

Impact of the use of smart contracts on the efficiency of Islamic banking

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Abstract

The objective of the research is to study the impact of smart contract technology on the operational efficiency of Islamic banks. To achieve the objective of the study, the study reviewed the nature of smart contracts and their compatibility with the rules of Islamic finance and the most important applications of smart contracts in Islamic banks. The operational efficiency was measured through some financial performance indicators for a sample of five leading Islamic banks in the field of smart contracts application during 2015 and 2017. Research methodology was based on secondary data collected from the published annual reports of the Islamic banks. The results of the study indicate that The greater the Islamic Bank's reliance on smart contracts in providing its services, the greater the financial performance indicators and the higher the efficiency of the Islamic Bank. The study also pointed to the need for Islamic banks to have mechanisms to deal with the challenges of smart contracts to increase its ability to achieve the positive benefits of smart contracts.

ملخص

يهدف البحث إلى دراسة تأثير تكنولوجيا العقود الذكية على الكفاءة التشغيلية للمصارف الإسلامية. ولتحقيق هدف الدراسة، استعرضت الدراسة طبيعة العقود الذكية وتوافقها مع قواعد التمويل الإسلامي، وتم قياس الكفاءة التشغيلية من خلال بعض مؤشرات الأداء المالي لعينة من خمسة بنوك إسلامية رائدة في مجال العقود الذكية. التطبيق خلال 2015 و 2017. استندت منهجية البحث إلى البيانات التي تم جمعها من التقارير السنوية المنشورة للمصارف الإسلامية. تشير نتائج الدراسة إلى أنه كلما زاد اعتماد البنك الإسلامي على العقود الذكية في تقديم خدماته، زادت مؤشرات الأداء المالي وارتفاع كفاءة البنك الإسلامي، كما أشارت الدراسة إلى حاجة البنوك الإسلامية إلى آليات للتعامل مع تحديات العقود الذكية لزيادة قدرتها على تحقيق الفوائد الإيجابية للعقود الذكية.

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Introduction

Although Islamic banks have achieved rapid growth in financial stability over the last four decades, they are currently experiencing a significant slowdown in their growth rates and profitability due to weak technological innovation of Islamic financial products, which affects the competitiveness of Islamic banks in the financial market.

The technological innovations contribute to increased market access and increased profitability for Islamic banks and the Islamic finance industry. However, the industry still lacks the enthusiasm and motivation to accept and adopt the technology revolution. Most of the employees in the Islamic finance sector do not know how to benefit from technological innovations , Especially blockchain technology and smart contract technology.

The research aims to study the concept of smart contracts as one of financial technological innovations(Fintech) to increase the efficiency of Islamic banks to provide better services and achieve greater customer satisfaction.

The research attempts to answer the following questions:

-What is the concept of smart contracts and their characteristics and compatibility with the rules of Islamic law?

What is the relationship between Blockchain and Smart Contracts?-

--Is there a proposed mechanism for using smart contracts in Islamic banks based on Blockchain?

?What are the most important benefits of applying smart contracts to Islamic banks-Measuring the impact of smart contracts on the operational efficiency of Islamic banks?

The search will depend on descriptive methodological in the description of the reality of smart contracts and their definition, and the inductive method in the survey of the international opinions of countries, institutions and specialists towards the applications of smart contract in the field of Islamic finance, and the analytical approach in studying the effect of smart contracts on the efficiency of Islamic banks.

1- Definition of Smart Contracts

Historically, the concept of smart contracts was first introduced in 1994, However, it went through a long gestation period of inactivity and disinterest due to the non-availability of platform to enforce them. This changed when blockchain technology was introduced in 2009. Smart contracts then began to gain traction, which are now becoming a basic tenet of overall blockchain's power(Buterin, Vitalik ,2013).

Smart contract is a term used to describe a computer program code that is capable of facilitating, executing, and enforcing the negotiation or performance of an agreement (i.e. a contract) using blockchain technology. The entire process is automated and can act as a complement or substitute for legal contracts where the terms of the smart contract are recorded in a computer language as a set of instructions.(PWC :2016)

A smart contract is a computerized transaction protocol that executes the terms of a contract. The general objectives are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, enforcement), minimize exceptions both malicious and accidental, and minimize the need for trusted intermediaries. Related economic goals include lowering fraud loss, arbitrations and enforcement costs, and other transaction costs .The table (1) shows difference between conventional contracts and smart contracts

Table (1) difference between conventional contracts and smart contracts

| Traditional physical contracts | SmartContract |
|--|---|
| <p>Created by legal Professionals .-</p> <p>Contain legal language.-</p> <p>-Vast Amounts of printed documents.</p> <p>-Heavily rely on third parties for enforcement.</p> | <p>Created by computer programmers.-</p> <p>-Entirely digital and written using programming code.</p> <p>Defines the rules and consequences-</p> <p>-Stating the obligations, benefits and penalties.</p> <p>-Code can be automatically executed by a distributedledger system.</p> |

