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## **ЧЕТВЕРТАЯ ПРОМЫШЛЕННАЯ РЕВОЛЮЦИЯ В ИСЛАМСКИХ ФИНАНСАХ: НА ПРИМЕРЕ ЦИФРОВЫХ ВАЛЮТ ЦЕНТРАЛЬНЫХ БАНКОВ**

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Достижения в области искусственного интеллекта, робототехники, нейронных сетей, искусственных конечностей и систем, автоматизации, виртуальной и дополненной реальности, машинного обучения и др. открывают большие перспективы для повышения эффективности и приобретения знаний. Децентрализация – одна из тенденций на современном мировом финансовом рынке. Активное развитие исламской финансовой и банковской индустрии, рост числа мусульман в мире и другие факторы определяют интерес исследователей к вопросам цифровизации. Данная статья посвящена изучению возможностей, подходов и взглядов на использование цифровых валют с точки зрения исламского финансирования. Применяются методы анализа и синтеза, сравнительного анализа. Анализируются подходы различных стран мусульманского мира к внедрению цифровых валют, рассматриваются текущие проекты. В исламском мире пока не сложилось единого мнения о допустимости и масштабах возможного использования цифровых валют. Авторы приходят к выводу, что в целом цифровые валюты могут гармонично использоваться в рамках концепции исламских финансов. Этому способствуют такие факторы, как прозрачность децентрализованных финансов и цифровых валют, вклад в защиту богатства общества, акцент на социальных выгодах, что соответствует благим целям исламских финансов и их социальной ценности.

Ключевые слова: децентрализованные финансы, криптовалюта, финансы, соответствующие шариату, цифровая экономика.

## **THE FOURTH INDUSTRIAL REVOLUTION IN ISLAMIC FINANCE: THE CASE OF DIGITAL CURRENCIES OF CENTRAL BANKS**

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Advances in artificial intelligence, robotics, neural networks, artificial limbs and systems, automation, virtual and augmented reality, machine learning, and other fields hold great

promise for improving efficiency and knowledge acquisition. Decentralization is one of the trends in the modern global finance market. The growth and active development of the Islamic finance and banking industry, the growth in the number of Muslims in the world and other factors determine the interest of researchers in digitalization issues. This paper is devoted to the study of the possibilities, approaches and views on the use of digital currencies from the point of view of Islamic finance. Methods of analysis and synthesis, comparative analysis are used. The approaches of various countries of the Muslim world to the introduction of digital currencies are analyzed, ongoing projects are considered. In the Islamic world, there has not yet been a consensus on the permissibility and scope of the possible use of digital currencies. The authors conclude that, in general, digital currencies can be harmoniously used within the concept of Islamic finance. This is facilitated by such factors as the transparency of decentralized finance and digital currencies, the contribution to the protection of the wealth of society, the focus on social benefits, which is in line with the good goals of Islamic finance and its social value.

*Keywords:* decentralized finance, cryptocurrency, Sharia-compliant finance, Digital Economy.

### Introduction

The arrival of a new era, the Industrial Revolution (IR4.0), is increasing the use of highly automated processes and new technologies that reduce human intervention and speed up simple processes in the banking life cycle. in arts and crafts. The 4th wave of the Islamic banking industry is compatible with existing fintech tools such as blockchain, robo-advisors, peer-to-peer finance, crowdfunding and payment gateways. However, the utilization rate is low in most Muslim countries due to financial constraints, regulations and shortage of software development professionals.

Since Islamic finance is relatively younger and smaller than its traditional counterparts, the opportunities for Islamic banks are more related to achieving success through digital transformation, which is also consistent with the academic consensus in the literature [17]. The growth of Islamic fintech and banking customers is driven not only by the growing trust of existing users, but also by the rapidly growing Muslim population around the world. The number of Muslims is projected to exceed 3 billion by 2060, and most Muslim countries are experiencing significant population growth rates [8].

### Methodology

The purpose of this study is to analyze the possibilities, approaches, and views on the use of digital currencies from the point of view of Islamic finance. Methods of analysis and synthesis, comparative analysis are used. The approaches of various countries of the Muslim world to digital currencies are analyzed. Reports of PwC, Council of Arab Central Banks and Monetary Authorities Governors, central banks were used as data sources.

### Decentralized Finance and the Concept of Islamic Finance: Opportunities and Threats

Decentralization is one of the trends in the modern global finance market. The idea is to deprive the state and centralized structures such as banks and governments of complete control over the issuance and circulation of money. In fact, thanks to the emergence of new technologies, such as blockchain, the need for centralized bodies and their infrastructure is significantly reduced.

