**Design and Implementation Of a Co-operative System for Baze University Staff**

**BY**

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**IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR OF SCIENCE IN SOFTWARE ENGINEERING, FACULTY OF COMPUTING AND APPLIED SCIENCE, BAZE UNIVERSITY, ABUJA.**

SEPTEMBER, 2024

**DECLARATION**

I hereby declared that this research project has been written by me under the supervision of Dr. Usman Bello Abubakar. The work has been presented in any previous research for the award of B.Sc degree to the best of my knowledge. The work is entirely mine and I accept the sole responsibility for any errors that might be found in the work, while the reference to publish material have been duly acknowledge.

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**CERTIFICATION**

This project entitled “**Design and Implementation of a Co-operative System for Baze University Staff”** meets the requirements governing the award of Bachelor of Science in Software Engineering in Baze University, Abuja.

**APPROVAL**

This is to certify that the research work title “**Design and Implementation of a Co-operative System for Baze University Staff”** by Anikwenze Olisa Harry with BU/21C/IT/5648 has been approved by the Department of Computer Science, Faculty of Computing and Applied Science, Baze University, Abuja, Nigeria.

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# **ABSTRACT**

In a time where technology is rapidly advancing, co-operative societies need to be carried along by digitalizing their activities, transforming their manual activities to follow a more technological based system. The applications being developed include a web application and a mobile application. The mobile application is s user friendly system that allows members to perform their regular activities on the go like requesting for loans, always viewing their loan status and balance. The web app will allow the admin to oversee activities performed on the system and swiftly act in the occurrence of certain events. Our developed system is tailored to meet the needs of the co-operative society managed by Baze University to streamline their activities.

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# **DEFINITION OF TERMS**

ERD- Entity Relationship Diagram

RAD- Rapid Application Diagram

HTML- Hypertext markup language

# **CHAPTER 1:**

# **INTRODUCTION**

## 1.1 Overview

## The System once fully developed, will provide a simple interface for the co-operative members to carry out their numerous activities *-activities which will be properly covered later in the chapters-* providing a secure, easy to use and efficient system with modern software development technologies to promote the saving of funds (at least monthly) among members. In this chapter, we will look at the expectations from the proposed system and a general overview of the problem which required the development of this system.

## 1.2 Background and Motivation

A co-operative society follows a system where a group of individuals come together and gather resources to reach mutually shared economic and social goals. It has become common practice for such societies to be found in the hearts of workplaces, allowing staff who decide to be members of the co-operative to help each other financially maybe by starting businesses together where profits will be split, or by contributing a certain amount over a certain time frame from which loans can be taken out of.

The organization concerned with this project is Baze University. It is a tertiary educational institution *-located at Plot 686 Cadastral Zone C00, Kuchigoro, Abuja-* and just like numerous organizations, has a properly functioning co-operative society where any of the staff whether academic or non-academic may join the society to enjoy the benefits it offers its members.

This system will greatly lessen the burden carried by the society’s executive team in the case of validating registration or even approving loans; and even those levied upon its members like in the case of requesting for loans.

## 1.3 Statement of the Problem

At Baze University, we are still trying to fuse technologies with our everyday activities to enhance efficiency and this case is no different; the co-operative society faces a problem since they currently lack a digital platform to perform their numerous activities. The prior statement shouldn’t lead to the conclusion that there is no technological structure in place now as there is a digital database that stores the staff-member details. But this is not enough. Members have no way to quickly see an accurate representation of their loan or savings balance at any given time or from any location including from bed when they wake up first thing in the morning; Or even when loans they’ve taken out are due for payment.

There is also the persistent issue of some requests, be it registration requests, loan requests etc. Not being attended to in the order of which they were made. Members have made complaints of their loan requests remaining unattended to for extended periods while others have already been sorted out; This shouldn’t lead to the assumption that staff are incompetent but rather should enforce the idea that there is a crucial need for the system to promote the efficiency and integrity of the co-operative.

Looking at the issues that the executive board face, they aren’t always able to stay on top of who has/hasn’t made their monthly contributions or keep track of all members and their status. They could be given real time notifications about most activities on the system that would require their attention.

## 1.4 Aims and Objectives

The main purpose for this project is to create a system to support the operations of the Baze University Co-operative society; thereby improving its efficiency, reliability, accessibility, and organization.

The goals for achievement are outlined below:

* Allow members of the Co-operative to request for loans.
* Encourage members to save and contribute funds using a reliable and efficient system.
* Include a voting system to simplify the verif process.
* Encourage more staff to join the co-operative society by simplifying the process of carrying out activities.

## 1.5 Significance of the Project

The completion of the co-operative society system will revolutionize the existing system now for all members of the co-operative society by employing modern technologies to give a safe and enjoyable experience.

To understand the benefits the proposed system will give, I will give a brief narrative on how the current system works. A staff of Baze University has decided to join the school’s cooperative society; they’re required to complete an in-person registration at the designated office (*hence it must be done during working hours, and they may have used this time to complete other school related tasks*). At the office, the staff is given a paper copy of the registration form (physical documents are less secure, difficult to manage and analyze *in the case of data mining* when compared to their digital counterparts); once done, the registration is processed and they’re now official members. But now the staff is burdened with personally keeping track of their finances or must visit the office to get accurate figures or even if they want to request for a loan or ensure their payment has been reflected. All this is valuable time and effort that can be significantly reduced with the introduction of a new system.

Below, the benefits have been outlined-

* **Faster decision making among the executive board**: an equal amount of voting power is given to each member of the co-operative, and they will be able give their individual votes at any time and from any location on their devices so that when the votes are accumulated, a task may or may not be carried out. The system looks at removing the constraints that may require the executive members to meet physically to give vote (to authorize a process), and the execution of that process (once votes are given, activity is carried out).
* **Improve the Registration Process by members**: with the existing measures in place now, members need to go to an office in order to be screened and registered as an active member; but with this system, staff will now fill out a brief registration form through the system which requires only relevant information for identification and validation; then the executives will be notified and can approve or decline the registration request that was made.
* **Streamline the loan request process:** instead of requiring all members to visit the office to make loan requests, with the new system, members will request loans on the application. Not just can they make requests, but they will also be able to manage their loans (*see the loan status which may have been approved, declined or pending. They can also see the deadline for approved loans and how much is left to upset the loan*) upon approval or decline, they will be notified through mail.
* Provide a webapp that allows the admin to have an overview of all contributions, withdrawals, registrations etc. that have been carried out on the system given a certain period. The admin will be able to oversee all the necessary information and activities on the system. The information gathered can be used to make decisions for the growth and improvement of the co-operative.
* **Easy verification of payments**: the app will feature the option to upload a document (may be a photo or a pdf) which shows the evidence of payment made by a member. The member should also be able to specify where the payment should be directed towards (the payment may be to settle a loan or towards their contribution). The system will be built on the principle that a member may not make payment towards their savings with the co-operative if they still have an active loan.

## 1.6 Project Risks Assessment

After careful analysis, I have identified possible risks that may hinder some part of the software development process and how it may be controlled.

**Table 1.1-** potential risks faced by the system

|  |  |  |
| --- | --- | --- |
| **RISK** | **RISK MITIGATION** | **IMPACT** |
| **Equipment failure hindering the software development process** | I have backed up the entire folder containing my projects documentation to Microsoft’s OneDrive. As of this time, the system is yet to be developed; but once the process in ongoing, it will also be backed up to the cloud. | MODERATE |
| **Equipment Loss potentially causing loss of work** | I will ensure the security of my personal devices that my work is stored on; in addition to backing up work both to the cloud and hardware devices (flash drives etc.) | MODERATE |
| **Unavailability of Essential software** | During the requirement gathering stage, required software will be identified and its availability will be considered. If not available, alternative means will be explored. | HIGH |
| **Data Security breaches** | I will implement measures to ensure security of the system and information is accessible only to the individual who owns it. The admin does not have access to information that may be used to identify a particular member, and neither can they modify a member’s details. | HIGH |
| **Coding issues (***low quality code***)** | Appropriate tests will be carried out to ensure usability and efficiency of the system. | HIGH |
| **Risks associated with Law and Compliance** | Proper referencing and citation will be made to any work that has contributed in any-way to the completion of this project. | HIGH |

## 1.7 Project Organization

Within this document, we will find material detailing the activities and the processes that lead to the development of a web and mobile application to support the activities of Baze University’s co-operative society. The System will have a user friendly and enjoyable interface with aim to encourage user interaction. The system will run efficiently across various supported devices (*specifications will be discussed in later chapters*) to ensure all members get a similar experience.

The later chapters will cover the designated topics identified below:

Chapter 2: Literature Review

* Looks at existing works related to a co-operative society’s management system.

Chapter 3: Methodology

* This chapter will discuss the tools, techniques and frameworks that have been used in the development of the project. Including the system architecture, flow of activities, system requirements etc.

Chapter 4: Implementation and Testing

* In this chapter, details of the application development are defined. The applications code for the front-end and back-end including test cases and how the system performed in these cases will be outline.

Chapter 5: Conclusion

* Summary of the project including its areas for potential improvement and key findings.

# **CHAPTER 2**

# **LITERATURE REVIEW**

## **2.1 Introduction**

In this chapter, we will find the literature review of the techniques used in this thesis. Details on past works that have been reviewed in relation to the project development, we will also look at literature on the technologies use i.e. NodeJS, React Native, MongoDB etc. and how they were used to address the issues raised in the previous chapter. This chapter will also delve into the impact technology has on co-operative societies.

## **2.2 Historical Overview**

Humans have always made major breakthroughs or achieved incredible feats due to the collective effort of some kind of community where each sector plays a crucial role and delivers accordingly, even for large scale systems, the final product is a result of a well working or managed community/society. This can be linked to the popular saying that “No Man Is an Island” coined by John Donne in 1624 and just tries to say that no man is better 4off on his own completely as everyone is a piece of the greater whole which is humanity itself (Seffusatti, 2024).

A co-operative society is built on similar principles, giving its members room to grow and carry out personal projects only possible with the combined efforts of the society. To give the members of the co-operative a digital platform to carry out their activities, this system makes use of proper cloud-based technologies to ensure appropriate features will be available to all members.

Over some years, great effort and work have gone towards research on how the use of computers and ICT technologies may be leveraged by co-operative societies in their day-to-day activities including registration of their members, monitoring of loan requests and active loans and all other operations performable within or outside the society. Some researchers aim to have a centralized system that keeps track of the operations of all co-operatives in Nigeria using a centralized system which will reduce the number of hours spent on manual computations of their activities (Olorunlomerue et al, 2017).er

**2.2.1 Earliest record of the Co-operative movement (1700s)**

Record on co-operative societies dates to 1761 in Fenwick, Scotland during a time when there was a decline in handloom weaving attributed to the sudden rise in addition of machines in the textile industry, the society was established for weavers to support each other to regulate price for the work, with the terms for being in the society including being honest to each other and to their employers (National Library of Scotland, 2023). While the initial cause for the co-operatives establishment was to give a society for weavers to support each other, in November 1769, the members of the co-operative wanted non-members to also benefit from their activities by using funds generated by the society to buy food in bulk that will be sold to both members and non-members but in smaller quantities and a slashed price. This gave non-members a cheaper alternative and also gave another income source to the society members as the savings would be split amongst them (Carrell, 2007). This was during a time long before the first computer was introduced, the activities of the society was greatly impeded. The printing press was used to spread information across wide areas while most kinds of transactions would have to be carried out manually, thereby slowing down their operations.