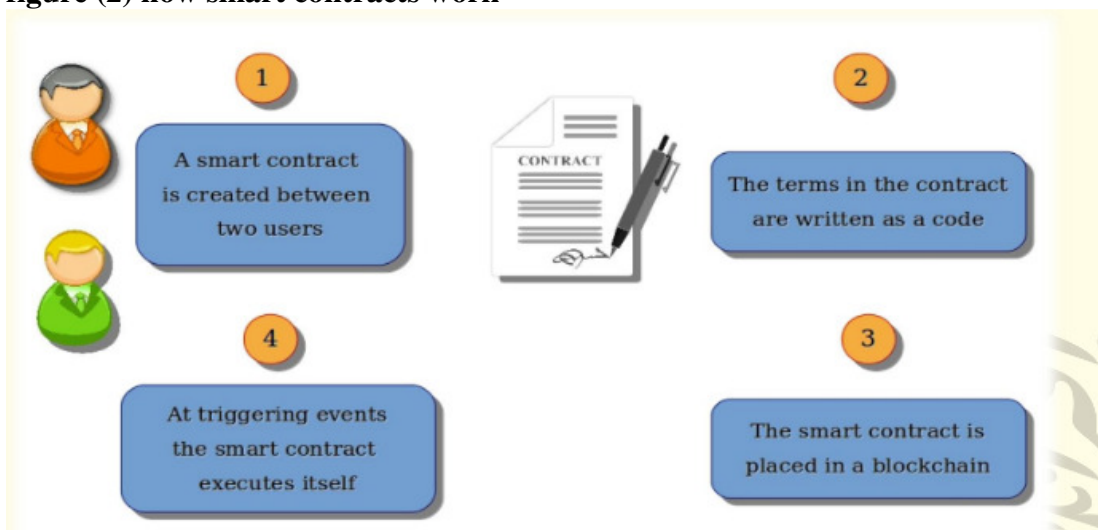
-If things go bad, rely on the public judicial system.

Source: Itzik Spitz "Traditional Contract vs. Smart Contract - can we bridge the gap?" <https://www.linkedin.com/pulse/traditional-contract-vs-smart-can-we-bridge-gap-itzik-spitzen>.

Smart contracts often depend on the blockchain technology, A blockchain essentially, facilitates the transfer of value or data without the need of a central authority or a third party. It is a decentralized digital ledger, which records transaction chronologically and publicly, allowing anyone to verify and access the data. (K. Christidis and M. Devetsikiotis, 2016)

The diagram shows (1) simplified explanation of how smart contracts work

figure (2) how smart contracts work



Source : Koulu, Riikka (2016) "Blockchains and Online Dispute Resolution: Smart Contracts as an Alternative to Enforcement" *ScriptEd*, Volume 13, Issue 1.

Smart contracts depend on a number of platforms, including : (Smart contract platforms

review <https://icorating.com/pdf/56/1//Bd40ljAOmjaCFAXmkCj9NAKZAIUj1Dwb9v75AAZe.pdf>)

- The Cryptocurrency platform is a digital currency that implements encryption to ensure its security. No central authority supports encrypted currencies and does not have any fixed relationship with the current currency. Most of these work through distributed accounting systems.

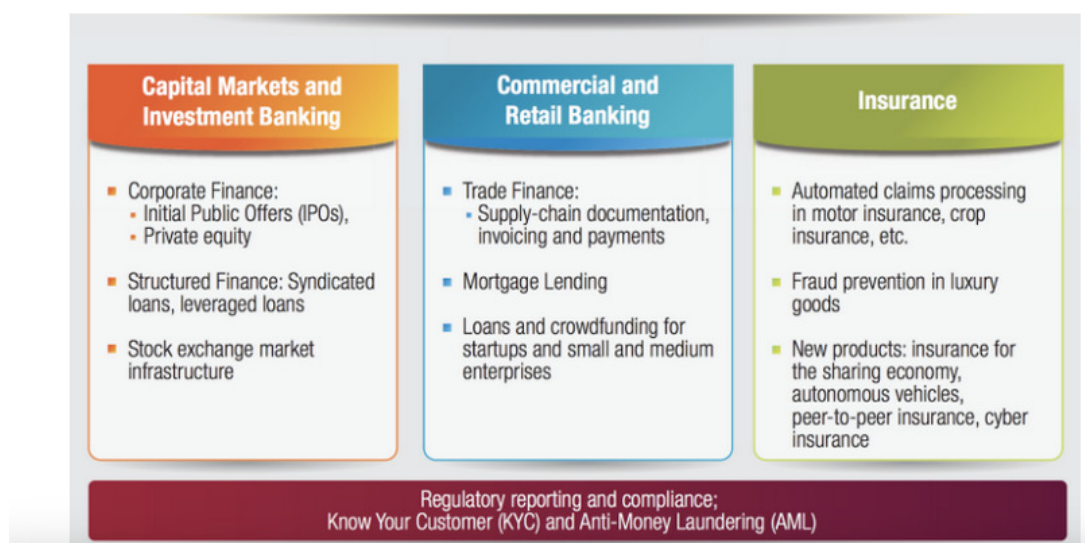
Transactions are recorded and verified through a network of nodes. It can search for previous transactions to verify that the "real" owner can only use the symbol currencies at any time and the symbolic currency owners can use personal keys to direct transactions. And the most popular digital currency encoded (Ethereum ,Bitcoin, NXT).