The benefits of using Islamic blockchain in finance and banking are very numerous (Table 1):

1. Transparency and accountability. Blockchain can increase the transparency and accountability of financial transactions. Each transaction is recorded on a public ledger, making it easy to track and verify. This makes it more difficult for fraud and corruption, which is one of the main problems in the Islamic finance industry.

2. Risk reduction: Blockchain can reduce the risk of errors and errors in financial transactions. Blockchain technology uses smart contracts, which are self-executing contracts with the terms of the agreement written directly into the code. This eliminates the need for intermediaries and reduces the chance of human error.

3. Efficiency. Blockchain can provide a more efficient way to conduct transactions. With blockchain, transactions can be carried out in real time, eliminating the need for intermediary banks and reducing the time and costs associated with traditional banking transactions.

Table 1

Comparison of Traditional and Decentralized Finance

	Traditional Finance (TradFi)	Decentralized Finance (DeFi)
1	2	3
Characteristics	Centralized financial institutions that provide financial services	Decentralized Applications and Protocols that provide financial services
Regulation (custody)	Held by institution or custody provider (held by a regulated service provider or custodian on asset owners' behalf)	Held directly by users in non-custodial accounts or via smart contract
Control	State, regulators, legislation	Not yet regulated and controlled
Management	Defined by exchanges and regulators	Managed by protocol developers and users
Access	At the platform's discretion	Free
Account unit	Fiat currency	Digital assets, cryptocurrencies, tokens, stablecoins
Fulfilment	Support through intermediaries	Simplified via smart contract
Speed	About 3–5 business days depending on the transaction, during business hours	From seconds to minutes depending on the blockchain, 24/7
Clearing	Facilitation through clearing houses	Facilitated through blockchain transaction

End of table 1

1	2	3
Auditing capability	Authorized third party audits	Open source and public ledger, can be checked by anyone
Collateral	Transactions can be without collateral, intermediaries take the risk	Usually an excess deposit is required
Risks	Vulnerable to hacking and data leakage in asset management software systems	Vulnerable to hacking and data leakage of smart contracts
Availability and privacy	Identity checks conducted by service providers. Personal data is subject to national privacy laws	Identity verification requirements are discussed as part of the anti-money laundering regulations. User balances and transaction activity are generally public

This leaves the question of whether decentralized finance is halal? If you look at the issue globally, then there is nothing haram about DeFi as such. In fact, it is perhaps more Islamic at its core. Here it is also worth understanding that Sharia law imposes restrictions and principles on the services themselves, but does not take into account their technological basis.

### Cryptocurrencies in Muslim Countries

The Islamic community partially understands the risks and uncertainty of cryptocurrencies, which can be understood from the fatwas of a number of Sharia mufti scholars. There has not yet been a consensus and approach to the interpretation and permissibility of cryptocurrencies in the Muslim world. For example, influential Sharia scholars from Egypt and Indonesia have declared that all cryptocurrencies are haram. However, Rabbani et al. [15] argue that not every Islamic scholar understands the basic structure of these products.

We should note that some Islamic scholars allow the use of cryptocurrency, but at the same time set such difficult conditions that, in fact, in reality reduce their permission to a prohibition [10].

Some studies draw attention to one of the main problems of all digital currencies – double spending. Double spending occurs when the same organization spends the same monetary unit twice. In centralized payment systems, the center maintains a transaction log. Thus, every spending is recorded. However, in a decentralized system, there is no center for the registry. To avoid double spending, any transaction must be approved by all joining nodes and then recorded in the ledger [4].

From a Sharia perspective, the major cryptocurrencies have a critical element of Gharar. It is revealed by high volatility, unknown real value, and wrong methods of accumulating value [1]. The Arabic word gharar (غرر) means excessive uncertainty and risk and is forbidden in Islamic transactions and contracts [3]. Meera A.K.M. focuses on the lack of intrinsic value and central bank oversight of cryptocurrencies; hence they will be against sharia in terms of social justice [11].

It's interesting that the key cryptocurrencies are usually classified as halal by the majority experts. These include Bitcoin, Ethereum, Tether, Litecoin and others. But the Synthetix cryptocurrency is considered as haram. In essence, the coin is a derivatives trading system. According to most Islamic scholars, the use of derivatives is unacceptable.

