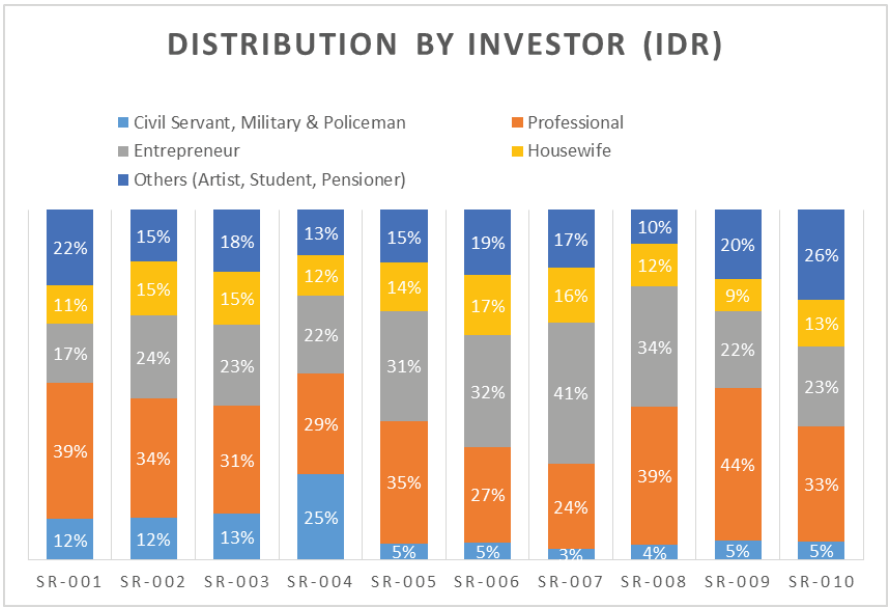


Figure 20 Retail Sukuk (SR) Distribution by Investor in IDR (Provided by Dr. Suminto on 12 March 2019)

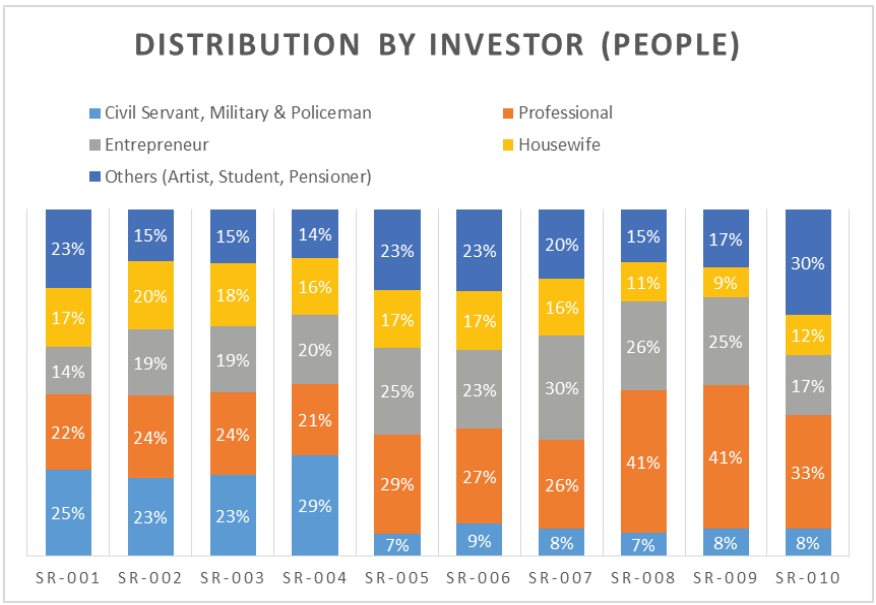


Figure 21 Retail Sukuk (SR) Distribution by Investor count (Provided by Dr. Suminto on 12 March 2019)

The MoF publishes a Memorandum of Information for every sukuk issuance where it details the information related to the legal, tax, sharia and risk aspects of the structure and issuance. It also details the purchasing, allotment, distribution and payment process.

Table 12 summarizes the subscription process of ST-003 sukuk (Non-tradeable) which was offered online by the ministry. The investor will approach one of the identified distribution partners to register in the sukuk subscription process. The distribution partner will support the investor in the sukuk registration process. It should be noted that the ST-003 distributors contain FinTech companies that facilitate the registration through their online application.

Sukuk investors need to have the following before registration[13]:

- Single Investor Identification (SID) is issued by The Indonesian Central Securities Depository (KSEI) for investors who want to trade in the securities market.
- Fund account number (Deposit account)
- Securities account number opened with a sub-registry that carries out the custodial activities and records the ownership of the sukuk on behalf of the investor

Table 12 ST Sukuk Registration Process Summary

Step	Entity	Process
1.1	Investor/ Indonesian Central Securities Depository	Open SID if not available
1.2	Investor/ Bank	Open Bank account if not available
1.3	Investor/Sub Registry	Open Securities account if not available
2	Investor/Distribution Partner	Distribution Partner will register the investor on the system. The distributor will verify the required documentation validity and support the investor to open the required accounts if required.
3	Investor/Distribution Partner	Distribution Partner will submit investor purchase order after the investor reviews the purchase terms and conditions

[13] Refer to Appendix four for additional details on the registration process of ST-003

4	MoF	The ministry application will verify the purchase request and a payment code will be sent to the investor (through the distribution partner or email)
5	Investor / (Bank/ Post Perception entity)	The investor using the payment code will make payment to the government account and the purchase order will be flagged as completed
7	MoF/Sub Registry	MoF will complete the sukuk allotment and submit a list to the sub-registry where the sub-registry will register the sukuk into the securities account of each investor
7	Distribution partner /Investor	Distribution partner will provide the investor with the evidence of sukuk ownership

When looking at selected websites of the banks acting as distribution partners of the government retail sukuk, it was noticed that sukuk applicants need to have a valid Indonesian ID (KTP) and bank account in the Bank. If the bank acts as a sub-registry, the investor will also need to pay the custodian fee and investor protection fund fee annually. The coupons are also subject to 15% final income tax. It should be noted that in March 2019, the ministry announced the issuance of SR-011 with a minimum order of IDR 1 million ($70) which is less than the SR sukuk issued earlier and maximum order of IDR 3 billion.

Unfortunately, although the Ministry of Finance cites financial inclusion as one of the objectives of the sukuk issuance, no formal assessment on the sukuk impact has been found. Overall, Indonesia accounts' ownership shows an increasing trend as illustrated in Figure 22 however, it is still behind its 75% target.

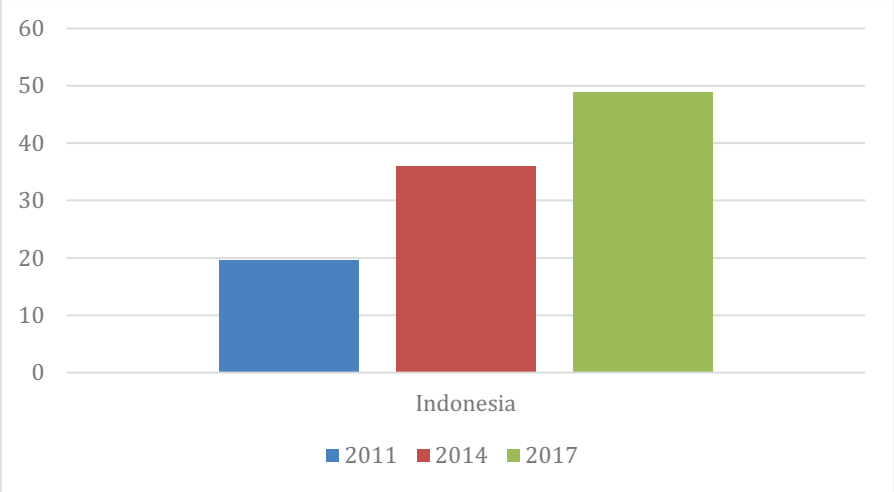


Figure 22 Adult with an Account (%)[14] (Global Findex database, 2019**)**

Figure 22 illustrates the cited barriers by adults for not having an account. Despite the projects initiated to address distance and cost, they remain among the significant barriers to opening an account in Indonesia.

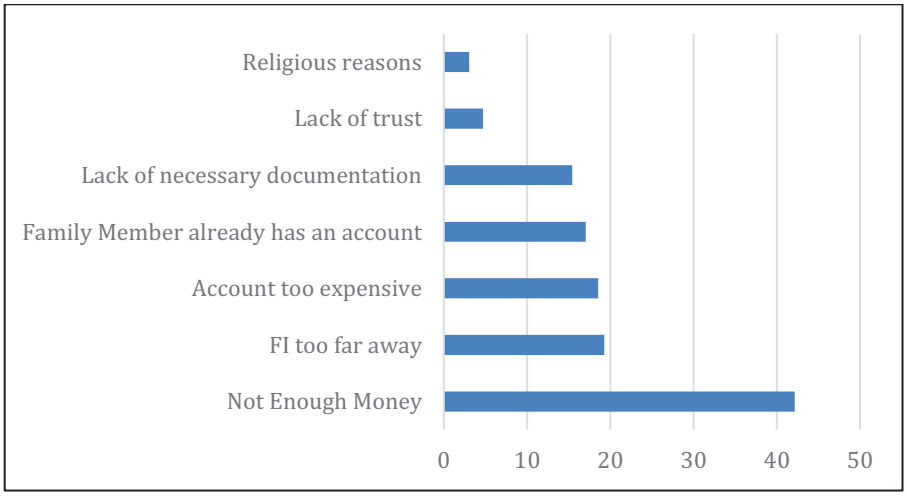


Figure 23 Indonesia - Adults without a financial institution account reporting barrier as a reason for not having one (%), 2017 (Global Findex database, 2019)

It should be noted that the retail sukuk registration process remains relatively complex where the customer needs to open three different accounts to subscribe to sukuk as indicated in Table 12. As mentioned above, increasing financial literacy is part of Indonesia

[14] Account (%) is: *"The percentage of respondents who report having an account (by themselves or together with someone else) at a bank or another type of financial institution (see definition for financial institution account) or report personally using a mobile money service in the .past 12 months (see definition for mobile money account)".* (Global Findex database, 2019)

financial inclusion plan; however, this is not expected to be achieved in the short run. Upon examining the information on retail sukuk available on the distribution agents' websites, it is noted that it refers to terms like Ijarah contract, Wakalah contract, rate of return risk and default risk which require advanced financial knowledge. Thus, to promote retail sukuk to address financial inclusion, it is recommended to simplify the information used to market the product and use simple terms in the sukuk prospectus. The retail sukuk in Indonesia can be seen as an efficient tool to support the state budget and involve the society in the country development plans.

CHAPTER 5: SUGGESTED IMPLEMENTATION FOR RETAIL SUKUK ON BLOCKCHAIN TO ADDRESS FINANCIAL INCLUSION

5.1 DLT/Blockchain and Financial inclusion:

In Chapter 3, several use cases of the DLT/Blockchain in the financial sector were presented. The Building Blocks is an example of projects on the blockchain which supported the refugees who due to their political situation are financially excluded. The concepts used in the project which are the Digital ID and the Wallet on the blockchain can be expanded to address the major barriers of financial inclusion.

The following were the cited barriers for financial inclusion (Demirgüç-Kunt, et al., 2018)

1. Not enough money
2. Do not need an account
3. Account too expensive
4. Family member already has an account
5. Financial institution too far away
6. Lack of necessary documentation
7. Lack of trust
8. Religious Reasons

Among the listed barriers, the lack of necessary documentation has been explored by government and non-government organizations as they intersect with several other initiatives in the SDGs. The lack of necessary documentation varies it can be lack of a valid identity similar to the refugee's situation, lack of proof of permanent address or lack of proof to date and place of birth. There are also the requirements set by the BIS to address the Anti-Money Laundering (AML) issues.

One of these initiatives is the ID2020 Alliance which is a partnership aimed to define the requirements and help create a digital identity for all individuals specifically those who lack a recognized identification. It seeks to create an identity that meets the governments, international organizations, business and individual's needs. Accenture and Microsoft are among the founding partners. Accenture is proposing the combination of the blockchain and biometrics technologies to create, store and maintain this identity[15]. Moreover, there are startup companies that offer the creation of digital ID's as a service utilizing the IBM Blockchain Trusted Identity™ like KYCK!.

The cost of an account is another barrier that technology and blockchain can address. A report published by International Telecommunication Union (ITU) focus group identified the potential of utilizing smart contracts to decrease the contracting and compliance cost on the financial institution making it feasible for them to open accounts for low-value transactions (Natarajan, et al., 2017).

Another potential of cost reduction using the DLT/blockchain is that of payments and remittances where the DLT concept helps eliminate many of the intermediaries. For example, Ripple published a case study in 2016 claiming that "*With Ripple, our respondent bank minimizes settlement delays and can realize 33 percent cost savings, or 6.8 bps11 total on international volume*" (Ripple, 2016, p. 7).

It should be noted that Ripple has launched at the end of 2018 a corporate social program Ripple for Good with a mission to '*to dramatically accelerate and expand global financial inclusion'* (Ripple, 2019a). As part of the program, Ripple partners with local FinTech companies to enable them to develop applications on the Ripple platform to address financial inclusion.