- Digital currency platforms issued by the Central Bank, which is a digital currency through which the Central Bank controls the currency and maintains it, without monetary equivalent, may require the issuance of a currency in this way from the Central Bank to issue a fixed amount of currency and allow interest rates determined by market activity, Fixed interest and allow the market to determine the amount of money during the purchase and sale of current assets. While theoretically, the digital currency issued by the Central Bank as a central model can be managed with transactions achieved by the central authority.(T. Chen, X. Li, X. Luo, and X. Zhang,2017)

1-1 Smart contracts in the banking industry.

Smart contracts in the banking industry are easily applicable. With their help clients can exchange money, shares, property, The most exhaustive insight into the application of smart contracts to finance services was made by Capgemini Consulting in their report Opportunities smart contracts In Banking Industry :

figure (1) Opportunities smart contracts In Banking Industry



Source: Smart Contracts in Financial Services: Getting from Hype to Reality

As illustrated by the figure the following smart contracts use cases outline how smart contracts come in handy within the industry :

- Investment banking and capital markets :When it comes to syndicated loans, the clients could expect settlement periods to be shorter. Instead of 20 days, they would be reduced to 6, for instance. It would lead to an increase in annual income and to a reduction of operational expenses.

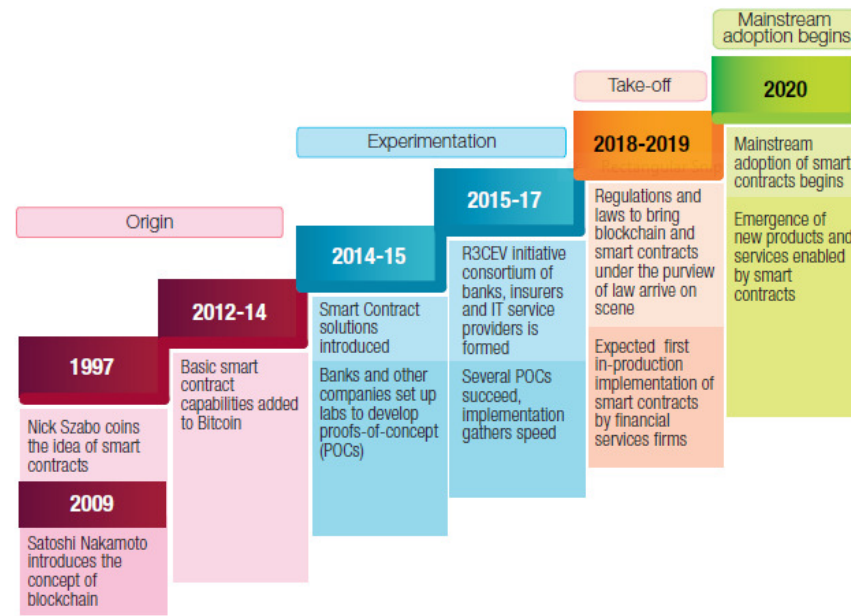
- Commercial and retail banking Within mortgage loan industry, the lower operational costs of every loan would reduce expenses for banks and cut fee expenditures of the clients.

Insurance:For insurance deals, smart contracts would bring cost savings due to the reduced .

today, a few banking startups already make their way in the market of blockchain. One of them is Polybius digital bank, based on the Ethereum blockchain. Their ICO technically supported by Ambisafe Software was extremely successful – they collected BTC 12,380 (over \$31,00,000, as of 2017 .Even though the benefits of the new technology for the financial sphere is pretty obvious, the future of smart contracts in banking remains unclear. There are several issues left to consider before smart contracts may be widely used in banking (POLYBIUS PROSPECTUS" **A Project of a Regulated Bank for the Digital Generation**"<https://polybius.io/media/prospectus.pdf>)

A period of time has been set for applying smart contracts in banks as illustrated in Figure(2)Timeline of Blockchain and Smart Contract

ImplementationFigure(2)Timeline of Smart Contract Implementation



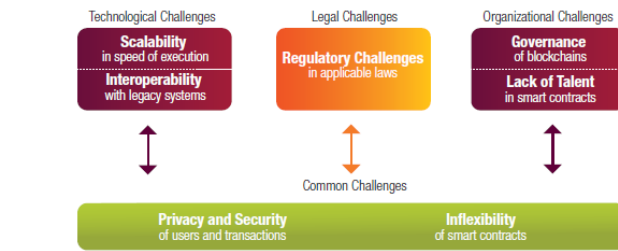
Source: Capgemini Consulting Analysis

Smart contracts cannot initiate wire transfers from one account in a regular bank to another , There are no interfaces that would bring together blockchain-based banks, tax regulator, and compliance monitoring institutions The data stored on the public blockchain has no privacy. When it comes to financial operations, not all the clients would be happy about it The legal status of smart contracts is not as clear as it should be The blockchain is vulnerable to some extent When these issues are resolved, we may expect a shift towards blockchain in the banking industry. However, it's likely that banks would keep on working with traditional contracts and fiat money but gradually introduce cryptocurrency solutions and smart contracts.

1-2challenges Of smart contracts.

There are several challenges that need to be overcome before complex smart contracts can become mainstream see Figure (3)

Figure (3) challenges Of smart contracts



Source: Capgemini Consulting Analysis

Inflexible contracts a-

Smart contracts are programmed logic and are immutable during the course of execution of a transaction. However, real-world contracts can be modified as long as the parties in the contract agree. Techniques need to be explored to upgrade contracts as necessary during the term of a contract.