Some cryptocurrencies have also been recognized as Sharia compliant: Stellar Lumens (XLM), OneGramCoin (OGC), etc. Of particular interest is the native coin of the Haqq Islamic coin (ISLM) ecosystem – in 2023, the world's first ecosystem was released that respects the principles and traditions of Islam. The coin is focused on providing the Muslim population of the world with a financial platform with 100% halal cryptocurrency. Focusing on stimulating the adoption of cryptocurrencies in 185 countries, Islamic Coin received accreditation and permission in accordance with the fatwa from several Muslim authorities. any project can be placed on the Haqq blockchain, but if it does not comply with Sharia norms and does not pass the verification, it will not receive the appropriate mark, which “guarantees the trust of the community.” However, some studies argues to the contrary that cryptocurrencies, even mainstream ones, can be allowed by Shariah, and none of the arguments related to their inadmissibility have any serious basis. Oziev & Yandiev mention these moments and argue that bitcoin's record highs are not due to its Gharar technicality, but to its rapidly growing popularity and era-opening innovations [12]. Moreover, in terms of public interests, cryptocurrencies could develop Islamic society in several dimensions, increasing the overall wealth. Indeed, the risk associated with investing in cryptocurrencies could be minimized by joining individuals in partnerships that would apply the Musharakah structure.

### **Central Bank Digital Currencies in Muslim Countries**

Another interesting phenomenon is the Central bank digital currency (CBDC) which became in fact the answer of central banks to the emergence of cryptocurrencies. Central banks and governments around the world do not view these cryptocurrencies and stablecoins as money and are warning the general public to use them with great care due to the high volatility of their value and therefore the high degree of risk.

The practice dates back to 2015, when Ecuador became the first country to launch an e-currency. The government banned bitcoin and competition for e-money systems before moving to e-money. Today, the list of such countries has expanded significantly – It is interesting that all these countries are united by the ongoing policy of de-dollarization.

According to the report of the Arab Monetary Fund (AMF) [9], 17 central banks of the Arab countries are in the process of studying or developing a CBDC – Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Yemen, Oman, Palestine, Qatar, Saudi Arabia, Sudan, Tunisia, UAE

(Table 2). But it is also important to note that so far there is no precedent for the transition from fiat currencies to digital ones, or even exceeding their share.

Table 2

**Participation of Arab Central Banks in Digital Currency Projects\***

Country	Considering or exploring CBDC	Current stage
Jordan	No	
UAE	Yes	Already engaged
Bahrain	Yes	Already engaged
Tunisia	Yes	Under exploration
Algeria	No	
Saudi Arabia	Yes	Already engaged
Sudan	Yes	Under exploration
Iraq	Yes	Under exploration
Oman	Yes	Under exploration
Palestine	Yes	Under exploration
Qatar	Yes	Under exploration
Kuwait	Yes	Under exploration
Lebanon	Yes	Under exploration
Libya	No	
Egypt	Yes	Under exploration
Morocco	Yes	Under exploration
Yemen	No	

\* Compiled on the Report of the Arab Monetary Fund (AMF).

Among Muslim countries, the ABR project implemented by the Saudi Arabian Monetary Authority (SAMA) and the Central Bank of the United Arab Emirates [16] has received the most development. The GCC countries are the most active in the Muslim world in the development of the digital economy [2]. It is not surprising that notable projects for the introduction of digital currencies are being implemented here.

The first steps towards the implementation of the project were taken in 2019. The main goal is to improve the efficiency of interbank and cross-border payments, as well as the relationship between the Saudi Riyal (SAR) and the Emirates Dirham (AED). The project is implemented using the DLT platform/protocol – namely Hyperledger Fabric (HLF), a protocol that was developed specifically for the requirements of the project. As part of the project, the ABR digital currency was created, pegged to the US dollar. Simply put, ABR effectively manages the exchange rates of the rial, dirham and dollar among themselves.

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Three use cases have been explored:

- cross-border settlement between two central banks;
- internal settlement through three commercial banks in each country;

– cross-border transactions between commercial banks using digital currency.

To date, the project has been deemed viable and additional options are being considered, including the possibility of exploring the role of a central bank versus commercial banks and testing a retail CBDC.

According to the PwC report [13; 14], Aber is one of the top 10 largest wholesale CBDCs in the world (in 2021 – 10th place, in 2022 – 7th place).

