



BSC (Hons) Software Engineering
Faculty of Computing

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**PROPOSAL FOR CEYLON ELECTRICITY
BOARD (CEB Care) APP OPTIMIZATION**

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1. Introduction

CEB care app is developed by the Ceylon Electricity Board(CEB) to provide the digital experience of their services and interact with consumers in a revolutionary way. This digital platform is designed to escalate the overall consumer experience by providing services that offer improved control, visibility, and convenience [1].

CEB focuses on providing a digital experience that empowers consumers to manage their electricity accounts more efficiently and effectively. Consumers can access a variety of services which were only available through traditional means. The services provided through this platform include lodging electricity complaints, managing multiple electricity accounts, receiving interruption alerts and accessing an interruption calendar, checking bill and payment information, making online payments, estimating electricity usage, and using a bill calculator.

This report evaluates the current state of the CEB Care app, identifies existing problems, and proposes solutions to enhance its usability, functionality, and overall user experience.

1.1 Problem Identification:

Through the analysis of the CEB Care app through user experiences, user reviews, and research it is observed that all of the existing problems are correlated with the user-friendliness of the application [2]. The features of the existing application lack most of the features that affect the user-friendliness of the application. By considering all the features this document categorized 5 main problems within the app under user-friendliness. these areas are discussed in the next section.

1.1.1 Current Problems:

- 1) The app lacks a user-friendly interface, making navigation difficult for users. The interface is extremely simple to the point it doesn't have a search bar or help icon to assist users in finding information or features within the app.

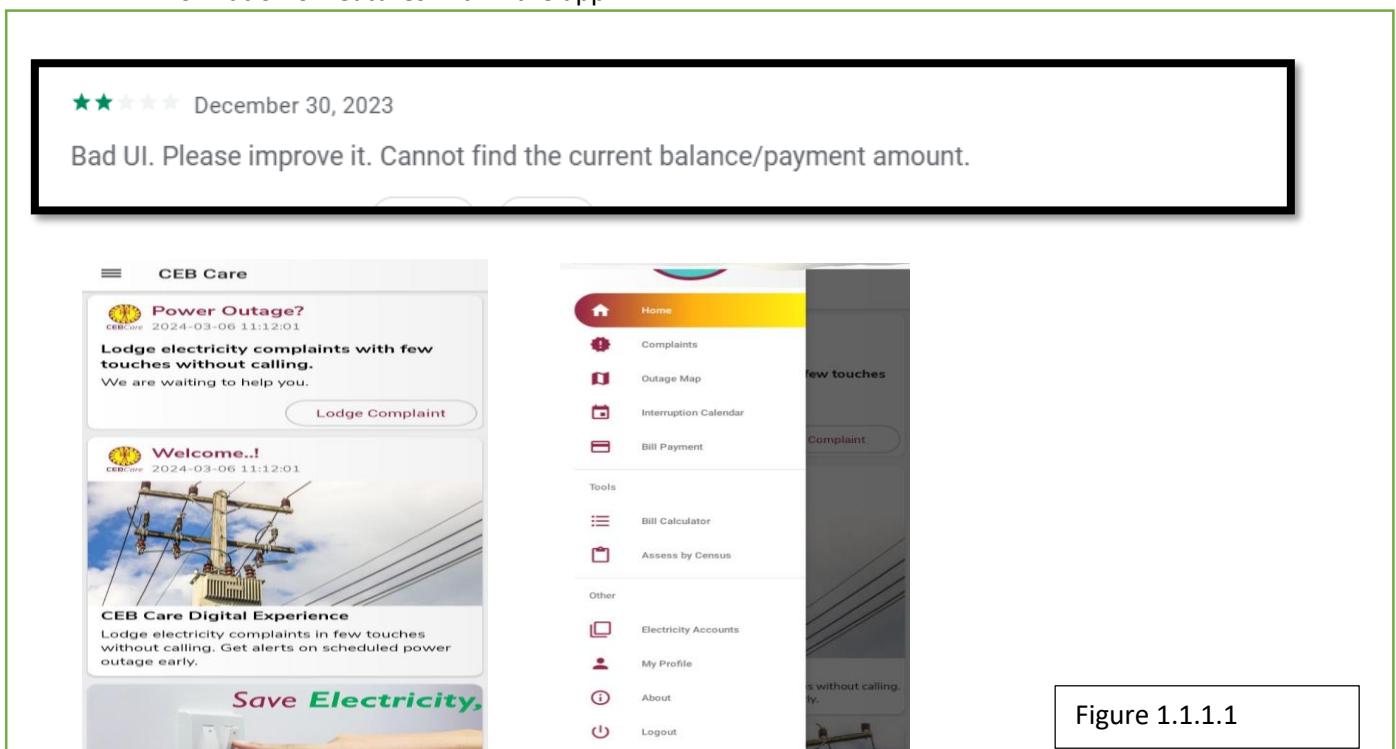
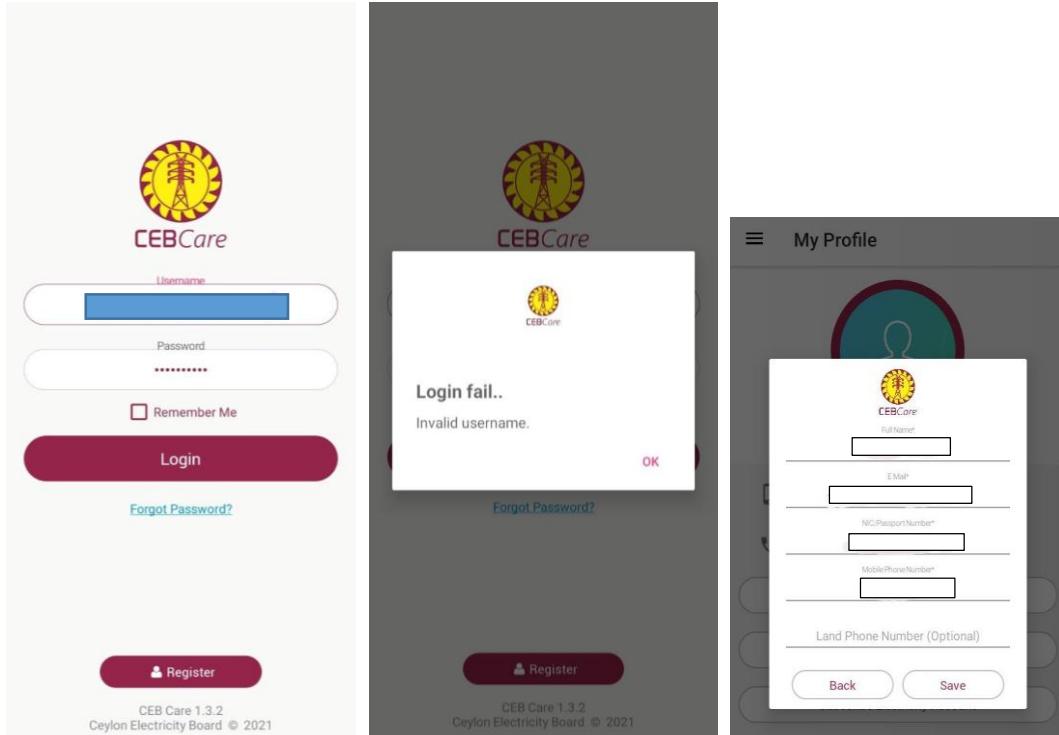


