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BLOCKCHAIN BASED RETAIL SUKUK FOR INFRASTRUCTURE DEVELOPMENT AND FINANCIAL INCLUSION IN PAKISTAN

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ABSTRACT

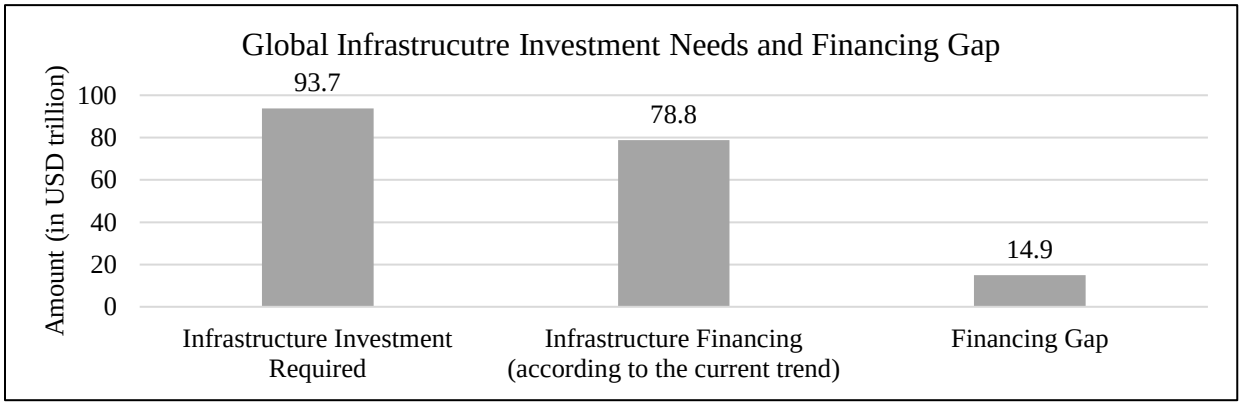
Developments around new technology are opening new avenues for business, commerce, and management. From instantaneous, low-cost transaction processing, clearing, and settlement to the management of government & commercial banking ledgers, disruptive technologies like blockchain has numerous applications in financial engineering and innovative product development. Distributed ledger technology can be used to develop innovative Shariah-compliant products including financial instruments that are beneficial for the growth and development of the Islamic finance industry along with the achievement of Sustainable Development Goals (SDGs). In this paper, blockchain technology is proposed to develop Sukuk to finance development infrastructure projects in Pakistan. With adequate governance, innovative products along with legal and regulatory support, Islamic finance has the potential to make a reasonable contribution towards the development of infrastructure along with the rising standard of living for people, eventually supporting Sustainable Development Goals (SDGs) set by the United Nations General Assembly in 2015 for the year 2030. Rigorous infrastructure is the key to the successful implementation and achievement of Sustainable Development Goals (SDGs).

Keywords: Blockchain, Infrastructure, SDGs, Shariah, Sukuk, Retail Sukuk, Financial Inclusion
JEL Classification: G1

1. INTRODUCTION

The significance of good quality infrastructure could not be denied as it is important for economic development, ensuring inclusive growth, where maximum people of a country could take advantage of the growth. Inclusive growth leads to equality in wealth distribution and poverty alleviation. According to the Global Infrastructure Outlook study, the global investment requirement in infrastructure is estimated to be USD 93.7 trillion from 2016 to 2040. With the current trend of investments, the global infrastructure investment will be around USD 78.8 trillion, with many countries not being able to meet the infrastructure needs, leaving a shortfall of USD 14.9 trillion in the same period. Rigorous infrastructure is the key to the successful implementation and achievement of Sustainable Development Goals (SDGs). There is a huge demand for infrastructure development on one side and huge financing gaps on the other side requiring countries to develop appropriate strategies to tackle sustainable infrastructure projects that could contribute towards economic development and achievement of SDGs (COMCEC Coordination Office, 2019).

Graph 1.1: Global Infrastructure Investment Needs and Financing Gap



Shortfalls in infrastructure financing are the most irresistible strategic challenge to be faced by nations today and in the future. Infrastructure projects are large, capital intensive with huge sunk costs takes a long time to build, and have a long payback period, hence investments in infrastructure projects are usually made by governments. Huge

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financing needs, large budgets deficits, and increasing public debt have put constraints on the government's spending. It is becoming difficult for governments to absorb all the costs themselves and finance the development projects on their own. Hence private along with public participation is required to bridge the gap (Biancone & Radwan, 2018). The asset-backed approach of Islamic finance structures along with the notion of risk-sharing makes it a consistent option for financing infrastructure public-private partnership (PPP) projects. Islamic finance emphasizes social and economic development through the creation of real assets in the economy instead of generating financial transactions only. Due to inherent flexibility in Islamic finance instruments, it can provide a complementary source of financing to bridge the massive deficit in infrastructure investment (World Bank, 2017).

This paper focuses on suggesting a blockchain-based application for subscription of smart retail Sukuk. It put forwards an idea of issuing project-based smart Sukuk backed by an infrastructure project that could be subscribed by the public through a blockchain-based mobile phone application. Hence the idea could solve the problem of infrastructure financing along with issues related to financial inclusion.

The paper is organized as follows: Section 2 defines methodology, section 3 presents a detailed literature review, section 4 proposes a blockchain-based retail Sukuk structure and section 5 concludes the research.

2. LITERATURE REVIEW

The global Islamic finance industry has reached USD 2.19 trillion in 2018. The Islamic finance industry is composed of three main components: Islamic banking being the biggest contributor, accounts for 71.7% of global Islamic finance service industry assets amounting to USD 1,571.3 billion, Islamic capital markets accounts for 27% of global Islamic finance service industry assets is worth about USD 591.9 billion and Takaful being the smallest contributor to Islamic finance industry is estimated at USD 26.1 billion accounts for 1.3% of global Islamic finance service industry assets in 2018. *(Islamic Financial Services Board, 2019)*. With an average projected growth of 10% per annum, the Islamic finance industry is expected to stand at USD 3.8 trillion in assets by the end of 2023 (Mohamed, et al., 2018). With a considerable share in the economy, Islamic finance can enhance financial inclusion and intermediation, contributing to economic development and stability (Mohieldin, 2012).

