

A Proposed Framework for Improving Online Banking Transactions Using Blockchain

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Abstract

The aim of this article is to propose a framework for mobile applications to improve online banking transactions using blockchain to secure customers' accounts for any transactions via application. The application addresses customer account security issues by improving online banking transactions. Blockchain technology creates a ledger to protect against hacking, improving efficiency. This solution reduces complexity by allowing apps to maintain and share secure, visible, and immutable records. The blockchain has the potential to optimize the internet banking sector by enhancing privacy, transparency, and effectiveness. Blockchain could change online banking by boosting transaction speed, lowering costs, improving transparency, and increasing privacy. It may also reduce the need for third-party intermediaries such as clearinghouses and other financial institutions. Consequently, transaction costs are reduced, and efficiency is increased. Additionally, by documenting all transactions and making it simpler for regulators to monitor transactions and avoid fraudulent activities that surround many of us as a result of corruption, blockchains can promote transparency. There are several methods that can satisfy the requirements of online transactions. Most online banking transactions that use blockchain to enhance frameworks benefit from a variety of technologies to provide comprehensive solutions. Consequently, for the blockchain to acquire its full potential in the online banking sector, these dangers must be addressed. while safeguarding the user and the infrastructure for smart applications. This paper provides a proposed framework for online banking transactions using blockchain.

Keywords: Online Banking Transactions, Blockchain Digital Transformation, Distributed Ledger Technology.

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إطار مقترح لتحسين المعاملات المصرفية عبر الإنترنت باستخدام تقنية سلاسل الكتل

الملخص

الهدف من هذه المقالة هو اقتراح إطار عمل لتطبيقات الهاتف المحمول لتحسين المعاملات المصرفية عبر الإنترنت باستخدام سلاسل الكتل لتأمين حسابات العملاء لأي معاملات عبر التطبيق. يعالج هذا التطبيق مشكلات أمان حساب العميل من خلال تحسين المعاملات المصرفية عبر الإنترنت؛ حيث تعمل تقنية سلاسل الكتل على إنشاء دفتر أستاذ للحماية من القرصنة وتحسين الكفاءة. ومن ثم يقلل هذا الحل من التعقيد وذلك من خلال السماح للتطبيقات بالاحتفاظ بسجلات آمنة ومرئية ويمكن مشاركتها وغير قابلة للتغيير. تتمتع تقنية سلاسل الكتل بالقدرة على تحسين قطاع الخدمات المصرفية عبر الإنترنت من خلال تعزيز الخصوصية والشفافية والفعالية. والجدير بالذكر بأن تقنية سلاسل الكتل يمكن أن تغير الخدمات المصرفية عبر الإنترنت من خلال تعزيز سرعة المعاملات، وخفض التكاليف، وتحسين الشفافية، وزيادة الخصوصية. كما يمكن أيضًا أن تقلل من الحاجة إلى وسطاء خارجيين، مثل غرف المقاصة والمؤسسات المالية الأخرى. وبالتالي يتم تقليل تكاليف المعاملات وزيادة الكفاءة وذلك من خلال توثيق جميع المعاملات وتسهيل مراقبة المعاملات وتجنب الأنشطة الاحتيالية التي تحيط بالكثير من المستخدمين نتيجة للفساد على المنظمين.

ونجد أن هناك العديد من الطرق التي يمكن أن تلبى متطلبات المعاملات عبر الإنترنت، وتستفيد معظم المعاملات المصرفية عبر الإنترنت التي تستخدم سلاسل الكتل لتعزيز الأطر من مجموعة متنوعة من التقنيات لتوفير حلول شاملة. ومن هنا يجب معالجة هذه المخاطر وذلك عن طريق تقنية سلاسل الكتل والتي تكتسب إمكانياتها الكاملة في قطاع الخدمات المصرفية عبر الإنترنت؛ مع حماية المستخدم والبنية التحتية للتطبيقات الذكية. لذا فإن هذه الورقة توفر إطارًا مقترحًا للمعاملات المصرفية عبر الإنترنت باستخدام سلاسل الكتل.

الكلمات المفتاحية: المعاملات المصرفية عبر الإنترنت، التحول الرقمي، سلاسل الكتل، تكنولوجيا دفتر الأستاذ الموزع.

1. INTRODUCTION

The Blockchain is a distributed ledger technology (DLT) that enables community validation to support most cryptocurrency adaptations through coordinated ledger contents duplicated across millions of users, which is at the heart of most cryptocurrency adaptations. Bitcoin, for example, is one of the cryptocurrencies that uses blockchain technology, which is a distributed peer-verified time-stamped ledger that shows all authorized exchanges sequentially [2], [12] and [21].

Digital transformation has entered a period of opportunity, traditional cash payment and transfer systems were replaced by the mobile banking system. However, the system is a manual [7].