Scalability of transactionsb-

For transactions such as syndicated loans or mortgages, where high speeds are not an issue

permissioned blockchains are, certainly for now the preferred path. This is because there tends to be fewer participants to the consensus, decreasing the time needed for consensus on transactions and execution time.

c- Scarcity of Talent Poolc

There is a dearth of smart contract and blockchain talent and capabilities within financial services banking. For example, banks may need to recruit "coder lawyers-

computer programming. banks need to put very rare combination of skills that

in place skills development programs for their existing resources, and some startups have started to provide training support on their platforms.

Contract Secrecy and Security Needs: -d

Secrecy of contracts may be a challenge for enterprise-related smart contracts depending on the type of permissioning put in place on blockchains.

Since transaction records can potentially be visible to all participants, banks will be reluctant to collaborate on a common smart contract platform if security and privacy of data are not taken into account. Cryptographic key management is crucial to hide transaction details from unknown parties.

-Governance:e

Smart contracts on distributed ledgers eliminate the need for a trusted intermediary, as the required authority is provided by the transparency and the consensus among the participants. This model requires that multiple banks, consumers and potentially regulators come together on one platform and agree on aspects of data access, dispute resolution and limitations of liability.

2- Smart Contracts in Islamic Banks

The financing instruments of Islamic banks are based on the contractual relationships between the parties of the transaction. The Islamic financing transaction includes three contracts to avoid uncertainty, speculation and interest. Therefore, they involve higher legal and administrative procedures than conventional banking services, which often involve a bank and a customer. This increases the cost of Islamic financing transactions. So Islamic banks always look for alternative solutions to reduce costs and improve the quality of services offered.

The application of smart contract should confront obstacles of Islamic finance to achieving the objective of Shariah (Maqasid al Shariah) namely to realize the benefits (Maslahah) and avoiding the harms or difficulties (Mafsadah and Mashaqqah) in the transaction.

Shari'a rules for contracting should be determined when applying smart contracts in Islamic banks. So do not conflict the application of smart contracts with a necessary principle of Sharia rules, or one of the conditions of the validity of the contract. For example, a clear offer and acceptance is required when the Islamic banks conclude a Murabaha contract with their customers. In any contract even if applied electronically. But because the lack of this condition not accept the offer and thus can stop the sequence of transactions, contrary to the fact that the contract intelligent self-implementation. Therefore there must be a mechanism requiring confirmation or allow interruption after each transaction during the duration of the smart contract. To ensure their compatibility with Islamic principles Sharia rules.

In order to compatible smart contracts with Islamic finance principles, a set of criteria must be met in the Islamic Bank's smart contracts:

- Prohibition of riba-based transactions, where Islamic law prohibits payment and collection of interest.
- Smart contracts should be based on Islamic financing modes based on participation in profit and loss.

- Do not allow the Islamic bank to establish a debt unless it is supported by a real asset, such as gold.

- Prevent the handling of smart contracts in Islamic banks on platforms cryptocurrencies : (Bangash, WWW.ISFIRE.NET)

Acceptance of the currency of the "Bitcoin" in Islamic should achieve conditions in the circulation of the lifting of Gharar and ignorance about them through the knowledge of the issuer and its ability to ensure the issuance, the achievement of public acceptance, and the availability of safety factors in a way that prevents evaporation of user accounts on their personal computers and the loss of their rights. These conditions are not available in cryptocurrencies in their present situation, where they are ignorant of those who issue them and those that guarantee their issuance, They also lack public acceptance, speculation, and excessive prices. In addition, they have become a source of money laundering. It is difficult to consider it a repository of value and a standard for future payments, which is incompatible with Islamic economic rules and purposes. Therefore, the Islamic finance system does not recognize the currency of Bitcoin and other cryptocurrency (Vizcaino, September 18, 2018 / 2:40 PM / 2 months ago).

:-Smart contracts in Islamic banks can be dealt with in two types of currencies

a- **The electronic currencies issued by Islamic banks** are subject to the supervision of the Central Bank, Such types of currencies do not involve Gharar or ignorance and derive their general acceptance from the power of the laws regulating them. This is acceptable in Islamic principles Sharia rules, as long as they are traded in light of the rules of legal dealing. When the union of the type, and even if the rule is not symmetric at the same type.

b- **onegram currency is a new digital currency**, based on a blockchain, covered with a golden cover, since each onegram is equivalent to one gram of gold and all financial transactions made through that currency are Sharia compliant because they are not based on riba-based transactions; Encourages participation in profit and loss, not depend on speculation, and requires gold to be present and therefore more stable.

If Islamic Banks complies with these criterions, it ensures that smart contracts do not conflict the Islamic Shariah rules.

In fact, the convergence has already been started in late 2017 when the Islamic Research and Training Institute, a member of the Islamic Development Bank Group, partnered up with fintech firms Ateon and Settlemint in working on blockchain based smart contracts to create Sharia-compliant financial products and automate the entire contractual process for

Islamic institutions. Not only are these blockchain smart contracts easy to verify, immutable, and secure, but they also alleviate additional administrative and legal complexities and redundancies associated with Shariah compliant financial products. Meanwhile, Emirates Islamic's security enhancement feature, called Cheque Chain, involves the bank issuing new cheque books carrying a unique quick response (QR) code on every leaf along with 20 random characters. The next phase of the project will see the bank registering each cheque leaf on its blockchain platform to validate the authenticity of the cheque at source.