But the use of the central bank digital currency in the UAE is not limited to this – there are also other projects. The UAE Central Bank is exploring the use of DLT technology in a number of projects, including a partnership with Emcredit to issue a stable digital currency called "emcash" pegged to the UAE dirham (AED). Development has not yet been completed, but given that emcredit is a subsidiary of the Ministry of Economic Development, its use as a CBDC is likely to be actively used.

It is also necessary to mention the mBridge project: in February 2021, the Central Bank of the United Arab Emirates (CBUAE) joined the Multiple CBDC Bridge (mBridge) project, which is being implemented in partnership with the BIS Innovation Hub, the Hong Kong Monetary Authority), the Bank of Thailand and the Digital Currency Institute of the People's Bank of China. The goal of the project is to develop an experimental prototype to facilitate real-time cross-border exchange payments using DLT technology. As of 2019, the total value of international trade transactions between mBridge members is about \$250 million.

### Discussion

When discussing cryptocurrencies, Sharia- compliant or not, the concept of a central bank-issued digital coin with real intrinsic value and underlying asset seems to solve most of the issues discussed. In the direct model, the concept of a central bank digital currency (CBDC) [6] allows users to open their accounts directly with the central bank rather than with commercial banks or other institutions. Such a system requires huge investments and a distributed ledger protocol. Therefore, the running costs of the consensus mechanism cause DLT-based infrastructures to require a large investment, making it unattractive for straight-forward CBDC structures. Except for small regions where the daily number of transactions is managed by the distributed ledger-based central bank infrastructure, the traditional central bank infrastructure is preferable for direct application CBDC projects. Several existing CBDC experiments in different countries also give similar results on this technical side [7]. Moreover, unlike a decentralized private coin, the consensus mechanism is quickly under pressure due to a denial-of-service attack, making it risky to be used as the infrastructure of an entire economy [5].

Cryptocurrency must comply with the key Sharia requirements for money. Firstly, the issuance process must be free from *riba*; banknotes can be made from

any material; the use of banknotes of other states is not prohibited; banknotes and money circulation should help smooth out social stratification; a person's property right to banknotes should not be unspoken. At the same time, many do not consider cryptocurrency as a currency. Instead, they are interested in long-term investments. Today, it is considered that investing in cryptocurrency is halal if the project itself is halal. However, when it comes to analyzing which cryptocurrencies are halal, there are different opinions on this issue.

It should also be noted that in practice the possibility of introducing digital tools and products in Islamic finance is difficult due to many facts, including the novelty of the product, the relatively small size of the Islamic finance market.

The emergence of digital currencies of central banks reduces the role of commercial banks in the country's financial system, and increases its transparency. Their feature allows you to fix the terms of use at the algorithm level – for example, by default, comply with the ethics of Islamic finance, regardless of the user's actions.

It is also important that this tool be used within the Muslim community, especially in the area of cross-border payments.

There are two main possible models for the adoption of central bank digital currencies in the Islamic region:

- The model of an Islamic state in which Sharia is dominant. In this case, the base CBDC is initially made as Islamic, with possible exceptions ranked by groups (for non-Muslims, expats, tourists, etc.);
- A model of a secular state in which the underlying CBDC is neutral. In this case, the state may allocate a sub-segment (or sub-segments) of the Central Bank for voluntary use by believers.

### **Conclusion**

The Islamic economy is experiencing significant growth on a global scale and has great potential to follow the global trends in the fourth industrial revolution. Technological innovations can transform production and improve living standards, especially in developing Muslim countries. However according to experts, writers and various leaders around the world, the globalization of the fourth industrial revolution is causing a lot of problems, changes and instability in international societies and governments, especially in Muslim countries and systems. In general, the study shows that decentralized finance and digital currencies do not contradict the doctrines of Islam and can be used in Islamic finance. We see confirmation of this in the active development of some areas on the part of Islamic financial institutions.

Transparency, investing for social benefit, protecting the wealth of people and the environment, protecting the human factor, and minimizing friction in terms of money, labor, and time are some of the common goals of both decentralized and Islamic finance.



In fact, Islamic financial institutions pioneered the use of digital banking and smart contracts (when issuing smart sukuk). It is also worth highlighting that digital currencies are widespread in Arab countries, which focus their efforts on the study and implementation of digital currencies as a tool to prevent money laundering, counter terrorism, improve the efficiency of both retail and wholesale, regional and international payments.

Much of the interest of the Arab world in central bank digital currencies lies in the strengthening of interconnections between central banks. However, the uneven development of new financial technologies and the launch of regional CBDCs is only the first step towards the financial revolution.

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