Blockchain technology, which was previously mainly used for bitcoin peer-to-peer transactions, has now been extended to include smart contracts, which are applications that self-enforce contract requirements on the blockchain and [17]. Although, when a person approaches a bank for a loan, it is always in excess of the basic credit limit, which may be given out in bulky, simple monthly payments, so the bank is more concerned to check out the customer's financial abilities of credit history and credit score, As a result, if a single blockchain framework is built that can handle both a retailer's transaction and credit orders, the process will be much more efficient and transparent [19].

Blockchain technology can support many industries and can be used in many more applications. This technology has a high potential to be used in the financial and banking industry. Block-chain technology is a technology in which digital information is stored in a public shared database [4].

The aim of this paper is to develop a framework for employing blockchain technology to enhance online banking transactions. The use of blockchain technology, particularly in finance transactions, has the opportunity for enhanced banking procedures, then to create a blockchain -based digital payment system that integrates smart contracts, payment gateway, and e-wallet functionality. The system will enable peer-to-peer transactions and provide additional features like automated execution of financial contracts, then the specific objectives of this project to create a blockchain-based digital payment system that uses smart contracts to facilitate transactions.

This paper is organized as follows: In section 2, introduces related work. While section 3, focuses on model architecture for blockchain diagram systems. In section 6, focuses on the use of blockchain technology such as blockchain crypto currencies, smart contract & financial transactions for enhancing banking transactions issues. In addition, highlights a framework on online banking transactions using blockchain & proposed an application framework in section 7. Finally, showed the experimental result in section 8.

2. RELATED WORK

Recent years, many experts and scholars have made a lot of research on blockchain technologies. The previous studies aimed to address the issues associated with online banking transactions between clients and central banks, as well as to evaluate blockchain technology and its potential applications for bank transactions. This section will give a review of the research literature. The first segment will introduce blockchain technology, which will be followed by sections on financial inclusion and mobile financial services.

In [7], Casino, et al., evaluated the literature review of the blockchain applications in different sectors such as supply chain, business, healthcare, IoT, privacy and data management, based on structured, systematic review and thematic content analysis of the discovered literature. The results showed that to identify theft reduction, more secure, faster exchange, cost reduction, improved information quality, KYC, brilliant contracts, payments, and exchanging stage, most of banks must transform into blockchain innovation.

In [20], Ojeniyi, et al, examined the security risk analysis and management in Online Banking transactions using blockchain. The aim of the research is to use Diamond Bank plc, Nigeria as a case study, this study aimed to examine the information risk associated with internet banking transactions. The results showed that the paper research attempted to solve, he studies discovered that most of the respondents have fundamental knowledge of security risk in terms of disclosing their online bank transactions details, indication shows that more need to be done in terms of bank client awareness about saving transaction details and passwords on transaction devices, should bank prevent personal data from any hacking by using security risk in online banking transactions.

In [4], Awotunde, et al., proposed a blockchain-based framework for protecting and securing financial data transfer on mobile devices. Then to protect mobile online banking, a multi-level authentication protocol was employed, as well as two-factor authentication protocol to generate a time-based one-time password received and request code at the same time to confirmation to log in with users (TOTP) for more secured money transfer via applications, the obtained results testify to the planned Framework's authority.

In [21], Saleh, et al., presented a framework for using mobile payment blockchain that can address banks and financial authorities concerns while also meeting the needs of customers (both merchants and retailers) for faster, safer, cheaper, real-time, and improve secure payments. The results showed that a framework to enhance the blockchain implementation to manage banking mobile payments using to solve the problem for both ways and reduce risk, prevent hacking data from bank, show that blockchain into solution extortion decrease, secure, quicker exchange, bring down the cost, enhanced information quality, KYC, brilliant smart contracts, payments, and exchanging stage, then provide the gatherings to solution the exchange for both customers with high secured in online baking.

In [18], Nandhini and Arumugam, presented a solution to connect the blockchain that will link every user on the network, and after a transaction has been authenticated, the network will broadcast it to all other users. Every transaction will also be recorded on the network. Rather than keeping any transactions in the block chain, the network will collect transaction data into blocks and distribute them throughout the network. Every block in this chain will connect to the previous one, known as the "genesis block." Block chain systems employ peer-to-peer networks and a method to eliminate the possibility of data modification. The construction of a decentralized cryptocurrency-based key management platform is the major topic of this article. The results showed that the suggested solution offers a net banking interface for accessing all transactions in crypto currency format and securing them with blockchain technology.

In [15], Luo et al., presented a simple two-period model for trying to analyze users' borrowing behavior on a decentralized platform for agreement and information distribution. Create a framework for mitigating bank risk and determine that decentralized digital identification and encryption technology are the most critical parts of achieving market equilibrium between decentralized agreement and information distribution. Microscopically, experts give fresh information on bank risk reduction. So, the authors then assess the relationship between digital identification and the opportunity cost of developing a digital scene. Consider the tradeoff between blockchain applications' decentralized agreement and communicating in view of the value of social capital and credit best estimate the implementation of digital identities and encryption technologies would create a balance between decentralized agreement and information distribution by allowing individuals to access a secure and transparent platform while simultaneously ensuring the safety of their personal data.