Figure 1.1.1.1

- 2) Network errors and login failures: Users frequently encounter network errors and login failures, even with a stable network connection. This disrupts their experience and prevents them from accessing the app's services.



★★★☆☆ February 27, 2024

Before i could add multiple electricity accounts in one login account. Now it shows the option to add but after giving details and press add button the message comes as maximum number of accounts reached Why??

Figure 1.1.1.2

The above snap depicts the login error that occurred when a user tried to log in with their registered email address. Some users can log in to the account using the registered email account. Once the user registers to the account with a username, full name, email, and phone number, the username cannot be edited again and it is not found.

And also there are so many problems with logging in, as mentioned in the above user review.

- 3) Bill payment updates: The app does not update bill payments in real time. After making the payment, users are not able to see the updated remaining balance to be paid, leading to confusion and potential payment errors.

The image shows two screenshots of the CEB e-Bill app interface. The left screenshot displays a bill statement with a 'Billing Date' of 'Wednesday, 14 February'. The right screenshot shows a 'Last Printed Bill' with a 'Billing Date' of '2024-03-07'. A callout box labeled 'Different dates' points to the date discrepancy between the two bills.

Screenshot 1 (Left): CEB e-Bill App Interface

- Details: ceb.lk/p/MjQwMjEwMDc0ND A0MDQ3NjU
- Date: Wednesday, 14 February
- A/C No: [REDACTED] (D1)
- B/F: Rs. 7,389.79
- Payments: Rs. 4,000.00
- Outstanding: Rs. 3,389.79 by 2024-02-07
- Reading Date: 2024-02-14 (426)
- Reading: 40762 - 40680 = 82 Units
- Charge: Rs. 3,656.00
- SSC Levy: Rs. 93.74
- Monthly Bill: Rs. 3,749.74
- Total Due: Rs. 7,139.53

Screenshot 2 (Right): Last Printed Bill

- CEB Care
- Last Printed Bill
- Billing Date: 2024-03-07
- Name: [REDACTED]
- Address: [REDACTED]
- Tariff type: Domestic
- Duration: 31 days
- Connection: 30 A
- Previous Balance: Rs. 3389.79
- Charge for the Period: Rs. 3656.00
- Current Balance: Rs. 3219.53

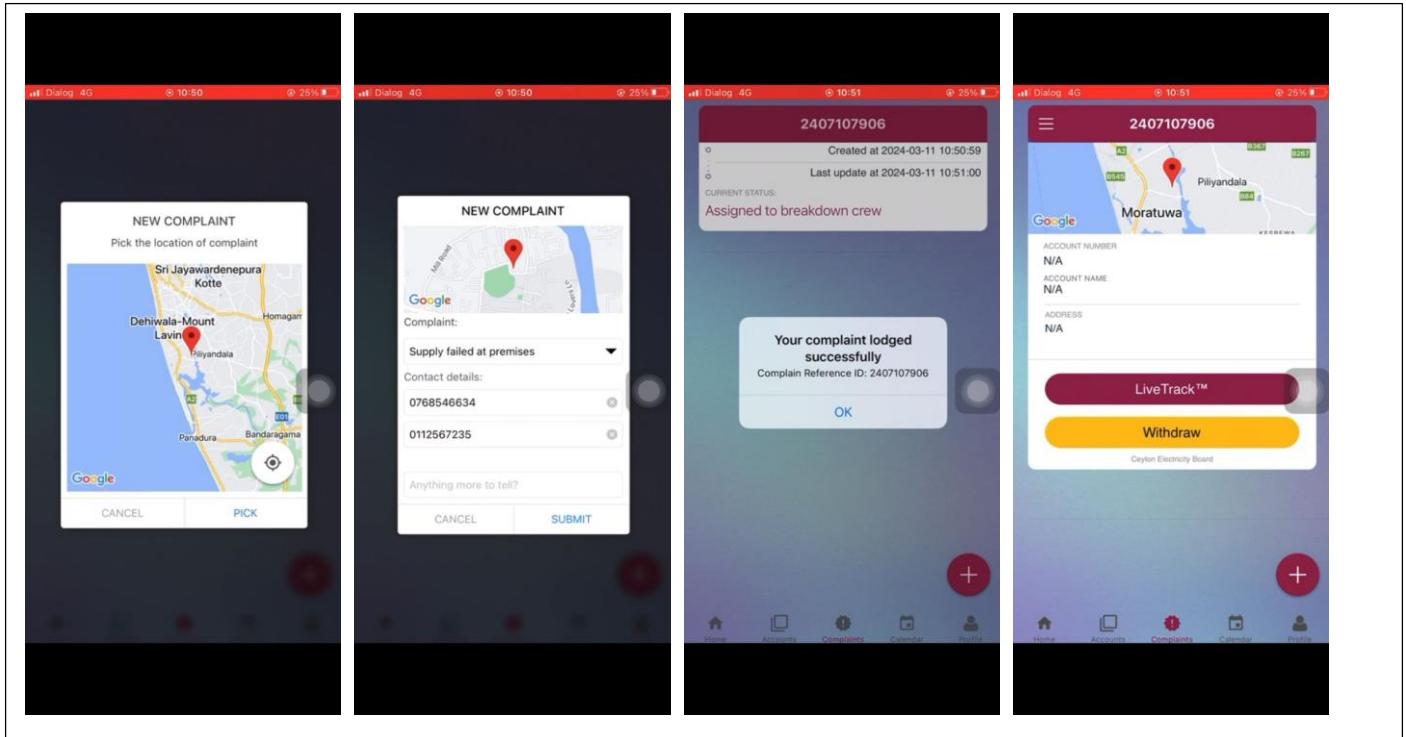
Review (Bottom):