Sukuk is the second largest contributor of global Islamic finance service industry assets amounted to USD 123.15 billion in 2018. Innovative Sukuk structures are required to take the Sukuk industry to the next level in terms of size. According to experts, the Sukuk market is destined to benefit from ongoing innovation in areas of blockchain and FinTech. The infrastructure needs of developing Muslim countries could be addressed through appropriate Sukuk issuances that are also compatible with Sustainable Development Goals (SDGs) and Maqasid al-Shariah (Alvi, et al., 2019).

Retail Sukuk can be used to finance various infrastructure development projects. Ministry of finance, Malaysia raised RM2.5 billion (US$789.14 million) by issuing DanaInfra Retail Sukuk to finance the Mass Rapid Transit (MRT) rail network, an infrastructure project in Kuala Lumpur. The issue was sold in three tranches with tenors of 7 to 20 years (Ahmed, et al., 2015). Malaysia has a dynamic Islamic capital market that had already raised funds for infrastructure projects by issuing Sukuk over the years. Since huge investment is required to finance an infrastructure project, the capital market could be a viable source to generate funds through various investors. Studies have shown that governments and government's subsidiaries had raised funds for infrastructure projects by issuing project specific Sukuk. Indonesia and Malaysia have issued retail Sukuk to expand the investor base and raise financing from institutional as well as a retail investor (COMCEC Coordination Office, 2019). Saudi sovereign Sukuk amounting to USD 9 billion, issued in 2017, is the largest Sukuk issued in the history, aims to direct its proceed towards financing infrastructure projects from which the general public of the country will benefit. Sukuk issuance is considered as an ideal financing solution for infrastructure development projects. But in 2017, only 4% of Sukuk proceeds were generated from infrastructure financing (Alvi, et al., 2019).

In Pakistan, assets of the Islamic banking industry stood at 2,995 billion while deposits were recorded at 2,407 billion by the end of the third quarter ending on September 30, 2019 (SBP, 2019). Islamic banks can help the Government of Pakistan (GOP) in financing infrastructure and development projects in the country where around 2% of sovereign financing is done through Sukuk. The energy infrastructure in Pakistan is also unable to meet the growing demand for energy in the country with increasing private businesses and expanding population. Eventually firms and household has to bear the burden of limited energy supply, with increased energy pricing and long hours of load shedding. These Sukuk has the potential to develop the Islamic money market and can arrange for more Shariah compliant investment alternatives to Islamic banks' treasuries (Shaikh, 2015). To resolve Pakistan's circular debt, the Ministry of Energy has issued the first tranche of Pakistan Energy Sukuk (PES-I) worth PKR 200 billion in 2019 (Bhatti, 2019).

In 2015, K electric, an electric supply company based in Karachi, Pakistan, issued Sukuk ul Shirkah worth PKR 22 billion out of which PKR 7 billion was reserved to be offered to the public which was fully subscribed within few

hours (Shaikh, 2015). K-Electric has also announced its plans to issue Pakistan's largest listed retail Sukuk in the private sector worth PKR 25 billion with a green shoe option of up to PKR 5 billion with a seven-year tenor. The proceeds will be used to meet the permanent working capital requirement and routine capital expenditures on the generation, transmission, and distribution of the company (Siddiqui, 2019).

The development of public infrastructure leads to positive externalities in many ways as the government can lease spare land on a long-term basis to be used commercially or residentially, generating lease income. Government has the option to issue public securities or sovereign Sukuk to generate the seed capital for a huge venture. For example, the spare assets of Pakistan Railways could be used by the government to develop a long-term Sukuk program for raising finance to renovate and develop railway infrastructure. Similar programs can be initiated in other loss-making government-owned entities, where financing could be attained via Sukuk to revive the business and reduce the burden from the government's account (Shaikh, 2015). The deficiency of infrastructure in quantity and quality is a significant constraint to the level of economic growth and development required in this region. For example, an efficient power supply can enhance the productivity of businesses and manufacturing concerns; better roads and rail systems can facilitate increased intra-regional trade and investment; better communication services can facilitate greater socio-economic integration among the people of the region. Similarly, access to clean water and sanitation improves the general health of the population, thus enabling more people to work and contribute productively to the economy (Abdurraheem & Naim, 2018).

It has been proposed to use innovative Sukuk structures based on risk-sharing principles subjected to profit/loss distribution among the investors. Capital intensive projects like construction of seaports, airports, tolled highways, railroads, mass rapid transit systems, and infrastructure related to electricity generation and telecommunication system could be financed through profit & loss sharing modes of Islamic finance. For non-revenue generating projects, Islamic social finance can potentially be an alternative source for providing social infrastructure services. Development projects such as road in rural areas of the country, government education programs, health care facilitates, sanitation and sewerage, the risk and reward sharing are done indirectly as there is no revenue to be shared and it is based on another government revenue source, any index or a benchmark such as GDP which is more associated with government income (Bacha & Mirakhor, 2017).

The government is aware of the country's infrastructure needs can finance these development projects through the issuance of Sukuk. The Sukuk market is expected to grow internationally due to global infrastructure requirements. Sukuk issuance requires complex and detailed documentation to ensure transparency of the procedure at every stage. It requires synchronized efforts from all the stakeholders including issuers, regulators, and investors for the growth and development of this industry. Sukuk is an attractive asset class for investors and issuers, has the potential to attract foreign investments, strengthen financial stability and support economic growth (Shafique, 2016)

As highlighted earlier, issuing Sukuk is complex and expensive (COMCEC Coordination Office, 2019) due to an underdeveloped secondary market and lack of standardization in terms of structure and Shariah rulings (Damak, 2016). Due to extensive documentation (legal and religious), issuing Sukuk is considered a time-consuming option as compared to conventional bonds (Ulusoy & Ela, 2018). Sukuk issuance involves several intermediaries and extensive documentation along with adherence to the country's local laws encompassing Legal and Regulatory framework, Shariah governance framework, and Accounting and Taxation laws. International organizations like AAOIFI and IIFM are making efforts to standardize the process. Due to differences in Sukuk structures in different jurisdictions, Shariah scholars and legal advisors face several challenges while formulating an opinion regarding new or existing structures. Common problems include ownership of the underlying asset to be used for Sukuk. For example, in Ijarah Sukuk, the asset could be legally held by the SPV or will stay in ownership of the government in case of sovereign Sukuk and might require permission from authorities before the transfer of ownership (Almahmood, 2019). A blockchain-based application could be used to receive a request for subscription and payment from a prospective Sukuk investor and disburse profits generated from the underlying project to Sukuk holders. Through distributed ledger technology (DLT) banks could have a real-time view of the transactions with short settlement time serving as a real-time register for Sukuk holders and issuers (Alvi, et al., 2019).