In [14], Lal & Marijan, examined the significance of BC-based software testing and to allow access to a logical, tested, and verifiable BC software development process. At first, the problem was presented that have been connected to BC-App testing. Secondly, the research covered the most recent testing projects in the application of BC technologies using a tiered approach based on the limitations and problems in the literature assessment of current testing methods for BC-Apps; present a set of future research goals. Researchers have concentrated a lot of attention on SCs and suggested a variety of tools to test them for security vulnerabilities and bugs. So, these tools are designed to automate BC testing, improve code coverage, and produce few false positives and negatives.

In [11], Junis, F., Prasetya, et al., proposed a preliminary framework for the application of blockchain-based smart contract in the academic field., then according to This research aims to revisit blockchain-based smart contract technology in order to better understand and explain the research gaps identified in previous studies, to facilities smart contract with customer depend on revisit on blockchain. Smart contracts built on the blockchain have become a growing field in blockchain technology.

In [8], Chakraborty et al., introduced a blockchain based environment may allow for the evaluation of a customer's qualifications over the order limit or credit limit that has been requested, as well as the analysis of the customer's qualifications to stand credit to protect from any risk to account and the calculation of the customer's credit score based on the agreement of different stakeholders in the network, such as banks, insurance companies, and other third-party financial organizations. Their result showed that the framework provided in the work appears to be the most optimal, relying solely on the management of the customer's entire and diverse history data, as well as determining all current credit points that the customer has left open. The framework's focus is on the amalgamation of different stakeholders into blockchain, where the customer's access grant is used.

3. MODEL ARCHITECTURE FOR BLOCKCHAIN DIAGRAM SYSTEMS.

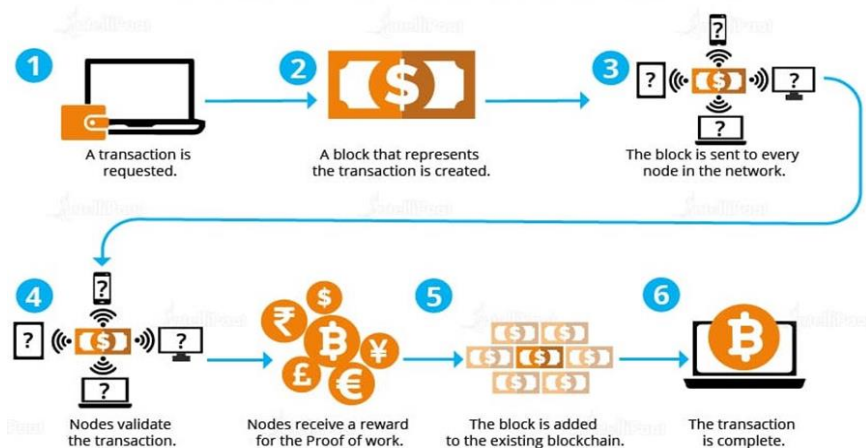


Fig.1. Model Architecture for Blockchain Diagram System
Source: (López-Martínez et al.,2016)

4. RESEARCH HYPOTHESIS

H0: there is no statistically significant impact of blockchain on online banking transactions.

H1: there is statistically significant impact of blockchain on online banking transactions.

5. RESEARCH METHODS

The research proposes a cloud data security system for online banking transactions using blockchain technology. A structured questionnaire was used to gather data from a large sample. The study analyzes the current state of blockchain technology and its potential applications in digital payments. It also examines existing payment gateway and e-wallet solutions, identifies areas for improvement, and creates a detailed project plan. User training will be provided on using the digital payment system. The Scrum Methodology is clarified in the following diagram.

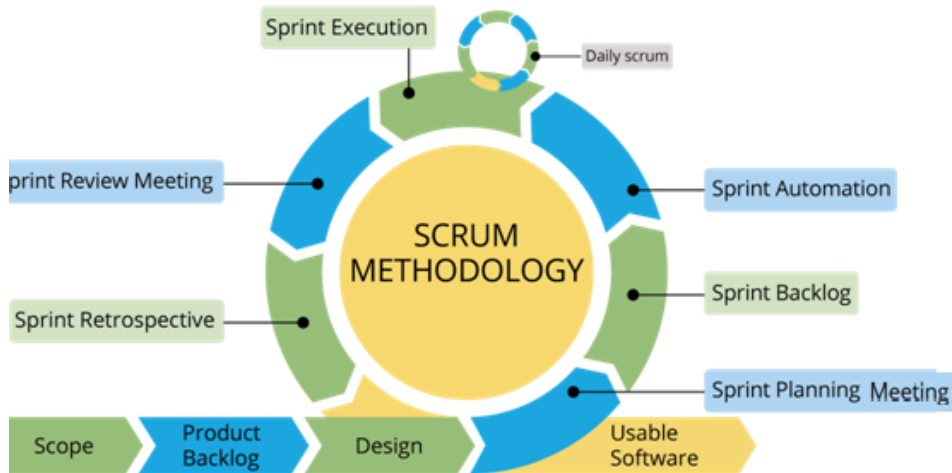


Fig. 2. Agile Scrum Methodology Works
Source: (Guzmán et al.,2019)