[15] Accenture prototype of the concept is demonstrated in a video their wesite: https://www.accenture.com/us-en/insight-blockchain-id2020

Another barrier that can be addressed using technology in general and blockchain in specific is the far distance of financial institutions. The Global Findex report noted that having a simple smart mobile phone with access to the internet can potentially increase access to financial accounts and services. There are 1.1 billion or two-thirds of all unbanked adults have mobile phones. It reported that mobile phone ownership is high among the individuals who cited distance as a barrier where 64% of these individuals own a mobile phone (Demirgüç-Kunt, et al., 2018, p. 93).

Thus, initiatives like digital banks which are emerging in the financial market can be one of the tools to address inclusion. In Indonesia Bank Tabungan Pensiunan Nasional (BTPN) launched a line of business referred to as Jenius to address the needs of customers who want to deal with the bank through digital channels only. The customer can download the application on a smartphone and complete its account opening through the application. The account is then activated by sending an agent to the customer's location or by visiting the Bank. The purpose of the visit is to verify the customer ID and take his signature on the forms.

In Africa, particularly Sub Saharan Africa[16] the success of mobile money has attracted the attention of Financial Institutions where the Global Findex reported that more adults have a mobile account than have a financial account (Demirgüç-Kunt, et al., 2018, p. 20). This led to Standard Charter Bank opening its first digital-only bank in Côte d'Ivoire without any physical presence.

[16] Sub-Saharan Africa countries are Burkina Faso, Chad, Côte d'Ivoire, Gabon, Kenya, Mali, Senegal, Tanzania, Uganda, and Zimbabwe.

5.2 Retail Sukuk on Blockchain: Suggested Implementation

As discussed in chapter 2, Retail Sukuk have the potential to promote financial inclusion. Assume the process to purchase sukuk is similar to the that of opening a bank account from an investor perspective where:

- The customer will approach the distribution partner to create an identification number to identify the customer in the distribution partner system. The customer is expected to present an ID and provide a deposit account number. If no deposit account is available, then the customer is expected to open an account with a bank
- The customer will fill in the sukuk order form and deposit the bank account with the sukuk subscription amount and charges
- Once the back-office process is completed, the distribution partner will share the coupons representing the sukuk ownership with the investor

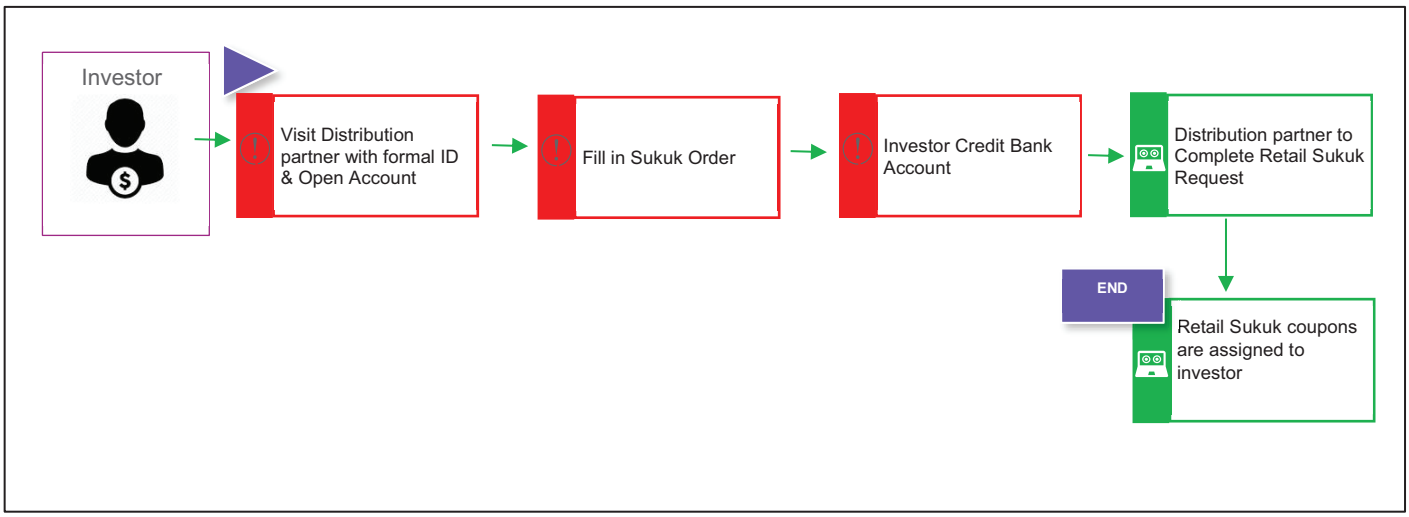


Figure 24 Retail Sukuk purchase process

The sukuk purchase process illustrated in Figure 24 might still not be feasible to the unbanked who cited barriers related to the high account cost, lack of necessary

documentation and distance to financial institutions. The DLT/Blockchain has the potential to overcome these barriers.

Mapping the possibility of addressing the barriers either through blockchain or retail sukuk, one may identify the potential of having the retail sukuk on the blockchain as displayed in Table 13.

Table 13 Mapping Financial Inclusion Barriers to Retail Sukuk and DLT/Blockchain

Cited Barrier	Potential of Retail Sukuk addressing the Barrier (Y/N)	Potential of DLT/Blockchain addressing the Barrier (Y/N)
Not enough money	Y	
Do not need an account	Y	
Account too expensive	Y	Y
Family member already has an account		Y
Financial institutions too far away		Y
Lack of necessary documentation	Y	Y
Lack of trust	Y	
Religious reasons	Y	

Table 14 lists possible solutions to barriers that might face the customer at each step of the sukuk subscription process.

Table 14 Retail Sukuk subscription process, Barriers and Potential solutions

Current process [17]	Possible Barriers	Potential Solutions
Open an account with a distribution partner	Financial institutions too far away Lack of necessary documentation	Open an account utilizing digital banking solution Digital identity through blockchain (i.e., ID 2020)
Fill in Sukuk order form	Financial institutions too far away Lack of necessary documentation	Utilize smart contract on the blockchain
Credit Bank account with the sukuk subscription amount	Financial institutions too far away	Transfer funds utilizing mobile money services and blockchain payment service (i.e., Ripple)
Receive a proof of ownership once the allotment results are announced	Financial institutions too far away	Receive the allotment in the form of tokens on the blockchain

[17] Based on the Indonesian's Retail Sukuk

If Indonesia is considered as a case study where the legal and regulatory framework of retail sukuk issuance is in place and the ministry of finance is active in issuing retail sukuk, one can propose the following workflow for retail sukuk issuance using blockchain technology:

Create R-Sukuk platform:

1. The BI, OJK and MoF to form a consortium that should include the financial institutions (FI), securities companies and FinTechs. The consortium can agree to develop an application we can refer to it as 'R-Sukuk' on an existing blockchain platform like the Ethereum or R3's Corda or the HyperLedger.
2. The R-Sukuk platform can have a servicing portal/application targeting sukuk subscribers.
3. The BI, OJK, MoF and all the members of the consortium will be represented as a node in the R-Sukuk platform.
4. The R-Sukuk can be linked to a blockchain application that enables the creation of digital identities (i.e., ID2020) or the consortium may decide to develop an option in the R-Sukuk application to enable the creation of a digital identity that can be linked to the government issued ID.
5. The R-Sukuk is to be integrated with the financial institution's systems to enable functions like:
    a. Account opening
    b. Credit Account
    c. Debit Account

When MoF issues sukuk say for example Retail Sukuk based on Ijarah contract (Sell & Lease Bank), the subscriber may either go to a distribution partner or use the R-Sukuk application. Figure 25 illustrates a possible workflow.

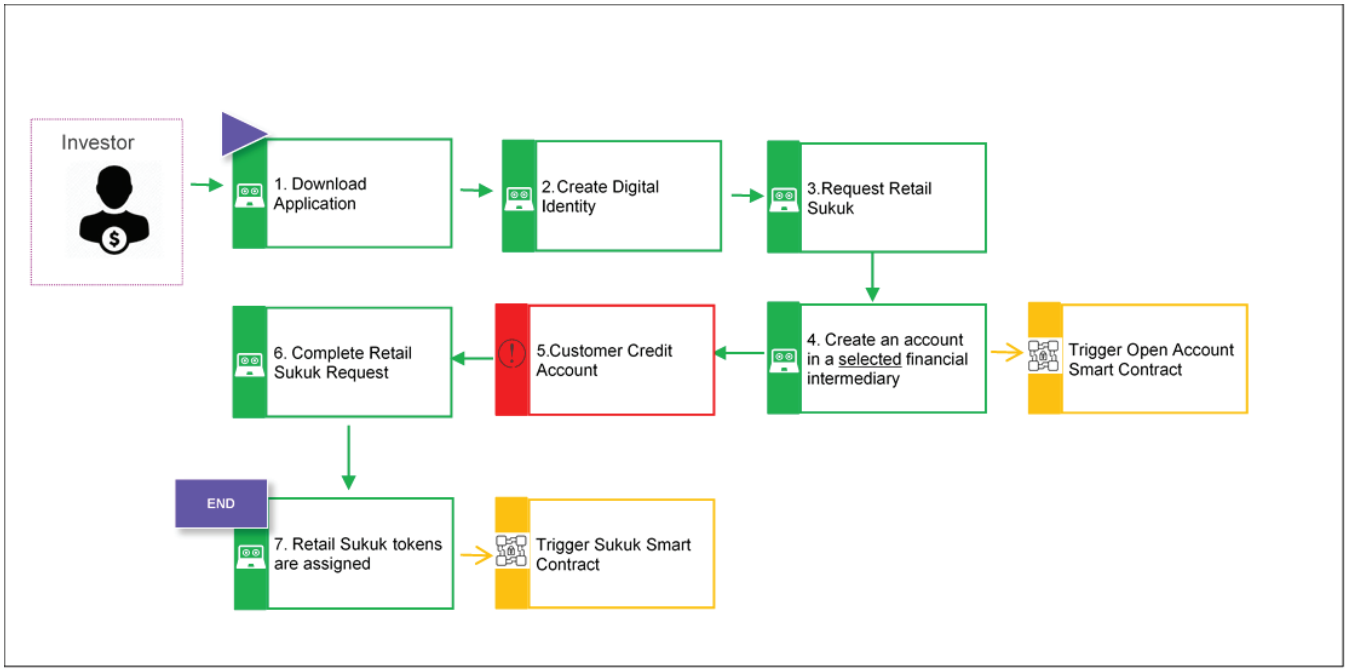


Figure 25 Retail Sukuk subscription process on R-Sukuk

The subscription process can follow the below steps:

1. Investor to download the R-Sukuk application if used for the first time. The application can be downloaded on a smartphone or accessed from a computer device.
2. Investor to create a digital identity using Biometrics (i.e., iris) on R-Sukuk application. The digital identity can be specific to the platform or similar to the ID2020 concept where it can be a public digital identity that can be re-used among the nodes on the platform. Authorized nodes will have access to the IDs ledger. The digital identity will represent the investor's signature.
3. The investor to request for retail sukuk subscription using the R-Sukuk application and input the subscription amount.

4. The application can ask the subscriber to input a bank account, or it can propose to create an account in a selected financial intermediary. If the application has access to the smartphone location, it can suggest nearby banks. This will trigger a new account smart contract and as the platform is connected to all the FI banking systems, the account will be automatically created in the selected FI. The FIs might choose to open the account in an 'Inactive' status and activate it once the individual visits the FI to credit the sukuk subscription amount. The process adopted to activate the account and deposit the subscription amount can be further enhanced via several approaches. One approach is to utilize the concept of mobile wallets adopted in some Sub-Saharan African countries. Mobile operators can become part of the R-Sukuk platform. In this case, the subscriber can transfer the subscription amount from the mobile wallet to the bank account without physically visiting the bank.
5. Once an amount is credited in the bank account, the subscriber can re-access the application to finalize the process. This will trigger the following conditions:
    a. If the amount deposited is equal to the sukuk input amount then complete the retail sukuk order.
    b. If the amount is less than the retail sukuk, the transaction will be updated with the new amount.
6. The application will prompt the user to complete the steps. The retail sukuk contract details will appear on the screen and the user will be requested to approve the transaction. Upon approval, the application will execute another smart contract with the following conditions:
    a. Hold amount in the newly created account.

b. If the allotment is granted, then the amount held will be released and deducted from the account. If not, the full allotment is granted. The held amount will be released either partially or fully.

7. Once the allotment is granted, the held amount will be released and deducted from the account and the R-Sukuk tokens will be transferred to the sukuk wallet in the application. The tokens will replace the concept of the sukuk certificate of ownership.

From the issuer perspective, the issuance process can also be executed on the blockchain platform. In the same example, the MOF is the Obligor and the SPV it creates is the issuer. Table 15 illustrates the current issuance process and a possible process if the issuance is carried on R-Sukuk platform. A node will represent each entity on the R-Sukuk platform.

Table 15 Retail Sukuk Issuance Steps

Step	Entity/Node	Current Process	Proposed
1.	MoF	Identifies the Assets	Identify and tokenize the asset on the R-Sukuk platform
2.	MoF/SPV	Sells beneficial title of the state-owned asset to SPV	Create a smart contract for selling the beneficial ownership of the asset to the SPV that is represented by tokens.
3.	Distribution partner	Compile order book and share it with MoF to allocate sukuk	The book building can be done through the R-Sukuk application (Step 5 in Figure 25)
4.	MoF/BI/ Sub-Registry	Allocate orders, and submit to BI to distribute to Sub-Registry.	Create a smart contract for the allotment process on the R-Sukuk platform and allocate the tokens to the sukuk subscriber wallet. The allotment smart-contract will be linked to the redemption smart contract.
5.	Sub Registry & Distribution partner	Sub Registry to register sukuk in each investor security account and share proof of ownership with distribution partner	The use of DLT/Blockchain eliminates the process.
6.	Distribution partner & Investor	Distribution partner to share the proof of sukuk ownership with investors	The use of DLT/Blockchain eliminates the process
7.	Distribution partner	Refund additional funds to investors	The refund process can be automated on the R-Sukuk platform (Step 7 in Figure 25)

8.	SPV	Lease Asset to MoF	Create a smart contract for leasing the beneficial title presented by tokens to the MoF. The lease contract will contain the lease amount and the lease period.

