

## **Smart contract applications via Block chain technology to support and enhance digital financial inclusion**

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### **Abstract:**

We aim through the research paper to present the contributions of block chain technology in achieving digital financial inclusion. This technology is considered one of the most important innovations of the digital revolution in the past two decades, and it is expected to have a similar impact to that of the internet when it first emerged. Its uses have quickly multiplied in various sectors, as it enables transparent transactions in a faster and more cost-effective manner, with easier and more secure means that help in digital transformation and the transition to smart systems. Based on this, this study comes to understand the role of block chain technology in promoting financial inclusion and implementing it in reality. Smart contracts reshape traditional industrial and commercial processes, as well as public electronic services, as they are an integral part of block chain networks. Smart contracts automatically execute contractual terms without the need for a trusted third party's intervention. As a result, smart contracts can reduce the burden of management operations, save service costs, improve the efficiency of business processes, and reduce risks in various important sectors of individuals lives.

**Keywords:** blockchain, financial inclusion, digital dransformation, smart contracts

**JEL Classification:** O32; G22; O30; Z33

## **Introduction**

The concept of financial inclusion emerged in the early 1990s and gained significant attention after the global financial crisis 2008. It is crucial in promoting development and economic growth and combating poverty and unemployment. It is considered one of the key pillars of financial reform, as it enables financial institutions to reduce the cost of financial transactions and provide various services that are compatible with customers' beliefs and social levels, anywhere and at any time, using multiple modern digital technologies such as blockchain, smart contracts, and artificial intelligence.

The world has witnessed an unprecedented technological revolution in recent years, led by artificial intelligence, the Internet of Things, blockchain, and machine learning. The use of these technologies and others is growing rapidly. This technological leap has quickly impacted people's daily lives, providing solutions to various problems that individuals used to face. Blockchain technology is a prime example of this, demonstrating its immense ability to manage and update multiple transactions in different sectors such as government, finance, agriculture, import, and export. Blockchain is a distributed ledger that includes data collection and conducts transactions without the need for a third-party intermediary in the shortest time and at the lowest possible cost, enhancing the trust of its users.

One of the most important technologies that has emerged in modern technology is blockchain technology, which was initially found as the technical basis for virtual currency and then emerged as a technology. It is now seen as a pioneering development that can reduce friction costs in current transaction systems and enable new models previously not applicable for social and commercial participation. The term "blockchain" refers to a "chain" of pre-defined "blocks" of transactions that form an immutable and distributed digital ledger and a flexible foundation for value transfer. The crucial advantage of blockchain is its ability to enable transactions in an environment where parties do not trust each other and do not want to rely on an intermediary. Blockchain is ideal for applications where transactions are transparent, and no user controls the transaction rules.

In contrast, our centralized cloud database places our entity as a single entity that controls the rules of the underlying system. It also creates a centralized data store that cannot be hacked or destroyed. For example, in places where land records are poorly kept or altered due to corruption, a cloud database managed by a central government will not provide the trust that a tamper-proof blockchain system offers.

**The Problem:** Based on this background, the study will try to answer the following problem:

**How does Block chain technology contribute to enhancing digital financial inclusion?**

In light of this general problem, the following sub-questions are posed:

1. What is Block chain technology? What are its characteristics?
2. What is digital financial inclusion?
3. What are the possible applications of Block chain technology that can enhance the functioning of digital financial inclusion?

**Study Methodology:** In this study, we adopted the descriptive and analytical methodologies, which are suitable scientific methods for the theoretical aspects of the subject and the analysis of its contents.

**Study Objectives:** The study aims to achieve the following:

- Highlight the nature of Block chain, its characteristics, and its advantages.
- Explain the possible applications and uses of Block chain technology in the field of financial inclusion.

**Previous Studies:** Considering the importance of financial inclusion, which has been the focus of many research studies, we mention some of them:

1-Study by **Anis Dergui**: `.