6. BLOCKCHAIN TECHNOLOGY & FINANCIAL TRANSACTIONS

6.1. Blockchain

The blockchain is a decentralized, distributed ledger that records transactions in a way that makes it impossible to edit or tamper with the data. Blocks of transactions are connected in a chain, thus the term blockchain. Each block has a unique code called a hash that connects it to the previous block, producing an unchanging chain of blocks. This produces a safe and visible record of transactions, which makes it suitable for applications requiring a high level of confidence, such as financial transactions and supply chain management. A blockchain may be public or private. Private blockchains are restricted and can only be viewed by a small number of participants, while public blockchains, such as Bitcoin, are available to anybody. Overall, blockchain technology provides a safe and transparent method of recording and managing data, making it suitable for a variety of applications in banking, government, and other sectors.

The concept of block chain began to arise in 2008, when Nakamoto authored a paper discussing the goal of spearheading a payment system revolution and setting the groundwork for the revolutionary cryptocurrency scheme Bitcoin. A blockchain is a shared, decentralized database that enables network transactions to be documented. The transactions are saved in an unchangeable block that contains all the transaction data. Any useful transactions or information may be logged and traded inside the network. Previous transaction recording solutions are centralized, inefficient, expensive, and repetitive, which is where blockchain comes in. A popular example of blockchain is Bitcoin, decentralized peer-to-peer digital money [6],[17] and [21].

6.2. Platforms of Blockchain-Based Smart Contract

Smart contracts are defined as contracts whose terms are encoded in computer language instead of legal language. Smart contracts can be executed by a computing network such as RSK, so that the terms of the contracts are automatically enforced by a protocol that all nodes in the network follow. A smart contract can be fully autonomous if all the objects referred (such as currency, payments, obligations, property titles, assets, licenses) have a digital representation in the platform. Smart contracts are widely known in modern entities and new methods to formalize the relationships that make up these institutions, are now made possible after the digital revolution. I call these new contracts "smart", because they are far more functional than their inanimate paper-based ancestors. No use of artificial intelligence is implied. A smart contract is defined as a set of promises, specified in digital form, including protocols within which the parties perform on these promises [11], [19] and [27].

6.3. Blockchain & Crypto Currencies

There are a lot of crypto currencies that have emerged in the last period. For instance; Ethereum (ETH) which have a larger importance other than Bitcoin, Bitcoin Cash (BCH) which is the fastest and less expensive bitcoin alternative, Cardano (ADA) is the safest Bitcoin alternative to invest in, Ripple (XRP) is a bitcoin alternative with massive potential, Litecoin (LTC) is the most important bitcoin alternative with no downtime, Cosmos (ATOM) is the top contender for best crypto of the future, Monero (XMR) is bitcoin alternative for anonymity, Solana (SOL) is the fastest growing smart contract ecosystem, Dogecoin (DOGE) is the most popular meme currency, and eventually Stellar (XLM) is the bitcoin alternative dedicated to the unbanked and underbanked. This research indicates the importance of Bitcoin, Ethereum, Cordano & Litecoin [11],[29], [24],[17]and [27].

6.4. Online Banking Transactions

Today's world is one with increasing the accessibility of online services is increasing in the modern world. The Internet financial system is one area of this that is developing quickly. Systems that allow bank clients to access balances and general knowledge about bank goods and services via a personal device (PC) or other intelligent devices are referred to as internet banking [21].

Consumers expect easy and safe accessibility to their financial information and transactions, which has led to an increase in the popularity of online banking transactions. Traditional internet banking platforms, on the other hand, could be open to fraud and cyberattacks that expose customer data and cause financial losses.

Blockchain technology provides a decentralized and secure record for online transactions, which represents a viable solution to these security problems. Blockchain technology can improve transactions' speed and effectiveness while decreasing the chance of fraud [10] and [17].

6.5. The Impact Blockchain Technology on Online Banking Transactions

The role of blockchain function and proposed solutions to various financial problems. Consequently, it covers the architecture of various financial trust mechanism's perspective and the perspective of the service application scenarios participating in financial innovation through blockchain technology and rule change. In conclusion, the issues, and the difficulties with using blockchain in financial services are discussed, and corresponding solutions are suggested. Eventually, this paper concluded those regulatory challenges in various financial service fields were also examined, and a plan for regulating blockchain technology in the fintech sector by programming rules into smart Contracts. Finally, fundamental guidelines and future directions for blockchain research were discussed [1] And [22] and [24].

7. A FRAMEWORK FOR ONLINE BANKING TRANSACTIONS USING BLOCKCHAIN

The use of blockchain technology in financial technology (fintech) has the potential to improve the efficiency and security of financial transactions greatly. One of the most promising areas of fintech is digital payments, which can greatly benefit from blockchain technology. This framework aims to create a blockchain-based digital payment system that integrates smart contracts, payment gateway, and e-wallet functionality.

This system will enable peer-to-peer transactions and provide additional features like automated execution of financial contracts [25] and [26].