Table 16 illustrates the periodic payment process and a potential process

Table 16 Retail Sukuk Periodic Payment Steps

Step	Entity/Node	Current Process	Proposed
1.	MoF	Pays SPV the lease amount	Pays the lease amount pursuant to the lease smart-contract. This step can trigger an API to debit the MoF account and credit the SPV account in an FI
2.	SPV	Distribute the lease amount among investors as per the ownership percentage	Under the lease smart-contract, the lease amount will be distributed to token owners as periodic profit payments. This step can trigger multiple APIs to debit the SPV account and credit the sukuk investor account.

Table 17 illustrates the sukuk redemption process and a potential process

Table 17 Retail Sukuk Redemption Steps

Step	Entity/Node	Current Process	Proposed
1.	MoF	Purchase beneficial title of a state-owned asset from SPV	At the end of the sukuk subscription period, MoF will execute the redemption contract that will trigger a Purchase contract This will execute a Purchase contract that will: • Transfer the ownership of the token from the SPV to the MoF • Debit the MoF account and Credit the SPV account in an FI This will also trigger a redemption contract that will: • Debit the SPV account and Credit the sukuk holders account

2.	SPV	Pays the Dissolution Amount to investors using the Exercise Price received from investors and redeem the sukuk, upon which the trust will be dissolved	The use of DLT/Blockchain eliminates the process

The same platform can be utilized to trade sukuk tokens. The R-Sukuk application can offer an option to sell the sukuk where a trading sukuk smart contract can be created to transfer the sukuk tokens to the sukuk buyer once he credits the amount in the sukuk seller account. Once the buy/sell of the sukuk is completed the nodes in the platform will have a copy of the contract in their ledger and will identify the latest owners of tokens. Thus, the lease amount and redemption amount will be transferred to the buyer in this example.

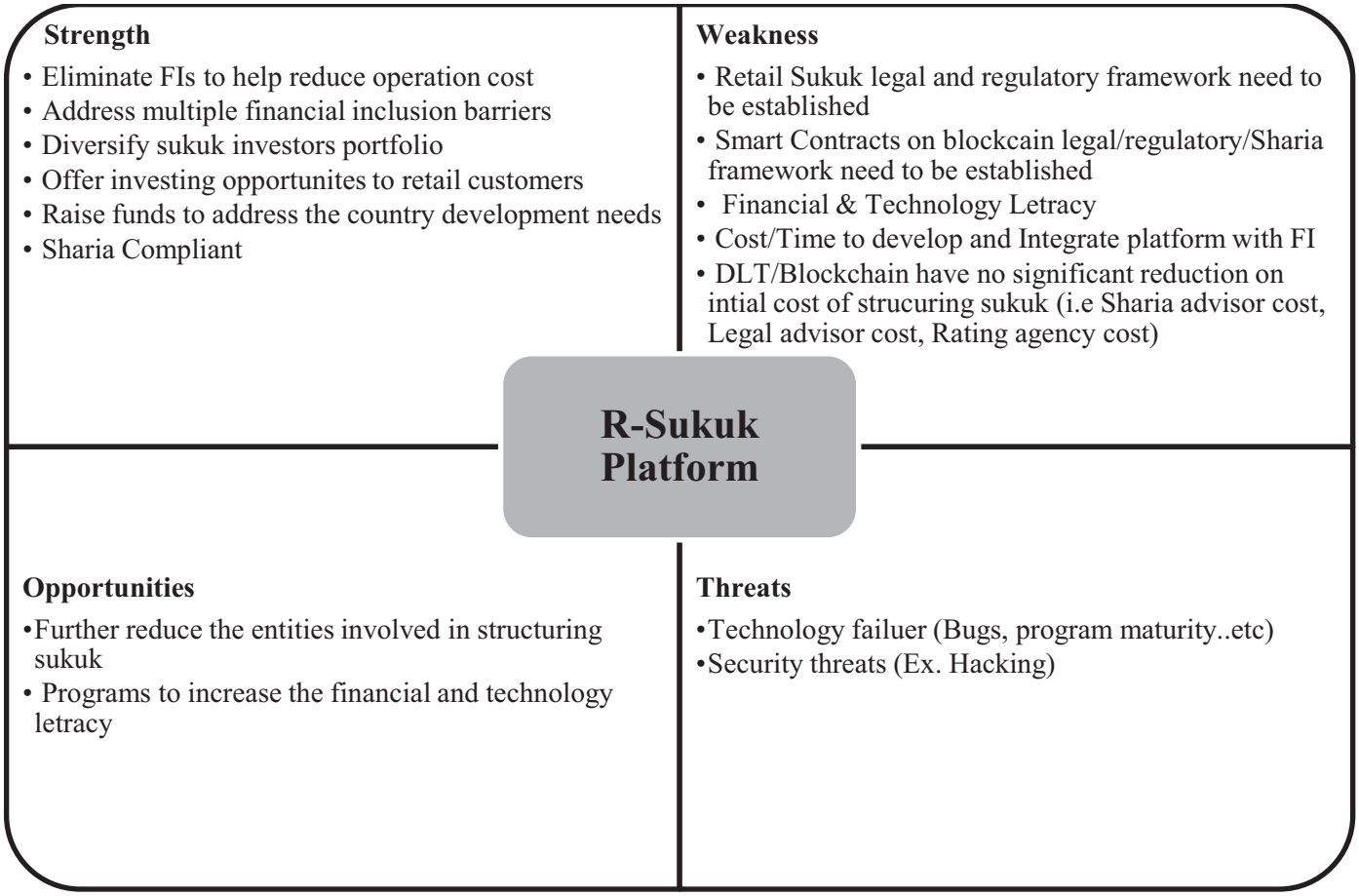


Figure 26 R-Sukuk Platform SWOT Analysis

CHAPTER 6: CONCLUSION

6.1 Conclusion:

The poor in the world and Muslim societies face several challenges in their journey to cater for their basic needs. Access to financial services is just one of the challenges faced by the poor, but if achieved it can help address some of the other development challenges. This requires innovative approaches to aligning financial innovation and technology. The objective of this research is to provide an overview of two innovative concepts, which are retail sukuk and DLT/Blockchain and explore how each can address financial inclusion separately and then attempt to develop a framework where both can be combined. Indonesia's retail sukuk issuance has been selected as a case study to review its experience in sukuk issuance.

In exploring sukuk and reviewing the structures of sukuk al Ijarah and sukuk al Wakalah, the first finding is the complexity of the overall process of sukuk issuance and the large number of intermediaries involved. Another finding is the limited number of sukuk targeting retail customers. The countries that issued retail sukuk are Malaysia, Indonesia, Pakistan, Turkey and lately Oman. Indonesia stands out with its established framework to issue retail sukuk, its efforts to promote it among retail customers and its yearly issuance since 2009.

Indonesia's experience in sukuk issuance highlighted the importance of tapping the local market to raise funds required for the country's development projects. The process to subscribe to sukuk particularly the ones through the distribution agents still requires retail investors to read and accept multiple legal documents. The documents include terms like Ijarah contract, Wakalah contract, liquidity risk and beneficial ownership indicating that the person accepting the terms need to have a high level of financial literacy to understand what he/she are engaging in. It can be concluded that educating the retail customer through

tailored campaigns is a critical factor in ensuring the success of the subscription. The campaigns should focus on educating the customer on the benefits and risks of investing in retail sukuk and the subscription process. Moreover, although the Ministry of Finance cites financial inclusion as one of the objectives for retail sukuk, no data is collected to indicate the impact of retail sukuk on financial inclusion.

The other aspect of the research is the DLT/Blockchain technology. In order to give an overview of the technology, the Bitcoin and Ethereum blockchains concepts and technology progress were reviewed. Moreover, the Sharia perspective on the technology has been explored by reviewing Sharia scholars' views and conducting an interview with Dr. AbdulAzeem an Associate Professor of Islamic Finance at HBKU concluding that the Sharia concern is mainly with considering the cryptocurrency in its current form as money. There is no Sharia objection in using the technology to develop financial applications that service the Islamic finance industry.

In the research, sample implementation projects and use cases of the technology in the financial sector have been explored and summarized. One use case is the issuance of Bond-i on the blockchain by World Bank and Commonwealth Bank. Another is the Lendercomm by Finastra as a servicing portal on a blockchain platform for syndicated loans. A third is the SmartSukuk on Ethereum by Blossom Finance to raise funds for microfinance banks and corporates. The key finding in this review is that the financial industry recognizes that the technology is not yet mature, but its potential advantages are driving the industry to continue investing and experimenting in use cases and prototypes. The research also explored the technology use cases for financial inclusion which led to the Building Blocks project by the World Food in Azraq refugee camp that confirms the potential of the technology in addressing barriers like lack of documentation and intermediaries' high cost.

As part of the research, a platform referred to as R-Sukuk platform was designed to attempt to bring the retail sukuk and blockchain concepts together to promote the sukuk and address financial inclusion. The R-Sukuk platform adopts the Indonesia issuance and subscription process since the legal and regulatory framework is in place. The platform has the potential to address several of the cited barriers to financial inclusion. The proposed design also illustrates how a decentralized platform can eliminate several intermediaries in the sukuk life cycle which can reduce the operational cost. The R-Sukuk proposition can be further enhanced to achieve its objective, but the key to its success will be educating the retail customers and raising their financial and technology literacy. Moreover, the proposed platform had no significant cost reduction in the initial structuring stage of sukuk.

6.2 Recommendations

Countries offering retail sukuk need to ensure that the legal, regulatory and Sharia frameworks simplify the retail customer subscription process similar to the opening of the saving account process. The framework should also encourage the retail customer through incentives like waiving income taxes. Moreover, the legal, regulatory and Sharia frameworks should enable the utilization of emerging technologies in general and DLT/Blockchain to support the growth of the Islamic Finance and the Islamic capital market.

The R-Sukuk platform proposed can be adopted by wider entities as a platform for sukuk issuance and trading. The adoption of a common platform will support the capital market in standardizing the issuance process which will support its growth. More importantly, the Islamic financial industry should invest in talent development specifically in the financial technology (FinTech) sector. These talents will support the industry in creating its technology platforms that will assist in innovating new financial instruments instead of investing time and effort in imitating the conventional financial instruments.

6.3 Recommendations for future research

- Further research needs to be done to identify the reasons behind the low supply of retail sukuk by sovereigns and corporates. Is it due to the lack of legal and regulatory frameworks supporting their issuance? Is it due to the issuance cost? Or is it merely because it is a new concept that is yet to be adopted?
- The saving/investment behavior trends in Muslim communities with low financial inclusion need to be studied and analyzed. The study should be specific to each community since each might have its specific barriers and challenges. This study will aid in proposing efficient solutions to increase financial inclusion.
- The impact of retail sukuk issuance in Indonesia on financial inclusion
- The DLT/Blockchain emerging use cases and implemented projects are limited. Thus, further research is required to identify use cases in the Islamic finance industry and evaluate their benefits and risks.

APPENDIX 1: INTERVIEW WITH DR. ABDULAZEEM ABOZAID[18]

Dr. Abdulazeem Abozaid is an Associate Professor is an Associate Professor in the College of Islamic Studies at HBKU. He holds a Ph.D. and a master's in Islamic Financial Law. He also holds BAs in Islamic Law, BA in Arabic Language and BA English Literature in addition to two higher studies diplomas in Islamic Law and Human Sciences. He is currently working on a research paper on the Sharia accepts of Cryptocurrencies.

1. **What is the Sharia view on cryptocurrency in general and the use of it to create sharia-compliant decentralized applications and smart contracts?**

In general, the issue with cryptocurrency is if it should be considered as money or not and if it can be dealings and transactions. In brief, the cryptocurrency lacks the Sharia conditions required for it to be considered as money or equivalent to money or subsidiary to money. Thus, let us start by citing the conditions required for a currency to be compliant with the Sharia.

The first condition is that it has to be widely accepted and used for the same functions that currencies are used for. The acceptance shall not be limited to a small group in the community but rather accepted but the whole community. Moreover, it does not need to be accepted as a currency in all territories, but at least in the territory, it is being used in. Now if we apply this condition to the cryptocurrency one can see that its acceptance it is limited. In fact, even among the individuals who use it, the usage is focused on speculation where one will buy the cryptocurrency hoping that its value will increase so he can sell it with profit. It is more like buying and selling shares in the stock exchange where one buys a certain share based on predictions that it will increase in price which may or may not

[18] The interview was conducted in Arabic and was translated to English by the author.

happen. Thus, as per the feedback from several central banks, the current popularity of cryptocurrency is not because it is used as money but because it is used as a financial speculation instrument like stocks and derivatives. Moreover, the demand for its use as money is very low and limited. Thus, it did not meet the first condition of being popularly used as money.