2-1 benefits of applying smart contracts in Islamic banks

The application of smart contracts in Islamic banks requires the adaptation of the terms of Islamic finance contracts with the smart contracts, The most important benefits are :

a - Reduction in the element of Uncertainty (ghara) through:

.Contractual terms will execute only if the conditions are met *

Automate the entire contractual process for Islamic institutions .*

*The Islamic contracts will be easy to verify immutable and secure mitigating gharar in the form of operational risks arising from settlement and counterparty risks

*Gharar in the form of administrative and legal complexities and redundancies will also be mitigated.

b-Reduce the cost of Islamic Finance products : Critics of Islamic finance often underline the higher administrative and legal costs associated with its composite products requiring multiple contractual arrangements so Self executing smart contracts resolve this precise problem .

c- Faster and efficient transaction by Lower execution cost , decentralize nature

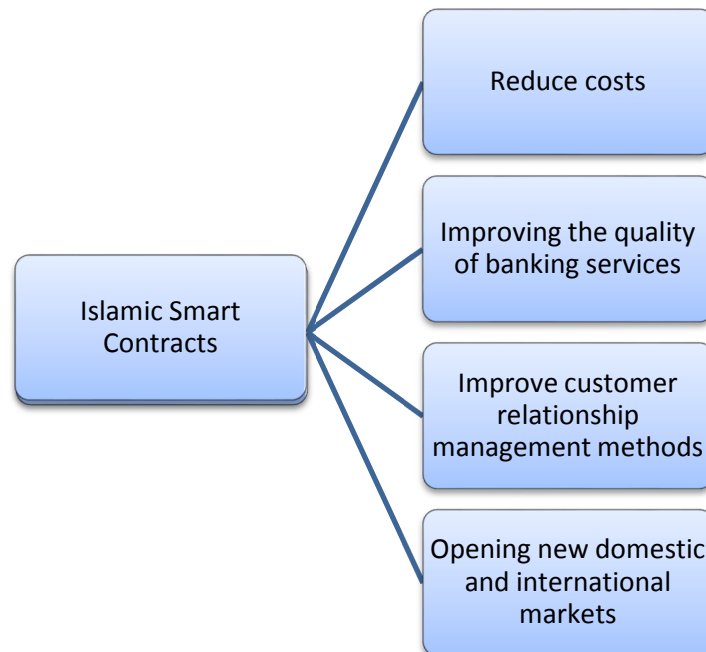
Transactions are trackable and irreversible ,and Eliminates the risk of conflict of interests and/or moral hazards between participant .

smart contracts and Islamic banksEfficiency2-2

The Smart contract applications in Islamic banksaccelerate exponentially, however, with the integration of AI, robotics, blockchain, open banking APIs and the internet of things. The smarter use of data, combination of non-financial and financial solutions, and new, real-time delivery alternatives could significantly change the entire structure of banking,the impact of new digital technologies will be felt across the entire Islamic banking value chain, impacting the competitive structure and the ways people bank. More than ever, the transaction-based component of banking will be commoditized, with differentiation achieved through the

personalized experiences provided the consumer .Increasing operational efficiency rates is one of the objectives that the Islamic Bank seeks to achieve when introducing applications Smart contracts within the banking services, The figure (4) shows the mechanism of achieving efficiency in Islamic banks based on smart contracts.

figure (4) shows the mechanism of achieving efficiency in Islamic banks based on smart contracts



The figure shows that:

-The adoption of smart contract applications in Islamic banks help Islamic banks

Opening new domestic and international markets , to break time and space barriers and gain market share in markets, and increase the chances of the Islamic Bank to open new domestic and global markets through modern means to provide services to the consumer through a wider geography.

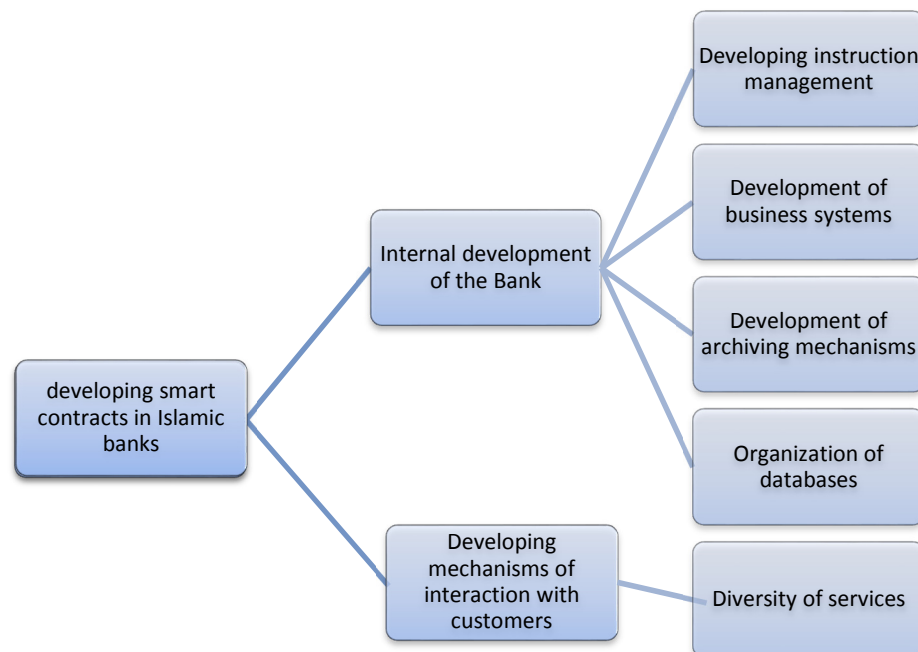
- Improving the quality of financing services provided by Islamic banks: The quality of the financing services provided by the Islamic Bank depends on the mechanisms of financing the smart contracts and the awareness of customers of the benefits of providing services with these innovative financial technologies for financing to achieve customer satisfaction and a sense of credibility towards the Islamic Bank.