In this section, the blockchain technology presents the system architecture as shown in figure 3. This system discusses three layers of system architecture as follows view, controller, and model. presented at the first one to show sign up and login to use system, flexibility transfer and payment methods for user interface, although second one to transfer through the accounts uses the E-wallet and controlling user model. Finally, the model presented the cashback, bills model, and cash with draw to connected three layers between us to show system architecture for user interface.

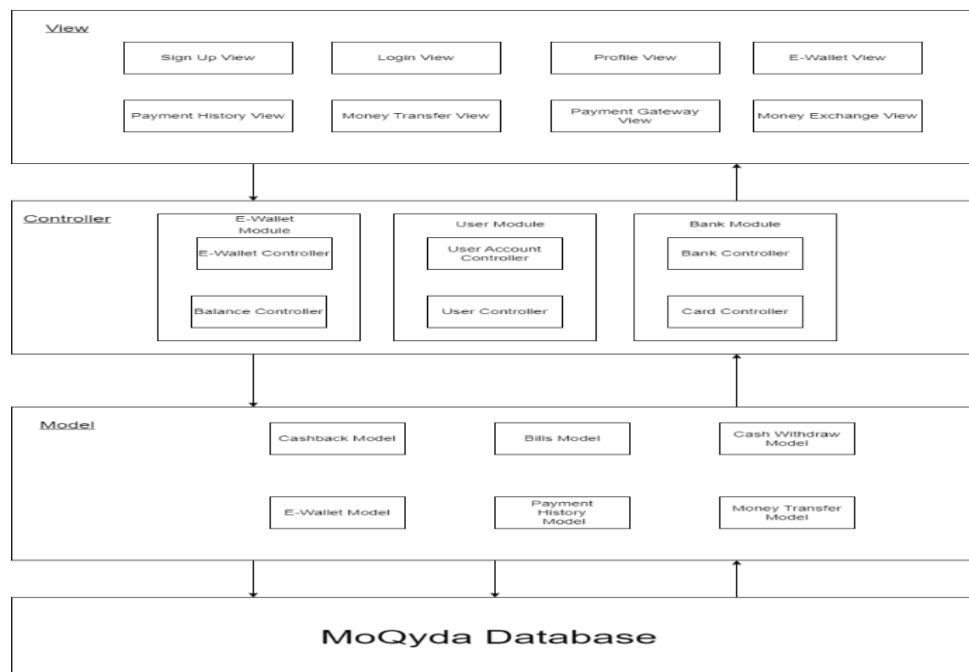


Fig.3. System Architecture
Source: Based on the authors

While in this section, proposes a framework for online banking transactions using blockchain as shown in figure 4. In this framework presents the steps for implementation of the blockchain application system. Flexibility to login easy to registration for user interface. Then, shows the authentication code to confirmation with OTP code. In addition, optimizes more clearly storage personal database to connected by private account for user interface through firebase code. Finally, presents more methods to easy for user by authentication code to approved with blockchain technology.



Fig 4. Develop Proposed Framework by Researcher
Source: Based on the authors

7.1. System Design

The System is based on the N-Tier architecture, an industry-proven software architecture model. it is suitable to support enterprise-level client-server applications by providing solutions to scalability, security, fault tolerance, reusability, and maintainability.

It helps developers to create flexible and reusable applications. The Code is separated between three files that make any change won't affect.

- **Presentation** Tier occupies the top level and displays Information related to services available on a mobile phone app in the form of a Graphical User Interface (GUI). It constitutes the front-end layer of the application, and the interface with which end-users will interact through a mobile-based application.
- **Application** Tier also called the middle tier, logic tier, business logic, or logic tier is pulled from the presentation tier. it controls the application's core functionality by performing detailed processing.
- **Data** Tier houses database servers where information is stored and retrieved

Presented in Fig. 5, Use Case Diagram is a graphical depiction of a user's possible interactions with system. Show interactions between user, blockchain & bank system describe relation between each other.

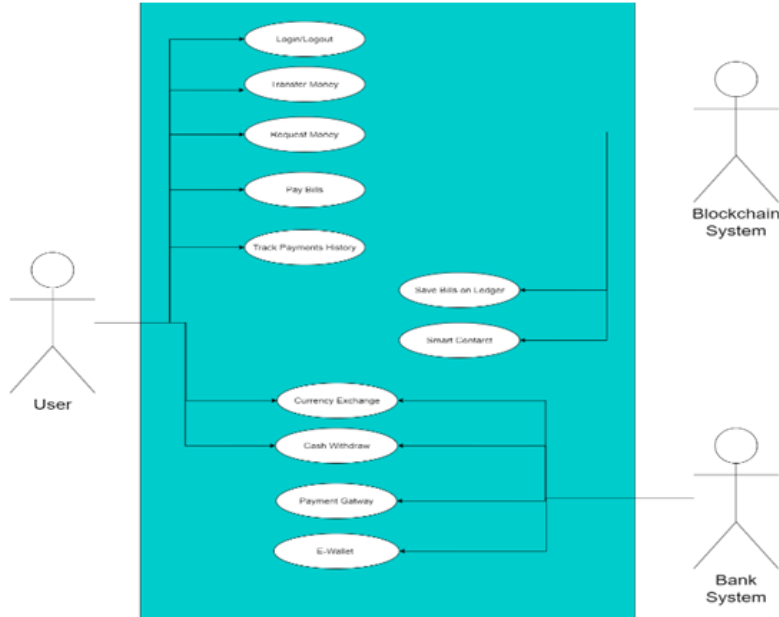


Fig.5. use case diagram
Source: Based on the authors

Presented in Fig.6, discuss a class diagram of the system to be created. In the diagram, there is relation between customer and application each class have sub class get relation with another relation to build system.