★ ★ ★ ★ ★ January 7, 2024

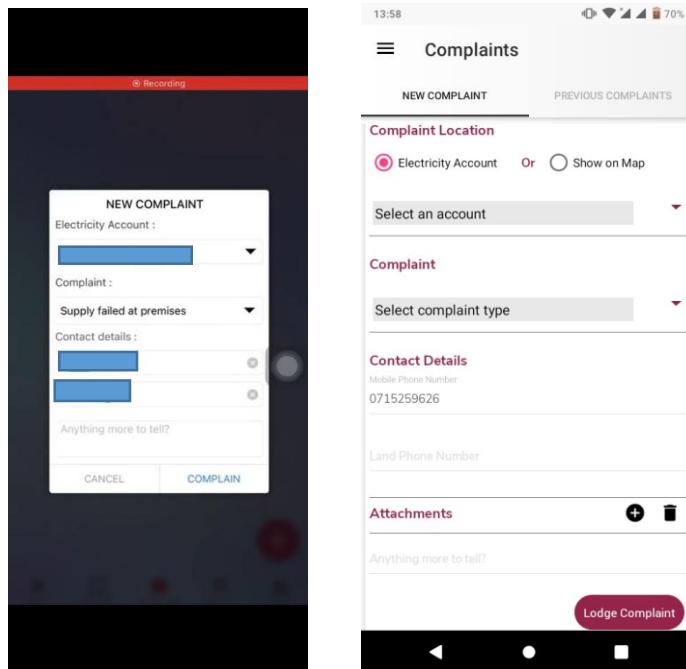
I've been using the CEB SelfCare app for months, and it's been a consistently disappointing experience. Despite regularly paying bills through the app, it fails to update for months, leaving me in the dark about my current status. The lack of timely updates diminishes the app's purpose and makes it unreliable for managing bills effectively.

Figure 1.1.1.3

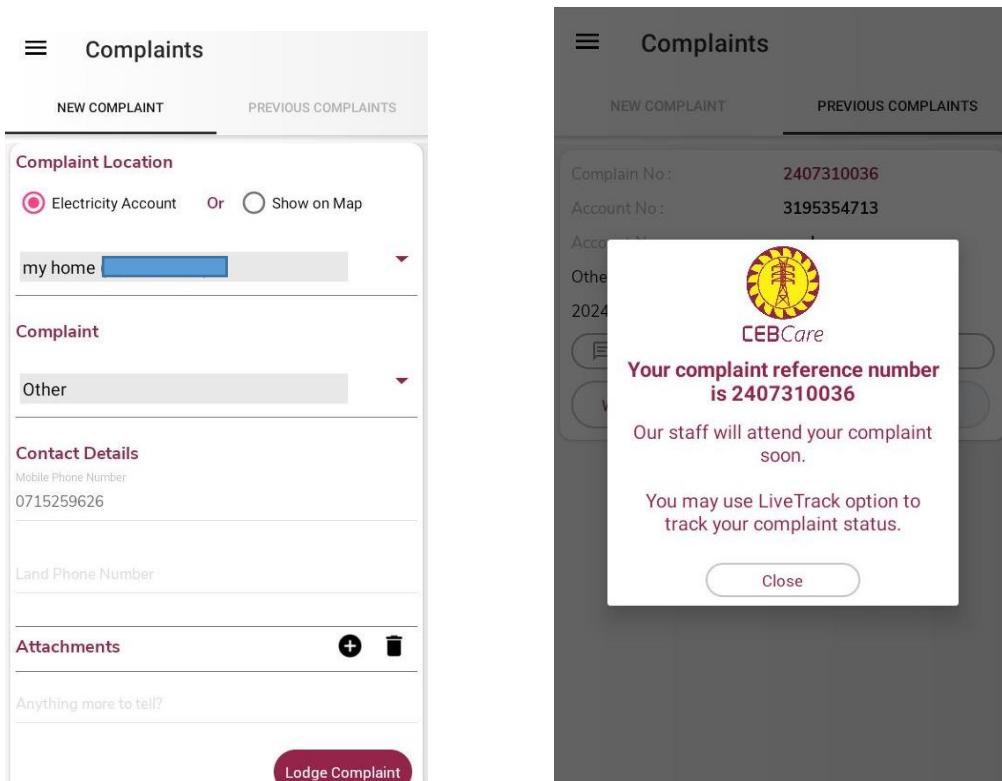
- 4) Complaint Filling Issues: When filing a complaint, users often receive error responses. Subsequent attempts to file the same complaint are blocked, as the app recognizes it as an ongoing process, limiting users' ability to report issues effectively.



The iOS users can file complaints using the map but they are unable to complete the same procedure using their electricity account. When the consumer files a complaint with the electricity account then complaint filing process ceases and redirects to the file complaining interface.



In android users' file complaining, only the electricity account option is valid and it redirects to the complaint interface and the option switches to the electricity account without displaying a map to choose the location.