The researcher prepared an article entitled "The Role of Insurance Companies in Promoting Financial Inclusion in Algeria: A Case Study of Fuel Insurance Companies." This study aims to measure the contribution of insurance companies in promoting financial inclusion in Algeria, by examining the case of CASH Fuel Insurance Company during the period of 2012-2019. We relied on descriptive and analytical methods to describe the problem and analyze the associated data, as well as statistical methods to model the relationship between the insurance sector and financial inclusion. We found a significant relationship between the study variables, but the contribution of the insurance sector in promoting financial inclusion in Algeria is weak, due to several factors, some of which are directly related to the insurance activity and others are external factors that insurance companies cannot control.

2-Study by **Saïdi Sabira**:

The researcher prepared an article entitled "Block chain Technology as an Entry Point to Support Insurance Activities and Enhance Financial Inclusion in Algeria." This study aims to highlight the role of modern technologies in supporting various types of insurance activities and enhancing financial inclusion in Algeria. Modern technology, particularly

block chain technology, is considered an application platform for smart contracts, where transactions are proven remotely in the form of digitally processed data, relying on data stored in digital records. This facilitates transparent and decentralized transactions without intermediaries, contributing to the spread of financial inclusion. It has been found that block chain technology plays an important role in developing insurance activities, through the facilitations provided by these technological applications to all those interested in obtaining various insurance services. The Algerian authorities are seeking to adopt various applications and uses of this technology.

**Importance of the study:**

The importance of the research stems from two main aspects. The first is the importance and novelty of the block chain technology topic, which is receiving significant attention and discussion among researchers and experts to determine the various uses of the technology and explore mechanisms for its development. The other aspect lies in exploring the government's use of the technology and its impact on the well-being and improvement of citizens' lives, as well as achieving financial inclusion.

Study divisions:

To address the study topic, three main axes were identified:

- An introductory approach to block chain technology and related foundations.
- Financial inclusion and its divisions.
- Possible applications and uses of block chain in enhancing financial inclusion efforts.

**1-1- The nature of block chain technology and its underlying principles**

All sectors in the world today are influenced by emerging technologies in technology, which are directly related to the internet, and block chain technology is considered one of the most important of these technologies. It has gained global attention in recent years due to its role in the fourth industrial revolution, contributing to changing the face of the global economy, in addition to its capabilities in opening new horizons for development, innovation, and improving human life.

**1-1-1 Definition of block chain**

Block chain or blockchains or chains of trust: A system that allows a group of interconnected computers to create an electronic ledger to verify and authenticate data and transactions, and store them in a long chain of encrypted data on millions of points called nodes around the world. It allows many parties to enter and verify information, so that each point or computer or entity in this chain has the same copy of this data and

information. Each time electronic contracts and agreements are added to the chain, they are verified and authenticated before being added, according to the consensus mechanism followed in the block chain, so that in the end, there is a public, encrypted, secure record that cannot be manipulated or modified. (Anonymous author, 2021)

### **1-1-2 Origin and development**

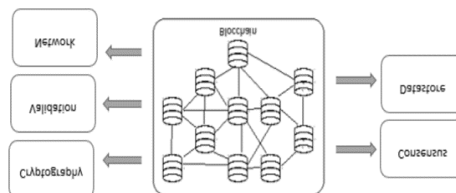
The term block chain was first mentioned in a research paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System," published in 2008 by a group of individuals under the name "Satoshi Nakamoto," and the name was given at that time to the basic part on which the Bitcoin electronic cash system, which was presented in the paper, operates. (Al-Subeai, 2019)

Block chains were first activated in 2009 to be part of the digital currency Bitcoin, as a declaration of rejection of money controlled by governments and banks (Ameroush, 2021). This technology gained global fame due to the widespread use of cryptocurrencies and their significant price increase after 2015. Due to the relative level of security provided by the technology, there has been a global trend by countries and major institutions to adopt it in various sectors, including the financial and brokerage sector. (Al-Subeai, 2019)

### **1-1-3 Components of block chain**

We can summarize the components of the block chain network as follows: (Al-Rahili, 2020)