The second condition is that it has to store its value. In general, the currency is known to either have its intrinsic value like currencies made from gold or silver whereby even if the authority decided to stop using them, they continue to have value. Therefore, one can reuse them as jewelry or sell it for its value. In recent years currencies are made from paper which does not have intrinsic value; instead, it has a technical value that is legally assigned to it by the issuing authority which is usually the government. Thus, it is the government duty as a guarantor to the value of the currency to maintain its paper form thus replacing any paper currencies that are old or damaged and ensure that it maintains its value and purchasing power. This is done by putting specific measures via monetary policies and tools. In the case of cryptocurrency, there no central authority that guarantees its value and the people who create it cannot also guarantee its value. Thus, if sharp fluctuation takes place, the contracts using this currency may suffer tremendous damage and loose. For example, a cryptocurrency unit value today might be $1,000 and tomorrow the value falls to $1. This sharp fluctuation was observed in the past two years with the bitcoin cryptocurrency. Thus, cryptocurrency does not meet the second condition.

Moreover, the cryptocurrency cannot be considered a commodity.

It should be noted that Sharia recognizes that money is a crucial pillar in the economy and its growth and as a result, it regulated it with strict rules to protect its functions. For example, the rule of spot exchange in case of gold as deferring payments, in this case, is

not permissible as it may lead to ‘Riba’. Sharia also restricted speculation by not permitting deferred payments in currency exchange.

In summary, the cryptocurrency did not meet the functions of money which are to act as a medium of exchange, store value and be a unit of measurement. Today, one cannot buy bread using this currency or cannot save it and expect that it will have the same value after a couple of days. One cannot also utilize it as a unit if measure where it is easy to value things using it in the sense that the value of this is 20, 30 or 50 units. For the cryptocurrency to be a unit of measure, it needs to be at least stable and fluctuations should be slight. Therefore, as the cryptocurrency cannot function as money, the money Sharia rules cannot be applied to it.

However, we cannot rule that the Sharia will never permit using cryptocurrency as currency. The Sharia might eventually rule its permissibility just like the paper money. The Sharia does not limit money to gold and silver. When Islam emerged people where using Dinar which was made of gold and Dirham was made of silver and Sharia accepted it. There is not any provision of Sharia that explicitly state that gold or silver is to be used to store value. The Sharia rules came to regulate the way Muslims use them to buy, sell and contract. Imam Malik noted that if the Muslims agreed to use the leather in place of the Dinars and Dirhams, they would have to observe the money exchange rules to avoid ‘Riba’. The Sharia scholars when they attempted to define the effective cause (‘illa) of the occurrence of riba in gold and silver they justified it because of the price and value associated to them. Therefore, anything in the future that people use for pricing will follow the Sharia rule of gold and silver in their exchange. The point is that the Sharia is not against people adopting a new currency if there is a benefit to the people behind it. It is currently known that the major powers in the world control the world economy through its strong currencies. Thus, having an alternative currency that is not created and controlled by one

authority might support decrease the dominance of these major powers on the weak and vulnerable countries can be recommended by Sharia. However, the alternative currency should be an improvement from the existing one, not one that has more issues. The current currencies do have issues but replacing them with the cryptocurrencies in the current form and with their identified issues and not valid. Especially with the news were are reading about people having their currencies stolen by hackers and others who lose or forget their private keys and as a result, simply lose access to their cryptocurrencies forever. Sharia will not accept such a system where people rights are not fully protected in the same way it does not accept paying one Dirham in the form of interest (Riba) or allow excessive uncertainty (Gharar) in contracts. Sharia principals are based on protecting the individual's money and rights even if they do not specifically need protection.

Accordingly, the cryptocurrency in its present form is not accepted by the Sharia as money, but if the above concerns are addressed, it might be accepted. Taking this into consideration, if an individual requires payment against a service only in the form of cryptocurrency and not in any other currency such as dollars or riyals, then this is fine. The Sharia would not have a specific ruling in this scenario; thus, it is permissible. This acceptance should not justify the substitution of money by cryptocurrency as this is a particular situation where cryptocurrency is the only accepted payment mean to use the service. For example, one can ask to be paid against a service he offers in liters of milk; this does not qualify milk as a currency. The payment of Ether in the Ethereum network should be looked at in the same manner.

2. **There are blockchain/DLT platforms that are used for several applications among the applications those that are not permitted in Sharia. What is the Sharia view of using the same platforms for Sharia-compliant applications?**

From a Sharia perspective, blockchain/DLT is a technology used to facility peer-to-peer communication in a transparent manner. Technology, in general, does not have a specific Sharia ruling. Just like a glass, one can use it for drinking water or juice and another can use it for drinking alcohol. Sharia cannot rule that the use of the glass is permissible or not. In fact, it is not recommended to give a Sharia ruling on the glass. If it is used to drink water, then this is permissible if it is used to drink alcohol then it is not permissible. The tool is permissible and the usage in case of alcohol is not permissible. In the same sense, the blockchain/DLT platform can be used for gambling applications and it can also be used to register land titles to protect the rights of the landowners.

3. **Does the Sharia have any concerns on the level of privacy in the blockchain/platform?**

Privacy in Sharia is limited to personal and family affairs and financial transactions do not fall under that. Sharia does not have a specific ruling on this as long as the individual accepts the privacy terms and conditions of the platform.

4. **If governments started to legalized the cryptocurrencies and set an exchange rate against its local currency, will this make it permissible?**

I would be surprised if a government decided today to link its currency with a cryptocurrency like the bitcoin. The trend is for governments to link their currencies with a stable one like the dollar or the euro as this will support the country economy by increasing the world confidence in its currency and ease the international transactions.

The link might benefit countries that have taxes as a way to monitor the cryptocurrency transactions and avoid tax evasion.

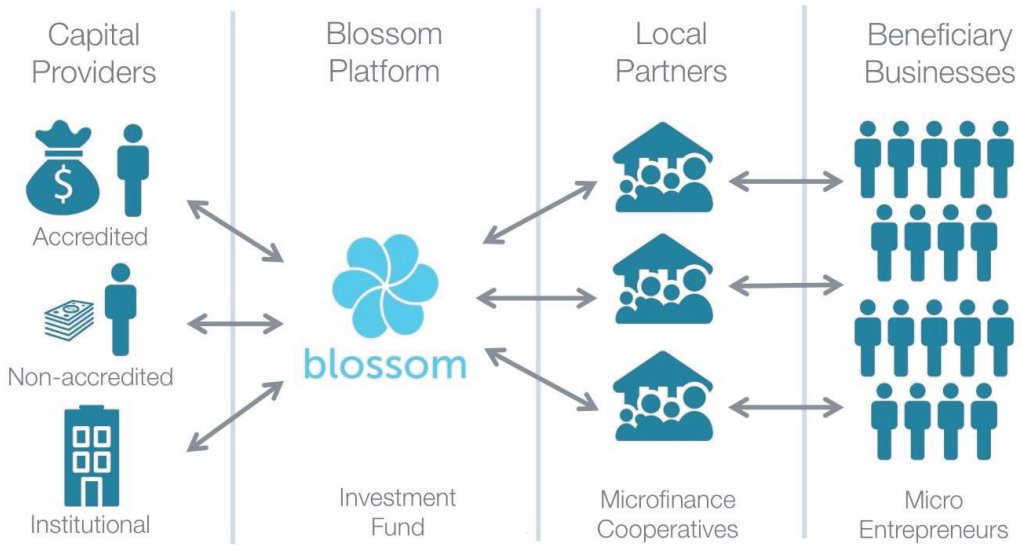
In general, the increase in the number of governments that legitimize and accept the cryptocurrency as a medium of payment and use it in contracts may stabilize the cryptocurrency which may help in accepting it permissibility as a currency. However, as of today, I do not see this happening. I do believe that eventually governments will accept the cryptocurrency and seek to stabilize it. This will help lift the dominance of the major powers' dominance on the world economy unless these countries find control over the cryptocurrencies.

APPENDIX 2: INTERVIEW WITH MATTHEW MARTIN BLOSSOM CEO

About Blossom Finance

Blosson Finance can be described as a company that facilitates raising funds for microfinance cooperatives using blockchain. Blossom raises funds from global investors using the mudaraba contract. Blossom invests the raised funds with different microfinance cooperatives in Indonesia.

Blossom utilizes the blockchain to mobilize the funds which help reduce the cost of eliminating the fees and charges that the intermediaries charge to transfer the funds from the global investors to Indonesia microfinance companies. Moreover, using the smart contract, the rules of the contract are executed including the calculation and the payment of the mudaraba shares and corresponding profit to the investors with no human intervention which also leads to reducing the operational cost. Blossom's profit is its share in the mudarba contract which is estimated to be 20%.



Appendix 2 - Figure 1 Blossom Business Model

1. Tell me about Smart Sukuk?

In today's world typically for Sukuk, there are 10 financial intermediaries providing a piece of technology and of value within a chain. For example, the registrar records the ownership of the sukuk coupon the transferring agent will transfer the coupon ownership between people the paying agent will ensure that when the coupon payment is made it goes to the owner of the coupon. The calculating agent will be based on the parameter of the sukuk will determine how much to pay and who gets what amount based.

Appendix 2 - Figure 2 List of financial intermediaries involved in sukuk

Today in conventional sukuk which uses 10 financial intermediaries to provide a small piece of value and each of them charging $100K per year instead we are using an ERC-20 token which is an international standard which represents ownership of an asset tracked digitally and tradeable meaning any ERC-20 token can be traded on a 3rd party exchange or directly exchanged peer to peer. Instead of managing the sukuk coupon offline using expensive parties, we are using the ERC-20 token to records the ownership and to transfer the ownership of the sukuk between parties without any intermediaries. This means the sukuk can be traded directly peer-to-peer or the transaction can be on a third-party exchange in secondary market trading. The second aspect which is the payment of the coupon: the parameters of the sukuk are put in a smart contract so based on the roles of the sukuk, for example, if it is a simple contract like our case with microfinance companies using

mudaraba sukuk which is profit sharing based on the ratio of capital invested. The calculation occurs in the blockchain using the smart contract. The institution that raises money (the issuer) will pay the money directly into the smart contract and the smart contract will automatically transfer that value to the sukuk coupon holder. If I have the coupon, I get the money. If I sell the coupon, the other person gets the money.

2. **You are working with microfinance companies which mean that there is actual money being transferred. How is this managed?**

The funds can be received in cryptocurrency, or we can receive a bank transfer. If it is a bank transfer, we can create a wallet on behalf of the investor and the wallet is tied to their identity and the ownership of the tokens. We have a digital platform where they can log on to their investor account where they can see their balance, they can sell, they can buy and they can withdraw.

Once we receive the funds in cryptocurrency, we immediately convert them to fiat currency which in this case is Indonesian Rupiah hence all sukuk are denominated in local currency. The Rupiah is paid to the issuer bank account hence eliminating the risk of cryptocurrency. This the blockchain, in this case, is acting as a digital wire. The recipients which in this case a microfinance institution which is a microbank will receive the funds and there is mudaraba contract with them and the investors. They will take the funds and in turn make microfinance investments. Monthly profits generated from the investments are shared with the investors, based on the nisbah (profit sharing ratio) of the mudaraba with the investors.

3. **What are the challenges you faced when launching the product with the regulators in Indonesia?**

Our main challenge was to figure out the right operating and regulatory module. The way we operate is as a foreign company and under Indonesian regulatory framework our sukuk is considered as a foreign loan to that business and Bank Indonesia (central bank of

Indonesia) has no problem. The only aspect we need to report is the in and outbound currency flow. There is also a tax withholding on the profit. We are seeking to optimize the operation by ensuring the microfinance institutions are treated as financial institutions, and therefore subject to withholding tax exemption.

4. What is the customer segment you are targeting?

The product has not been marketed yet as we had just announced the platform in March 2018. We focused on finding institutions that are strong, responsible, and open to embracing new technology. We have a network of over 300 institutions that are connected to over 3 million customers.

On the retail side, we will have a digital marketing strategy and we may work with financial institutions who can license our platform to provide retail sukuk to their customers or use the platform to issue digital sukuk on one side to raise money and sell it to institutions on the other side. We can also take existing sukuk which are already issued sukuk and tokenize them and sell it. Essentially, any asset that is a halal asset we can tokenize that asset and we can offer it for sale either to institutions or retail.

We previously tested the concept through a private blockchain offered to high net worth to issue retail sukuk, and we're now testing the system in the public Ethereum blockchain.

5. What are the customers' motives behind buying the sukuk?

The first batch of customers – all of which who were high-net-worth - were interested in the technology; they were customers from within our close personal network. As far as investors who have registered directly on our website, the main motivation stated was profit, followed by social impact as a secondary motivation, and halal investments as a close third priority.

6. Have you started distributing profit?

We ran a private investment project, which ended in 2016 and returned a 14% annualized profit. Our first fully public sukuk will be this quarter (Q1 2019).

7. How do you see the performance/profit for the company?

The company profits from the two-sided mudarbah. The sukuk is sukuk al mudarba, meaning the contract between the SPV and the MFI is mudarabah. The contract between the SPV and the investor is also mudaraba, where Blossom's share of the investors' profit is 20%.

The underlying microfinance conducted by the MFI is murabahah – not commodity murabah, but rather actual murabaha to finance raw materials or equipment for market traders or micro businesses. In some cases, the MFI takes their own share of the profits and creates social enterprises using diminishing musharaka as part of their social impact mission, but this is not directly involved with the sukuk.

The key for this process to succeed is the risk appetite of the initial investor. Our thesis is that the retail investor will have this appetite because they are not conditioned by the conventional financial system where everything is measured against a fixed rate of return. We are seeking to address a different kind of mindset which believes in an equity-based structure which is line with the SDGs.