People having smartphones with internet connectivity can use distributed ledger technology to lower operational costs and eliminate multiple intermediaries and agents. Pakistan is one of the least financially inclusive countries in the world where 85% of the population has no access to formal banking channels. Due to high infrastructure and transaction costs, most of the population lacks access to formal financial services. The problems relating to accessibility could be solved by digitalizing financial services in the country (Mohamed & Ali, 2018).

Pakistan has over 145 million cell phone connections verified by National Database & Registration Authority (NADRA) with more than 48 million having internet (3G/4G/LTE) connectivity. In 2008, SBP had issued Branchless Banking Regulatory Framework, as an effort to team up telecom service providers and banks (financial institutions), where people can benefit from digital financial services by making use of cellular networks' outreach.

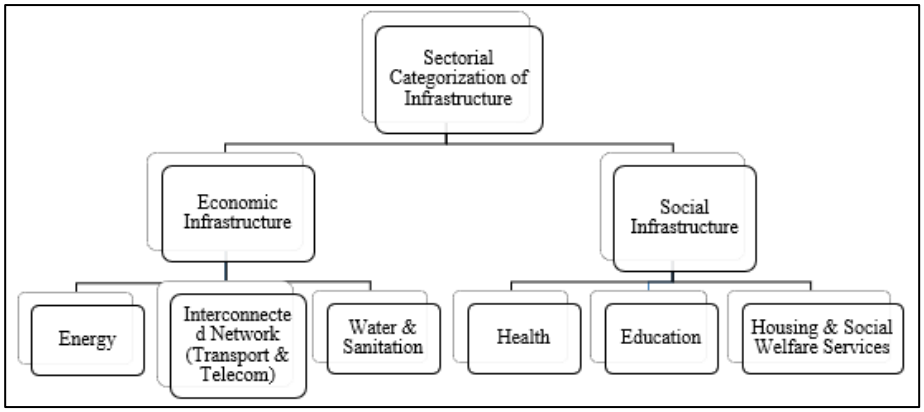
The branchless banking industry has 11 licensed service providers allowing customers without a bank account in remote areas of the country to send and receive remittances & welfare payments on behalf of the government and non-government institutions and pay utility bills using formal banking channels. Around 33 million branchless banking accounts have been opened and over 420 thousand agents are serving as an access point for these financial services. Pakistan can boost financial inclusion through the provision of digital financial services having a high mobile phone penetration ratio, high internet usage, multiple mobile money operators, regulatory guidelines, and the majority youth population (underage of 45 years). The service providers need to introduce, ease and convenience in access and operation of the branchless banking account as 53% out of 33 million branchless banking accounts are inactive with an average deposit balance of PKR 340 in total accounts. With the rise in smartphone penetration, the biggest challenge for successful implementation of the DFS ecosystem is to create customer awareness, limited interoperability, high transaction cost, low-income customers using basic phones, reluctance by banks to collaborate with FinTechs, and lack of application programming interfaces (APIs) at financial institutions. A huge portion of branchless banking accounts remain inactive as the existing products in the DFS ecosystem fails to attract potential users. There is a need to create innovative, market-competitive digital services that have the potential to cater to the financial needs of the masses effectively. According to an estimate, Digital Finance services in Pakistan has the potential to cross USD 36 billion by 2025, boosting the country's GDP by 7% along with the creation of 4 million new jobs and USD 263 billion new banking deposits. With the help of technologically innovative financial systems, financial services could be accessed by every citizen of the country without any limitations. The Digital Finance services framework aims to make a financially inclusive ecosystem, so comprehensive that even a small entrepreneur or a farmer in a far-flung rural area can sell his commodity online across Pakistan and can collect the price digitally in their mobile wallets (National Financial Inclusion Strategy, 2019). The Governor SBP has also stressed on quick digitalization of payments in day-to-day activities for economic efficiency. It will help to document the economy along with the provision of user-friendly and cost-effective digital financial services to the public (SBP, 2019).

Financial inclusion is featured as a target in eight of the seventeen sustainable development goals (SDGs) set by the United Nations General Assembly in 2015 for the year 2030. There is ample academic evidence for financial inclusion acting as an enabler to achieve broader development goals and support economic growth. According to Pakistan Economic Survey 2017-18, the stock market in Pakistan can be the one to witness blockchain technology application in near future due to the increasing usage of high-speed internet and smartphones along with consumer's preference for online and digital commerce. With around 3 million internet banking users and 3 million mobile banking users in Pakistan, an annual growth rate of 75% in internet banking and mobile banking users has been recorded in 2018 (Anon., 2018). Blockchain can encourage financial inclusion by allowing the unbanked individual, access the global capital market through his smartphone. Smart retail Sukuk has the potential to grow and develop its target market reaching the untapped potential investors that otherwise would not be possible (Bangash, 2017).

2.1. Infrastructure and its importance for Economic Development

Infrastructure refers to the fundamental facilities, including physical installations and systems (roads, buildings, electricity, and telecommunication) and services (education and health) that are crucial for the functioning of an economy and promotion of economic growth and development (COMCEC Coordination Office, 2019).