**Figure number (01): The essential elements of the block chain system structure**



**Source:** (Al-Subeai, 2019, p. 04)

### **1-1-4 Network Devices**

**1-1-4-1** These are the network nodes, and every block chain network consists of multiple devices called "Nodes".

- Transactions or data are stored in them, forming the distributed ledger of the block chain. The individuals working on these devices are called Miners or participants, and their function is to verify the operations and agree on the correct date of the block. This is done through consensus algorithms.
- Consensus Algorithms: Also known as decentralized consensus, these are algorithms that allow the nodes or devices within the block chain to reach consensus on the blocks added to the block chain. There are several well-known algorithms, including:
- Proof-of-Work (PoW) Algorithm: This is one of the most famous algorithms used in Bitcoin. It relies on rewarding the verification of transactions. After confirming the validity of the transaction data, network devices attempt to guess the block code by solving mathematical transactions. When a device finds the solution, the block is created within the block chain, and the miner receives a financial reward. This process is called mining and requires significant computational power and specialized processors to solve mathematical problems and create the block.
- Proof-of-Stake (PoS) Algorithm: This algorithm requires a financial amount in the wallets of the network participants. They are not called miners here because they do not engage in mining for block codes. However, after verifying and confirming the transactions, the block is added to the network, and everyone receives a financial reward. If any device manipulates the data, the block chain deducts digital currency from their wallet as a financial penalty. This algorithm does not require significant computational power or massive processors.

#### **1-1-4-2 Encryption:**

Encryption is considered one of the features of block chain. We distinguish two types of encryption: The hash function: The hash function encrypts inputs of different lengths and converts them into outputs of fixed length, represented by unique and fixed-length codes. Not all data is displayed in the block, but the block is encrypted and a unique code is generated for each block. The encryption code for each block is created based on the encryption code in the previous block. If someone wants to change the data in a block, all the encryption codes for the previous blocks will change, and when creating the encryption code for the block, its timestamp is added and its creation time is determined.

Key encryption: Also known as symmetric or symmetric-key encryption, it has many forms. Files are encrypted using keys. This encryption has been

used in block chain to issue digital signatures on transactions. Each user has two keys: a public key and a private key, which consist of numbers and letters.

**1-1-4-3 The block:** The block contains transaction data and consists of two parts:

- **Block header:** This is the top part of the block and contains the block number, the encryption code for the previous block, the timestamp (the time the block was created), and the data of the consensus algorithms.
- **Block content:** This is the bottom part of the block and contains transaction data such as amounts and addresses of parties, and the encryption code for the current block. The data of the consensus algorithms changes from one block chain to another.

**1-1-4-4 Distributed Ledger or Distributed Database:** Each node within the block chain retains a copy of the transaction record because the process of verifying new transactions and adding blocks to the network requires the complete record of previous transactions. Therefore, each node or device within the network owns a complete copy of the database or ledger.

### **1-1-5 Block chain Technology Working Mechanism**

The working mechanism of block chain technology is based on distributing data across a large number of points scattered throughout the network, which act as computers whose task is to verify the validity of data and operations performed in this network before adding them, in exchange for a reward determined by the system. These points encrypt each operation and link it to the previous operation through encryption technology that prevents modification or manipulation. The blocks are linked to each other through the public key used across the network to identify the operation, and there is a private key owned only by the owner of the operation.

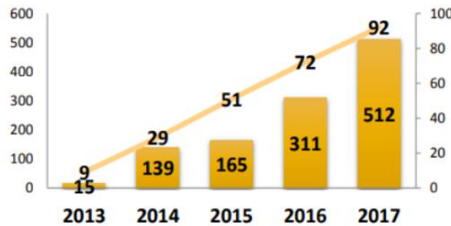
To bring the picture closer, the stages of block chain technology can be visualized as follows: (Agarwal & Wenlan, 2020, pp. 307-346)

- **First:** Encrypt the data and information with which the operations will be performed, so that it becomes a block.
- **Second:** Carrying out the transaction directly from the sender to the receiver without a third intermediary (Peer to Peer).
- **Third:** Verifying the process through a massive network of computers, known as the block chain (Nodes).

- **Fourth:** Adding the block to the chain after verifying it, in exchange for a commission received by whoever decrypts this block by guessing.

**1-1-6 Types of Block chain Trust Chains:** Block chain networks are divided into three types, each with different uses and features: public block chain, private block chain, and consortium or alliance.