Nevertheless, we are studying the option to have capital protection for sukuk al mudarba through a government Takaful company to reduce the risk of loss of capital

8. **Where do you see the future of the company going? Is the product going to expand to a larger retail segment? Maybe to the poor?**

As of today, since the company is foreign, we can only raise funds from foreign investors and not local ones. The model so far is supported by the government as we are supporting the economy by bringing in foreign investments.

9. **I am writing a paper on how to use retail sukuk to address financial inclusion, specifically those with a very small amount of savings. From your business/technical experience how can we simplify the process to get this segment on board?**

We're confident that anyone with a smart phone who can use Facebook or Instagram can invest in sukuk using Blossom's investor platform. All you need is an email address to sign up.

10. **How can this segment in Indonesia convert the money to go to blockchain?**

We have an extensive network of BMT (microfinance cooperative) institutions which are effectively bank teller branch locations. If someone does not live near a BMT, Indonesia has a quite well established cash payment network at the countries two most popular convenience stores: Indomaret and Alpha Midi. Paying for utility bills in cash at these convenience stores is very common, especially in rural areas and for those without a bank account.

The network of BMT branches plus the cash-payment network can be used as funding mechanisms to purchase sukuk. Ultimately though, one aim for financial inclusion is that the 'unbanked' can become 'banked', and BMT branches are one key tool to help improve financial inclusion. These branches are not just a tool for typical bank-like savings and loan products, but they're also a key tool for education and financial literacy within rural communities.

As far as embracing a digital investment platform, on the whole, digital financial services are rapidly on the rise in Indonesia and quite mainstream at this point. GoJek - an on-demand platform mainly using scooter and motorcycle drivers for logistics - has over 1 million registered drivers[19] and between 20-25 million monthly active users[20]. This represents at least 26 million e-wallets just on one single platform.

11. Do you believe that blockchain technology will support financial inclusion?

Yes. The problem today with sukuk other than the government one is that the only way you can subscribe is through banks cause lot size is high. With blossom using the blockchain we are able to bring down the lot size and eliminate the unnecessary cost. Hence raising small funds for the MFI becomes more feasible. The key is to make blockchain accessible by everyone just like the internet. The internet is successful, in part, because it's a public, inclusive network. The global banking system today is a private, exclusive financial system. One important disruptive aspect of blockchain is that it's a public, inclusive financial system.

[19] https://blog.gojekengineering.com/how-go-jek-manages-1-million-drivers-with-12-engineers-part-1-978af9ccfd32

[20] https://www.cnbc.com/2018/11/29/go-jek-singapore-ride-service-hopes-for-many-thousands-of-customers.html

APPENDIX 3: INTERVIEW WITH DR. SUMINTO SASTROSUWITO

Dr. Suminto Sastrosuwito is an Assistant Minister for Government Expenditure (July 2018 -present) in the Ministry of Finance in the Republic of Indonesia and before that he served as Director of Islamic Financing (2014-July 2018). He holds a Ph.D. in Development Economics from Ritsumeikan Asia Pacific University, Japan and M.Sc. in Development Finance from Hiroshima University, Japan.

1. What are the types of Sukuk offered to the retail consumer in Indonesia?

ROI has two series of Sukuk for retail investors, namely Sukuk Ritel (SR series) and Sukuk Tabungan/Saving Sukuk (ST series). Although these two series have similar features: only for domestic retail investors, offered through book building method, channeling through appointed Distribution Partners, but they cater different segment of retail investors.

Sukuk Ritel (SR) is aimed for retail investors who are mature both in term of age and financial, have better understanding of the capital market instrument and mostly still prefer to use conventional banking service. In order to accommodate this segment needs of Sukuk, SR is designed with features: minimum order of IDR 5 million and maximum order of IDR 5 billion, tradable, fixed yield, 3 years tenor, and putting offline order through sales team of Distribution Partners.

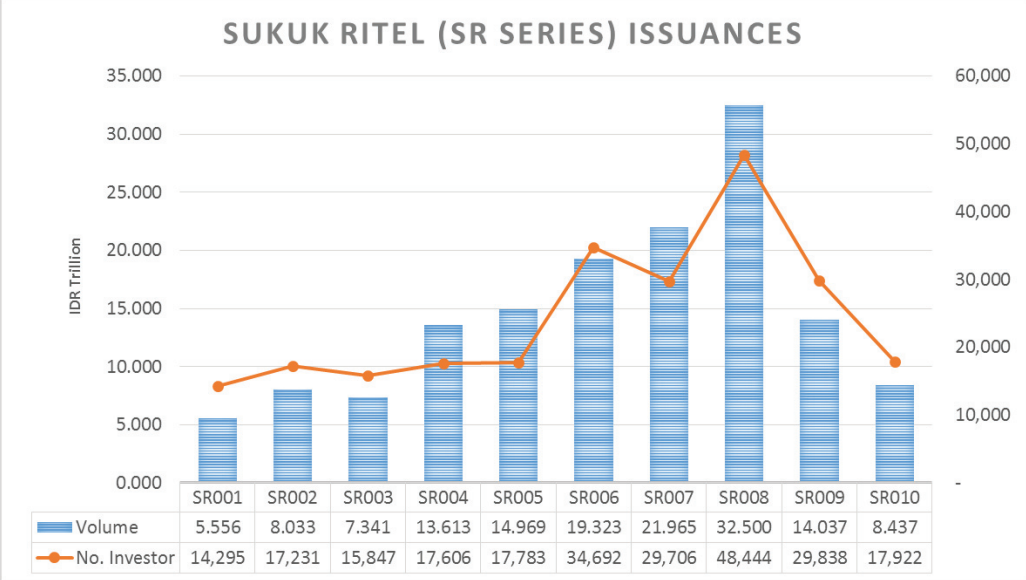
Sukuk Tabungan/Saving Sukuk (ST) is intended for retail investors who are at the beginner level understanding of the capital market, looking for a safe but profitable instrument, as well as comfortable and savvy in using internet/mobile banking services. ST features to cater to this segment are minimum order of IDR 1 million and maximum order of IDR 3 billion, 2 years tenor, floating with floor yield that is basedon BI 7 Days Reverse Repo and

reviewed every 3 months, non-tradable with window for early redemption after 1 year, and putting order through online apps of Distribution Partners.

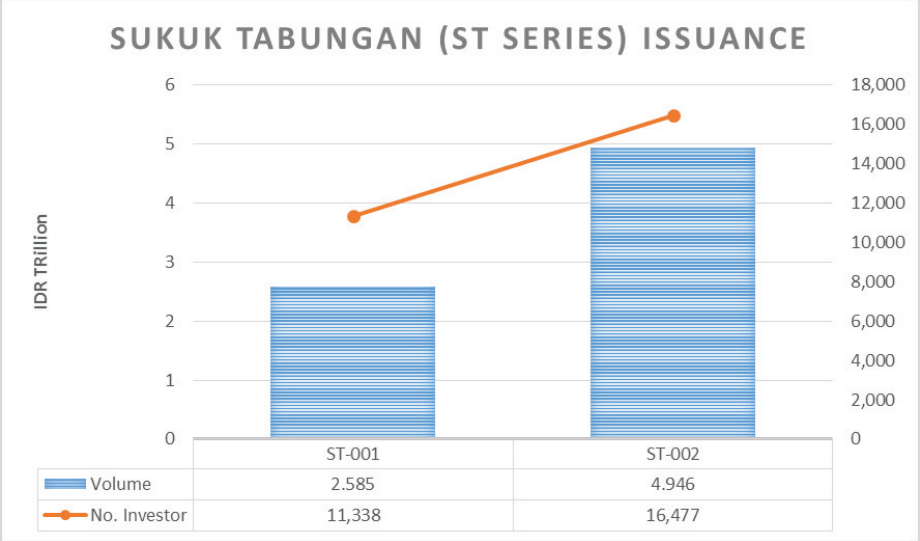
2. What objectives the Indonesian government has achieved and is planning to achieve from the issuance of such an instrument?

The main objective is to deepen the domestic market through financial inclusion in which individual investors can participate and get the benefit of the capital market. A deep capital market will be functioned as a cushion for the economy during the crisis. The first step to encourage engagement of retail investors in the capital market is by shifting a saving-oriented society into an investment-oriented one. Few ways to do this are by providing suitable instruments for certain segments as well as by continuous media exposure of the instruments in order to make information is accessible for everyone.

Indonesia has issued retail sukuk since 2008 and the increasing number of retail investors recorded each year shows we are in the right track to the main objective.



Appendix 3 - Figure 1



Appendix 3 - Figure 2

3. **It is noted that law No. 19/2008 was pivotal to the Sukuk Issuance. How did this law pave the way to Retail Sukuk issuance?**

The Law No. 19/2008 provides the legal foundation for all Indonesia's sovereign sukuk issuance as well as the basis for other technical regulations related to sukuk issuance such as the latest Minister of Finance Regulation (PMK) No. 125/2018 on Retail Sukuk Issuance. The PMK provide guidance for issuing retail Sukuk, the selection process to get appointed Distribution Partners, criteria of Distribution Partners, etc.

4. **How did Indonesia establish the legal and financial framework for the sukuk issuance?**

In establishing a legal framework for Sukuk issuance, Indonesian Government works together with the House of Representative that resulted with the Law No. 19/2008 as well as approval for the use of State Own-Asset as Sukuk's underlying transaction.

In term of sharia framework, the Government works with Sharia National Board in formulation fatwa for the structures and sharia approval for each sukuk transaction.

In terms of financial framework, the Government works together with Indonesia's Tax Office, Financial Service Authority of Indonesia (OJK) and Bank Indonesia.

5. Can you explain how the sukuk are structured?

Indonesia's retail sukuk is using a combination of tangible and intangible assets as its underlying transaction. Because of tradability feature, the structure used in SR and ST is different.

For SR series, Ijarah structure is used in which the composition is a combination of a tangible and intangible asset without a specific percentage for each. Based on renting contract (Ijarah contract), tangible asset portion will generate fixed income thus makes tradability possible.

For ST series, Wakalah structure is used in which composition of an intangible asset is no less than 50% of total asset, thus making it non-tradability is sharia complied.

Fundamentally, Indonesia's sukuk structures (Ijarah/wakalah) is a project based structure in which sharia complied projects are used as an intangible asset for the underlying transaction of the sukuk. It means when investors buy retail sukuk, they directly participate in the financing of state's projects construction/restoration, to which the construction process is organized by the government. After construction/restoration done, the government will rent those projects from investors (who held the beneficial ownership of the projects) for a period of time and pay the rent fee as agreed at the time of transaction periodically. When the sukuk mature, the government will buy back the project 100% of the nominal of the sukuk from investors.

6. **Sukuk offered to the retail customers is a new concept in the Islamic Finance market. How did you manage to educate the consumers on the product and how was it marketed to the mass?**

For public and potential investors, education was held through dissemination and media publication. For academics, it was held through training and a public lecture.

7. **How did you manage to promot the investing culture in the Indonesian society?**

It is a process that takes times and continuous effort through various ways as well as coordination and cooperation with other institution such as OJK, Universities, Stock Exchange, Financial Institutions, etc.

8. **What type of sukuk offered to the retail customers are most popular? The tradeable or non-tradeable sukuk?**

Both tradable and non-tradable sukuk has its own investor segments. Looking at historical data, SR has been in the market about a decade (2009) while ST was introduced to the market in 2016. Moreover, issuance volume of tradable and non-tradable sukuk take into consideration of Indonesia's portfolio. Thus, it is not quite correct to compare the popularity of both by its issuance volume or outstanding.

9. **How did the Sukuk help promote financial inclusion? Please provide any impact assessment studies, if available.**

As one of many financial market instruments, retail sukuk is taking part in supporting financial inclusion in Indonesia by regularly come into the market with features that suitable for a certain segment of investor (as explained above). Though there is no

assessment about its impact on financial inclusion, the increasing number of its investors (proxy to issuance volume) shows positive growth of people benefitted by this instrument.

10. Have there been special programs to promote the sukuk to the 'unbanked'?

Indonesian Government has done several educative campaign program to the public such as dissemination and socialization to Islamic Schools and Universities, communities. Moreover, the Indonesian Government also assists high education institution to develop curriculum related to Sukuk, accept student internship and support sukuk-related academic research.

11. The 2017 Findex report noted that around 33% cited distance of financial institution as a barrier to having an account. How did you manage this issue when marketing the sukuk?

For a country like Indonesia (a vast archipelagic country), access is a major challenge in many aspects of life, including financial access. But thanks to the internet, information about sukuk can be spread out via social media such as twitter, facebook, Instagram and whatsapp not only by the sales team of Distribution Partners but also by individual investors to their own network.

Not only addressing the issues of access to information, Indonesia even addressed challenges faced by potential investors in a remote region to get sukuk by providing online apps to put the order on retail sukuk (ST series only since ST-002 in 2018). With these online apps, investors can buy ST wherever they are located as long as they have internet access.

12. Another barrier cited in the report was 'religion'. How did the sukuk help overcome this barrier?

Sukuk, a sharia compliance financial instrument, is NOT a product for moslem investors only. Although sukuk underlying transaction must comply with sharia principles, it can be bought by anyone regardless of their religion because as financial instrument, sukuk also comply with general principles and standardization of global financial instrument. For instance, since the Sukuk transaction must adopt a certain structure to be sharia complied, Indonesia develops a structure that can provide certainty to the investors in the form of fixed return rather than floating.