**2.2.2 The Technology Boom (1800s)**

After a long time of co-operatives running their operations manually, slowly they started to make use of modern-day technologies; like with the use of transport networks to cover wider ground and grow their member base, they also made use of the telegraph to better communicate within the society or facilitate better communication with other societies allowing them to share good practices (Muller & Tworek, 2015). With less need for the use of manpower for some operations, the co-operatives were able to invest more time in their societies to increase productivity and value to both members and non-members

**2.2.3 Emergence of Online Platforms (20th Century)**

With the introduction of web-based technologies in the 20th century, the co-operatives were only strengthened further. With online applications making it easier for members of the societies to collaborate and communicate by abolishing the barrier of geographical location (Wegner et al., 2023).

**2.2.4 Interactive Collaboration**

This advancement also meant that the societies were able to cut costs in some area by leveraging on the use cases that the platforms come with. There was less need for paper works, physical meetings as they could be hosted online, and other dated methods of communication and forms of management (Atanasova et al, 2024).

**2.2.5 Increased Technology Accessibility (Late 2000s - Present)**

With the launch of the Apple app store and the ever-growing popularity of web applications, it marked a turning point (Goray, 2024). Co-operatives are now more equipped with technology that allows all their members to perform operations on the go. Smartphones have now become a core part of our everyday lives with almost everyone owning one, with about 7.2billion smartphones in circulation (Howart, 2024) there is a high chance each member has access to a smart phone. This means systems that support the operations of the co-operative can easily be loaded and accessed by members on their smartphones at almost any time. The systems are also more usable by members with special needs with features like text-to-speech, screen reading, and even language translation.

Another area where the use of technology shines is with the administrator’s management of the society. The admin may now better track the activities within the cooperative thereby improving transparency and accountability from all members (Sobolev et al, 2023).

All these advancements in technology have made it possible to develop mobile and web applications that use cutting-edge cloud computing to offer interactive and responsive applications available across different platforms.

The technologies used in this work include:

* **React:** React is a popular JavaScript framework that employs Webpack to compile React, JSX and ES6 code and handles CSS file prefixes. It is mostly used because of its easy creation of dynamic applications which greatly supports code reusability with their components that can be custom made and reduces overall development time, it’s improved performance with Virtual-DOM that updates related items when states in the browser are updated (Deshpande, 2024).
* **Cascading Style Sheet (CSS)**: CSS was developed by the world wide web consortium(W3C) and it’s used to style elements written in markup languages like HTML. This allows developers to create visually appealing interfaces (Domantas, 2023).
* **React Native:** React Native is a JavaScript mobile app framework that allows development of mobile applications for IOS and Android. React Native was built on React with several similarities allowing developers who are familiar with JavaScript and React to quickly pick it up (Budzinski, 2024). It has been used for the development of mobile applications and has been hosted on expo go which is a cross-platform application for building mobile applications for IOS and Android.
* **MongoDB:** MongoDB is a NoSQL database management program that is used as an alternative to traditional databases (Gillis, 2023). MongoDB is popular among developers because of the NoSQL format that appears very similar to JavaScript objects therefore giving developers a familiar feel as the same concepts can be applied to them.

Some features of MongoDB –

* + **Replication:** A replica is where two or more MongoDB instances are used to provide high availability and redundancy. It does this by creating multiple copies of the data onto a server so that if one fails, the other is taken up (Gillis, 2023)..
* **Scalability.** MongoDB allows vertical and horizontal scaling of documents. Where vertical scaling works by adding more power to an existing machine, and horizontal scaling works by adding more machines to a user's resources (Saini, 2024).
* **Load balancing.** MongoDB handles load balancing without the need for a separate, dedicated load balancer, through either vertical or horizontal scaling.
* **Schema-less:**  MongoDB uses a scheme-less database meaning that one collection may hold different kinds of documents in it, the documents stored in the same collection must not have the same properties or size (Saini, 2024).
* **Document Oriented:** Data in MongoDB is stored in documents with key-value pairs instead of rows and columns, which makes the data more flexible when compared to SQL databases.

## **2.3 Related Work**

Some individuals have been able to complete the development of digital systems to support co-operative societies in Nigeria as most existing systems support foreign accounts. Some of these systems include, (Olorunlomerue et al, 2017) who proposed a web-application system for handling records of cooperative societies in Nigeria. They used Java and MySql to build the systtem which was meant to be used to register co-operative societies in Nigeria to enable the Government to collect data on co-operatives for proper planning.

Still in 2017, (Onyeama et al, 2017) completed the development of a system designed to manage short-term and long-term loans. The system also kept tract of the inflow and outflow of cash within and outside a cooperative society. To build the system, they used CSS and HTML at the front end and PHP and MySQL for the backend. The project was said to allow investors to easily retrieve relevant information about the cooperative. (Oluyombo, 2013) took interest in how co-operative society loans met the financial needs of their members in rural areas, while his research did not seek to find ways ICT would solve co-operative loan management, it further highlighted the issues with managing the loans manually and can be used to see the crucial need of a digital revolution in the area.

Meanwhile, (Mbam & Igboji, 2013) took on the project of developing a system that will aid a co-operative society’s loan management process including short-term and long-term loans. MySQL server was used for the database with Visual Basic net framework on the frontend. Overall, the system failed because investors failed to see an area where the system was operational.

A potent research and project was conducted by (Caroline, 2018) where a loan cooperative information system in the form of a web application was developed for Cempaka cooperative. The project aimed to build an information system using a rapid prototyping, PHP and MySQL were used on the backend with HTML on the front-end. The finished system consisted of numerous capabilities including, savings and loan transactions, loan instalment transactions, cash withdrawal transaction etc. (Pane,2019 ) took on a project to create an information system for a savings and loan cooperative system in the form of a web-application for the Pancuran Hidup Credit Union. The system employed the waterfall model to create a savings and loan information system that allowed the employees to manage their loan and savings data making it easier to report more accurate data to them.

1. **Co-opify (**[**https://coopify.africa/**](https://coopify.africa/) **)**

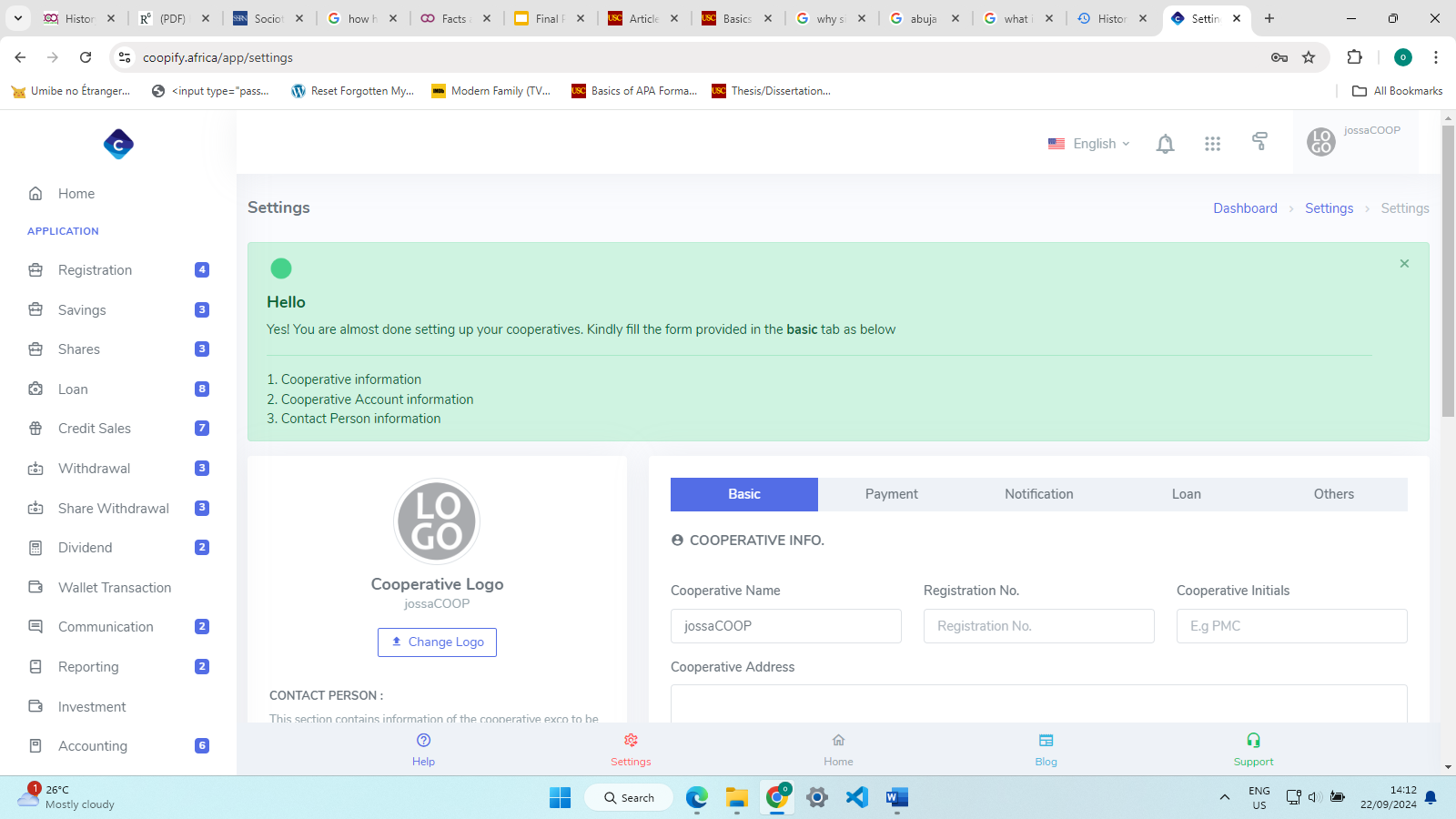
Coopify is a web-based application that aims to provide a system that meets the needs of different co-operatives societies

**Features**

* + There are numerous features on the system. from adding members, requesting for loans and adding savings.
  + The admin has an overview of the system activities and directly manages the system.
  + Broadcasts can be made to third party apps like WhatsApp to alert members on any events.

**Limitations**

* + There is no login for the members as the admin must perform actions on the members behalf.
  + There are a lot of features that are very niche and unnecessary to most co-operatives, making the system seem clustered with unnecessary features.
  + The admin must manually send messages on the supported third-party applications to send messages to other members.
  + Nigerian Prominent banks do not seem to be supported as some didn’t come up during registration.
  + Since the system requires you to fill in all bank information relating to the co-operative, it poses great financial risks.