**Figure number (02): The size of investment in block chain companies**



**Source:** Qaraouni, Mariam, Hibash, Fares, The Role of Insurance Technology in Supporting Operational Innovation in Insurance Companies, Journal of Management and Development for Research and Studies, Volume 08, Issue 01, p.6.

**1-1-6-1 Public Block chain:** It is a decentralized network, fully open to all devices that join it. Anyone or any entity can use it to create and verify transactions without the need for permission from a controlling entity. Its applications, such as Bitcoin and Ethereum, primarily operate on the idea of consensus in building the block chain. The public transaction record is updated by creating transaction blocks and appending them to the block chain after consensus and approval from all relevant parties, using pseudonyms to preserve data privacy and confidentiality.

**1-1-6-2 Private Block chain:** It is a network in which the permission to read and update the transaction ledger is restricted to a specific entity. Its applications can be used internally within institutions, in database management, to benefit from the properties and features of block chain in simplifying processes, eliminating data duplication, facilitating auditing, reducing costs, preserving records, ensuring transparency. This private network is characterized by its speed compared to the public network, as the confirmation process takes 100 milliseconds per transaction.

**1-1-6-3 Consortium Block chain:** Also known as a hybrid network, it is an open network but not fully, as it grants permission to create and update transactions only to a specific group of authorized parties who have a direct working relationship or an agreement that requires confirmation of shared transactions among them, such as a group of banks, hospitals, government



entities, commercial entities, and others. An example of this is the Ripple Consortium, which allows banks and financial institutions to use block chain to carry out transactions and financial transfers between them in a cheaper, easier, and faster way, and to benefit from its analytical tools and features in their work

### **1-1-7** Characteristics of Block chain

Block chain has many characteristics that have given it significant importance, some of which are as follows: (Raza, 2021)

- **Decentralized distribution:** It does not rely on a central entity to store, verify, process, and transfer data, which gives it a higher degree of security, transparency, and risk distribution. It is difficult to lose or tamper with this data.
- **Open-source software:** Block chain systems are open for anyone to use in any application they want, which saves a lot of money and eliminates the monopoly of some dominant companies in the markets.
- **Immutable and unchangeable:** This preserves rights in case there is no intention to change what is recorded, which is good for operations such as voting, registration, and transfer of ownership, for example.
- **Transparency:** Everyone can access the information that is intended to be transparent, such as voting, without the ability to hide information from others if the information is private. This is specific to public networks, not private ones, and according to the self-imposed rules that have become changeable. Sometimes, this characteristic poses an ethical problem in public networks, but it may be required for certain circumstances and reasons.
- **Independence:** Each processing point in the network is independent of the others and not affected by them, which achieves equality and fairness.
- **Efficiency:** Operations across the block chain network are characterized by high efficiency.
- **Speed:** There is greater speed in data transfer compared to current systems.
- **Cost reduction:** Automating operations and eliminating the need for employees who perform routine tasks can be done quickly and with higher accuracy by computers.
- **Security:** Some hacking cases have been recorded, but they are very limited, mainly due to the small size of the networks involved, while

many cases of hacking on banks and their operating systems have been proven.

- **Control:** Limited individuals control the network and its operations, which helps in updating data on the network instantly.

### **1-1-8 Smart Contracts in the Block chain System**

When Bitcoin was launched in 2009, the block chain was more than just a record-keeping technology, a database that does not allow deletion, which only provides the ability to store and retrieve data, and is called "Block chain 1.0" platforms.

In 2015, Ethereum (one of the most widely used block chain platforms) introduced the concept of "Block chain 2.0" platforms by introducing the concept of Smart Contracts. (Ameroush, 2021)

**Definition of Smart Contracts:** They are automated electronic contracts that automate contracting processes, enabling users to execute, perform, and monitor contractual obligations automatically, which contributes to cost reduction and minimizes human errors, with speed in contract execution. They also greatly reduce the trust element necessary to reach an agreement, reducing the risks of financial agreements and the likelihood of ending up in court.