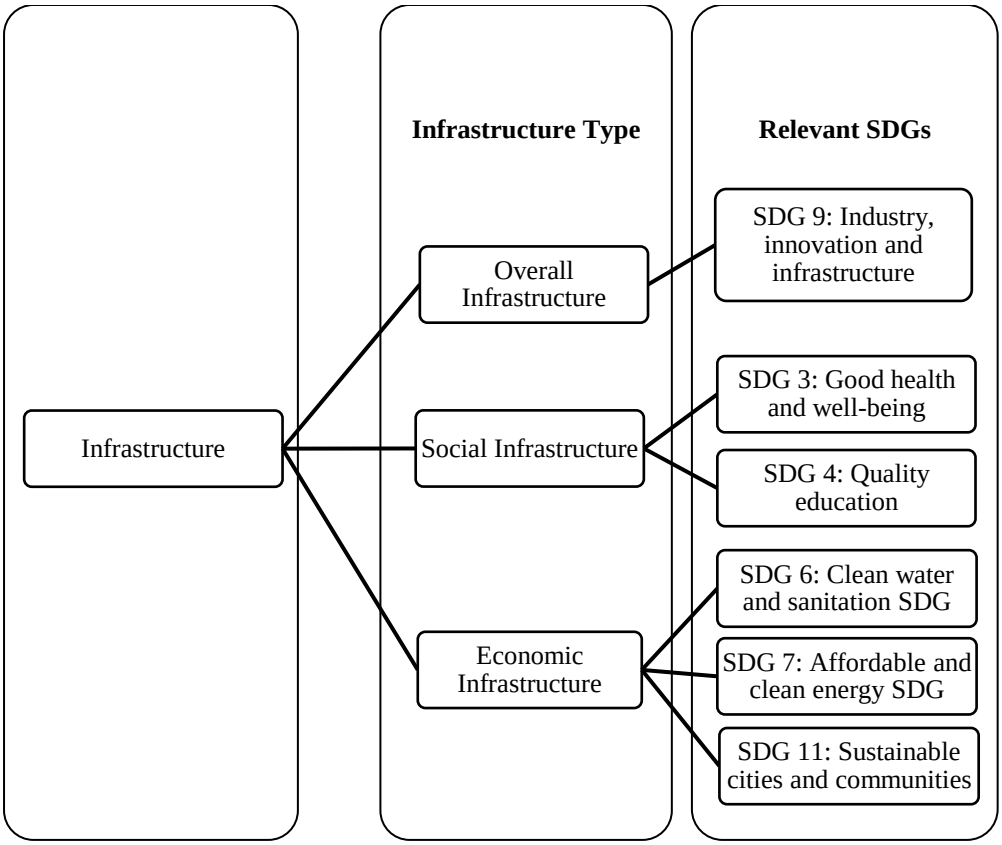
Figure 2.1: Sectorial Categorization of Infrastructure



Author's Illustration (COMCEC Coordination Office, 2019)

Along with the provision of basic services including power, water, sanitation, transportation, and telecommunication to the household, an established infrastructure encourages business activities and provides job opportunities. Empirical research also supports the positive role of infrastructure in economic development. Sustainable Development Goals (SDGs) are 17 goal sets to be achieved by 2030 globally, set by United Nations General Assembly in 2015. Each goal has a list of targets to be measured with indicators (United Nations General Assembly, 2015). SDG 9: Industry, innovation, and infrastructure (Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation) directly point out to overall infrastructure, other SDGs that would have been indirectly impacted by the development of social and economic infrastructure has been shown in figure 2.2.

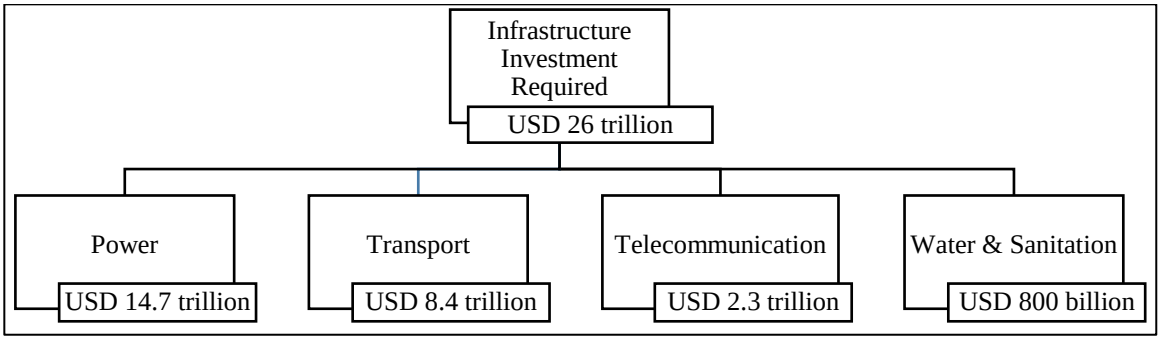
Figure 2.2. Infrastructure Types with Relevant SDGs



Author's Illustration (COMCEC Coordination Office, 2019)

Traditional public finance is insufficient, and policymakers are looking for innovative cost-effective solutions to finance infrastructure development projects. Most of the developing countries do not have ample financial resources to meet the infrastructure demand. In addition to financial sources, these countries also need reasonable expertise and personnel to understand and overcome this challenge (World Bank, 2017). To maintain the current growth trend, developing countries in Asia will have to invest USD 26 trillion in total or USD 1.7 trillion annually in infrastructure-related projects from 2016 till 2030 including investments to respond to climate change (ADB, 2017). Without investments in climate change mitigation strategies and adaptation needs, the baseline estimate for infrastructure development would still be USD 22.6 trillion or USD 1.5 trillion annually (COMCEC Coordination Office, 2019).

Figure 2.3. Breakup of Major Investment Requirement in Infrastructure



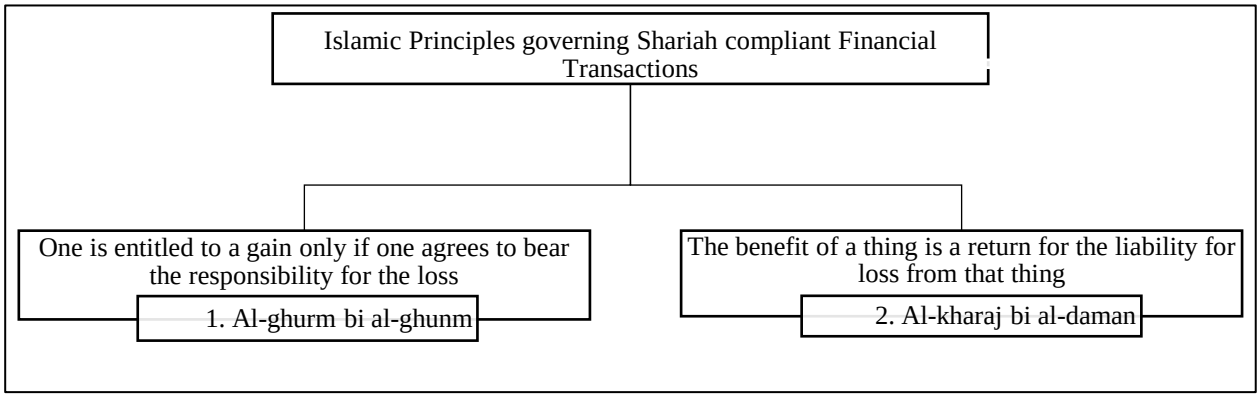
Author's Illustration (COMCEC Coordination Office, 2019)

Competitive infrastructure facilities are the main determinant of long-term sustainable growth of an economy enhancing trade and commerce (Ahmed, et al., 2015). For example, the development of transport infrastructure has the potential to significantly decrease transportation costs directly and inventory carrying costs indirectly, encouraging swift business operations and promote economic efficiency (COMCEC Coordination Office, 2019).
Traditionally, the government is held responsible for providing basic infrastructure facilities of a transportation network, energy, water, and sanitation. In most developing countries, due to huge debts and deficits, it is difficult to internally finance those developmental projects. The private sector, whose contribution, despite the potential, in financing infrastructure projects is very small; could partnership with the public sector to generate financing for these development projects. There is a need to think of fresh and innovative ideas where new investors and financiers could contribute towards the expansion of sustainable infrastructure. Sustainable infrastructure refers towards approaches that are environment friendly and considerate towards climate change and issues like global warming (Ahmed, et al., 2015).