- Smart Islamic contracts in Islamic banks contribute to reducing the average cost of the productive unit and increasing the internal size economies of Islamic banks as a result of reducing the administrative complexity necessary to complete transactions and enhancing the ability to expand their financing. investing in human resources and developing their skills and expertise through specialized training .

.Maximizing the expected returns of a smart contract application to Islamic banks requires the improvement of the corresponding supplements associated with the application of that financial technique:

-An appropriate business climate: Islamic banks need to update data on the Islamic banking industry through an information bank that serves these banks. In order to raise the efficiency of Islamic banking business, The success of the proposed mechanism to improve banking efficiency through smart contracts requires a number of requirements described in the figure(5).

As shown figure (5)requirements of smart contracts in Islamic banks in figure (5)**requirements of smart contracts in Islamic banks**



Improving the efficiency of human capital through: Activating e-culture among officials ,Encourage officials to make investment decisions in technologyMeeting the high cost of investment in technology,face the risks of protection and systems security.

-The existence of rational and efficient management that is compatible with technical finance, and has the ability to interact with developments, interaction with variables and strategies.

Islamic banks Efficiency (Case Study)3 -

Based on the experiences of other countries, it can be said that Malaysia, Indonesia, and the Gulf Cooperation Council countries are among the most important countries in the Islamic world that have been interested in smart contract technology in developing the performance of Islamic banks .Although digital technology services included a limited number of services such as online payment and banking services, these banks have been able to introduce their products and improve their services through the digital technology of smart contracts, which has contributed to the efficiency of these banks competitiveness .Operational efficiency has been achieved under smart contracts by strengthening the direct e-payment system, automating processes and eliminating the possibility of errors in operations, smart contract technology can contribute to maximizing efficiency of Islamic banks , Islamic banks tend to have higher operating costs vs conventional banks, The usage of smart contract could make banking efficient by lowering operational cost providing banking solutions to the unbanked and Rising internet mobile , smartphone penetration in markets with Islamic banking supports the growth of Fintech models to provide banking solutions Thus lack of the availability of Islamic investment options for investors makes the process of building a sharia-compliant investment portfolio complex, expensive and inefficient. However, smarter use of technology could be very well used to screen all available investment for fraction of the cost contracts to smart contracts and cutting cost of services substantially Blockchain could help Islamic banks adapting Islamic finance contracts

.In this part of the research we will attempt to study the impact of smart contracts on the efficiency of the Islamic banks . But because of the difficulty of conducting a comprehensive survey of all Islamic banks that used smart contract technology for the high costs and effort required, the study sample was limited to five leading Islamic banks using smart contracts (Bahrain Islamic Bank, Al Baraka Bank Bahrain, Emirates Islamic Bank, Dubai Islamic, Boubyan bank Kuwait), During the period 2015- 2017 . The research was based on the financial statements and annual reports of the banks under study

Operational efficiency (ChoiKanghwa,2000,p590)is defined as the relationship between the amount of resources used and the results achieved,

by maximizing outputs, Or reduce the amount of inputs used to reach a certain volume of output, measured as follows: Actual outputs / maximum outputs from available resources; Operational efficiency consists of technical efficiency and custom efficiency. Technical efficiency is defined as the ability of an enterprise to produce a certain level of output or product With the lowest amount of resources (inputs), assuming that the technological factor is constant; and allocative efficiency is the manner in which resources are optimally distributed to different alternative uses, taking into account the costs of their use.

The operating efficiency of Islamic banks has been assessed using financial ratios to measure their efficiency in using Resources, and the extent to which they are successful in achieving their objectives. The function of these standards is to measure the Bank's success in effectively linking the resources used and outputs. It aims at demonstrating its success in achieving the best possible outputs with minimal inputs

Profitability assessment

The profitability of the sample of the banks under study is measured by the indicators of return on equity Asset Benefit, Equity multiplier, Return on Assets ,The table (1) shows the most important indicators of profitability for the sample of Islamic banks studied for the period 2014-2017

Table(1) profitability for the sample of Islamic banks studied for the period 2015-2017

| Islamic banks | The Return on Equity (ROE) | The Return on Assets)ROA(| Asset Utilization (AU) | equity Multiply)EM(|
|------------------------|-----------------------------------|-----------------------------------|-------------------------------|-----------------------------|
| Bahrain Islamic Bank | %9,98 | 2,06% | %5,03 | 5,00 |
| Al Baraka Bank Bahrain | %9,77 | %0,99 | %5,85 | 9,88 |
| Emirates Islamic Bank | %9,29 | %2,45 | %5,57 | 3,87 |
| Dubai Islamic Bank | %17,67 | %1,79 | %5,71 | 10,40 |
| Boubyan bank | %7,86 | %1,58 | %6,38 | 5,30 |

Source: Preparation of the researcher based on published financial reports of the studied banks

The table shows that Dubai Islamic Bank has achieved the highest rate of return on equity, followed by Bahrain Islamic Bank, while the asset benefit index is close to the studied Islamic banks.