- ★ ★ ★ ★ ★ February 8, 2024
So many errors and keep sending notifications endlessly. Also it fails to log reports and complaints. CEB never fixed it
- ★ ★ ★ ★ ★ December 8, 2023
It's great thing to moving along with technology. Mobile app platforms are convenience to everyone. But with this app or current release is bit behind to the production quly standards. Everytime i do a complain showing error response. And then when i try agian, its says like "there is ongoing one". But i cannot see any pending complains in that screen. This is the main feature most of the users currently using with this app. Please fix those things and do a new release.

Figure 1.1.1.4

- 5) Outage Map: The outage map is not updated in real time, which can lead to inaccurate information about service disruptions, affecting users' ability to plan accordingly. consumers with registered electricity accounts can only view the outage in their relevant area. Also, it is only visible only if the outage is a maintenance outage. The map doesn't update in real-time to notify consumers of the sudden disruptions due to disasters.

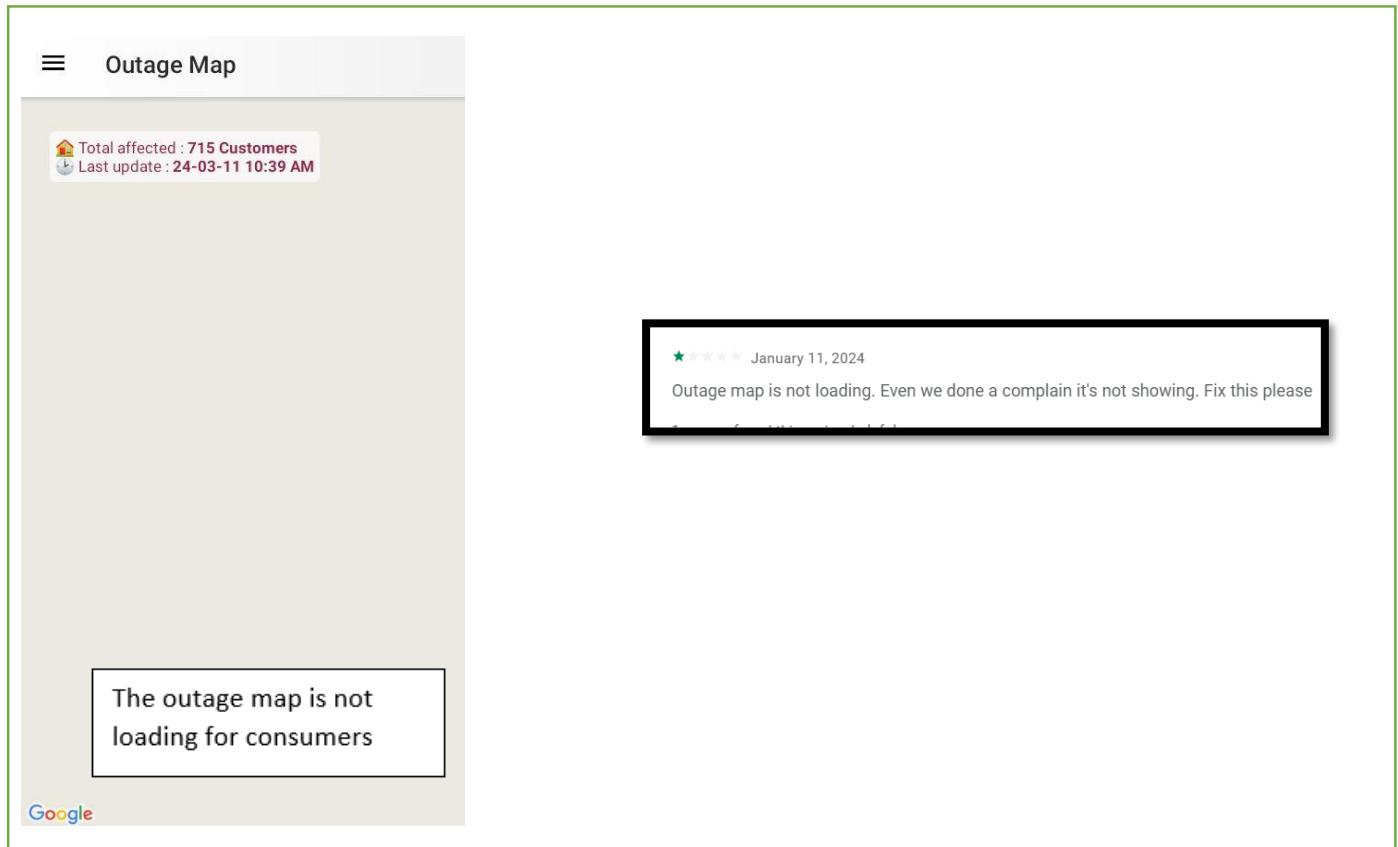
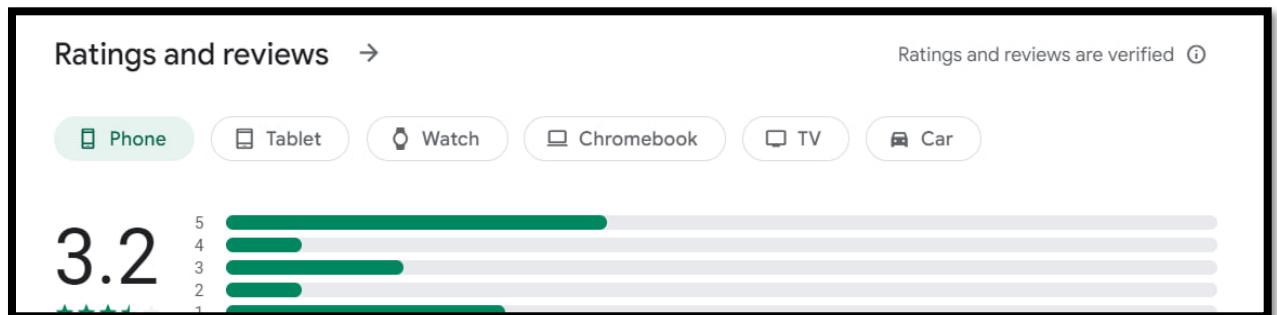


Figure 1.1.1.5

1.1.2 Need for a New Software Solution:

These issues demonstrate the critical need for a new software solution that addresses the app's usability, reliability, and functionality. The new software solution improves user experience, provides real-time updates, and enhances overall app performance. As this app has many weak features the new solution will be useful for app optimization and user satisfaction. Some needs are given below with proofs.