2.2. Applicability of Islamic Finance in Infrastructure Projects

The business operation of Islamic finance is focused on halal (permissible in religion) business activities and investments (not involving alcohol, drugs, gambling, speculation, weapons, or any other business domain not permissible by Shariah). These business activities are characterized by the prohibition of Riba and avoidance of gharar (uncertainty). Business transactions should be free from Maysir (speculation) or Qimar (gambling). In Islamic finance, returns are linked and generated from an economic activity associated with real assets along with liability for loss (COMCEC Coordination Office, 2019). To improve stability in the financial system, the principles of risk-sharing and linking finance to the real economy needs to be followed along with the prohibition of derivative instruments used for speculation (Ahmed, et al., 2015). Two Islamic legal maxims that govern Shariah-compliant economic and financial transactions and support linking returns to risks are as follows:

Figure 2.4: Islamic Legal Maxims for Financial Transactions

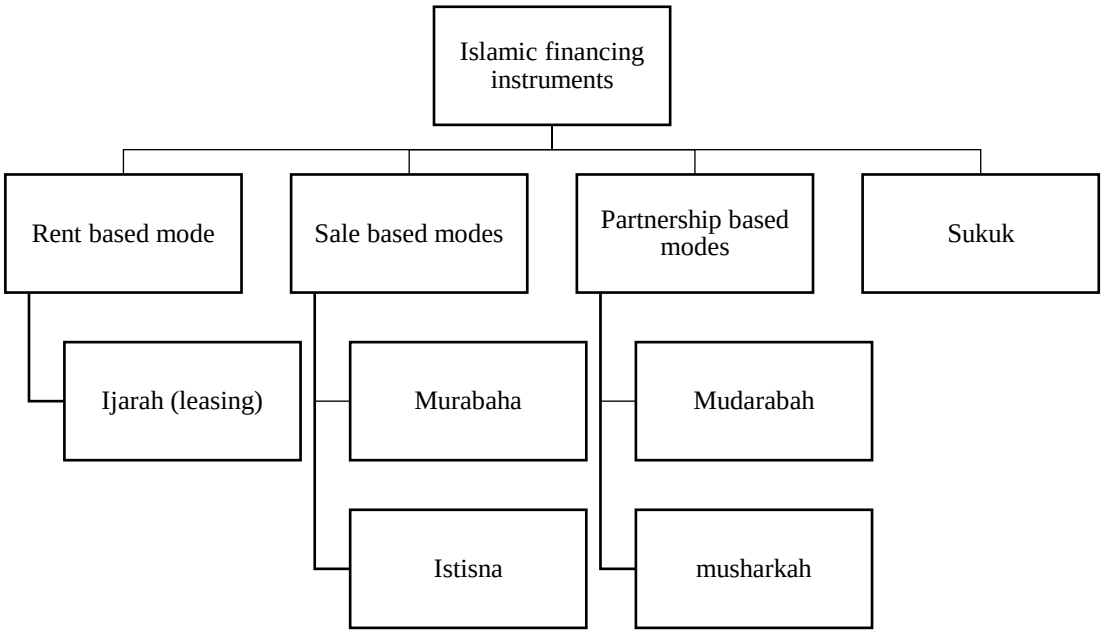


Author's Illustration (Ahmed, et al., 2015).

The first legal maxim implies that in profit and loss sharing modes of Islamic finance (Musharakah & Mudarabah), profits are shared according to the predetermined ratio agreed between partners while loss is borne by the investor only (mudarabah) or shared in the proportion of investment of each partner (mushrakah). The second legal maxim implies that the party enjoying the full benefit of an asset should also bear the risks associated with that particular property (Ahmed, et al., 2015).

The financing infrastructure sector is an untapped ideal business opportunity for the Islamic finance industry as it focuses on the real economy and social development at large. As infrastructure development benefits the common people of the country, financing these projects is also consistent with the philosophy of Islamic finance. The involvement of tangible physical assets in infrastructure investment provides the first foundation to the asset-backed risk-sharing perspective of Islamic finance. Islamic finance provides flexibility in form of different structures available to be chosen from, according to the nature of the project (World Bank, 2017). Islamic financing modes and instruments that can be used to finance an infrastructure project are summarized in figure 5 below:

Figure 2.5: Islamic Finance Instruments for Financing Infrastructure Projects



Author's Illustration (World Bank, 2017).

In Pakistan, the construction of a National Highway (N-5), Karachi Thatta Dual Carriageway project was financed through Musharakah. Master Wind Energy Limited, a wind farm in Sindh province was financed through a combination of Musharakah and Ijarah. Liberty Power Tech Limited is a residual fuel oil-based power project in Faisalabad, financed through Musharakah and Sukuk (World Bank, 2017). Neelum Jhelum Hydropower project was partially financed by issuing Sukuk based on diminishing Musharakah structure (COMCEC Coordination Office, 2019).

2.3. Sukuk for financing infrastructure projects: why and why not?

Globally, the size of Islamic capital markets is very small as compared to the Islamic banking sector. Considering investor's preference for liquid assets, capital markets can be used to raise funds for development projects. Since the sale or transfer of debt along with its risks is prohibited in Islamic finance, debt-based Sukuk cannot be sold in the secondary market, hence it is preferable to issue asset-based or equity-based Sukuk. The risk-sharing and liquidity feature of these instruments will attract financial institutions to invest in infrastructure projects (COMCEC Coordination Office, 2019).