Evaluation of cost efficiency

In the cost efficiency assessment we rely on the profit margin indicator (PM) ,Costs to income (CTI) , which shows the Islamic Bank's ability to control its costs

Table (2) average cost efficiency of the sample of Islamic banks studied during the period 2015-2017

| Islamic banks | Costs to income CTI)(| Net profit margin PM)(|
|------------------------|------------------------------|-------------------------------|
| Bahrain Islamic Bank | %34,92 | %40,16 |
| Al Baraka Bank Bahrain | %48,42 | %19,48 |
| Emirates Islamic Bank | %33,65 | %44,68 |
| Dubai Islamic Bank | %26,04 | 30,40% |
| Boubyan bank | %30,44 | %25,18 |

Source: Preparation of the researcher based on published financial reports of the studied banks

The table shows that Dubai Islamic Bank achieved the lowest cost to income ratio during the period of study by 26.4%, while Al Baraka Bank of Bahrain achieved the highest cost to income ratio of 48.42%. Costs during the study period

Emirates Islamic Bank achieved the largest profit margin during the period of study at 44.68%Bahrain Islamic Bank achieved the smallest margin of 19.48% during the study periodThis explains that Emirates Islamic Bank has introduced a package of intentional smart contracts on Blockchain,Which was reflected in the increase in the profit margin and did not appear in the cost index .

economies of scale

Technological innovation through smart contracts has led to the reduction of the average cost of the productive unit and increase internal economies of scale of the Islamic banks as a result of reducing the administrative complexities necessary for the completion of transactions, enhancing the ability to expand their financing and investment operations invest in human resources and developing their skills and expertise through specialized

training, The table (3) shows Economies of scale for the sample of Islamic banks studied during the period 2015-2017

table (3) Economies of scale for the sample of Islamic banks studied during the period 2014-2017

| Islamic banks | Total Output (Thousand dollars) | Economies of scale |
|------------------------|---------------------------------|--------------------|
| Bahrain Islamic Bank | 335.644 | 0,4263 |
| Al Baraka Bank Bahrain | 1. 918.428 | 0,6589 |
| Emirates Islamic Bank | 7. 295.399 | 0,7419 |
| Dubai Islamic Bank | 22. 278.985 | 1,3472 |
| Boubyan bank | 854.687 | 0,5417 |

Source: Preparation of the researcher based on published financial reports of the studied banks

Most Islamic banks studied have economies of scale, The smaller the size of the bank, has a relatively high positive economies of scale compared to the rest of the sample, while larger Islamic Dubai has negative economies of scale (Diseconomies of Scale)

Conclusion

although Islamic smart contracts have positive effect for operational efficiency of Islamic banking ,but Islamic banks must take into consideration the most important challenges to the application of smart contracts, as smart contracts could signal threats for the smaller Islamic banks Which has relatively limited technological infrastructure For example, SMEs could increasingly shift towards these Fintech Islamic banks for their capital needs – driven partly by their simple, low-cost alternative financing instead of tedious and lengthy procedures offered by the Islamic banks, At the same time the only way for the smaller Islamic banks to avert pressure is to rapidly adopt digital strategies and use them effectively to deliver value to their customers. The bigger Islamic banks have realized this threat and have been pushing to have the best IT solutions in place. One possible direction for development of Fintech technologies by the incumbent banks was revealed by the recent launch of Algo Bahrain – where Islamic banks have agreed to come together to develop and commercially use Fintech solutions. Strategic risk as banks lose a large part of their market share or profitability if emerging financial technology firms can innovate faster, expand, and deliver lower-cost services that better meet customer expectations and reach wider segments of customers. The legal

risks that occur when the Bank does not respect the legal rules and legislations provided or where there are no clear and precise legal systems for new banking operations. The most important legal challenges are: determining the acceptance of the law for electronic contracts, proof of proof, means of payment, Electronic signatures, cash payment systems, digital or electronic money, information confidentiality, information security from the risk of high-tech crime, customer privacy, liability for errors and risks, authenticity of electronic communications, contracting Electronic banking, and intellectual property issues for the software and the rules of bank information or used from the site of the bank or associated with them, and the relationships and bank contracts with providers of technology or services supplied to or with allied sites or merger, participation and cooperation informational projects.