13. Do you think decreasing the minimum order amount will help in attracting more investors? Will it be feasible?

Smaller minimum order obviously appeals to certain investor segments and sure it is feasible to be implemented as we did it with the issuance of ST series.

14. Will it be possible to share statistics on the % of the individuals who were included in the financial sector due to their investment in retail sukuk?

In the context of Sovereign Sukuk, below are the ownership statistic of Indonesia Sovereign Sukuk. As of 20th February, the portion of individual investors that held tradable sukuk is 4.79% and for non-tradable sukuk is 1.09%.

INSTITUTIONS	Feb-18		Jun-18		Dec-18		Jan-19		February 20, 2019	
	Miliar	%	Miliar	%	Miliar	%	Miliar	%	Miliar	%
TRADABLE	331,934	89.43	354,277	90.61	392,985	90.63	403,790	90.86	413,060	91.45
Total Bank	163,251	43.98	162,872	41.66	178,369	41.13	198,234	44.60	196,297	43.46
Conventional Banks	*123,124*	*33.17*	*120,725*	*30.88*	*134,560*	*31.03*	*158,519*	*35.67*	*156,182*	*34.58*
Sharia Banks	*40,127*	*10.81*	*42,147*	*10.78*	*43,809*	*10.10*	*39,716*	*8.94*	*40,115*	*8.88*
Bank Indonesia	3,156	0.85	15,680	4.01	25,031	*5.77*	18,006	4.05	23,605	5.23
Insurance Company	38,874	10.47	41,955	10.73	49,351	*11.38*	49,158	11.06	49,301	10.91
Pension Fund	40,861	11.01	42,884	10.97	44,167	*10.19*	44,276	9.96	46,263	10.24
Individual	21,259	5.73	23,694	6.06	21,962	*5.06*	21,762	4.90	21,616	4.79
Mutual Fund	15,692	4.23	17,294	4.42	20,169	*4.65*	20,442	4.60	21,009	4.65
Non Resident	23,597	6.36	20,591	5.27	19,044	*4.39*	17,597	3.96	16,928	3.75
Others	25,244	6.80	29,307	7.50	34,891	*8.05*	34,313	7.72	38,040	8.42
NONTRADABLE	39,221	10.57	36,721	9.39	40,643	9.37	40,643	9.14	38,643	8.55
Public Institution	36,697	9.89	34,197	8.75	34,197	*7.89*	34,197	7.69	32,197	7.13
Individual	2,524	0.68	2,524	0.65	4,946	*1.14*	4,946	1.11	4,946	1.09
Others	-	-	-	-	1,500	*0.35*	1,500	0.34	1,500	0.33
TOTAL	371,155	100.00	390,997	100.00	433,627	100.00	444,432	100.00	451,702	100.00

Note :
** In million Rupiah*
** Not Included Global Sukuk and SUN ownership*
Others consist of Corporate,Securities Company, Foundation, etc.

Appendix 3 - Figure 3

15. Do you have any plans to consider technology (fintech, blockchain) to widen the retail investor base in the future?

Indonesia worked with fintech companies to distribute the last two series of ST (ST-002 and ST-003) which were offered through online apps.

16. Can you please describe the distribution mechanism of retail sukuk? (primary dealers system, book building, etc.).

Retail sukuk is offered through appointed Distribution Partners who collect the order from investors during the offering period. Once the offering period closed, the Indonesian Government will allot the order book based on set criteria (including maximum order, administrative documents, etc). Once allotment and settlement finish, investors will get confirmation of ownership sent by Distribution Partners with whom they put their order.

17. Please provide historical data on retail sukuk issuance (investor profile breakdown, shariah structure, rating, issuance amount, spread, etc.).

a. Sukuk Ritel (SR series)

	SR-001	SR-002	SR-003	SR-004	SR-005	SR-006	SR-007	SR-008	SR-009	SR-010
Issuance Date	25 Feb 2009	10 Feb 2010	23 Feb 2011	21 Mar 2012	27 Feb 2013	5 Mar 2014	11 Mar 2015	10 Mar 2016	22 Mar 2017	21 Mar 2018
Tenor	3 years	3 years	3 years	3,5 years	3 years	3 years	3 years	3 years	3 years	3 years
Structure	Ijarah Structure									
Coupon	12,00%	8,70%	8,15%	6,25%	6,00%	8,75%	8,25%	8,30%	6,90%	5,9%
Volume (IDR Billion)	5.556	8.033	7.341	13.613	14.969	19.323	21.965	31.500	14.037	8.437
No. Investor	14,295	17,231	15,847	17,606	17,783	34,692	29,706	48,444	29,838	17,922

Appendix 3 - Figure 4

b. Sukuk Tabungan/Saving Sukuk (ST series)

	ST-001	ST-002
Issuance Date	7 Sept 2016	29 Nov 2018
Tenor	2 years	2 years
Structure	Wakalah Structure	
Coupon	6,90% (fixed coupon)	8,30% (floating with floor)
Volume (IDR Billion)	2.585	4.946
No. Investor	11,338	16,477

Appendix 3 - Figure 5

18. Can non-Indonesian residents invest in retail sukuk?

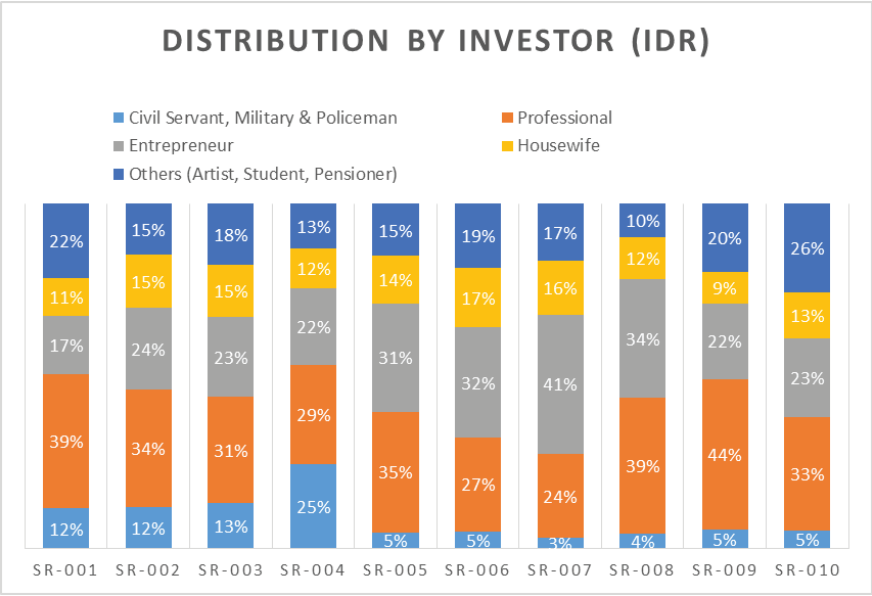
Not in the primary market, but possible in the secondary market.

19. Is there a reason behind the high number of investors for SR-008 in comparison to the others?

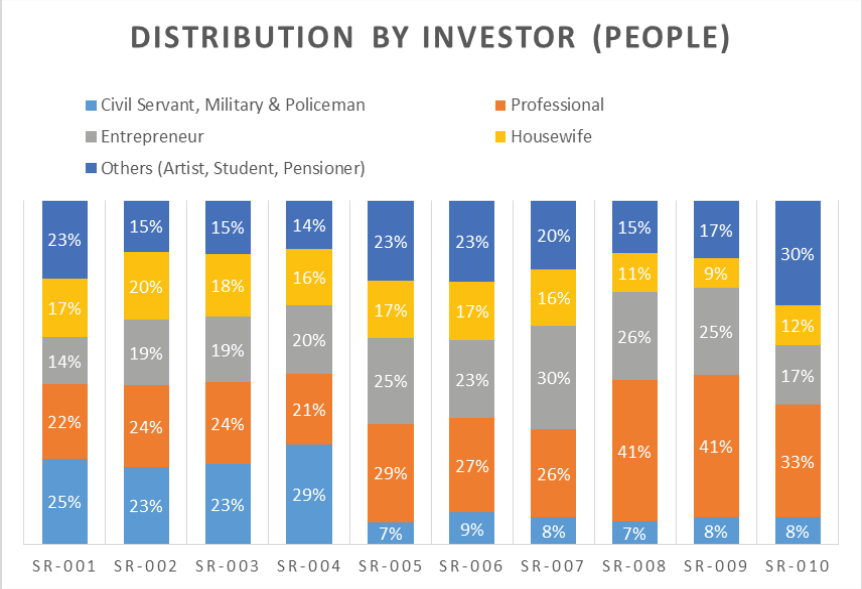
First of all, a number of investors are related to the issuance volume; a larger volume is always meant more investors. SR-008 is the largest SR series ever issued to date, both in term of volume and investors. The high number of SR-008 investors is caused by:

- More attractive yield compared to the previous year with different market conditions, including higher expected inflation rate in the coming months, fluctuative exchange rate because of current account deficit and anticipating the increasing FFR in 2016 that has been signaled by the Fed before.
- GoI effort to drive transformation from saving-oriented society to investment-oriented one resulted in larger issuance targets for SR series in that year.
- GoI strategy of increasing domestic investor ownership on Sukuk Negara portfolio.
- There is an SR series (SR-005 amounting IDR 14.9 trillion) matured during marketing period which definitely affected demand on SR-008.

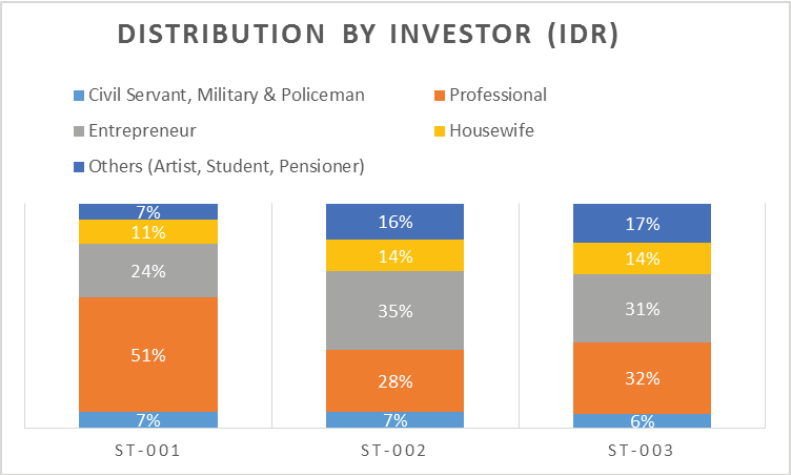
20. Can you share the breakdown of the investor types in each SR/ST?



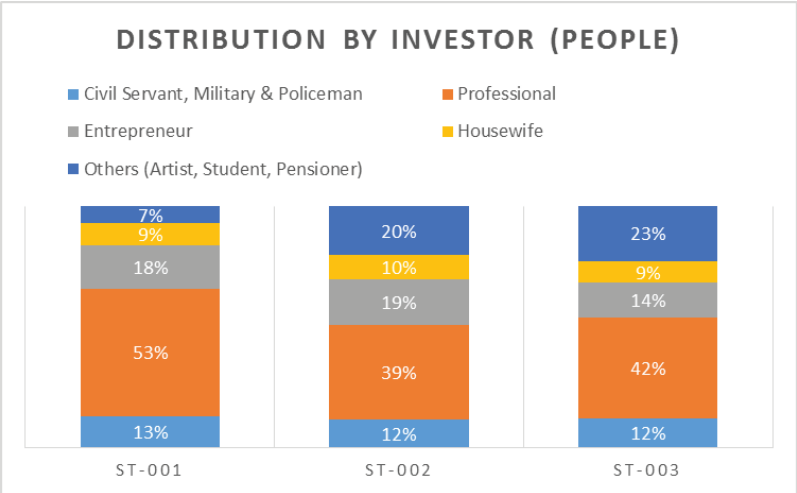
Appendix 3 - Figure 6



Appendix 3 - Figure 7



Appendix 3 - Figure 8



Appendix 3 - Figure 9

APPENDIX 4: GOVERNMENT OF THE REPUBLIC OF INDONESIA MEMORANDUM INFORMATION OF SUKUK TABUNGAN (ST-003 SERIES) - ARTICLE FOUR AND FIVE[21]

IV. TERMS AND PROCEDURES FOR PURCHASE ORDERING

1. Provisions

1.1 Entitled Buyer

Indonesian citizens or individuals who have a Sign Card Population (KTP) with the Population Registration Number (NIK) registered at the Ministry of Home Affairs at the Director General of Population and Civil Registration

1.2 Period of Offer

The ST-003 Offer Period will begin on February 1, 2019, at 09:00 WIB and closed on February 20, 2019, at 10:00 WIB. In the event that is needed, the government can make adjustments to the Offer Period of ST-003 with the first announcement to the public.

1.3 Limitation of Purchase Orders for Each Investor

Minimum ST-003 Purchase Order is 1 (one) unit or worth Rp1,000,000.00 (one million rupiahs) and in multiples of 1 (one) unit or value Rp1,000,000.00 (one million rupiah). Purchase Order ST-003 per investor the maximum is 3,000 (three thousand) units or valued at Rp 3,000,000,000.00 (three billion rupiahs).

---

[21] The Memorandum is extracted from Investree website, an ST-003 distributor agent (Government of the Republic of Indonesia, 2019). The Memorandum is in translated to English using Google translator tool. The translation link is: https://translate.googleusercontent.com/translate_c?depth=1&hl=en&prev=search&rurl=translate.google.com&sl=id&sp=nmt4&u=https://www.kemenkeu.go.id/media/11724/memorandum-informasi-st-003-final.pdf&xid=17259,15700022,15700186,15700191,15700248,15700253&usg=ALkJrhh6tzlKIqJ5qpgel39fOKyS9velWg

1.4 Others

Distribution Partners have the right to refuse Purchase Orders that do not fulfill terms.