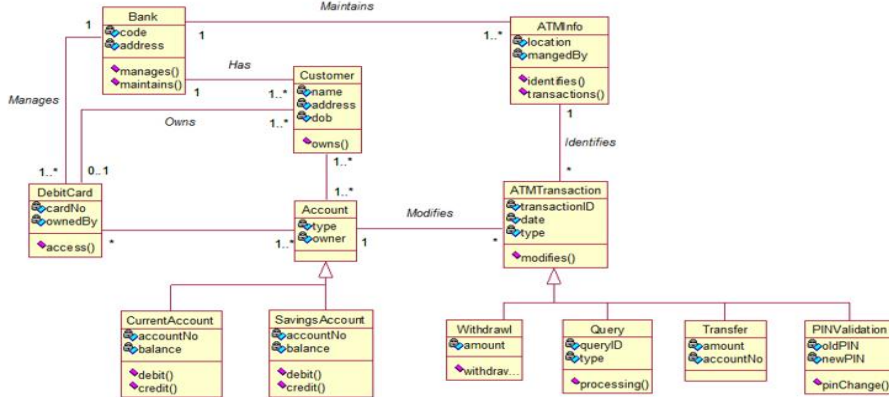


Fig. 6. Class Diagram
Source: Based on the authors

Presented in Fig. 7, Accomplishing the mission of reaching the end of flowchart, Flowchart of Proposed an application framework for improving online banking transactions using blockchain.

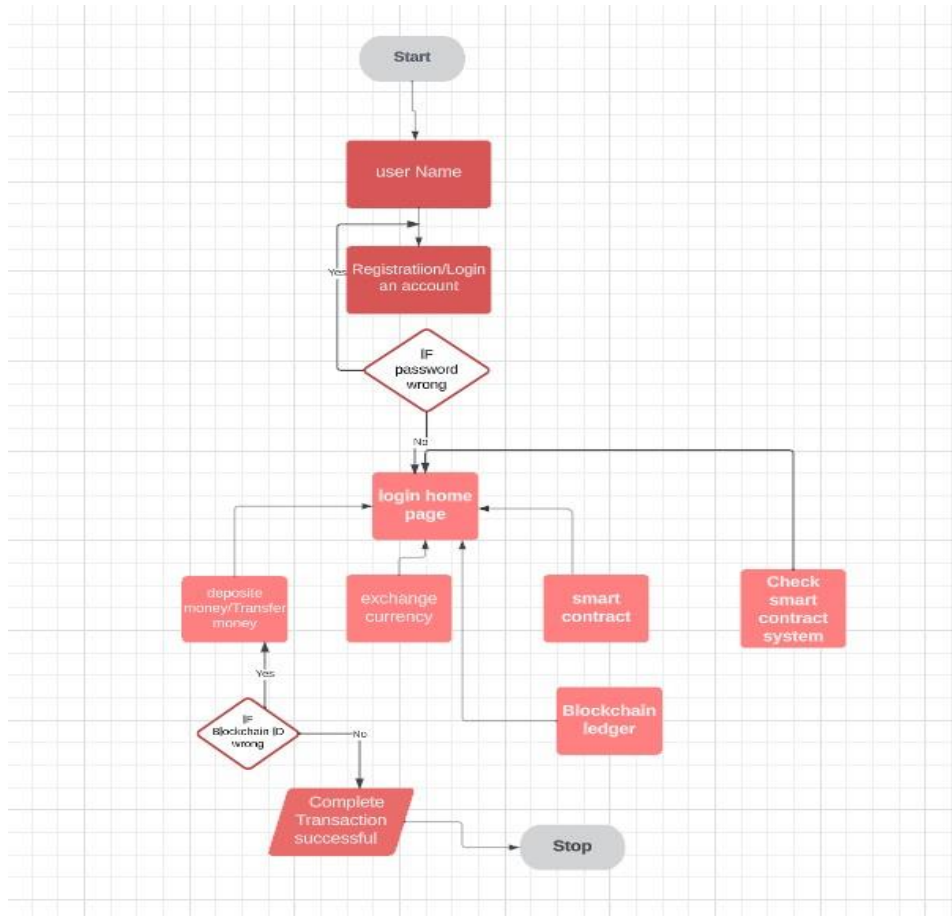


Fig. 7. Flowchart for Application system
Source: Based on the authors

Shown in fig.8, A Sequence Diagram shows object interactions arranged in a time sequence for Applications.