These contracts are carried out through various platforms, including the open-source Ethereum platform, and have applications in many financial sectors such as Islamic banks, insurance, payments, and others. (Ameroush, 2021)

Smart contracts are considered more secure and governed documentation, revolutionizing the world of contracts and agreements. However, they are criticized for the difficulty of changing the contract pattern when needed, the inability to accommodate exceptional cases, the difficulty of resorting to litigation in their early stages when disputes arise, and the shift of power towards their programmers, making many of them contracts of submission.

**Automation:** Performing routine operations automatically without human intervention and assistance.

### **1-1-9 Obstacles to the spread of block chain technology**

- **First: Security issues facing the block chain**

Despite the high level of security of block chain technology, it is not immune to risks. Researchers have found a number of problems associated

with its implementation, including identity theft, hacking, fraud and deception, control and division issues, and the lack of legal regulations and international standards for technology implementation.

– **Second: Efficiency issues.**

High operating costs: especially in public networks, they require many points (for processing and storage)

High integration costs: in terms of loss of current systems and high prices of future systems, in addition to the costs of maintenance, monitoring, and training employees to understand and deal with them.

Problems with cash applications: high costs of network maintenance, the problem of seizing the benefits of issuance by private entities, and deviating from the legally centralized control governed by popular delegation to centralization of miners, programmers, and private entities, and the difficulty of recovering rights in case of transfer errors, loss of password, death of the account owner, or legal reservation for stupidity or confiscation of rights, and others.

– **Third: Legal problems and privacy issues**

Governance challenges and challenges facing lawyers currently in terms of the difficulty of keeping up with this technology.

The need for special legal frameworks for financial innovations to monitor developments in the technical field and their applications, what is suitable and what is not suitable according to clear and fair foundations and standards.

The problem of inheritance and the mechanism of confiscating funds in case of stupidity and financial blockade issues due to the inability of a third party to intervene. (Al-Shater, 2019)

**1-2- Financial inclusion**

**1-2-1 - Definition of financial inclusion:**

It is defined as: (tbaiba, 2014, p. 14)"The process by which the scope of benefiting from high-quality financial services is expanded, which includes loan services, deposits, payment systems, pensions, financial education, and customer protection mechanisms."

The Consultative Group to Assist the Poor (CGAP) defined financial inclusion as: the access of households and institutions to appropriate financial services and their effective use, and the necessity of providing these services responsibly and sustainably in a well-regulated environment.

**1-2-2 Importance of financial inclusion:** (Madfouni, 2015)

- Improving the balance of payments and reducing the general budget deficit
- Greater attention to the poor and low-income individuals, and helping them improve their income and save for retirement
- The spread and expansion of the use of financial services contribute to achieving social justice

**1-2-3 The principles of financial inclusion** adopted by the G20 include a set of principles that contribute to achieving financial inclusion, which are: (Salihah, 2017)

- **Leadership:** The necessity of government entities committing to expanding the financial inclusion base to help reduce poverty levels.
- **Diversity:** Implementing policies that promote competition, as well as providing diverse financial services.
- **Innovation/Renewal:** Encouraging technological innovations as a means to expand and facilitate access to financial services.
- **Collaboration:** The need to create a clear work environment with defined parameters based on clear coordination within the government sector.
- **Knowledge:** Sufficient data must be provided and utilized to measure access to financial services

**1-2-4 Components of digital financial inclusion:**

The components of digital financial inclusion are as follows: (Ozili, 2022, p. 231)

- **Digital devices:** Such as mobile phones, smartphones, laptops, or computers, which allow for the transfer of information. Or electronic tools.
- **Retail agents:** They are sellers or agents who have a digital device connected to the communication infrastructure, enabling them to send and receive details of financial transactions that allow customers to convert money into electronic stored value and vice versa.
- **Additional financial services:** This refers to additional financial services provided by banks, non-banks, or financial technology

companies to customers, including credit products, savings products, insurance products, investment products, mortgage products, and risk management services.

- **Digital transaction platform:** Refers to the interface that connects the customer to the financial institution providing specific financial services. The digital transaction platform may be a banking application, a digital program, or an online website.
- **Customers:** Customers include individuals, youth, elderly, families, individuals living in poverty, individuals with low income, individuals with medium income, individuals with high income, in addition to small and medium-sized enterprises and large companies. It also includes municipal agencies, neighborhoods, and other government agencies.