**Figure 2.1 User Interface of Co-opify**

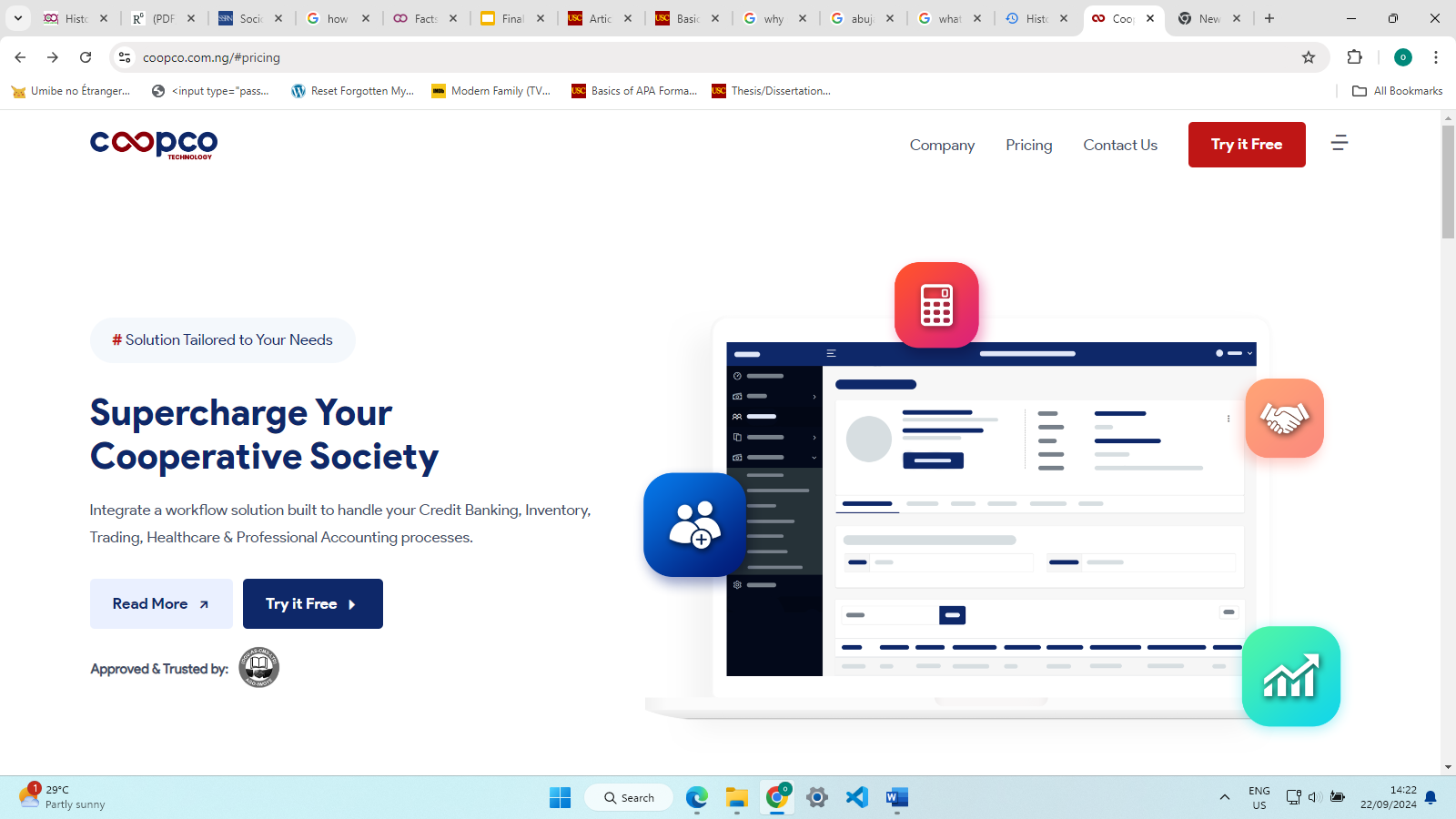
1. **COOPco (**[**https://coopco.com.ng/contact**](https://coopco.com.ng/contact) **)**

**Features**

* + Loan Requests
  + Said to support member registration

**Limitations**

This system does not support any free trials with the lowest tier starting at $10 (US Dollar)/month. The registration process for a live demo kept falling through and some input fields accepted wrong inputs e.g. a phone number field accepting string characters. All these show signs of a poorly managed system.



**Figure 2.2 User Interface of COOPco**

1. **Electric Cooperatives FCU (mobile application)**

**Features**

* Allows users to see their account balance at any time.
* Users can view and pay bills
* Users can see recent transactions

**Limitations**

* Only foreign banks seem to be supported on the application.
* It is more of a personal banking application than suited for a co-operative society.

## **2.4 Summary**

This chapter showed the review process of the literature regarding the numerous technologies and resources used through the development process. The Historical overview show how co-operative societies have been able to evolve over the years mainly to the rapid development of technology. The related works goes over different works that are similar to the system being developed, highlighting its benefits in terms of collaboration across the society, accessibility to members, over-all user Interface, and technical robustness of the system, we also looked at the challenges these systems face including scalability, security risks, and data accuracy.

The cooperative society being developed takes these issues into account and strives to provide solutions that are tailored to the needs of the co-operative society of Baze University.

Chapter 3 will delve into the requirements analysis and the methodology that has been used to solve the stated issue, including the provision of diagrams like the Use case, Activity. ERD etc.

## **2.4.1 Related Work summary Table**

Table 2.1 related works summary

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **App Name** | **Features** | **Limitations** |
| 1 | Co-opify | Allows, requesting for loans and adding savings.  Admin directly manages the system.  There is provision for communication with members. | Admin performs activities on behalf of members.  Oversaturation of features that are not necessary to a cooperative.  Communication with members could be easier. |
| 2 | Co-opco | Loan Requests  Said to support member registration | Poorly managed system  Does not offer a free version to test the app |
| 3 | Electric Cooperatives FCU | users can see their account balance at any time.  Users can view and pay bills  Users can see recent transactions | The system is more suited as a personal banking application and doesn’t allow collaboration among members. |

**CHAPTER 3**

# **REQUIREMENTS, ANALYSIS, AND DESIGN**

**ABBREVIATIONS USED IN THIS CHAPTER**

* RAD- RAPID APPLICATION DEVELOPMENT
* ERD- ENTITY RELATIONSHIP DIAGRAM

## **3.1 Overview**

This chapter will give an overview of the analysis carried out on the system to gather the requirements for the system (including the methods to gather these requirements). The methodology with its required steps will also be discussed. A general view of the design of the proposed system should be expected.

## **3.2 Proposed Model**

I have decided to use a hybrid of the Waterfall model and RAD (Rapid Application Development) for the system.

## **3.3 Methodology**

Choosing an appropriate methodology for software development is crucial and requires proper understanding of what kind of application is being developed, how it may be used and other factors. Software development methodology is the set of processes, practices, and principles guiding software development. It encompasses all aspects of software development, from initial planning and requirements gathering to coding, testing, deployment, and maintenance (Sumana, 2023).

* RAD is a software development approach that focuses less on detailed planning and places huge emphasis on user involvement throughout the software development process in aims to reduce the risk of project failure. Instead of gathering user requirements and developing the system based on those set of requirements and then involving the user again when the final product is delivered, we will gather user requirements, design the system, and then deliver the product in increments where each increment should fulfil some functional requirement. The developer doesn’t follow a definite set of requirements, instead they create multiple prototypes as fast as they can and show it to the client to identify what they like and what they don’t *(“What is Rapid Application Development (RAD)? An Ultimate Guide for 2024”*, 2024).

## **Data Gathering Method 1 (interview)**

Interviews on some staff of Baze university were conducted; not limited to those who are in the co-operative society but also those who aren’t but may be considering joining. This can help me identify areas which if improved will encourage them to join the institutions co-operative.

## **3.3.2 Date Gathering Method 2 (Questionnaire)**

A list of questions that helped to find patterns in the behavior of the co-operative’s members and how to enhance the overall systems experience was curated.

**NOTE**: details and findings on the interview and questionnaire will be covered properly in the Appendix.

**3.4 Tools and Techniques**

To ensure the successful development of the application, the use of various existing programming tools and techniques have been employed; they will help in various stages including but not limited to the creation, testing and maintenance of the application. These tools include-

* **React JS** - this is a JavaScript framework that is used for front-end web development. It has been used for the web application which provides an interface for the admin to oversee certain activities performed in the co-operative.
* **Node JS** - this is an open-source and cross-platform JavaScript runtime environment that allows developers to build both front-end and backend applications (Semah, 2022). For this application, it will provide functionality and connection to our database and some API calls.
* **React Native -** is also a JavaScript framework that supports front-end development. It will be used to develop the mobile which all members of the co-operative will interact with.
* **MongoDB-** it is a NoSQL database manager, NoSQL in the sense that it does not have relational databases as opposed to a database manager like MySQL (Gillis,2023).

A combination of these various technologies allowed me to develop an efficient and reliable app that significantly improves the lives of Baze University staff (especially those in the co-operative).

## **3.5 Ethical Consideration**

To guide my research design and patterns, I will follow some set of principles which will enforce some trust and reliability in the application.

* **Integrity**: All finding, and facts stated in this document will be researched on to allow users -or anyone related to the project- have confidence in the facts stated. Also, effort will be made to fulfil promises made concerning the project and reasons will be given if some features can’t be implemented. Data displayed from the system will not be tampered with to avoid any form of false representation; this reflects the transparency of the system. Proper technologies and tools will be implemented to ensure the security and integrity of data to protect it from outsider attacks; measures will also be taken to minimize the risk of insider techniques.
* **Intellectual Property**: all algorithms will be developed solely by me unless stated otherwise; in which case appropriate recognition will be made to the authors in form of referencing and Citations.
* **Confidentiality**: All records stored on the system will only be available to authorized individuals. Each member only has access to their own data and the admin will only see certain data across-board. Data that is considered highly sensitive isn’t shown to the admin. No data will be involved in any form of external data mining and will only be used in analysis that can improve the co-operative society at large. In the occurrence of an event where user data is required, the consent of every member involved will be requested for which is in-line with the Nigerian Data Protection Regulation Act.
* **Non-discrimination**: All members are treated equally and enjoy the same rights and privileges. Certain activities will only be performable only by the executive and the admin which is in line with their activities/responsibilities within the society and in no way will they be referred to in higher regards than other members within the system. There will also be no bias in any area of the application development or decision making; taken for example the system design or data analysis. In fact, research will be made to implement features that will provide a pleasurable experience for members with some disabilities.
* **Legality**: all activities carried out on the system are legal regarding the 1999 Nigerian Constitution and other Law-making bodies. An example is the protection of users’ data governed by NDPR (Nigerian Data Protection Regulation).

## **3.6 Requirement Analysis**

To develop an app that will meet most of the members’ needs, I held multiple interview sessions with a key player in Baze’s co-operative. This was very helpful because the co-operative is only open to staff of the school meaning that a student such as myself can-not gain firsthand experience. Through the interviews I have understood to a significant degree the problems the co-operative faces at large and the problems faced by individual groups like the members, executives and even admins.