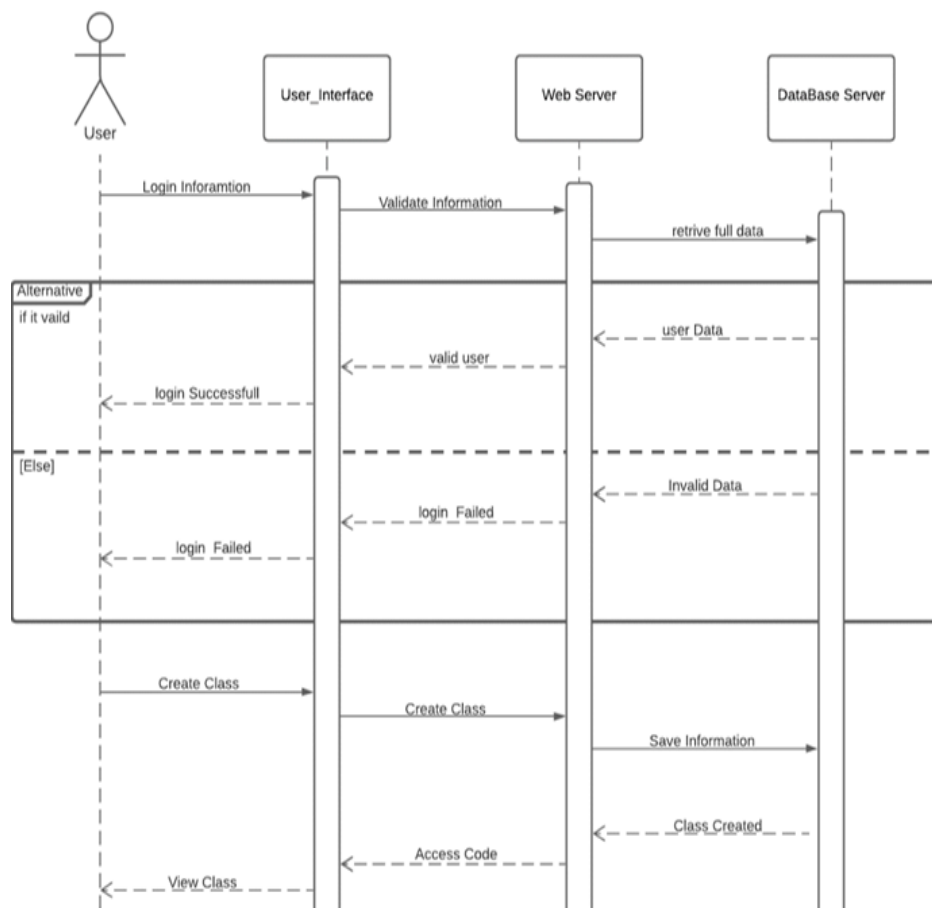


Fig.8. sequence diagram
Source: Based on the authors

8. IMPLEMENTATION

In the first, show Splash Screen (logo) and second one show procedures of various payment, consequently, how to show transfer way via application with secured methods and tracking your finance, finally show the home page of application.

In the Second, show the list of crypto currencies in market and tracking curve of line to show increasing and decreasing platform in application, then on one hand, the researcher has used development tools such as Visual Studio Code & Android Studio IDE for developing the blockchain mobile application efficiently. Additionally, Figma was used to create App UI interface, where draw.io was used to draw software diagrams and Hyperledger Platform.

On the other hand, programming languages such as Front-End: Dart, HTML, & CSS, Back-End: Java Script, Bide.js & Java, Database such as Firebase and Framework: Flutter were used.

Eventually, components obtained from external sources such as the HEROKU web hosting platform are used.