Infrastructure projects are of long duration including construction periods lasting for years. These projects require funds at different intervals throughout the project life. The issue with financing green-field infrastructure projects through Sukuk is that Sukuk raises funds through a subscription process to acquire funds on the first day of subscription. But funds are injected into the project at different time intervals. This cost of carrying adds up an extra

burden on the project as the raised finance will start accruing mark-up/ profit or rent instantaneously. For that reason, Sukuk is not used to finance infrastructure projects (World Bank, 2017).
Such concerns could be addressed by issuing Sukuk in tranches. GDP-linked Sukuk are proposed to finance Diamir Bhasha Dam that is issued and subscribed in tranches made available annually according to the budgetary requirements of the projects (Iftikhar & Jawed, 2018).
Domestic Sukuk issued in small denominations will supplement efforts towards financial inclusion and capital market development. For a huge capital-intensive project, a combination of international and domestic Sukuk could also be considered. High-impact profitable projects like tolled highways, telecommunication, and power generation infrastructure, and mass transit system for cities require a heavy upfront investment but can provide stable returns in the future contributing towards overall economic development. In development, projects the government has to take the initiative to execute and coordinate the funding arrangement, without paying anything from the government's budget. However, the government takes advantage during or post IPO as it has the option to sell its stake in the open market or hold it to earn dividends in the future. Local equity markets also flourish due to the listing of huge and stable instruments on a domestic stock exchange. By assigning small face value to an instrument, small investors could also participate, in that way encouraging financial inclusion. Such investments do not bring any financial obligation to the government (Bacha & Mirakhor, 2017).
Huge projects, after spending millions of dollars investments initially are being suspended or terminated in many parts of Sub-Saharan Africa. Investors are always reluctant to invest in projects with long-term maturity due to the risk of policy continuity. Investors cannot earn promised returns on these long-term projects until the completion of that project. Hence Sukuk cannot be considered as a viable alternative for financing infrastructure projects in Sub-Saharan African countries. (Abdurraheem & Naim, 2018).

2.4. Retail Sukuk: Opportunities Ahead

Usually, institutional investors and financial institutions seek to invest in Sukuk to diversify their portfolio and maintain regulatory requirements. Retail Sukuk is such an innovative saving product that can broaden the Sukuk investor base that in return can create a liquid market, having the potential to address the issue of financial inclusion while addressing religious concerns of investors. Fintech can promote financial inclusion by lowering the cost of a transaction. On the other hand, mobile wallets can solve the problem of accessibility to financial institutions (Demirgüç-Kunt, et al., 2018).

2.5. Towards Financially Inclusive Community

In the context of financial inclusion, issues like financial literacy and consumer protection need to be addressed as well. Developing countries excessively focus on micro-credit services to combat barriers related to financial inclusion. The basic assumption is that with the funds provided through micro-credit facilities, individuals will be able to invest and built wealth eventually pulling themselves out of poverty. But this assumption doesn't always work out as it leads to over-indebtedness as not all poor people have entrepreneurship skills that could help in the smart deployment of borrowed funds. Instead of investing funds, they consume them to fulfill their survival needs. Hence it has been proposed to issue saving instruments instead of credit instruments to combat financial inclusion and poverty. To address daily needs, the marginalized segment of society requires a regular income flow that could be achieved by offering innovative saving products that offer short-term rewards to low-income individuals (IEG World Bank Group, 2015). The role of capital markets has been recognized in achieving sustainable development goals. To cater financial needs of the poor, capital markets need to introduce and offer additional investment opportunities with an option of retail and low-value transactions. Instruments with small denominations help in the development of capital markets and promote financial inclusion by providing saving opportunities to the underprivileged segment of society (IEG World Bank Group, 2017).
Bonds can be used to promote financial inclusion as they can be offered as a saving instrument to a financially exclusive population as regular income certificate. These certificates, on one hand, can serve as a source of regular income for poor people having fewer avenues to invest. On the other hand, funds acquired through these instruments could be deployed in development projects supporting SDGs like developing infrastructure for health, education, and technology. Retail Sukuk has the potential to attract funds from religious investors to finance local projects that can help expand the Sukuk market by increasing the demand-side. Retail Sukuk exclusively address the needs of retail investor with limited funds. Due to the absence of a legal framework in most countries and the complexity of legal documentation, retail Sukuk are not widely issued (Almahmood, 2019).

2.6. Underlying Benefits of Blockchain Technology:

About 10 years ago, bitcoin emerged as the first decentralized digital currency that enables the user to instantly exchange money without the involvement of any intermediary like banks. Today around 1,500 cryptocurrencies exist and are transacted daily. Cryptocurrencies use a technique called cryptography that provides users with a secure network to prove their identities and transact without any trusted intermediary. Bitcoin and blockchain are used interchangeably, where bitcoin is a cryptocurrency and blockchain refers to underlying decentralized ledger technology that facilitates the exchange of cryptocurrencies. It is a ledger of transactions that stores secure and immutable data in form of blocks. When information is added to the network, a new block is formed that is linked to the previous data block forming a chain, hence the name blockchain came into existence. The availability and accessibility to the historical data help the system protect against malicious entries or transactions in the network (Galen, et al., 2019).

Blockchain would simply restrict or omit the involvement of third-party service providers (brokers, agents) help to simplify the Sukuk structure and reduction of overhead costs associated with intermediaries. Operational costs and agency fees associated with the issue, settlement, and termination of traditional Sukuk would not be applicable due to the elimination of intermediaries from the overall structure. Reduced back-office operations save cost and time adding to the operational efficiency. Information asymmetries can also be removed through the application of distributed ledger technology as it assists in the provision of an unambiguous and immutable record of transactions to all the users of the network, increasing transparency of the Sukuk, in terms of its structure, participants (issuer, Sukuk holders), underlying assets and cashflow (whether generated from real business activity). It provides the investor with real-time data on the performance of an investment. It benefits the secondary market as investors can make informed decisions about buying, selling, or holding the security. All the terms and conditions of a contract are programmed in a smart contract that encapsulates all the legal and regulatory documentation requirements would further make the overall transaction, time-efficient and secure since the technology uses cryptography.

Such an application would assist the management of Sukuk including receiving proceeds from Sukuk holders and coupon payment to shareholders according to the terms and conditions of the smart contract (Alvi, et al., 2019). This technology has the potential to not only bring down Sukuk issuance and operational cost but could also act as a catalyst in the development of infrastructure, promoting financial inclusion, hence contributing towards SDGs along with the fulfillment of Maqasid-al-Shariah.

4. BLOCKCHAIN BASED RETAIL SUKUK

The whole idea of blockchain-based retail Sukuk can be divided into two broad categories: one is the supply side that deals with the issuance of instruments and the other are the demand side that will facilitate the subscription of the instrument.