★ ★ ★ ★ January 7, 2024

I've been using the CEB SelfCare app for months, and it's been a consistently disappointing experience. Despite regularly paying bills through the app, it fails to update for months, leaving me in the dark about my current status. The lack of timely updates diminishes the app's purpose and makes it unreliable for managing bills effectively.

★★★☆☆ March 24, 2023

Update 24.03.2023 Cannot withdraw complaints. It is easier to make complaints and CEB responds fast. The payments are updated quite well. Bill calculator works well. There are an ample amount of options. However, It is difficult to navigate to each menu, since they are in the side bar and sometimes within a sub menu. Hence it is less user friendly. I would like to suggest the IT team to redesign the GUI to be more user friendly and easier to navigate around. And do change the home page as well.

★ ★ ★ ★ May 4, 2023

Worst App with minimal information, 1. There are no features for meter readings or units to crosscheck the usage and payment deduction. 2. Deduction update seems to be very complicated to find out the actual due to be paid. 3. Taking too much time to update payments and deduction. All the above issues should be rectified to make this app suitable. Further, pls refer to the NWSDB Selfcare App for the rectification. Thank you

1.2 Proposed solutions

This project report is based on the CEB care app of the Sri Lankan government. According to our research, investigations, and observations, we found that the main problem of this app is the lack of user-friendliness. This part of the project report will discuss the solutions that can be proposed for the problems reported above.

The main purpose of this part of the report is to provide concise, unambiguous answers for several issues we found regarding the app from user reviews, personal experiences, and all the other available resources. All our interpretations identified the biggest drawback of the app is the lack of user-friendliness. Our observations provided us with 5 key points of impact for this subpar app feature.

1. Problem: Navigation problems and lack of search Bar / Help icon option and setting.

Q- Problems can lead to user difficulties and frustrations in using this CEB app. User has no option to manage and update their accounts and passwords.

Solution:

- Implementation of the user-friendly navigation menu
- Introduce a search bar for users to quickly find information in need.
- Include a visible help icon, and create and assign real-time helping assistance or AI helping assistance to reply to frequent questions from users.

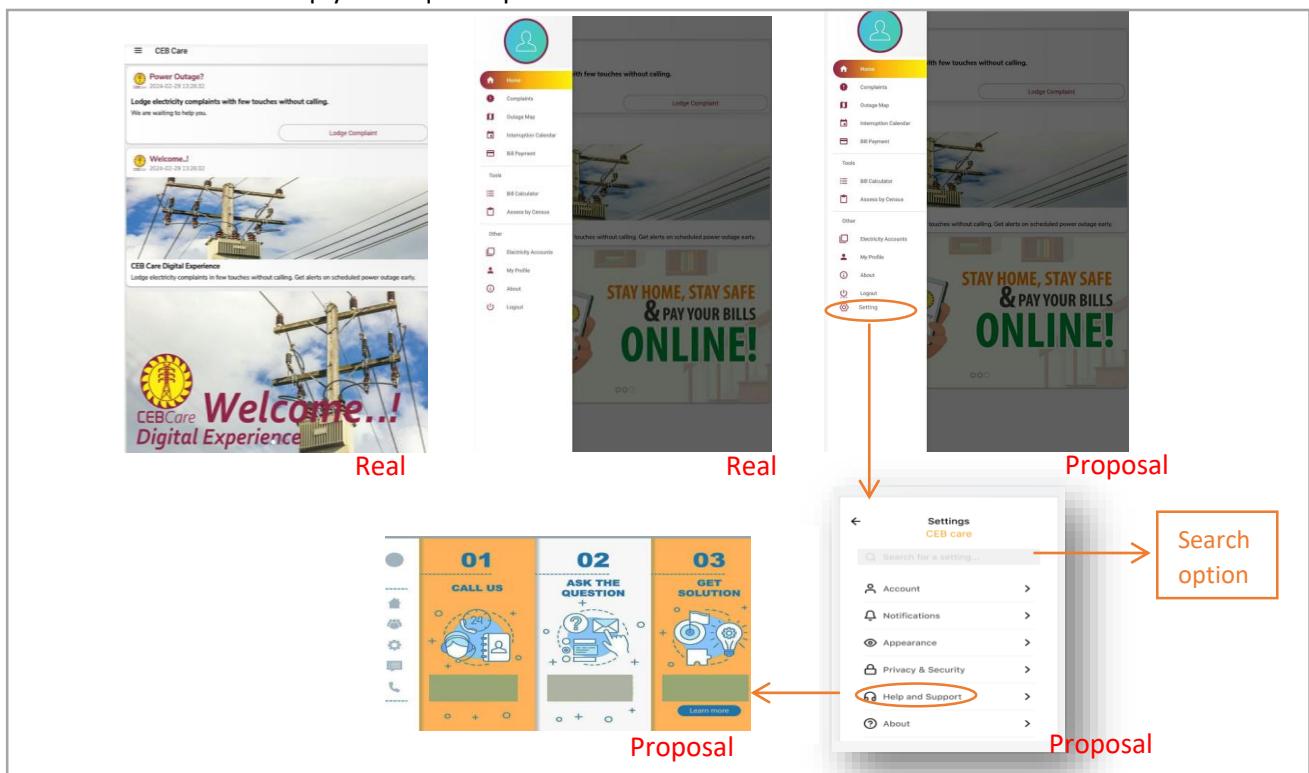


Figure 1.2.1.1

2. Problem: Network Errors and Login Failures

Q- in case of emergency, inconvenient for users.