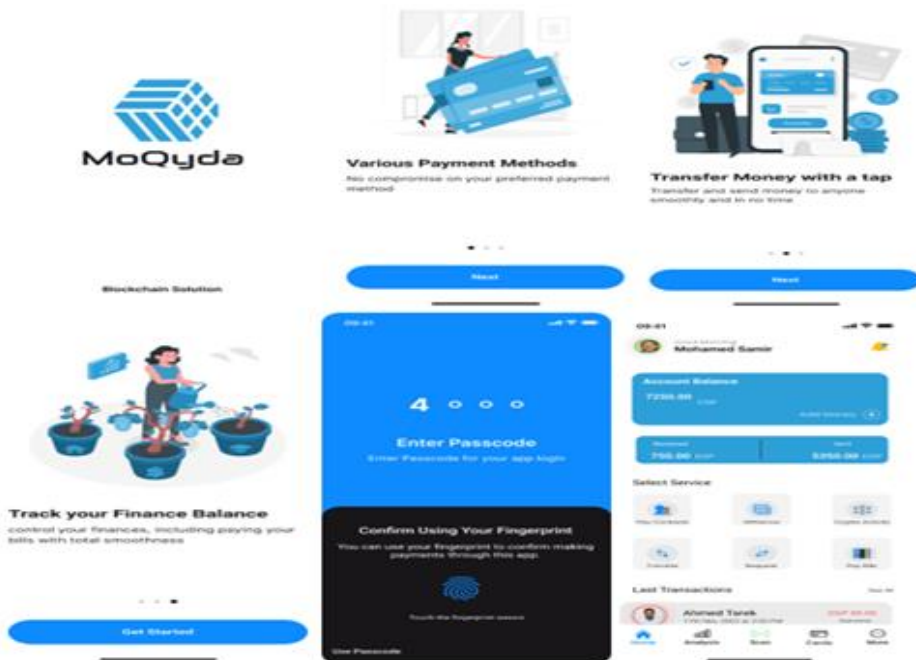


Fig.9. Application overview
Source: Based on the authors

8.1. Testing

After implementation is done, we have started developing a testing plan to determine the scope of testing and the test objectives and describe when to test and how to test. so first, we started to test the project by myself to ensure that every button on every screen works functionally and runs tests to ensure that the basic stream functionality works, so 6 users to test all the app functionalities. then a group consisting of 40 users from my contacts users was Divided into 8 groups to test the app functionalities and give their feedback.

Table.1. Check Register Functionality

Test Case	Test Data	Expected Result	Actual Result	Status
Enter the Wrong Format of the Email.	Name: name Email: user.com Password: Password	An Error Message Should Appear and Should not Register.	An Error Message Should Appear, and Should not Register.	Success
Enter Weak Password.	Name: name Email: user@gmail.com Password: 123	An Error Message Should Appear and Should not Register.	An Error Message Should Appear, and Should not Register.	Success
Enter an Empty Name.	Name: Email: user@gmail.com Password: password	An Error Message Should Appear, and Should not Register.	An Error Message Should Appear, and Should not Register.	Success
Enter Empty Email.	Name: name Email: Password: password	An Error Message Should Appear and Should not Register.	An Error Message Should Appear, and Should not Register.	Success
Enter an Empty Password.	Name: name Email: user@gmail.com Password:	An Error Message Should Appear and Should not Register.	An Error Message Should Appear, and Should not Register.	Success
Ignore Choose a Type	Type:	An Error Message Should Appear and Should not Register.	An Error Message Should Appear, and Should not Register.	Success

9. RESULTS AND DISCUSSION

The goal of this study is to investigate the impact of blockchain on Online Banking Transaction. To achieve this, the researcher has developed a set of assumptions and tested their validity by preparing an online questionnaire.

The researcher entered the data and analyzed them by applying some statistical methods mentioned in the program of statistical package for the social sciences (SPSS-25) as follows: Cronbach's alpha, Descriptive Statistics, T- Test, Correlation and Regression. The study reveals that there is statistically significant impact of blockchain on online banking transactions.

The coefficient of R-square equal reveals that 85% of the variation of online banking transactions is due to using blockchain and 15% is due to other factors.

9.1. Regression Results

- Online Banking Transaction= $1.955 + 0.741$ Blockchain.
- $\beta_0 = 0.741$ means that if there wasn't any usage of blockchain, the online banking transaction will equal 1.955
- The blockchain has a positive impact on online banking transaction, where (Sig.0 <.05). And for every additional use of blockchain, online banking transaction increases by 0.741.

10. CONCLUSION

This study concluded in the banking sector as it proposed a blockchain application for simplifying the financial online transactions. Although, this technology wasn't adopted in Egypt, but there is a lot of banks that are about to initiate in adopting this technology such as HSBC, CIB and QNB. Firstly, a structured questionnaire was used as a primary source of data, and it was distributed online to reach the maximum number of samples. This study uses various surveying techniques to prove that the proposed framework is of great need to the managers and stakeholders of several sectors. This research uses different surveying techniques to prove that the research problem is important to solve. Furthermore, these surveying techniques will be used to verify the previous solutions for the research problem. This research will be conducted based on the following steps: surveying financial transactions problems, then viewing the previous studied which adopted solutions to solve the research problem, after that adopting a proposed framework that helps in solving the research problem and enhancing the financial transactions using Block chain, implementation of the proposed framework and eventually evaluation of the suggested framework on real case studies.

Online banking transactions using blockchain analysis for storage over data and reducing the results is undoubtedly a huge challenge. Most online banking transactions using blockchain to improve frameworks benefit from different systems to develop complete solutions. Most of the frameworks for online banking transactions using blockchain benefit from different systems to develop complete solutions and more efficiency. The main concern with blockchain technology is the security of all transactions made online.

Many private data have been stolen through different illegal activities so there is no legal route for them to have been passed through. so, Blockchain is already well-known for online banking transactions and is critical to many banks and other institutions in securing their normal daily financial activities, although it still has many problems, through This process using blockchain technology is complex and as once it is decentralized and encrypted, as this study has predicted, it helps in supporting various processes in the applied sector. Eventually, this study examined multiple blockchain technology's importance in the present world for enhanced online banking transactions. Finally, these are all the most immediate issues with blockchain technology at the current time, although they can all be resolved using current techniques.

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