4.1. Sukuk Issuance Process

Issuance of blockchain-based retail Sukuk calls for information interoperability among government, regulators and central bank and other interrelated parties that facilitate the Sukuk issuance process. In the case of Pakistan, these include State Bank of Pakistan (SBP), Securities and Exchange Commission of Pakistan (SECP), Ministry of Finance (MoF), Pakistan Stock Exchange Limited (PSX), Central Depository Company (CDC), Financial Institutions (Banks and Insurance companies) and FinTechs (digital lending platforms and payment solutions, financial products and services providers).

The biggest implication of technology in the realm of Sukuk issuance is digital record creation of land that can benefit the overall process including identification of an asset with a clear title without posing any question as to legal ownership and transfer of ownership to SPV and Investors. After identification and tokenization of assets, the regulator will identify investors through an auction in case of initial public offering (IPO) first-time issuance of the instrument. Investors here will apply/ subscribe to purchase Sukuk by filling a request form accessible from the mobile application.

A single smart contract will have the following contracts and undertaking embedded in that will be automatically executed upon subscription:

i. Traditionally investors execute **Certificate Subscription Undertaking** in favor of SPV where the investors appoint the same SPV as their agent and commitments of investors for subscription to Sukuk are recorded. The function of SPV can also be eliminated since the contract is now being executed digitally between the issuer and investor.
ii. An **agency agreement** between a mobile financial services provider and investors is executed where a digital financial services provider is appointed as paying agent of the investors that will collect subscription proceeds from the Investors and pass it on to the issuer of the Sukuk certificate. It will also be responsible

for the collection of periodic rentals/ profit from the issuer and distribute the same to the Investors. The same branchless banker would act as a Reference Agent and Registrar for the Investors. Appointing a FinTech startup will also support businesses providing digital payment solutions, financial products, and services to the unbanked, under-banked and millennial customer segments in Pakistan. Traditionally, an agency agreement is executed between SPV and Banking Service provider but since the contracts are digital in nature intermediaries and unnecessary agents could be eliminated from the process.

iii. A **Certificate Issuance Undertaking** is traditionally executed between SPV and issuer in favor of investors where SPV undertakes to issue Sukuk certificates to investors. Also under this agreement, SPV accepts its role as an agent of investors. In a smart contract, SPV can be eliminated to execute the contract directly between investor and issuer.
The appointed digital financial services provider collects the subscription proceeds from investors and pays them to the issuer (credit to the issuer account) as the purchase price of the asset-backed token/ Sukuk certificate. Each certificate represents a percentage/ undivided share of investors in ownership of the asset.

iv. A **Purchase Agreement** between SPV and issuer also takes place where SPV purchases the agreed percentage of an asset at an agreed price on behalf of investors. But the registered title will be retained by the issuer and a **Declaration of Trust** in favor of investors is signed where the issuer will hold the registered title to the extent of their undivided share in the ownership of the Asset. While constructive possession encompassing risks and rewards of the asset will be delivered to investors to the extent of their ownership.

v. SPV/ Investors and issuer will enter into a Shariah Compliant Contract for example **Ijarah Agreement** where the share of an asset purchased by investors will be leased back to the issuer for a fixed period and predetermined periodic rentals according to predefined terms and conditions specified in the agreement.

Lease rental will be calculated using the following formula:
Periodic Rental Amount = Face value of Sukuk (Rental Rate x No. of days in rental period/ 365)

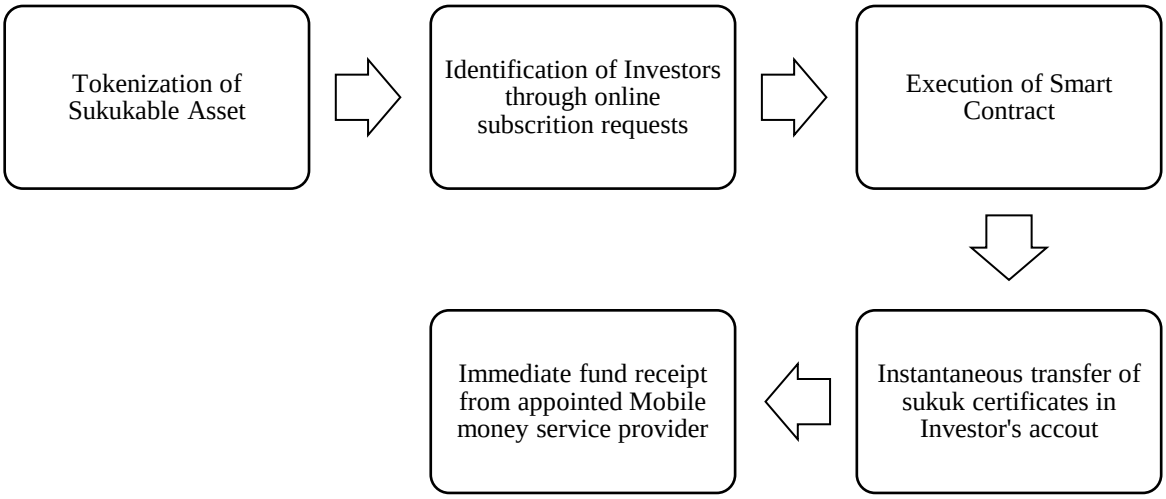
vi. In a **Service Agency Agreement** between issuer and investors/ SPV, the issuer is appointed as a service agent against a nominal fee. Routine maintenance is carried out by the lessee while major maintenance has to be the responsibility of the lessor. These clauses are well incorporated in the Ijarah agreement and Service Agency Agreement.

vii. A **Purchase Undertaking** has to be executed between the issuer and SPV/ investor where the issuer undertakes to purchase the leased asset at the exercise price (an amount equal to the initial purchase price of the Sukuk certificate/ face value of the Sukuk certificate) upon maturity, default or termination. Investors are also liable to sell their share in event of default/ termination or maturity.

viii. In **Cost Undertaking** the issuer undertakes to bear all the issuance cost, fees, and expenses related to the Sukuk issuance.

All the agreements and undertakings are embedded in a single smart contract that leads to fast execution, low transaction cost, and independence from centralized intermediaries. The documentation and sequence of the transaction have been extracted from SBP's Transaction Structure of GoP Ijarah Sukuk (SBP, n.d.). Any regulator (SECP or SBP) shall take responsibility to monitor the overall transaction till the redemption of Sukuk for ensuring proper execution and ensuring legal acceptability of the smart contract.