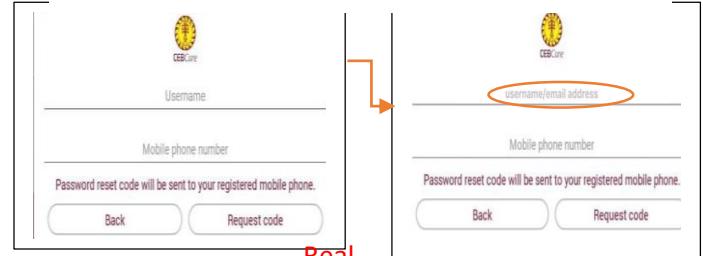
Solution:

- Improve reliability by optimizing the app for various network conditions
- If any, provide an error message by describing the next step that should be followed by the user.
- Consider some login methods such as biometric authentication to improve user experience

Network Errors may occur due to different reasons. Some common reasons are [1],

- Network connectivity issues
- Server-side errors
- Firewall and security issues
- Load Balancing and scalability
- API Endpoint changes
- Client-side code issues Caching problems
- App version problems

Proposal to optimize the Forgot password option. adding both username and email-address instead of username.



The step-by-step procedure to solve the problem is given below as a summary of all investigations and interpretations.

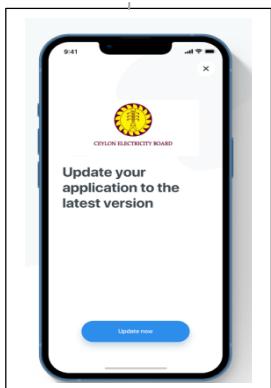
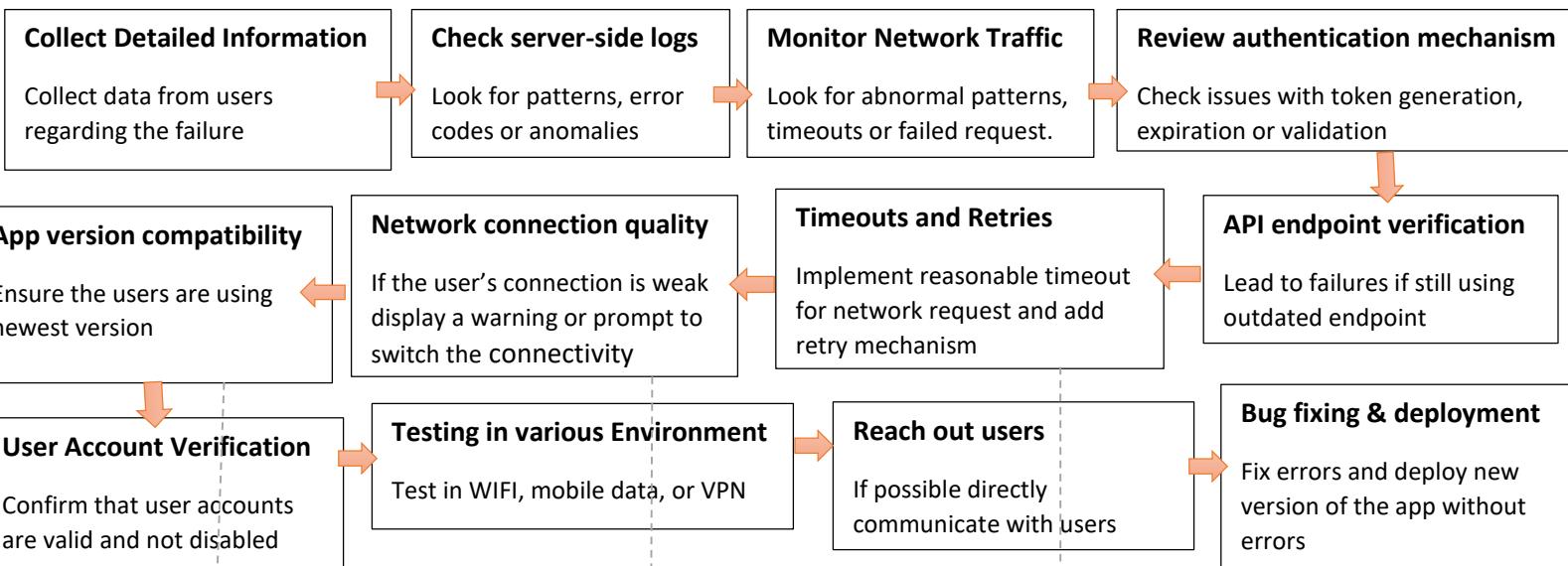


Figure 1.2.2.1
Proposal



Figure 1.2.2.2
Proposal

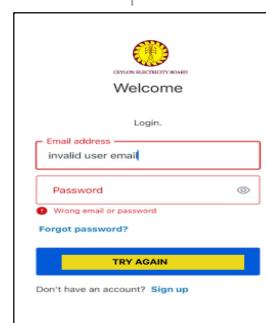


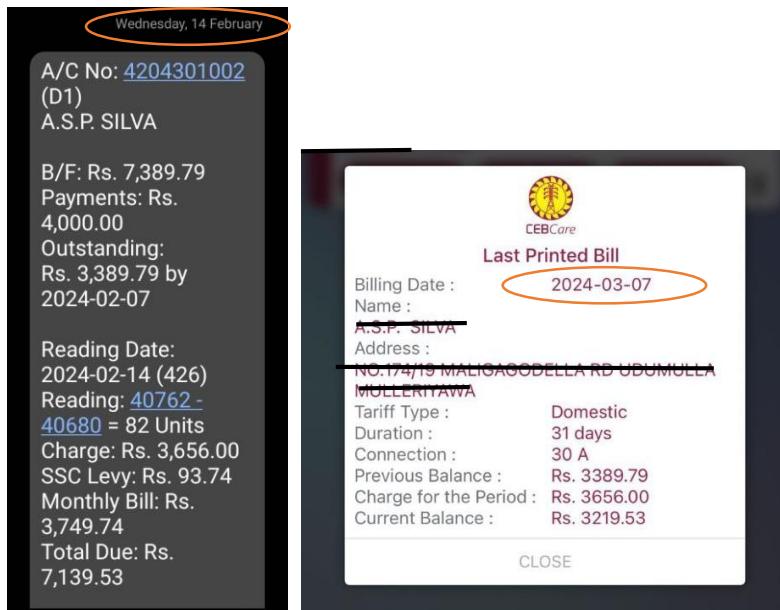
Figure 1.2.2.3
Proposal

3. Problem: Not Real-time Updates for Bill Payments

Q- can lead to user inconvenience and confusion because it is the one of most important parts and the main function of the application.