2. Procedures for Purchasing ST-003

2.1 Provisions and Registration Procedures for Distribution Partners

a. Before making a Purchase Order ST-003 for the first time on a Distribution Partner, prospective investors first carry out the registration process through Electronic Systems provided by Distribution Partners. Information regarding the website address and/or application for purchasing ST-003 from each. Distribution Partners are listed in Appendix I of this Information Memorandum.
b. The registration process is carried out by potential investors by entering information at least regarding Single Investor Identification (SID), fund account number, and the securities account number it has.
c. Prospective investors who do not have a Single Investor Identification (SID), account funds, and/or securities accounts, must first make it assisted by a Distribution Partner with procedures that apply in each Distribution Partner.
d. The registration process and creation of Single Investor Identification (SID), number securities account, and/or fund account number can be done before ST-003 Offer Period begins.
e. Single Investor Identification (SID), securities accounts, and fund accounts those entered into the Electronic System must be on behalf of potential investors ST-003. Distribution Partners verify the suitability of Single Investors Identification (SID), fund account number, and securities account number with the identity of prospective investors ST-003. The government in terms of needed can do further verification to ensure the validity of prospective investor data ST-003.

f. Before submitting the registration, prospective investors must first read and agree to the terms and conditions for using Electronic Systems services as well as ensure that the data submitted is true and complete. Opening a securities account at a Sub-Registry or Participant / Sub- Customer. The Registry is intended to record the ownership of ST-003 on behalf of investors. Opening a fund account at a public bank is intended to hold cash for payment of rewards/coupons and ST-003 Nominal Value at maturity and during Early Redemption.

2.2 Purchase Order Terms and Procedures

a. ST-003 Purchase Orders can be made at any time during the period Offer (1 February 2019 at 09:00 WIB to 20 February 2019 at 10:00 WIB).
b. ST-003 Purchase Orders are made by prospective investors who have registered to Distribution Partners through Electronic Systems using computers and/or other electronic media connected to the internet network.
c. Prospective investors make a Purchase Order ST-003 by entering Order data through Electronic Systems at Distribution Partners.
d. Prospective investors must first:
    1) read and understand the Information Memorandum;
    2) approve Wakalah contract;
    3) the terms and conditions set by the Distribution Partner;
    4) ensure that the data submitted is true and complete before deciding to make a Purchase Order ST-003.
e. Each ST-003 Purchase Order will then be forwarded in real time from Electronic Systems in Distribution Partners to Electronic Systems is in the Ministry of Finance.

f. The Electronic System at the Ministry of Finance will verify above ST-003 Purchase Order that enters the quota availability (target) per series of Government issuance as well as compliance with the provisions concerning Limit on Purchase Orders for each Single Number of Investor Identity (Single Investor Identification / SID). The verification process is based on order time (time priority) the entry of orders into the Electronic System at the Ministry of Finance.

g. Verified Purchase Order ST-003 (along with order) the payment code will be informed to potential investors through the System Electronics in Distribution Partners and/or via electronic mail (e-mail) that registered.

h. Each Subscription ST-003 has been verified (verified order) cannot be canceled and withdrawn.

i. Every verified ST-003 Purchase Order will reduce the maximum purchase quota of ST-003 per individual.

2.3 Payment Terms and Procedures for Purchase Orders

a. Prospective investors make a payment for the ST-003 Purchase Order verified (verified order) based on the code of payment received by prospective investors.

b. Payment for ST-003 Purchase Orders is made through the channel- channel of payment to government accounts owned by the Bank / Post Perception no later than 3 (three) hours after Purchase Order ST-003 verified. Information about the list of Perception Banks / Posts that can receive payment for ST-003 Purchase Orders is listed in Appendix III This Information Memorandum.

c. Payment for ST-003 Purchase Orders can be made at any time on a calendar day.

d. Purchase Orders are considered completed and completed (order) after payment for ST-003 Purchase Orders was successfully carried out, i.e., if prospective

investors have obtained NTPN (State Revenue Transaction Number) listed on the BPN (Proof of State Revenue) issued by Perception Bank / Post.

e. Purchases that have been completed and completed (completed order) will be informed to prospective investors through the Electronic System on Partners Distribution and/or by e-mail registered.

f. The government ensures that every Purchase Order has been completed and completed order will receive an allocation of ST-003 on Date Settlement.

g. Prospective investors who do not pay for a Purchase Order ST-003 up to the time limit as explained in letter b then. The purchase order is considered null (unpaid order). Nominal amount Purchases that are considered null and void will be returned and increase the maximum purchase quota of ST-003 per individual concerned in the next 2 (two) calendar days.

h. Prospective investors can return to make a Purchase Order ST-003 as long as it is still in the Offer Period and in accordance with the provisions regarding Purchase Order limits for each investor.

i. If the prospective investor successfully makes payment for the payment code but has not obtained NTPN (State Revenue Transaction Number), then The Sukuk Savings Purchase series ST-003 will not be considered null and void if the prospective investor has obtained NTB / NTP (Transaction Number Bank / Postal Transaction Number) listed on the BPN (Proof of Receipt Country) issued by Perception Banks / Posts. Next order Purchases will be considered finished and complete (completed order) at the latest on the next 2 (two) Business Days, namely after NTPN (Transaction Number State Revenues) have been successfully issued through the reconciliation process on the System Electronics in the Ministry of Finance.

j. In the event of a condition in the letter i above, the investor must inform these conditions to Distribution Partners where investors make bookings Purchase.

3. Determination of Sales Results ST-003

Determination of sales proceeds ST-003 will be made no later than 3 (three) Business Days after the end of Offer Period. All ST-003 Purchase Orders that have been completed and Full (completed order) will obtain allocations of ST-003 on the Settlement Date.

4. Distribution ST-003

The government will issue ST-003 globally (jumbo) and submit it to the Bank Indonesia to be distributed to the Sub-Registry on February 27, 2019. Furthermore, on the same date, the Sub-Registry or Participant / Sub-Registry Customer will register ST-003 into the securities account of each investor. Evidence ST-003 ownership confirmation with the format as contained in Appendix IV This Memorandum of Information will be submitted to the Owner of ST-003 by the Distribution Partner, Sub-Registry, or the Participant / Client Sub-Registry by electronic mail (e-mail) that registered or other communication media no later than March 14, 2019 (10 working days from Settlement Date).

5. Determination of Sales and Settlement Schedule of ST-003

a. a. The government sets the proceeds of the sale of ST-003 on February 25, 2019.
b. b. The ST-003 Settlement Date is conducted on 2 (two) Business Days after the date of the stipulation the proceeds of the sale of ST-003, namely on February 27, 2019.

V. ADMINISTRATION OF ST-003

1. Ownership Registration ST-003

ST-003 can only be owned by individuals or Indonesian citizens. Ownership of each ST-003 Owner will be recorded in a system by the Registry, among others by loading the following:

• Owner's name and address ST-003;

• Type of Sukuk Savings owned;

• The nominal amount of ST-003 owned.

The facility to monitor investor ownership of the ST-003 it will have depended on it of the policies of each Sub-Registry or the Participant / Client Sub-Registry which appointed. Before opening securities account at a Sub-Registry or Participants / Customers of certain Sub-Registries, investors need to ascertain the extent to which facilities provided by Sub-Registry or Participant / Sub-Registry Customer to investors in monitoring ownership of ST-003.

2. Clearing and Settlement

ST-003 Clearing and Settlement follows Bank Indonesia regulations.

REFRENCES

AAOIFI, A. (2015). *Shariah Standards for Financial Institutions*. Manama: The Accounting and Auditing Organisation for Islamic Financial Institutions.

ABN AMRO and Triodos Investment Management (2016). *Mobilizing Impact Capital from Retail Investors, SDG Investing as the 'New Normal'*.

AbuBaker, M. (2018). Shariah Analysis of Bitcoin, Cryptocurrency, and Blockchain. [online] Blossom Labs, Inc. Available at: https://blossom.docsend.com/view/x4ayq52 [Accessed 12 Apr. 2019].

AbuBaker, M. and Habib, F. (2018). Cryptocurrencies and Islamic Finance. Islamic Financial news (IFN), pp.24-25.

Adam, F. (2017). Bitcoin: Shariah Compliant? [online] Amanah Finance Consultancy. Available at: http://darulfiqh.com/wp-content/uploads/2017/08/Research-Paper-on-Bitcoin-Mufti-Faraz-Adam.pdf [Accessed 12 Apr. 2019].

Al-Haddad, H. (2018). حُكمُ التعامُل بالعُملة الإلكترونيَّة المُشفَّرة: (البتكُوين) وأخواتها. [online] dorar.net. Available at: https://dorar.net/article/1982/حكم-التعامل-بالعملة-الإلكترونية-المشفرة:-البتكوين-وأخواتها [Accessed 12 Apr. 2019].

Al-Qaradaghi, A. (2018). الموقع الرسمي لفضيلة الأستاذ الدكتور علي محيى الدين القره داغي. [online] Qaradaghi.com. Available at: http://www.qaradaghi.com/Details.aspx?ID=3790 [Accessed 22 Mar. 2019].

Asian Development Bank (2018). *Microfinance Helps Women in Rural India Find Paths out of Poverty*. [online] Asian Development Bank. Available at:

https://www.adb.org/news/videos/microfinance-helps-women-rural-india-find-paths-out-poverty [Accessed 22 Mar. 2019].

Assouli, D. (2019). *Design and Sharia Structure of Contracts: Sukuk Fundamentals and Key Structuring Features*.

Bank BTBN (2019). *Jenius*. [online] Jenius.com. Available at: https://www.jenius.com/ [Accessed 27 Mar. 2019].

Bank for International Settlements (2018). *Annual Economic Report 2018*. [online] Bank for International Settlements, p.99. Available at: https://www.bis.org/publ/arpdf/ar2018e.pdf [Accessed 27 Mar. 2019].

Bloomberg New Energy Finance (2017). *How Blockchain works*. [image] Available at: https://about.bnef.com/blog/applications-blockchain-grow-energy-transport/ [Accessed 27 Mar. 2019].

Blossom Labs, Inc (2019). *Blossom Finance*. [online] Blossomfinance.com. Available at: https://blossomfinance.com/ [Accessed 22 Mar. 2019].

Buterin, V. (2013). *White Paper: A Next-Generation Smart Contract and Decentralized Application Platform*. [online] Available at: https://whitepaperdatabase.com/ethereum-eth-whitepaper/ [Accessed 27 Mar. 2019].

Cambridge Dictionary Press (2019). Saving. In: *Cambridge Dictionary*. [online] Available at: https://dictionary.cambridge.org/ [Accessed 22 Mar. 2019].

Central Bank of Nigeria (2019). *Central Bank of Nigeria: Financial Inclusion*. [online] Cbn.gov.ng. Available at: https://www.cbn.gov.ng/FinInc/ [Accessed 22 Mar. 2019].

CGAP (2019). *International Funding for Financial Inclusion in 2017: Global Data*. [online] CGAP. Available at: https://www.cgap.org/research/data/international-funding-financial-inclusion-2017-global-data [Accessed 24 Mar. 2019].

Clifford Chance LLP (2009). Dubai International Financial Centre Sukuk Guidebook. [ebook] Dubai: Dubai International Financial Centre (DIFC). Available at: http://cibafi.org/ControlPanel/Documents/Laws/Dubai%20International%20Financial%20Centre%20Sukuk%20Guidebook%20UAE.pdf [Accessed 24 Mar. 2019].

Commonwealth Bank of Australia (2018). *CBA picked by World Bank to deliver world's first standalone blockchain bond*. [online] Commbank.com.au. Available at: https://www.commbank.com.au/guidance/newsroom/cba-picked-by-world-bank-to-deliver-world-s-first-standalone-blo0-201808.html?ei=card-view [Accessed 22 Mar. 2019].

Commonwealth Bank of Australia (2019a). *Project Bond-i - CommBank*. [online] Commbank.com.au. Available at: https://www.commbank.com.au/business/business-insights/project-bondi.html [Accessed 22 Mar. 2019].

Commonwealth Bank of Australia (2019b). *Trade chain experiment - CommBank*. [online] Commbank.com.au. Available at: https://www.commbank.com.au/corporate/solutions/working-capital/trade-finance/trade-chain-experiment.html [Accessed 22 Mar. 2019].

Cook, T. and Osano, E. (2018). *The story of M-Akiba: Selling Kenyan treasury bonds via mobile – Financial Sector Deepening*. [online] Fsdkenya.org. Available at: https://fsdkenya.org/blog/the-story-of-m-akiba-selling-kenyan-treasury-bonds-via-mobile/ [Accessed 22 Mar. 2019].

Copied by the: State Ministry of National Development Planning/ National Development Planning Agency (BAPPENAS) (2007). *LAW OF THE REPUBLIC OF INDONESIA NUMBER 17 OF 2007 ON LONG-TERM NATIONAL DEVELOPMENT PLAN OF 2005-2025*. Jakarta.

Dar-alifta (2018). مفتي الجمهورية يبيّن حكم التعامل بالعملة الإلكترونية البتكوين. [online] Dar-alifta.org. Available at: http://www.dar-alifta.org/ar/Viewstatement.aspx?sec=media&ID=5617 [Accessed 12 Apr. 2019].