**3.7 Requirements Specifications**

Requirements specification is one of the critical parts of software development as it’s crucial to the success or failure of a project. It allows the developer and the stakeholders to meet each other half-way. After requirements have been collected to give the developer an understanding of what is expected from the final product, they will be review the requirements and filter out un-realistic expectations or provide alternatives; by the end of this, some sort of middle ground should be reached. Some requirements may not even be identified as un-implementable at the moments but at the numerous other meetings with the stakeholders. I will look at the major kinds of requirements, and they are –

* Functional requirements
* Non-functional requirements

**3.7.1 Functional Requirements Specifications**

**Table 3.1** functional requirements of the members

|  |  |
| --- | --- |
| **Req. No** | **Description** |
| **R-1** | The system should allow users to view their savings balance and loan balance. |
| **R-2** | The system should allow users who have taken out loans should see the deadline for the loan anytime. |
| **R-3** | The system should allow users to request for loans; they should always see the status of the loans and get an email in a case where the loan is either approved or denied. |
| **R-4** | The system should allow users to log in/Sign out. |
| **R-5** | The system should allow users to register; giving only minimal information. |
| **R-6** | The system should notify users when their request to join the co-operative (after registering) has been approved or denied. |
| **R-7** | The system should notify users when a payment is verified or not. |
| **R-8** | The system should allow users to modify SOME details related to their account; like a password. |
| **R-9** | The system should allow users to see all activities performed on their account. |

**Table 3.2** functional requirements of the executives

|  |  |
| --- | --- |
| **Req. No** | **Description** |
| **R-101** | Each executive should be given equal right to vote in cases like -approving loans, approving registration, exemption from a month’s contribution etc. |
| **R-102** | Executives should be notified immediately requests are made by other members. |

**Table 3.3** functional requirements of the admin

|  |  |
| --- | --- |
| **Req. No** | **Description** |
| **R-201** | They should be able to see all members in the co-operative including active, suspended, and ex-members. |
| **R-202** | They should be able to suspend a members account |
| **R-203** | They should be able to see the total amount contributed |
| **R-204** | The admin should be able to update payment made by members. |

### **3.7.2 Non-Functional Requirement Specifications**

Non-functional requirements are those requirements that are necessary to be met to enhance the end-user’s experience. To do this, the following criteria will be met-

**Table 3.4** *Non-functional requirements*

|  |  |  |
| --- | --- | --- |
| **Req. No** | **Description** | **Type** |
| **R-301** | The system shouldn’t quit randomly after the user opens it and must stay active until closed or some hardware failure. | performance |
| **R-302** | Users should be able to use the system at any time of the day if they have internet connectivity. | Availability |
| **R-303** | The system should give results quickly if the result doesn’t rely on user input. | Performance |
| **R-304** | The system should only provide data and prompts associated to an account to whoever has authorized access to the account. | Authorization |
| **R-305** | The system should be properly run across numerous smartphones (for the mobile app) and laptops/desktops (web application). | Portability |
| **R-306** | The system should CPU and memory resources in an effective manner. | Efficiency |

### **3.7.3 System Requirements Specifications**

**Table 3.5** system requirements

|  |  |  |
| --- | --- | --- |
| **Req. No** | **Description** | **Type** |
| **R-403** | The system should safely store members data | Security/data  Encryption |

## **System Design**

The components of the system are:

1. **ADMIN:** the admin is a key player in this system. They oversee most of the activities performed by the members. They can see the active members, ex-members, and suspended members, and payments under a members account, and they can suspend members or even activate a suspended members account.
2. **REGISTER:** this page could be seen as a sign-up page, but the staff are really creating a whole new account; instead, they will provide minimum information that may be used to identify them including - the staff ID, first name and last name, and their email address- and they would’ve successfully applied when this process is completed.
3. **LOGIN**: Existing members of theco-operative will be able to login with their existing record if the data given exists.
4. **HOME PAGE:** the home page will give a brief overview of any updates to the user. The user’s name will be displayed, the savings and loan balance will be showed in the same field. Information about any upcoming/on-going events or any deadlines (for loan applicants) will be shown below the user’s balance. And finally, a summary of the last few activities will also be shown with the option to see the full list of activities.
5. **NAVIGATION BAR:** at the bottom of the screen there is a navigation bar that gives quick access to key features of the app from almost every page. There are 4 quick links available, and they are- home, loan requests, activities, and profile.
6. **DROP-DOWN MENU:** the drop-down menu should provide links to other pages that were not included in the navigation bar. Some of the links will be to see your loan status, for the executives; they’ll be able to see loan and registration requests made by other members, logout etc.
7. **PROFILE PAGE:** members will be able to see an immutable list of details related to them. The only detail they’ll be able to change is their password which can be changed from settings.
8. **LOAN PAGE:** the results on this page will differ depending on if the user is a loan applicant or not. If the user has an active loan, then they will see details on the current loan including the deadline, amount paid etc. but if not, then the user is shown the page to request for a loan.
9. **SETTINGS:**  in the settings, the user can change their password where they must provide their current password correctly and then confirm their new password before the change is effective. This change will be reflected under the account’s activities.
10. **ALL ACTIVITIES/TRANSACTIONS: t**hese pages should show details on all the verified activities and transactions carried out on the account.

## **Application Diagram**

An application architecture is a structural map of how a software application is assembled and how applications interact with each other to meet business or user requirements (Gavin & Ferguson, 2024). Refer to figure 3.1 to find the application diagram.



**Figure 3.1- Application Diagram for mobile application**



**Figure 3.2- Application Diagram for web application**

## **3.8.2 Use case diagram**

A use case diagram captures the possible actions performable by the end-users of a system. Below I have specified the actions that the members admin and executives can perform on the system.

It is also worth noting that the actor labeled ‘executive’ is also a member but can perform an extra set of functions that other members can’t.



**Figure 3.3- Use case diagram for members and admin**

**Table 3.8.1 - Use case description for loan Request**

|  |  |  |
| --- | --- | --- |
| Use case | Request loan | |
| Description: | This use case describes the process of a member requesting for a loan. | |
| Actor | Member | |
| Preconditions | Member is logged in  Member has at least 5000 in savings  Member has paid part of their active loan | |
| Post Conditions | Confirmation message or failure message is displayed | |
| Main flow | **User**  1) user selects loan requests  2) user enters loan details  3) user submits form | **System**  4) system checks if the user balance is above 5000.  5)system checks if other conditions are met to request for a loan.  6)system either displays confirmation message and sends a request to the executive, or it displays a failure message. |
| Exception condition | No details entered in the form or invalid characters entered. | |

**Table 3.8.2 - Use case description for View Loan Status**

|  |  |  |
| --- | --- | --- |
| Use case | View loan status | |
| Description: | This use case describes the process of a member viewing their loan status | |
| Actor | Member | |
| Preconditions | Member is logged in | |
| Post Conditions | Details of active loan displayed | |
| Main flow | **User**  1) user selects loan status | **System**  2) system searches the active loans collection for loans with the staff-id  3)system displays all results |
| Exception condition | No details entered in the form or invalid characters entered. | |

**Table 3.8.3 - Use case description for uploading payments**

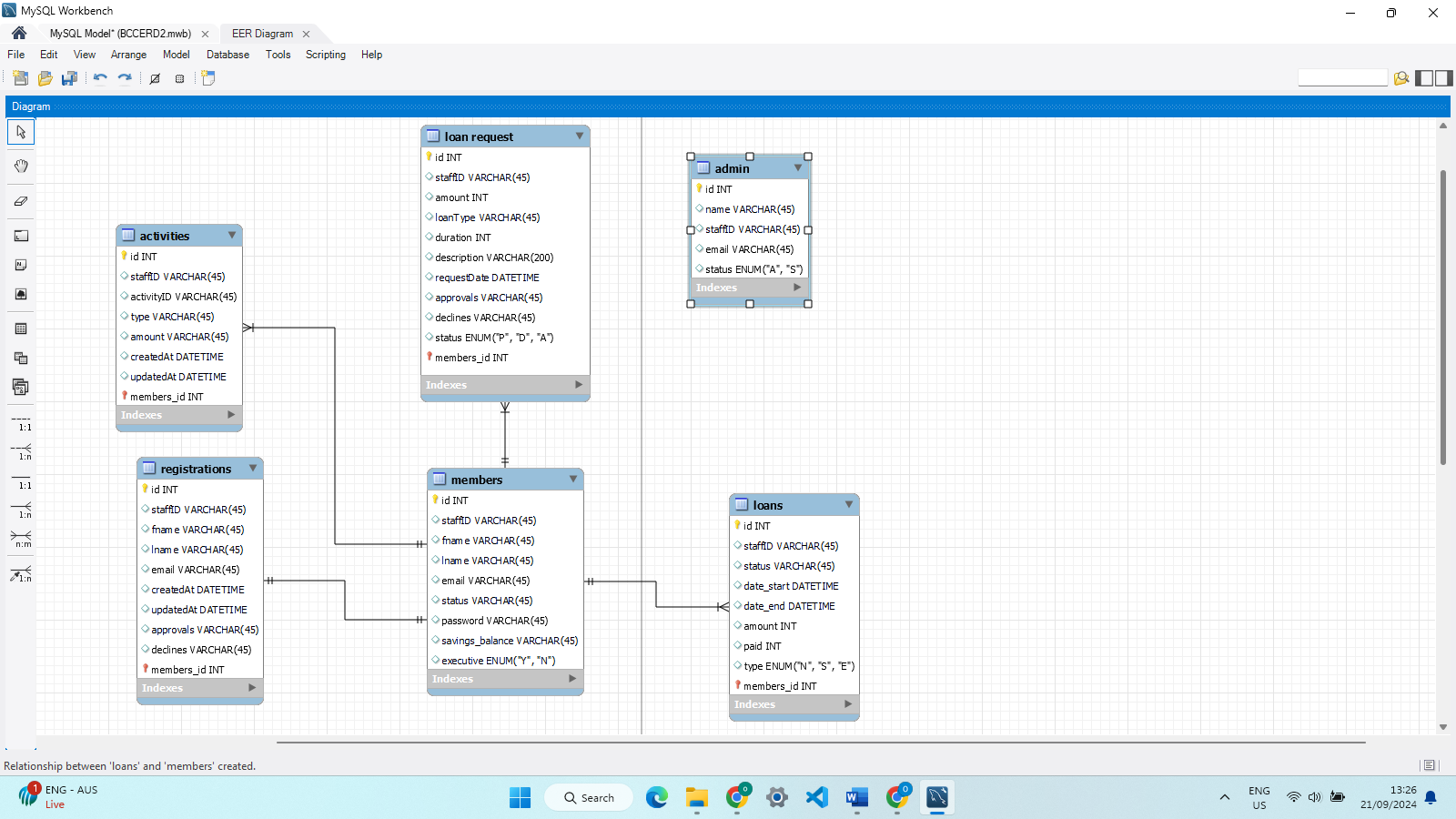
|  |  |  |
| --- | --- | --- |
| Use case | Uploading payments | |
| Description: | This use case describes the use case for the admin uploading a member’s payment | |
| Actor | Admin | |
| Preconditions | Admin is logged in  Staff-id is valid | |
| Post Conditions | Savings or loan balance of Staff will be updated | |
| Main flow | **User**  1) Admin selects upload payments  2) Admin enters staff id and paid amount | **System**  3) system searches the database for if the member has a loan or not  4 ) If there is a loan, the loan balance is updated, else the savings balance is updated |
| Exception condition | Staff ID doesn’t exist | |

**Table 3.8.4 - Use case description for registration approvals**

|  |  |  |
| --- | --- | --- |
| Use case | Registration approvals | |
| Description: | This use case describes the registration process of members | |
| Actor | Executive member | |
| Preconditions | Executive member is logged in | |
| Post Conditions | Registration of member is either approved or declined | |
| Main flow | **User**  1) Executive member selects registration Requests  2) member selects either approve or decline | **System**  2) system finds registration request, if approved, create a new member account.  3)send email to member |
| Exception condition | Member email is incorrect | |

**3.8.2 Entity-Relationship Diagram (ERD)**

The figures below show the relationship between multiple entities in the database and capturing their interactions.



**Figure 3.4 ERD diagram**

* + 1. **Data Design**

The structure by which user data is collected and a brief explanation on the purpose for some key attributes will be given.

**Table 3.6 Data Dictionary for Member Table**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Type** | **Range** | **Required** | **PK/FK** |
| staffId | INTEGER | 45 | Y | PK |
| fname | VARCHAR | 45 | Y | - |
| lname | VARCHAR | 45 | Y | - |
| email | VARCHAR | 45 | Y | - |
| status | ENUM(‘S’,’A’,’E’) | - | Y | - |
| password | VARCHAR | 45 | Y | - |
| savings\_balance | INTEGER | - | Y | - |
| phone\_number | VARCHAR | 45 | Y | - |

For the ‘*status’* attribute, its type is an ENUM which is short for enumeration and allows you to the specify certain values that the column can take as values. Here I have in the ENUM ‘S’,’A’,’E’. where-

* ‘S’- signifies that a member has been suspended.
* ‘A’- signifies that a member is active.
* ‘E’- signifies that a member is now an EX-member.

NOTE: This set of values will be used in the structure of other tables.