Solution:

- Must implement real-time updating systems regarding bill payments.
- Adding a feature to send an email or a message upon successful payment.
- Optimize the app to reflect the remaining balance immediately after the payment.



Real



Proposal

Proposal

Figure 1.2.3.1

4. Problem: Complaint Filing Errors

Q- this may lead to a lack of confidence regarding the functionality of the app and frustration.

Solution:

- Create an automated system or assign manual assistance to respond to user complaints add those to a database and provide solutions for their problems as soon as possible.
- Allow users to update, edit, or review the status of their complaints as needed.
- If there's any error provide an informative error message to guide the user for their next step.

Real

Note

- You can not lodge new complaint while having another processing complaint.
- You will be notified while complaint is in process.

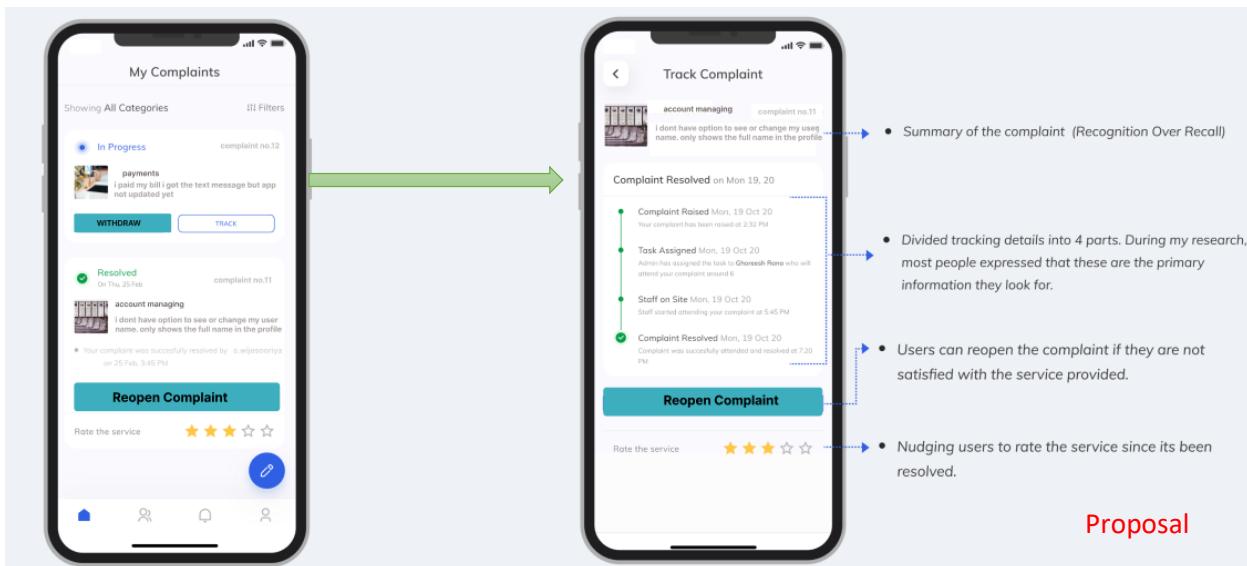


Figure 1.2.4.1

5. Problem: Outage Map Not Updating Real Time

Q- this can lead to misinformation during service breakdowns.

Solution [2]:

- Implement a real-time updating mechanism for the outage map, use a real-time database, and assign separate job roles for that responsibility.
- Integrate automated alerts or notifications or red flags on a map displayed in the app during outages. Not for power cuts (for that this service is already there) but for emergency outages.

Grid Data: Gather up-to-date information about power lines, substations, and other pertinent infrastructure from the electrical grid. Sensors, smart meters, and other monitoring equipment placed across the grid may provide this data.

Allow users to report outages via the app's outage report feature. Crowdsourced data from people who are having power outages may be included in this.

Information Processing: Integrate data from several sources while maintaining accuracy and consistency. To produce a cohesive dataset.

Geospatial Processing: To translate the grid data into a geographical representation, utilize geospatial processing if the outage map is shown geographically.

Streaming Data: To manage constant updates from the grid and other sources, put in place a real-time data streaming system. For this, technologies like MQTT and Apache Kafka could be employed.

Processing on the server side: Create an architecture that is event-driven to handle incoming data and cause updates to be made to the outage map.

Use caching techniques to save data that is accessed often, which will lighten the load on the backend and speed up response times.

Database: To effectively store and retrieve geospatial data, one can use a spatial database. MongoDB or PostgreSQL with PostGIS extensions are popular options for storing spatial data.

Backend Services: To manage communication between the application and the server, create RESTful or GraphQL APIs. Access to user reports, outage data, and other pertinent data would be possible using these APIs.

Map Visualization: To present outage information in an approachable way, utilize mapping tools such as Leaflet, Mapbox, or Google Maps API.

UI Updates in Real-Time: Take advantage of frameworks such as React, Angular, or Vue.js to offer a dynamic and responsive user interface that automatically refreshes when new information about outages becomes available.