### **1-3 Possible applications and uses of block chain technology in enhancing financial inclusion work.**

#### **1-3-1 The role of block chain technology in enhancing financial inclusion.**

Financial inclusion is considered one of the most important pillars of financial reform, which most countries in the world are striving to achieve due to the recognition of the importance and role of comprehensive financial systems in reducing poverty and promoting shared prosperity (muneeza, 2018, p. 06). Financial inclusion is positively correlated with economic growth and enables the poor to improve their lives and access essential financial services. However, financial systems in developing countries lack financial inclusion, as the poor are required to pay fees for their money transfers, and accessing financial services is not only more difficult but also time-consuming, especially in rural areas in Africa, Asia, and Latin America To achieve financial inclusion and eliminate financial exclusion, four challenges need to be overcome, namely high costs, unsuitable banking products, geographic barriers, and financial illiteracy. Block chain technology can help countries overcome these four challenges through digital solutions provided by block chain technology (schuetz, s.d, p. 01).

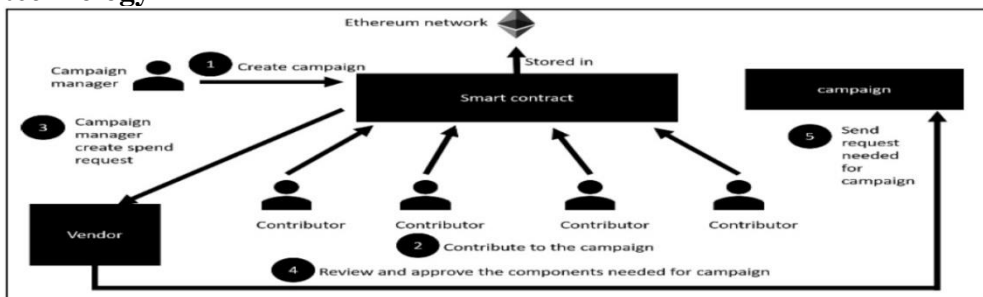
#### **1-3-2 Applying block chain technology in crowdfunding to expand financial inclusion.**

To reach financially excluded individuals, financial institutions have utilized various digital technologies to provide financial services electronically in a cost-effective manner. Financial innovations such as

crowdfunding and block chain play a vital role in facilitating access to financial services for financially marginalized individuals, as the increasing use of peer-to-peer lending and block chain technology has become a powerful new means of reaching financially underserved individuals, households, and financially constrained companies. Crowdfunding is an innovative method to enhance financial inclusion, and technology and finance can increase financial inclusion because they have the ability to reach diverse individuals in different regions (muneeza, 2018, p. 83)

However, in the current process of crowdfunding, many conditions and standards that are unique to the different platforms must be taken into account, which costs time, money, and resources in order to confront these challenges and reduce transactions. The crowdfunding platform is based on the block chain (billert, s.d), where the campaign manager creates a campaign to fund. Collectively for a specific project, by publishing all the details of the campaign on the block chain to convince the contributors after that on the platform page. Then the campaign manager creates an account request, which consists of a list of the elements necessary to implement the campaign. The contributors receive notifications, “A new expense request has been added.” The contributors then review the item that the manager suggested. The campaign, whether it is appropriate or not, if it is appropriate, can contribute by voting to approve the item listed. If the majority of contributors agree, the smart contract will send the collected funds to the relevant sellers, then the relevant seller and the agreed upon item to the campaign manager (halim, s.d, p. 412). These stages can be summarized in the following figure:

**Figure number (03): A crowdfunding platform based on blockchain technology**



Source: (halim, s.d, p. 412)

The block chain application will allow crowdfunding platforms to facilitate collective financing, corporate governance, and the use of smart contracts to track agreements, preventing fraud and forgery. It will also specify the conditions under which transactions are conducted, helping regulators monitor and regulate investment shares and investor qualifications. This increases trust in crowdfunding platforms, leading to an increase in funded projects and the number of individuals benefiting from financing.