**Table 3.7 Structure of data collected for Admin.**

This table collects relevant data on the Admins of the Co-operative.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Type** | **Range** | **Required** | **PK/FK** |
| staffId | INTEGER | 45 | Y | PK, FK |
| email | VARCHAR | 45 | Y | - |
| status | ENUM(’A’,’T’) | - | Y | - |
| password | VARCHAR | 45 | Y | - |

The ENUM with values ‘A’,’T’ is described as-

‘A’- the admin is currently active in the co-operative.

‘T’- the admin has been terminated.

**Table 3.8 Structure of data collected for Loan.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Type** | **Range** | **Required** | **PK/FK** |
| id | INTEGER | - | Y | PK |
| amount | INTEGER | - | Y | - |
| status | ENUM(‘A’,’C’) | - | Y | - |
| paid | INTEGER | - | Y | - |
| date\_start | DATETIME | - | Y | - |
| staffID | INTEGER | - | Y | FK |
| duration | INTEGER | - | Y | - |
| Date\_end | DATETIME | - | Y | - |

the attribute “*status*” has type ENUM(‘A’,’C’) where-

* ‘A’- means active, meaning that a loan is active (it has been approved and has not been paid off).
* ‘C’- means completed, meaning that a loan is completed (it has been fully paid off).

**Table 3.9 Structure of data collected for activities.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Type** | **Range** | **Required** | **PK/FK** |
| activity\_id | INTEGER | - | Y | PK, |
| date | DATETIME | - | Y | - |
| staffId | INTEGER | - | Y | FK |
| type | ENUM(‘A’,’L’,’R’,’P’) | - | Y | - |
| amount | INTEGER | - | Y | - |

the attribute “*type*” has type ENUM(‘T’,’L’,’R’,’V’) where-

* L- means loan request.
* R- means registration.
* P- means password changed.
* A- means

**Table 3.10 Structure of data collected for loan Requests.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Type** | **Range** | **Required** | **PK/FK** |
| activity\_id | INTEGER | - | Y | PK, FK |
| amount | VARCHAR | 45 | Y | - |
| status | ENUM(‘A’,’D’,’P’) | - | Y | - |
| description | VARCHAR | 45 | Y | - |
| date\_end | DATETIME | - | Y | - |
| staffId | INTEGER | - | Y | FK |
| loanRequestcol | INTEGER | - | Y | - |
| duration | INTEGER | - | Y | - |
| approvals | INTEGER | - | Y | - |
| type | ENUM(‘N’,’E’) | - | Y | - |

For the “*status*” column, it takes values ‘A’,’D’,’P’ where-

* ‘A’- means that the loan has been approved.
* ‘D’- means that the loan has been declined.
* ‘P’- means that the loan is pending.

The “*type*” column shows what kind of loan is being requested either ‘N’,’E’ which represent “Normal” and “Emergency”.

**Table 3.11 Structure of data collected for registration Requests.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Attribute Name** | **Type** | **Range** | **Required** | **PK/FK** |
| activity\_id | INTEGER | - | Y | PK, FK |
| staffID | INTEGER | - | Y | FK |
| Date\_end | DATETIME | - | Y | - |
| approvals | ARRAY | - | Y | - |
| declines | ARRAY | - | N | - |
| status | ENUM(‘D’,’P’,’A’) | - | Y | - |

For the “*status*” column, it takes values ‘A’,’D’,’P’ where-

* ‘A’- means that the members registration has been approved.
* ‘D’- means that the members registration has been declined.
* ‘P’- means that the members registration is pending.

### **Activity Diagrams**

The diagrams below will detail the activities performed by the users and in what order they will be executed.