Figure 4.1. Sukuk Issuance Process



Author's Illustration

4.2. Sukuk Subscription Process

With increased connectivity and digitization, there is a rise in demand for identity authentication through consumer biometrics, for example, fingerprint sensors, voice, and speech recognition. The global digital identity solutions market size is anticipated to grow from USD 13.7 billion in 2019 to USD 30.5 billion by 2024, at a Compound Annual Growth Rate (CAGR) of 17.3% from 2019 to 2024 where Asia-Pacific is expected to have the highest growth rate in terms of technology deployment (Digital Identity Solutions Market, 2020). Digital identity is a combination of biometrics, machine learning, and artificial intelligence that can help combat authentication and identity frauds along with an easy-to-recognize individual with the availability of the biometric device. A combination of biometrics and blockchain technology could help financial institutions overcome the obstacles related to identity and help save time and cost spent to identify and authenticate an individual for regular business transactions.

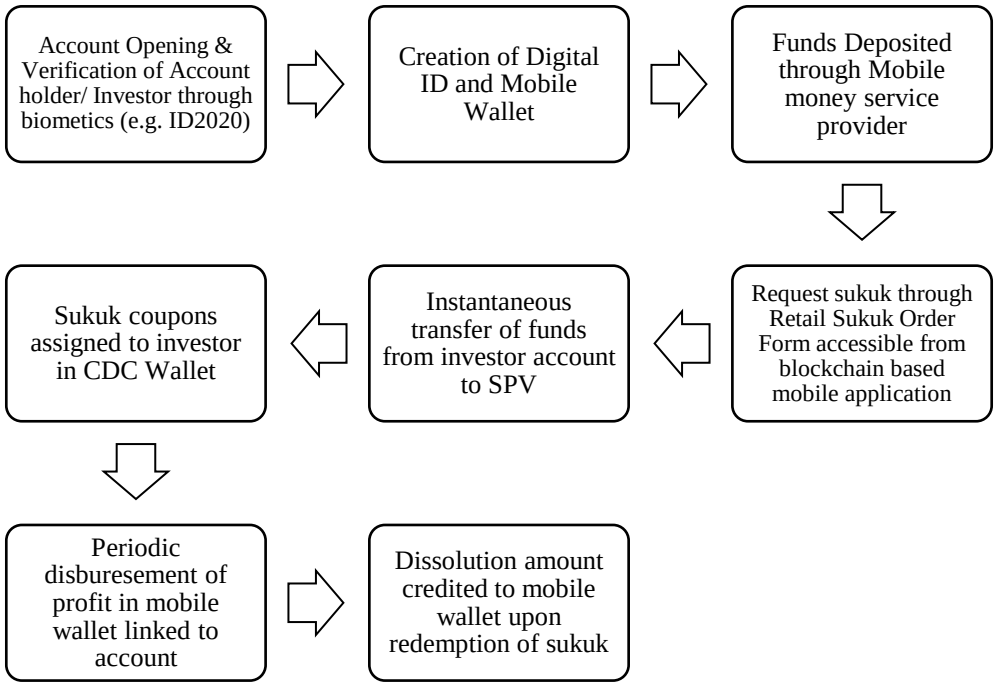
Developing a smartphone application that integrates financial institutions, capital market

1. Such an account could be opened by downloading a blockchain base mobile application and filling in the account opening request through smartphones. Representatives from the financial institution shall visit the customer to confirm his whereabouts and obtain a biometric identity. Accenture, a technology service provider, combines biometrics and blockchain technology for the creation of Digital ID to store and maintain individual identity. Such technology could be used to create mobile wallets. After successful account processing, funds could be deposited in an activated account.

2. Upon account activation, the account holder can subscribe to available Sukuk in the system by filling in another online application form and transferring money right away. This would lead to an instantaneous transfer of funds and receipt of Sukuk coupons in the customer's account. Periodic coupon payments would be credited to the same account.

3. Sukuk buyer can sell his instrument through the same mobile phone application and can receive the sale proceeds as soon as the order is matched with a purchase order. These instruments would act as a saving instrument supporting the underprivileged segment of the economy bringing these individuals into the documented part of the economy. Direct participation of these and they would be able to earn as well.

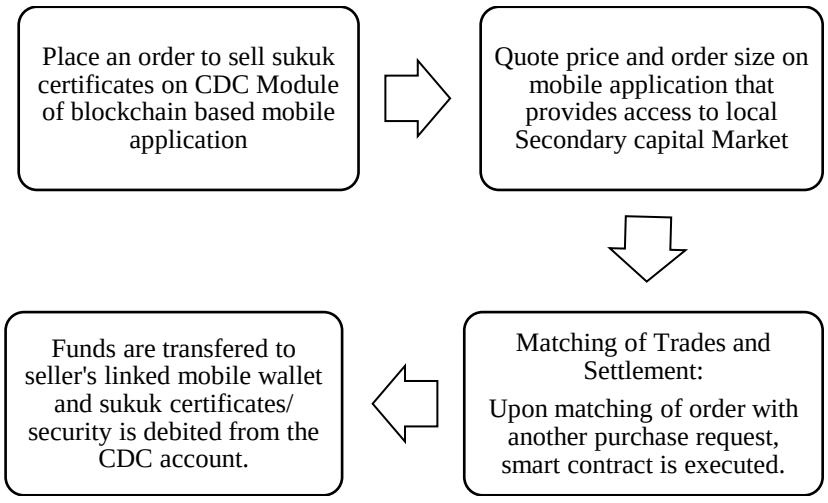
Figure 4.2. Sukuk Subscription Process



Author's Illustration

Ideally, these certificates will be tradable in the secondary market, hence an active capital market must exist.

Figure 4.3. Process Flow for Online sale of Retail Sukuk



Author's Illustration

Target investors for these projects are restricted to the geographical location of Pakistan as the main aim of the issue is to solve the problems related to financial inclusion in the region.

5. CONCLUSION

Smart retail Sukuk, such as designed above using distributed ledger technology like blockchain poses an opportunity for Islamic finance as it could be used to finance infrastructure development projects along with increasing financial inclusion in third world countries like Pakistan. Application of blockchain technology-based retail Sukuk is highly possible due to various pending infrastructure projects in our country. The work on projects like Lahore's Orange Line Metro Train and Karachi's Metro bus was halted after authorities failed to pay the construction companies (Iqbal, 2019). To mitigate agency problems and ethical issues, government organizations need to focus on securitization to finance infrastructure and development projects. Ports, aviation, energy, fuel, and water sector are among the potential areas that need financing in the coming years in Pakistan (Arif, 2007).

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