References:

- "Smart Contracts in Financial Services: Getting from Hype to Reality", Capgemini Consulting Interview, June-July 2016 .
(SANER), pp. 442-446, IEEE, 2017.
Access, vol. 4, pp. 2292-2303,.
- Amjad Bangash "Bitcoin, Cryptocurrencies, Blockchain Technology: A SHARI'A Analysis And Their Applications In Islamic Finance" , ISLAMIC FINANCE REVIEW , WWW.ISFIRE.NET.
- Bernardo Vizcaino " **OneGram lists Islamic cryptocurrency on its own virtual exchange**", Financials ,September 18, 2018 / 2:40 PM / 2 months ago..
- Buterin, Vitalik (2013): A Next-Generation Smart Contract and Decentralized Application Platform, Ethereum White Paper.
- CB Insights (2017) "Venture Capital Funding Report 2017" «New York .
- Cecchetti, S G and K L Schoenholtz (2017a), "**Modernizing the U.S. Payments System: Faster, Cheaper, and More Secure**," www.moneyandbanking.com, 31 July.
- Chishti, S., & Barberis, J. (2016). *The Fintech Book. The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries*. Chichester, West Sussex, United Kingdom: Wiley & Sons Ltd.
- CoinDesk, "**Deutsche Bank Seeks Real-World Impact With Blockchain Strategy**", April 2016 .
- Das, S. (2017). **OneGram Launches \$500 Million ICO for Sharia-Compliant Gold-Backed Digital Currency**. Crypto Coins News. 29 May, 2017. Available Online: <https://www.cryptocoinsnews.com/onegram-launches-500-million-ico-sharia-compliant-gold-backed-digital-currency>.

- Dhaliwal, S. (2017). **Is Bitcoin Halal? How Cryptocurrency Conforms with Shariah**. *Coin*. Coin Telegraph. February 23, 2017. Available Online: <https://cointelegraph.com/news/is-bitcoin-halal-how-cryptocurrency-conforms-with-islam>.
- Evans, C.W. (2015). **Bitcoin in Islamic Banking and Finance**. *Journal of Islamic Banking and Finance*, Vol. 3, No. 1, pages 1-11.
- Fait Muedini "(2018) **"The Compatibility of Cryptocurrencies and Islamic Finance"***EJIF – European Journal of Islamic Finance No10, August* .
- Geiger, P. (2017). **Get into Bitcoin before the next financial crisis**. Medium. September 11, 2017. Available Online: <https://medium.com/@philgeiger/get-into-bitcoin-before-the-next-financial-crisis-f0707e2d56c1>.
- Habib Ahmed. 2017. **Contribution of Islamic Finance to the 2030 Agenda for Sustainable Development**. <http://www.un.org/esa/ffd/high-level-conference-on-ffd-and-2030-agenda/wp-content/uploads/sites/4/2017/11/Background-Paper-Islamic-Finance.pdf>.
- Italik Buterin Ethereum White Paper"**A Next Generation Smart Contract & Decentralized Application Platform** " (2015) .
- J. Stark. Making "sense of blockchain smart contracts" (2016) www.coindesk.com/making-sense-smart-contracts
- Josh Stark, "**How Close Are Smart Contracts to Impacting Real-World Law?**" , (2016) www.coindesk.com/blockchain-smartcontracts-real-world-law .
- K. Christidis and M. Devetsikiotis, 2016 "Blockchains and smart contracts for the internet of things," IEEE
- Luisanna Cocco, Andrea Pinna, and Michele Marchesi "**Banking on Blockchain: Costs Savings Thanks to the Blockchain Technology**", *Future Internet* **2017**, 9, 25.
- McLean, J. (2016) "**Banking on Blockchain: Charting the Progress of Distributed Ledger Technology in Financial Services**" Technical Report; Finextra Research Ltd.: London, UK.
- Michael Casey, Gary Gensler, 2017 "**The Impact of Blockchain Technology on Finance: A Catalyst for Change** ", Geneva Reports on the World Economy. Oxford University, "**Smart Contracts: Bridging the Gap Between Expectation and Reality**", July 2016.
- PWC (2016): **How Smart Contracts Automate Digital Business**. <http://usblogs.pwc.com/emerging-technology/how-smart-contracts-automate-digital-business/>
- Schroeder "**Bitcoin and the Uniform Commercial Code**" ,(2016) 24 U. Miami Bus. L. Rev. 1 at 65; Joshua A.T. Fairfield Bitproperty, 88 S. CAL. L. REV. 805 ,2015.
- T. Chen, X. Li, X. Luo, and X. Zhang, 2017 "Under-optimized smart contracts devour your money," in IEEE 24th International Conference on Software Analysis, Evolution and Reengineering

-
- T. Swanson. Great chain of numbers "A guide to smart contracts, smart property and trustless asset management", 2014,
- Talini, C. and J. Gans (2018), "Initial Coin Offerings and the Value of Crypto Tokens", MIT Sloan Research Paper No. 5347-18.
- The Conversation, "Blockchain could challenge the accepted ways we shape and manage society", January 2016.
- Vigna, P., & Casey, M. J. (2015). *Cryptocurrency. The Future of Money*. London: Vintage.
- Zarrouk, Hajer, Teheni El Ghak, Elias Abu Al Haija, (2017) "Financial development, Islamic finance and economic growth: evidence of the UAE", Journal of Islamic Accounting and Business Research, Vol. 8 Issue: 1, pp.2-22, <https://doi.org/10.1108/JIABR-05-2015-0020>.- Hazik Mohamed 2016 " The Blockchain and Islamic Finance", Islamic Finance Today - November | December .