**Figure 3.5 - activity diagram for a member’s login.**



**Figure 3.6- activity diagram detailing the registration process of a user.**

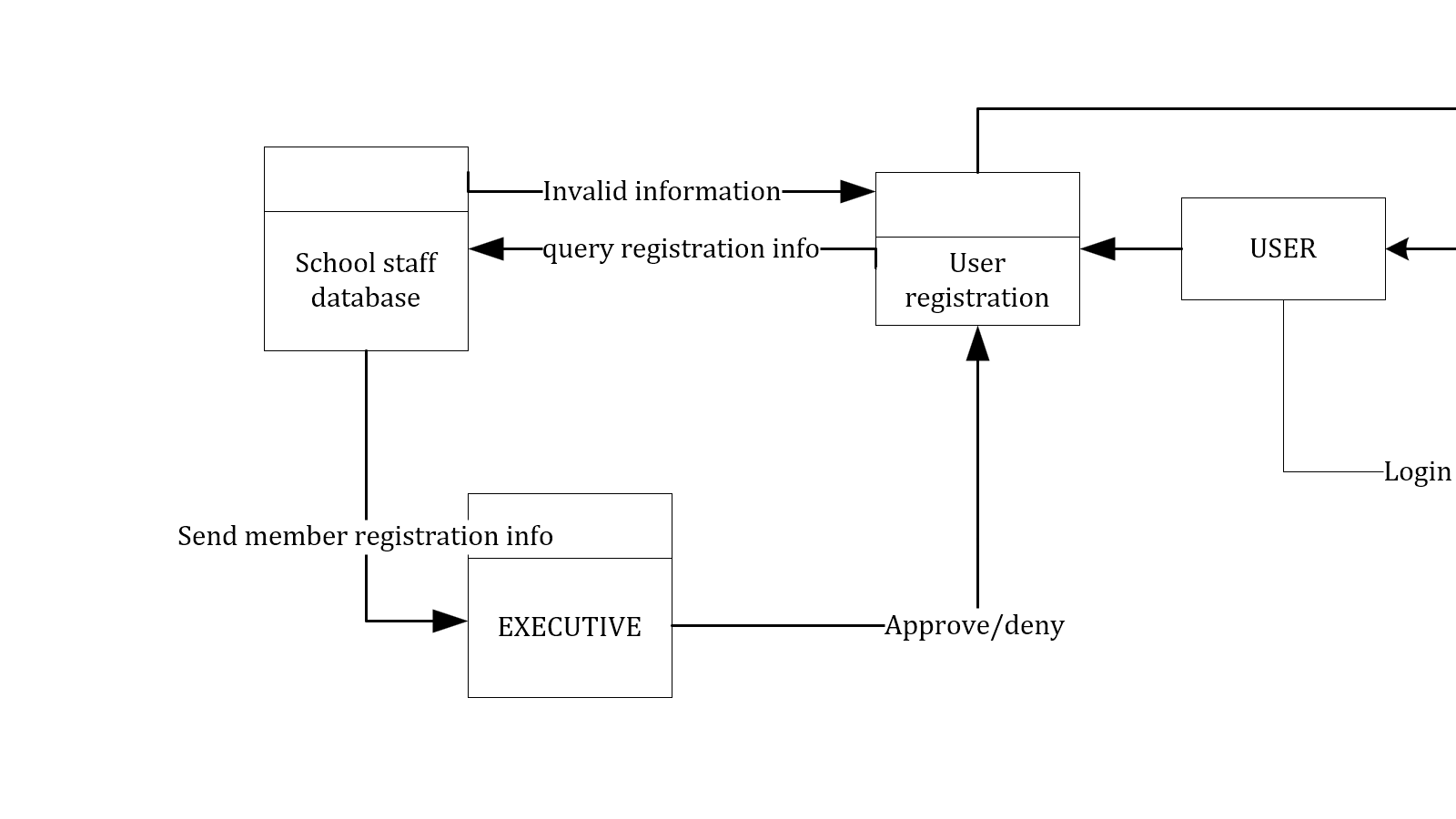


**Figure 3.7 activity diagram detailing the loan request process by members.**

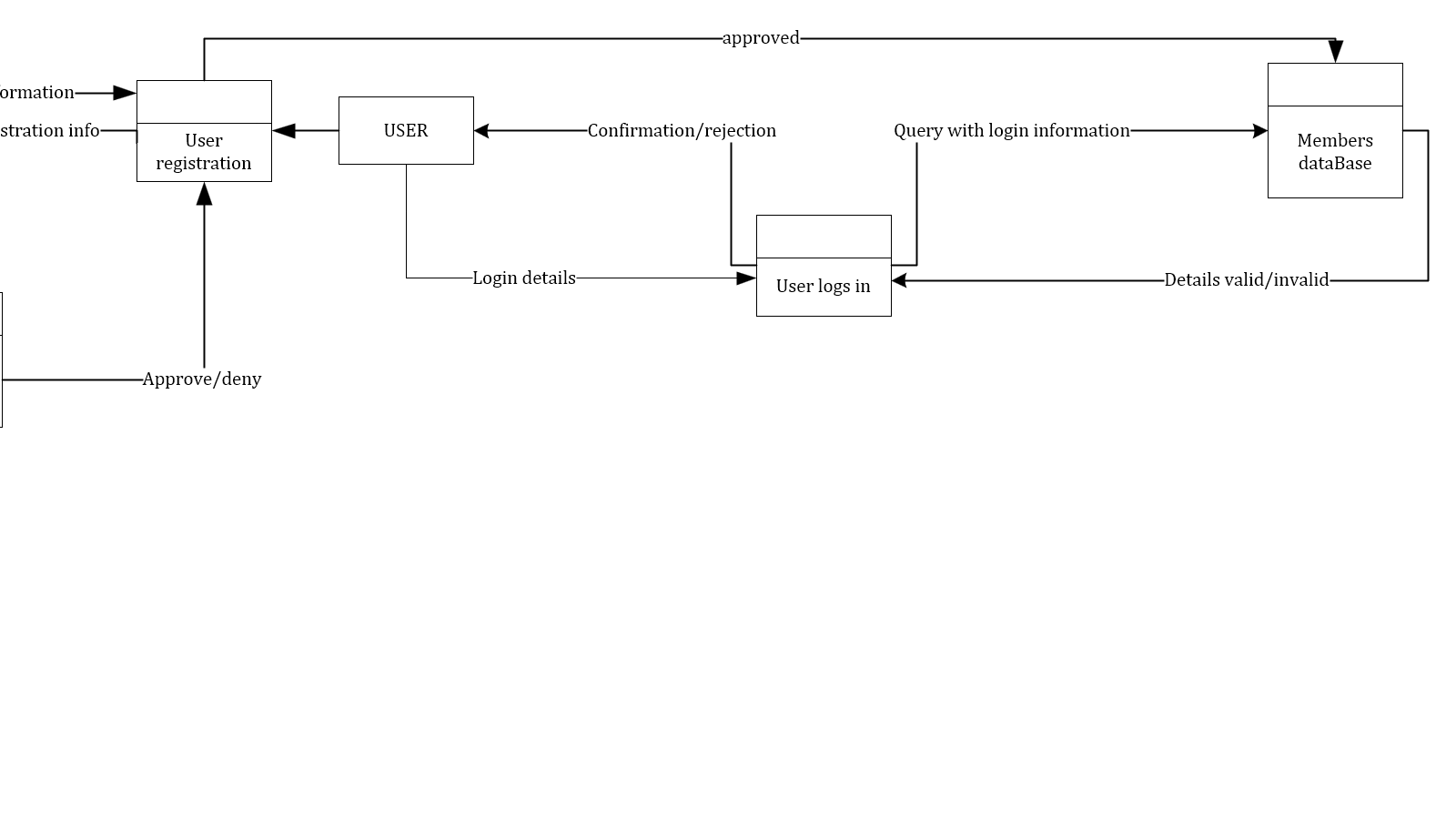


**Figure 3.8 activity diagram detailing the changing of passwords by users.**

### **3.8.5 Data Flow Diagram**



**Figure 3.9- data flow diagram for user registration**



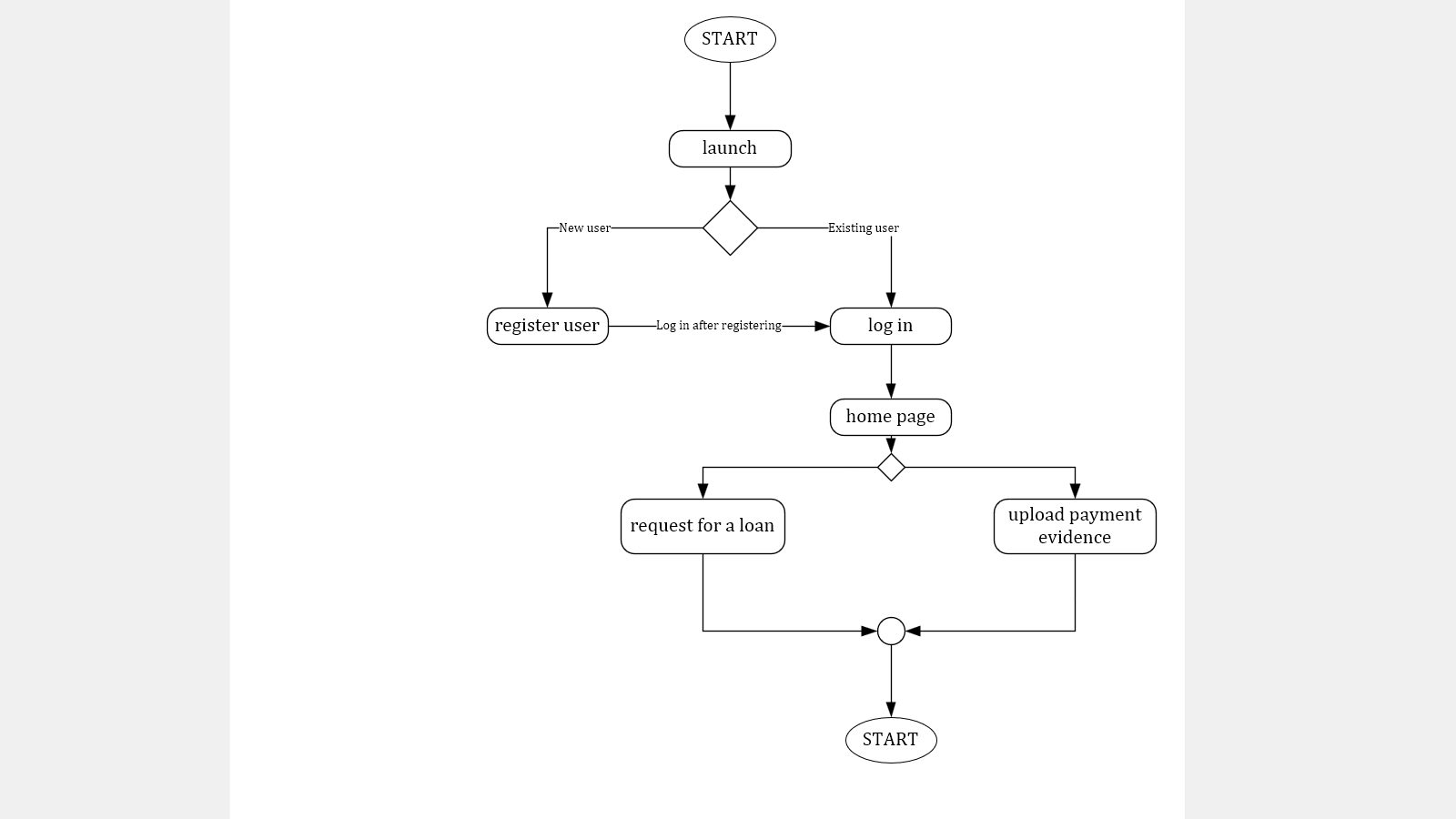
**Figure 3.10 – data flow diagram for user login**



**Figure 3.11- data flow diagram for loan request process**

### **3.8.6 Control Flow Diagram**

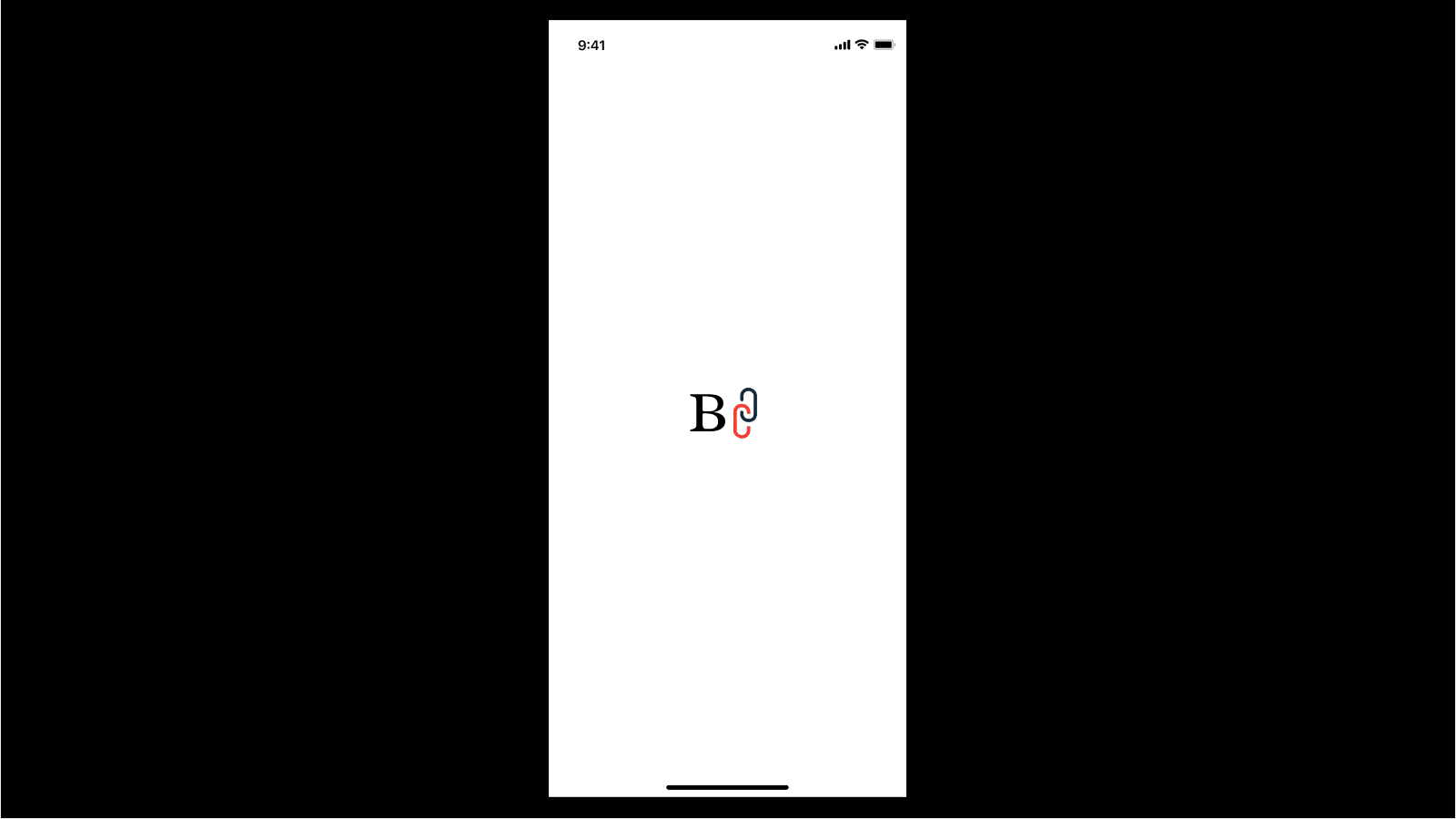
The control diagram should depict how certain actions alter the application’s flow of execution.



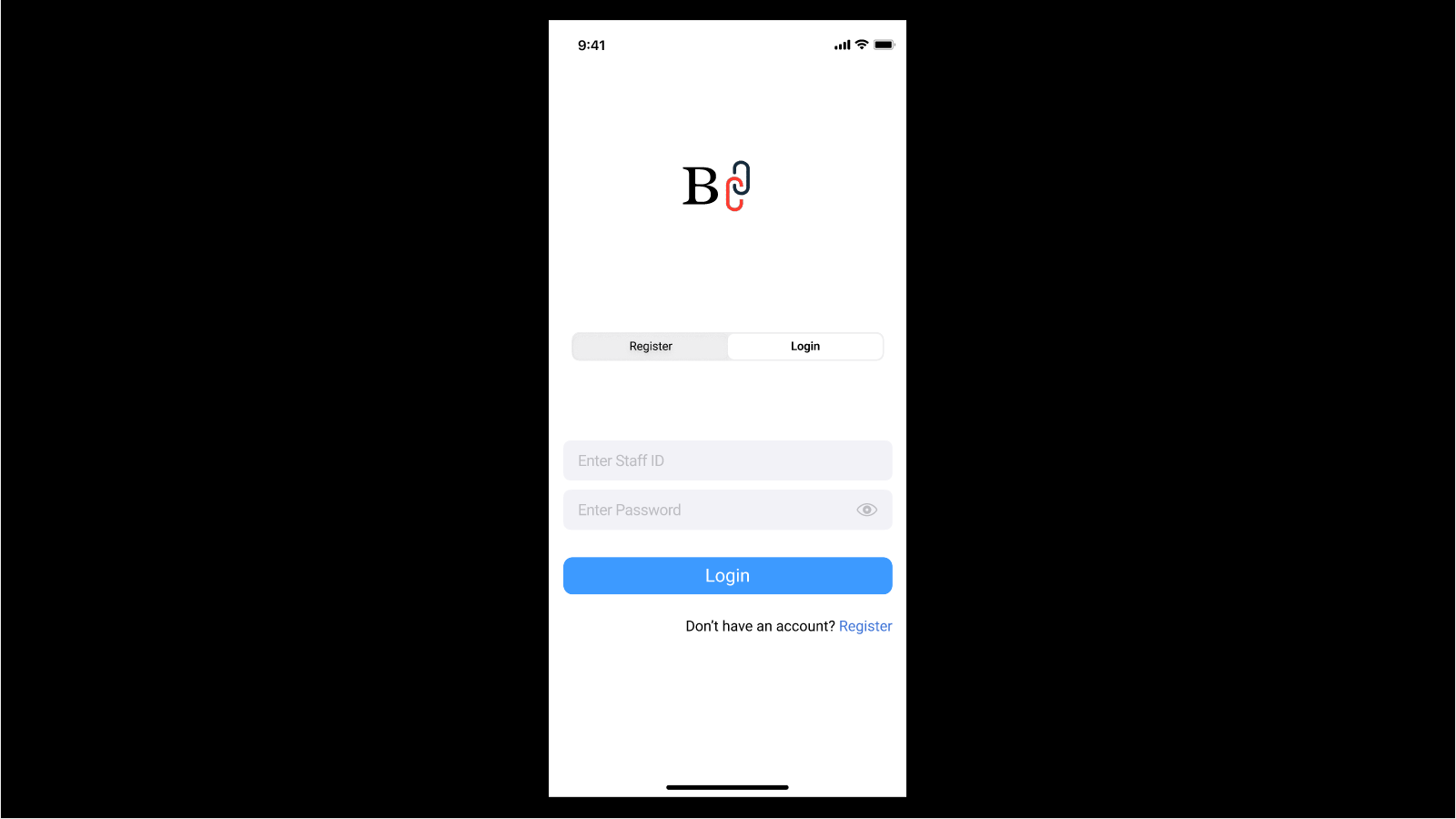
**Figure 3.12- the figure below shows the control flow diagram.**