### **1-3-3 Block chain application to reduce the cost of financial transactions**

The high cost of financial services is a barrier to expanding financial services to include the poor and marginalized. For example, in the United States, keeping \$1000 in a bank account for a year can cost \$100 or more, and low balance accounts incur monthly fees of \$10 or more, in addition to fees for each transaction. This makes the most impoverished groups face a limited and expensive range of options that are not suitable (CONLERY, n.d, p. 16). This obstacle can be solved by using a block chain technology that is characterized by its ability to reduce the costs of financial transactions by eliminating the intermediary and allowing transactions to be directly conducted between the parties involved. This allows for a reduction in fees imposed by third parties. For example, the Noah Coin application, based on block chain technology, helps Filipino workers in Japan to make remittance payments at a much lower cost than traditional banks. Block chain technology also reduces the time required for transaction settlement in financial services, whereas traditional banking transactions may take several days to settle. This is important because long settlement periods may hinder the reliance on financial services when there is a need for immediate money transfer. Therefore, block chain technology is known for significantly reducing the costs and time associated with financial transactions (schuetz, s.d, p. 04). Additionally, the Bit Pesa platform, based on block chain technology, facilitates commercial payments between Africa and the rest of the world, allowing individuals dealing with local small banks to send money to a local bank in Kenya, Nigeria, and Tanzania without the need to go through intermediary banks, with faster settlement times and much lower costs than traditional banks. This enables companies to mitigate the risks of

exchange rate fluctuations caused by delays in transaction completion by providing certainty regarding exchange rates (ponnuraj, 2017, p. 321).

### **1-3-4 Applying block chain technology to provide suitable financial products and services**

One of the main issues for citizens who do not deal with banks is the lack of a credit history and guarantees for lenders, as well as the slow and costly financial services that do not include rural areas and the poor. In addition, different beliefs and religions are not taken into consideration. For these reasons, financial institutions seek to use block chain technology to enable fast and cheap transactions without the need for intermediaries, allowing users to discuss borrowing terms with their families informally. Furthermore, the use of smart contracts, referring to automated transaction protocols, can provide guarantees for individuals and institutions by enforcing loan repayments once funds are available. For these reasons, the social lending platform Kiva utilizes block chain technology in an attempt to assist financially excluded individuals in Africa (schuetz, s.d, p. 04). Additionally, it is possible to provide financial services that are compatible with the beliefs of citizens and bank customers. For example, the Islamic finance industry can greatly benefit from block chain technology and smart contracts, which provide Sharia-compliant financial services by programming them according to Islamic principles, such as profit and loss sharing and prohibiting funding of prohibited industries (alcohol, pork, drugs, etc.). It does not charge any interest on loans, which energizes financial services in various Islamic countries and enhances financial inclusion. For instance, in Malaysia, its government, along with a South Korean block chain lab, is working to develop the incuBlock platform based on block chain technology and Islamic approval in order to provide suitable financial services for Malaysian citizens (muneeza, 2018, p. 91).

### **Conclusion**

Block chain technology is a recent innovation that will bring about a new qualitative leap, solving many problems faced by individuals, institutions, and even governments. The current centralized systems rely on the principle of having a trusted third party that can be referred to and relied upon. Individuals and institutions depend on the government for the protection it provides and its essential role in safeguarding the rights of all parties. This model will change in the future with the adoption of block



chain networks that provide trust, transparency, stability, and decentralization. In this study, we have discussed the concepts of block chain technology and its applications for effective and intelligent governance. Through the presentation and analysis of the study's topics, the following results and recommendations have been reached.

**Results:**

- Block chain is a modern technology that is increasingly being used day by day.
- Digital transformation is taking on different forms than what we have known in the past decade, and at an alarming pace.
- Smart government is nothing more than a natural extension of e-government.
- Investing in modern technologies will enhance financial inclusion.
- Block chain technology is an innovative mechanism to reduce administrative and financial corruption.

**Recommendations:**

- Work on establishing a highly efficient digital infrastructure.
- Invest in block chain and adopt it as an alternative to current electronic systems.
- Improve internet speed, network quality, and update them.
- Train qualified human resources to keep up with rapid technological advancements.
- Develop workforce capabilities to embrace these technologies and avoid isolation.

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