Deloitte (2017). *Blockchain risk management Risk functions need to play an active role in shaping blockchain strategy*. [online] Deloitte Development LLC. Available at: https://www2.deloitte.com/content/dam/Deloitte/us/Documents/financial-services/us-fsi-blockchain-risk-management.pdf [Accessed 24 Mar. 2019].

Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S. and Hess, J. (2018). *The Global Findex Database 2017 Measuring Financial Inclusion and the Fintech Revolution*. [online] Washington, DC: World Bank Publications. Available at: https://globalfindex.worldbank.org/ [Accessed 24 Mar. 2019].

Ethereum community (2016). *What is Ethereum? — Ethereum Homestead 0.1 documentation*. [online] Ethdocs.org. Available at:

http://www.ethdocs.org/en/latest/introduction/what-is-ethereum.html [Accessed 22 Mar. 2019].

Ethereum Foundation (2018). *What is Ether*? [online] Ethereum.org. Available at: https://www.ethereum.org/ether [Accessed 22 Mar. 2019].

EY (2017). *Innovation in financial Inclusion, Revenue growth through innovative inclusion*. [online] EYGM Limited. Available at: https://www.ey.com/Publication/vwLUAssets/EY-innovation-in-financial-inclusion/%24FILE/EY-innovation-in-financial-inclusion.pdf [Accessed 22 Mar. 2019].

Farina, P. (2019). *BBVA issues the first blockchain-supported structured green bond for MAPFRE*. [online] NEWS BBVA. Available at: https://www.bbva.com/en/bbva-issues-the-first-blockchain-supported-structured-green-bond-for-mapfre/ [Accessed 22 Mar. 2019].

Finastra (2018). *FUSION LENDERCOMM Streamlined information exchange for Syndicated Lending*. [online] Finastra. Available at: https://www.finastra.com/sites/default/files/documents/2018/02/fusion-lendercomm-streamlined-information-exchange-syndicated-lending.pdf [Accessed 22 Mar. 2019].

Global Findex database (2019). *Global Financial Inclusion | DataBank*. [online] Databank.worldbank.org. Available at: https://datacatalog.worldbank.org/dataset/global-financial-inclusion-global-findex-database [Accessed 22 Mar. 2019].

Government of the Republic of Indonesia (2019). *MEMORANDUM INFORMASI, SUKUK TABUNGAN SERI ST-003*. [online] Available at:

https://sbn.investree.id/assets/sbn/files/pdf/MemoInfo_ST-003.pdf [Accessed 24 Mar. 2019].

Hürriyet Daily News (2017). Turkey's top religious body declares Bitcoin 'inappropriate'. [online] Available at: http://www.hurriyetdailynews.com/turkeys-top-religious-body-declares-bitcoin-inappropriate-123243 [Accessed 12 Apr. 2019].

Identity2020 Systems, Inc (2019). *ID2020 | Home*. [online] ID2020. Available at: https://id2020.org/ [Accessed 22 Mar. 2019].

IIFM, I. (2017). *SUKUK REPORT; A Comprehensive Study of the Global Sukuk Market*. [online] International Islamic Financial Market. Available at: http://www.iifm.net/system/files/private/en/IIFM%20Sukuk%20Report%20%286th%20Edition%29_2.pdf [Accessed 24 Mar. 2019].

IIFM, I. (2018). *IIFM SUKUK REPORT APRIL 2018 ; A Comprehensive Study of the GLOBAL SUKUK MARKET*. [online] International Islamic Financial Market. Available at: http://www.iifm.net/system/files/private/en/IIFM%20Sukuk%20Report%20%287th%20Edition%29_0.pdf [Accessed 22 Mar. 2019].

Independent Evaluation Group (IEG) (2015). *Financial Inclusion: A Foothold on the Ladder toward Prosperity?*. [online] Washington DC: World Bank Publications. Available at: http://ieg.worldbankgroup.org/sites/default/files/Data/Evaluation/files/financialinclusion.pdf [Accessed 22 Mar. 2019].

Independent Evaluation Group (IEG) (2017). *Conversations: The Role of Capital Markets in Financing the SDGs*. [online] Ieg.worldbankgroup.org. Available at: https://ieg.worldbankgroup.org/news/conversations-role-capital-markets-financing-sdgs [Accessed 22 Mar. 2019].

Islamic Finance News (2018). *IFN Indonesia 2018 Report*. [online] Kuala Lumpur: RedMoney. Available at: https://www.islamicfinancenews.com/supplements/ifn-indonesia-2018-report [Accessed 27 Mar. 2019].

Juskalian, R. (2018). *Inside the Jordan refugee camp that runs on blockchain*. [online] MIT Technology Review. Available at: https://www.technologyreview.com/s/610806/inside-the-jordan-refugee-camp-that-runs-on-blockchain/ [Accessed 27 Mar. 2019].

Kahf, D. (2017). *FATAWA MONEY, CURRENCIES, GOLD, SARF (2000-2017)*. [online] Available at: http://monzer.kahf.com/fatawa/FATAWA_CURRENCIES_GOLD_COMMODITIES.pdf [Accessed 22 Mar. 2019].

Karppinen, U. (2018). *BBVA signs world-first blockchain-based syndicated loan arrangement with Red Eléctrica Corporación*. [online] NEWS BBVA. Available at: https://www.bbva.com/en/bbva-signs-world-first-blockchain-based-syndicated-loan-arrangement-with-red-electrica-corporacion/ [Accessed 22 Mar. 2019].

Klapper, L., El-Zoghbi, M. and Hess, J. (2016). *Achieving the Sustainable Development Goals The Role of Financial Inclusion*. [online] Washington DC: CGAP. Available at:

https://www.cgap.org/sites/default/files/researches/documents/Working-Paper-Achieving-Sustainable-Development-Goals-Apr-2016_0.pdf [Accessed 22 Mar. 2019].

Muhammad, D., Ramli, R., Sairally, D., Kasri, D. and Zaki, I. (2018). *The Role of Sukuk in Islamic Capital Markets*. [ebook] Ankara: The COMCEC Coordination Office. Available at: http://ebook.comcec.org/Kutuphane/Icerik/Yayinlar/Analitik_Calismalar/Mali_Isbirligi/Toplanti10/files/assets/common/downloads/publication.pdf [Accessed 27 Mar. 2019].

Muhammad, M., Sairllay, B. and Habib, F. ed., (2015). *Islamic Capital Markets: Principles & Practices*. Kuala Lumper: International Shari'ah Research Academy for Islamic Finance.

Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System*. [online] Available at: https://bitcoin.org/bitcoin.pdf [Accessed 22 Mar. 2019].

Natarajan, H., Krause, S. and Gradstein, H. (2017). *Distributed Ledger Technology (DLT) and Blockchain: Fintech note no. 1*. [online] Washington, DC: World Bank Publications. Available at: http://documents.worldbank.org/curated/en/177911513714062215/pdf/122140-WP-PUBLIC-Distributed-Ledger-Technology-and-Blockchain-Fintech-Notes.pdf [Accessed 22 Mar. 2019].

Ohnesorge, J. (2018). *A primer on blockchain technology and its potential for financial inclusion*. [online] Deutsches Institut für Entwicklungspolitik. Available at: https://www.die-gdi.de/uploads/media/DP_2.2018.pdf [Accessed 22 Mar. 2019].

OJK, F. (2018). *Snapshot of Indonesia Islamic Banking Development 2017*. [online] Jakarta: Financial Services Authority, Republic of Indonesia Banking Licensing and Information Department. Available at: https://www.ojk.go.id/en/berita-dan-kegiatan/publikasi/Documents/Pages/Snapshot-of-Indonesia-Islamic-Banking-Development-2017/Indonesia%20Islamic%20Banking%20Snapshot%202017%20(V3).pdf [Accessed 27 Mar. 2019].

OJK, F. (2019). *Indonesia Banking Statistic*. [online] Jakarta: Financial Services Authority, Republic of Indonesia Banking Licensing and Information Department. Available at: https://www.ojk.go.id/en/kanal/perbankan/data-dan-statistik/statistik-perbankan-indonesia/Documents/Pages/Indonesia-Banking-Statistic---December-2018/Indonesia%20Banking%20Statistic%20December%202018.pdf [Accessed 22 Mar. 2019].

Pakpahan, D. (2016). Retail Sukuk (Sukuk Ritel): Indonesia Experience. In: *1st Annual Islamic Finance Conference Sukuk for Infrastructure Financing & Financial Inclusion Strategy*. [online] Available at: http://www.irti.org/English/Research/Documents/Conferences/IDB-AM-41/Retail%20Sukuk-Indonesia%20Experience.pdf [Accessed 22 Mar. 2019].

PRESIDENTIAL REGULATION OF THE REPUBLIC OF INDONESIA (2016). NUMBER 82 YEAR 2016 CONCERNING NATIONAL STRATEGY FOR INCLUSIVE FINANCE. Jakarta.

Quran (2016). Al-Qur'an al-Kareem - القرآن الكريم. [online] Al-Qur'an al-Kareem - القرآن الكريم. Available at: https://quran.com/ [Accessed 24 Mar. 2019].

Republic of Indonesia (2008). *Law of the Republic of Indonesia Number 19 of 2008 on The Sovereign Syariah Securities*. [online] Jakarta. Available at: http://www.iefpedia.com/english/wp-content/uploads/2010/07/Law-No.19.2008.pdf [Accessed 24 Mar. 2019].

Ripple (2016). *The Cost-Cutting Case for Banks The ROI of Using Ripple and XRP for Global Interbank Settlements*. [online] Available at: https://ripple.com/files/xrp_cost_model_paper.pdf [Accessed 22 Mar. 2019].

Ripple (2019a). *Ripple For Good | Ripple*. [online] Ripple. Available at: https://ripple.com/ripple-for-good/ [Accessed 22 Mar. 2019].

Ripple (2019b). *SBI Remit Case Study | Ripple*. [online] Ripple. Available at: https://ripple.com/customer-case-study/sbi-remit/ [Accessed 22 Mar. 2019].

Sastrosuwito, D. (2017). Session 1 - Developing Sovereign Sukuk Market, Indonesian Experience. In: *IIFM Specialized Sessions on Islamic Finance: Sukuk, Islamic Hedging and Liquidity Management*. [online] Available at: http://www.iifm.net/sites/default/files/Session%201%20-%20Developing%20Soveriegn%20Sukuk%20Market%2C%20Indonesian%20Experience%20-%20Dr.%20Suminto%20%28MoF%20Indonesia%29_0.pdf [Accessed 22 Mar. 2019].

Tanenbaum, A. (1996). *Computer networks*. 3rd ed. New Jersey: Pearson Hall.

The Government of Kenya (2017). *M-AKIBA*. [online] M-akiba.go.ke. Available at: http://www.m-akiba.go.ke/ [Accessed 22 Mar. 2019].

United Nations (2015). *The Millennium Development Goals Report 2015*. [online] New York. Available at: http://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf [Accessed 22 Mar. 2019].

United Nations, General Assembly (2015). *Transforming our world: the 2030 Agenda for Sustainable Development A/RES/70/1*. [online] Available at: http://ask.un.org/faq/14438 [Accessed 24 Mar. 2019].

Verma, S. (2018). *Proof Of Work - A Puzzle for the new economy*. [online] Medium. Available at: https://medium.com/coinmonks/proof-of-work-a-puzzle-for-the-new-economy-552cb0f1cf45 [Accessed 24 Mar. 2019].

World Bank (2014). *Global Financial Development Report 2014: Financial Inclusion*. Washington, DC: World Bank Publications.

World Bank and Islamic Development Bank Group (2016). *IslamIc Finance A Catalyst for Shared Prosperity?*. [online] Washington, DC: World Bank and IDBG. Available at: http://www.irti.org/English/News/Documents/438.pdf [Accessed 22 Mar. 2019].

World Bank and the People's Bank of China (2018). *Toward Universal Financial; Inclusion in China Models, Challenges, and Global Lessons*. [online] Washington DC: World Bank Publications. Available at: https://openknowledge.worldbank.org/bitstream/handle/10986/29336/FinancialInclusionChinaP158554.pdf?sequence=9&isAllowed=y [Accessed 22 Mar. 2019].

World Bank Group (2018). *World Bank Prices First Global Blockchain Bond, Raising A$110 Million*. [online] Available at: https://www.worldbank.org/en/news/press-

release/2018/08/23/world-bank-prices-first-global-blockchain-bond-raising-a110-million [Accessed 24 Mar. 2019].

World Bank Group (2019a). *Indonesia | Data*. [online] Data.worldbank.org. Available at: https://data.worldbank.org/country/indonesia [Accessed 24 Mar. 2019].

World Bank Group (2019b). *Overview Financial Inclusion*. [online] World Bank. Available at: http://www.worldbank.org/en/topic/financialinclusion/overview [Accessed 24 Mar. 2019].

World Bank Group (2019c). *Who We Are*. [online] World Bank. Available at: http://www.worldbank.org/en/who-we-are [Accessed 24 Mar. 2019].

World Economic Forum (2016). *The future of financial infrastructure*
An ambitious look at how blockchain can reshape financial services. [online] Available at: http://www3.weforum.org/docs/WEF_The_future_of_financial_infrastructure.pdf [Accessed 22 Mar. 2019].

World Food Programme (2018). *Blockchain for Zero Hunger | WFP Innovation*. [online] Innovation.wfp.org. Available at: https://innovation.wfp.org/project/building-blocks [Accessed 22 Mar. 2019].