### **3.8.7 User Interface Design**

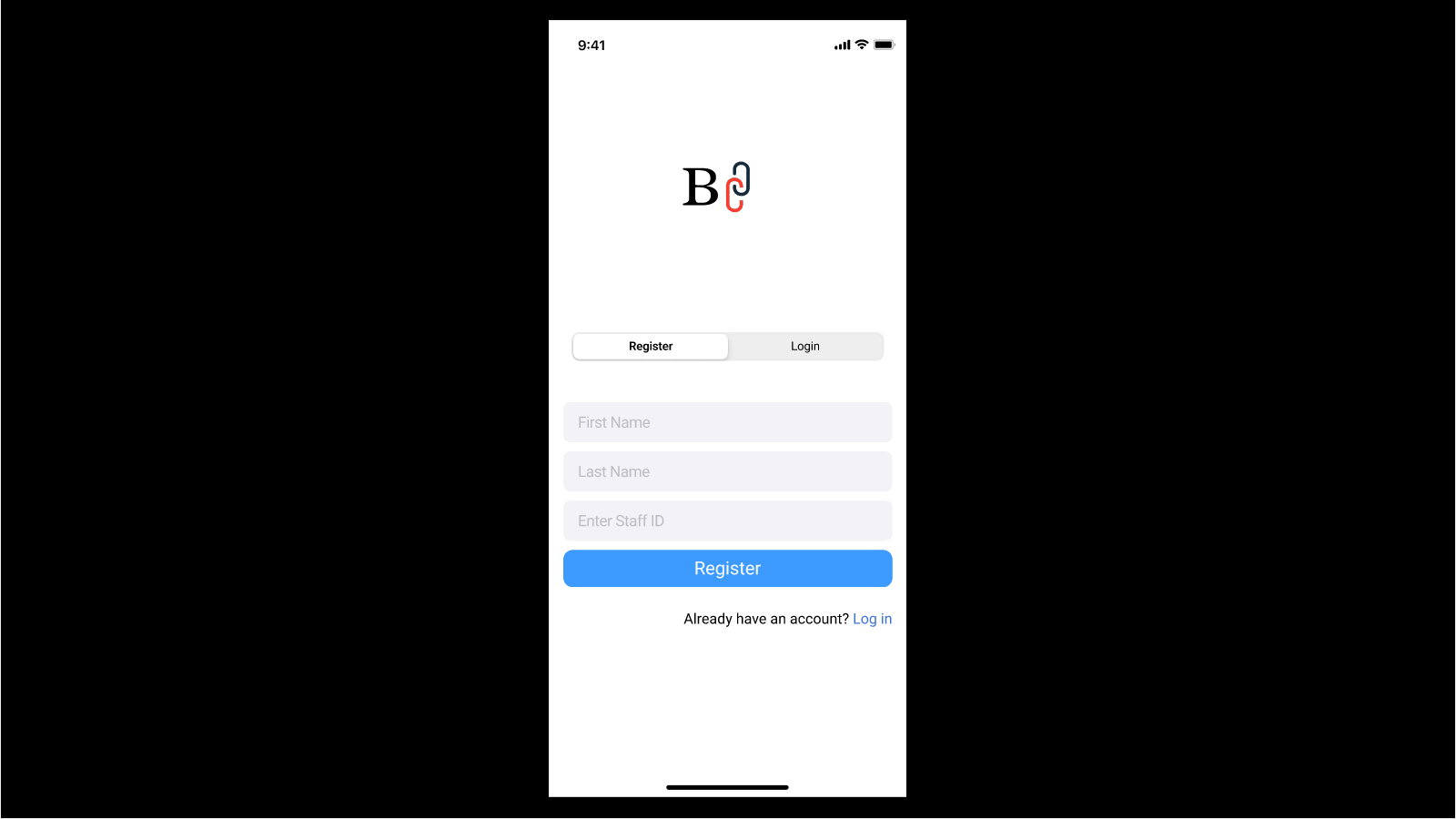
Analysis conducted on the user interface.



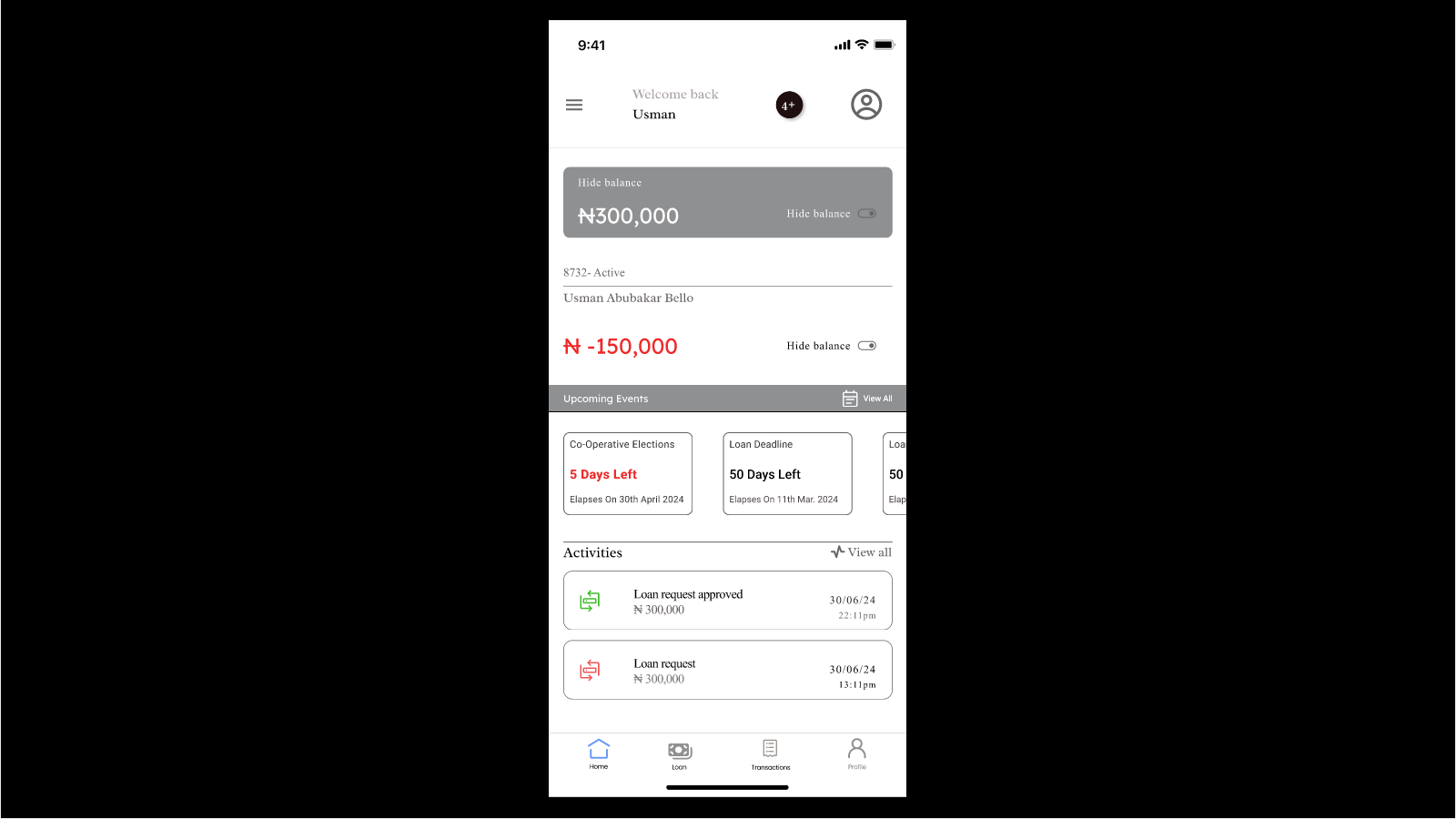
**Figure 3.13 mobile application loading page below.**



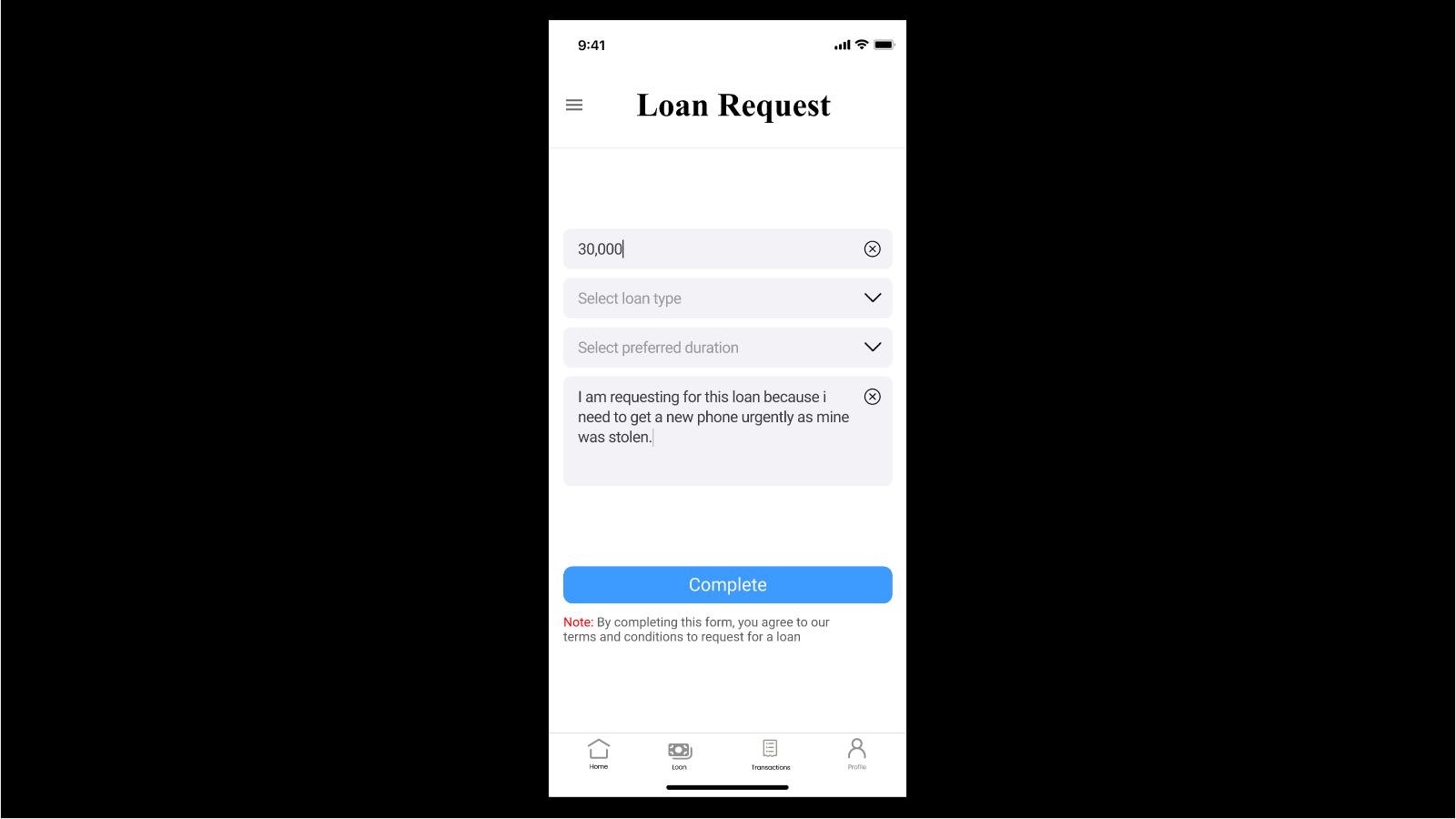
**Figure 3.14 mobile application log-in page.**

****

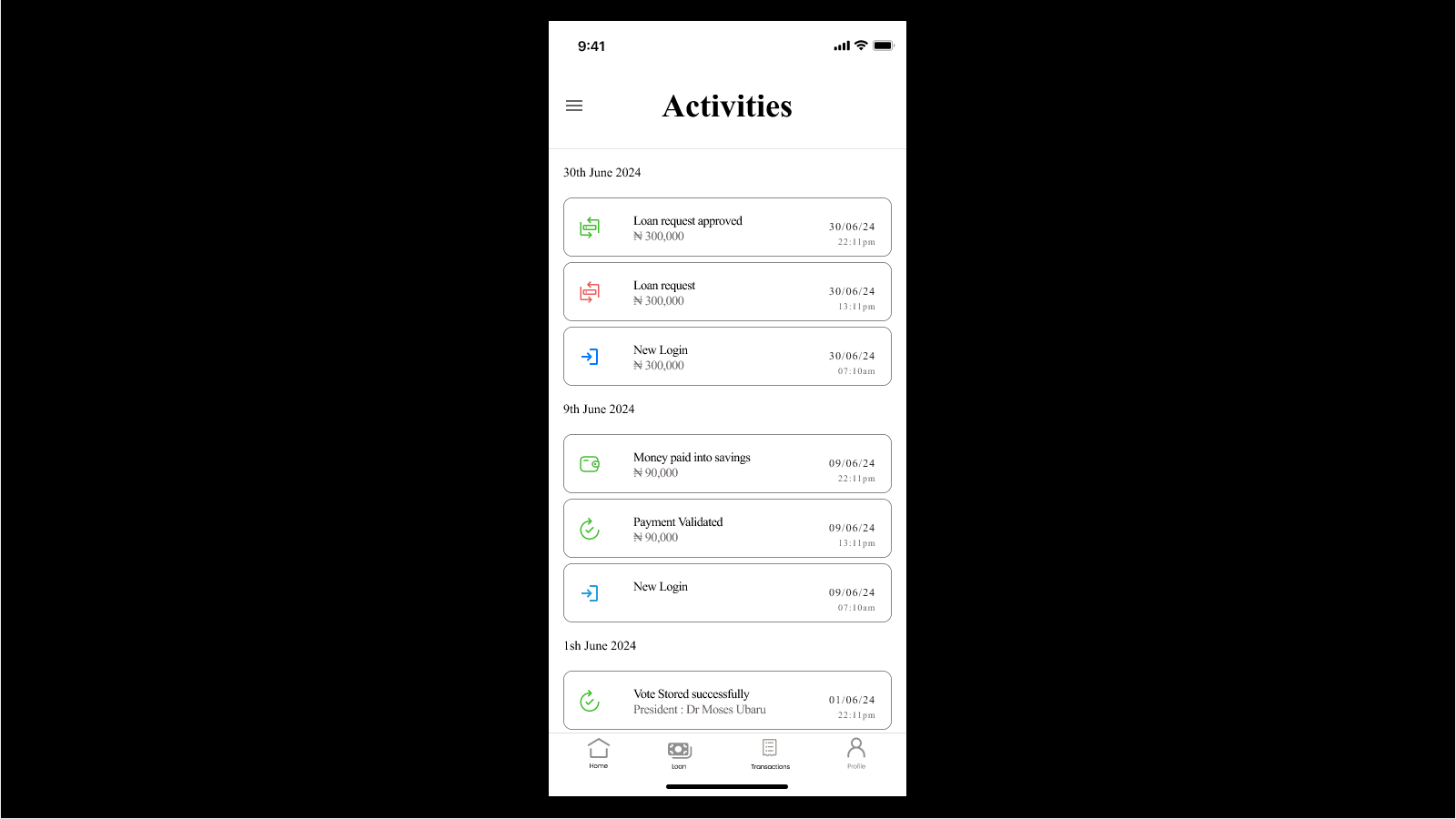
**Figure 3.15 mobile application registration page.**

****

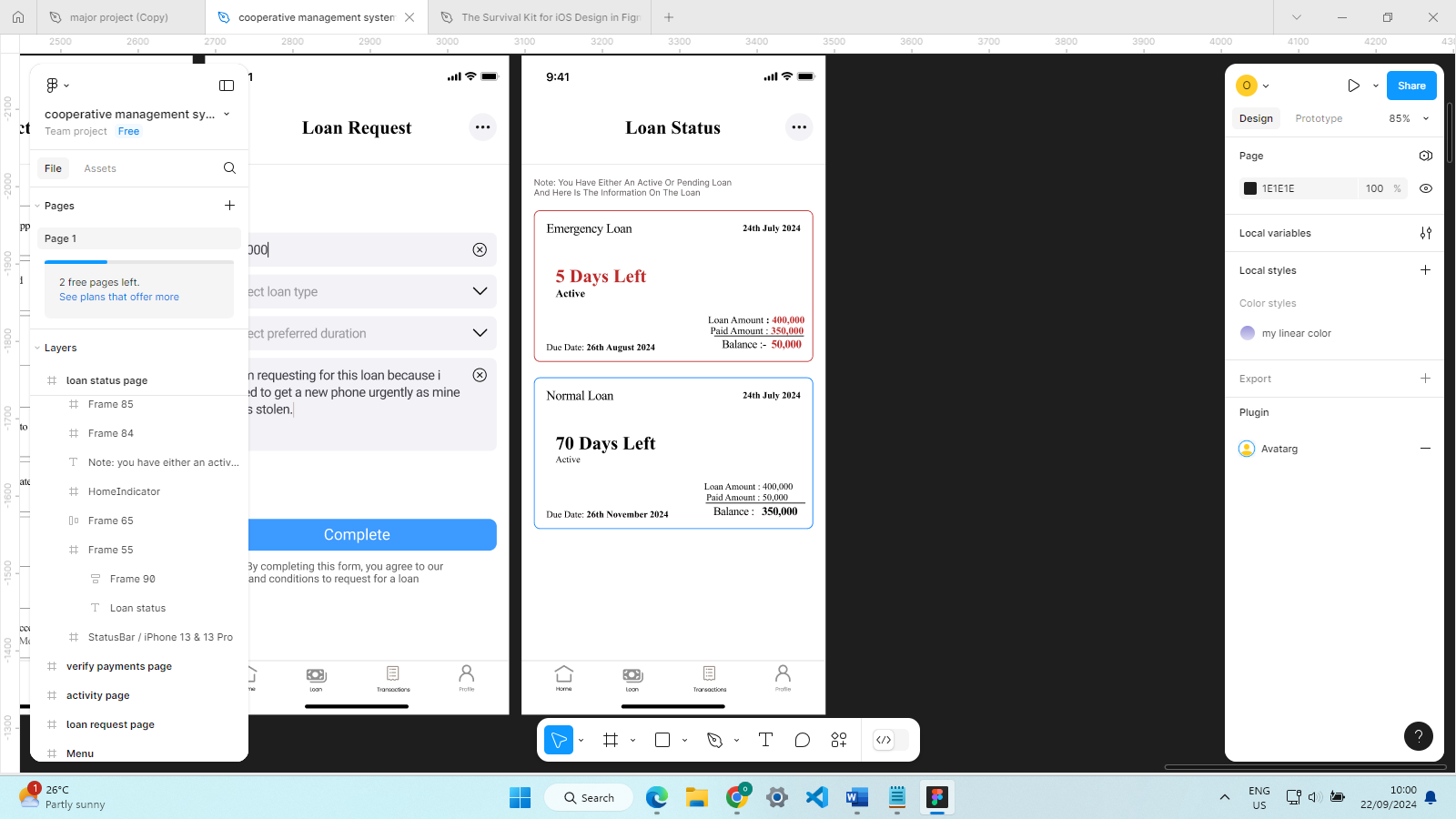
**Figure 3.16 mobile application dashboard page.**

****

**Figure 3.17 mobile application Loan Request page.**



**Figure 3.18 mobile application Activities page.**



**Figure 3.19 mobile application loan Status page.**

**Chapter 4**

**Testing and Implementation**

**4.1 Overview**

This chapter covers the development of the system as well as other relevant aspects that have helped with the development like the database, frontend and backend. As well as difficulties faced throughout the development process and how they were solved.

**4.1 Main Features**

The main features of the system are-

* **AUTHENTICATION**: the backend server contains logic that allows us to authenticate users on the system. New members may sign up on the Register page that is shown below so that the registration data will be stored in the database.

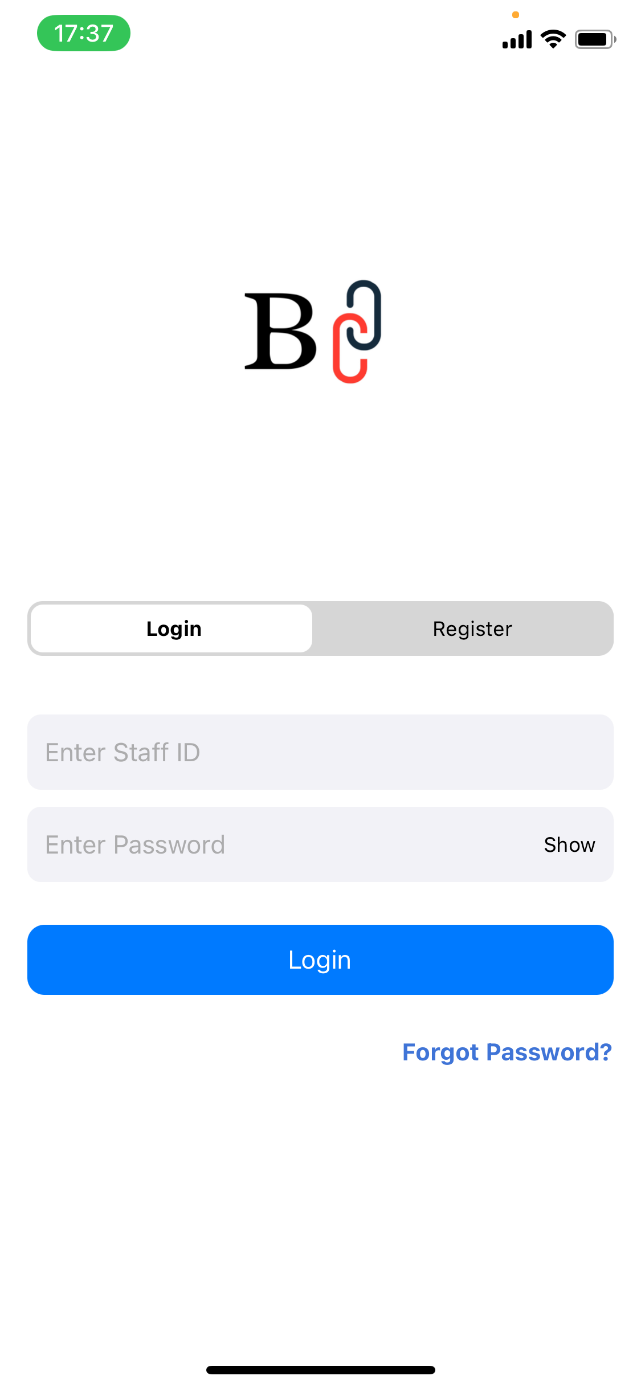
****

Figure 4.1 Login Page

aget

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