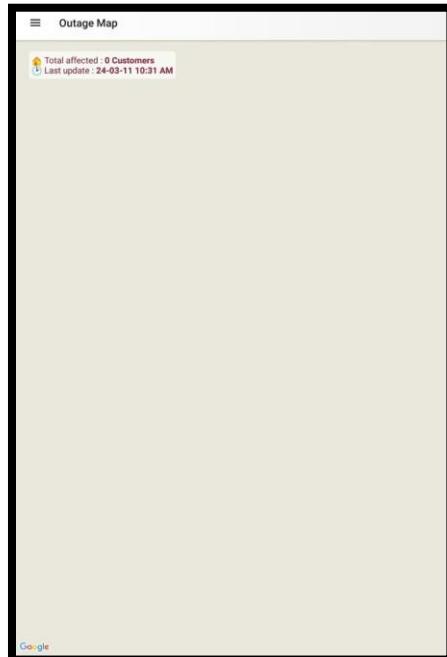
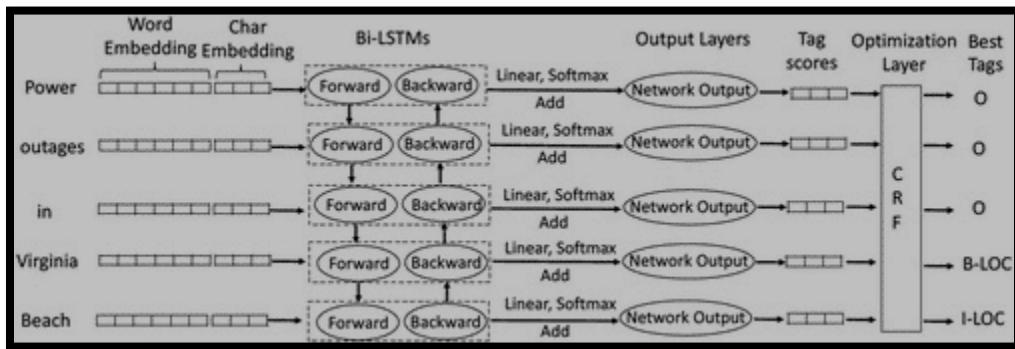
Integration of Mobile Apps: To expedite development if the software is offered on several platforms, consider utilizing cross-platform development frameworks like React Native or Flutter.

Observation and Analysis: Use tools for tracking performance, spotting problems, and guaranteeing system dependability. To learn more about user behavior, outage trends, and general system utilization, employ analytics technologies.

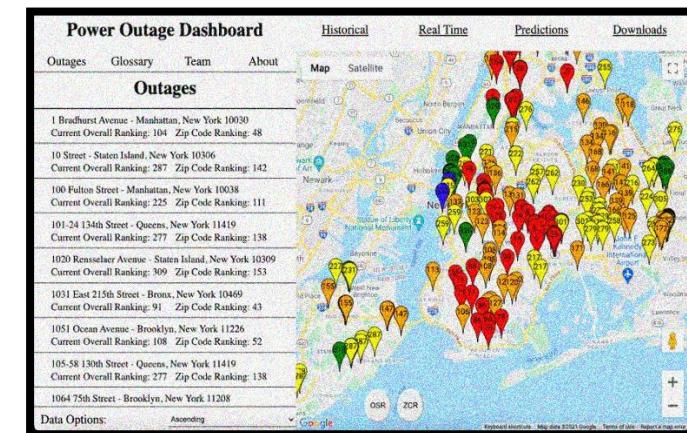
Scalability.

Horizontal Scaling: Create a scalable design that will enable the system to accommodate higher loads during peak periods or in the case of widespread failures.

Example->mapping near-real-time-power outage from social media [2]



Real



Proposal

Figure 1.2.5.1

1.3 Purpose

This project is focused on improving the current CEB app so that it can efficiently meet its goals without any interruptions. Our research shows that the app is having difficulties functioning properly and providing accurate services to its customers. The project's objective is to address the issues mentioned in problem identification and create a more user-friendly interface so that customers can interact with the app without any inconvenience. The mentioned goals are the project's goals to develop the CEB app to be more reliable to the customers.

- Provide a detailed user-friendly interface to the customers.
- Update the bill payments promptly.
- Make the app more reliable without any login failures.
- Make the provided email address of the app user more important and useful when resetting and updating the user profile details.

1.4 Scope

CEB Care is software designed by the Ceylon Electricity Board to provide improved control and visibility over consumers' electricity accounts. Lodge electricity complaints, manage multiple electricity accounts, interruption alerts, interruption calendars, check bill information, check payment information, and make online payments are services offered by the current application. This software application is provided by the Sri Lankan Government, and as such, it's important to ensure that the software performs to the best of its abilities since it represents the country's reputation. Research conducted on the CEB Care app has provided valuable insights into the current performance and user experiences of the app, which is beneficial for the project.

The passage above highlights the problems that have been identified with the current software and proposes a solution to address them. Additionally, this report discusses the architectural and SDLC styles, while taking into account the project constraints, stakeholder concerns, and software requirements. The report also includes detailed UML diagrams with proposed modifications.

1.5 SDLC STYLE

In our project, the purpose is to identify some weak points in an application and propose some ideas to optimize the features of the app. This is a project that needs to be completed within 2-3 weeks by documenting all the functionalities of the app. When considering key features of the project in our view, the best software development life cycle process style is the Agile development process.

Agile development

Agile development is one of the process models that mainly focuses on developing software quickly, with frequent customer collaboration. Therefore, this model is more adaptable to changes than most other SDLC styles.

Some specific reasons for selecting this style for our project are given below.

Individuals are more important than processes and tools

#collaborating instead of contract signing

Focus on responding to changes

Mainly 6 steps

1. concept
2. inception
3. iteration
4. release
5. production
6. retirement

- Advantages
 1. increased flexibility
 2. improved communication
 3. reduced risks
 4. increased customer satisfaction
- Disadvantages
 1. Limited control
 2. Lack of documentation
 4. High level of user involvement
 5. complex projects can be lengthy

2. General Description

2.1 User Characteristics

2.1.1 User Types

- 1) Residential Consumers: Residential users make up a significant portion of the app's user base. They primarily use the app to manage their electricity accounts, check bill information, and make payments online. Their needs include easy navigation, clear bill information, and quick access to payment options.
- 2) Commercial Consumers: Commercial users include businesses and organizations that require electricity services for their operations. They use the app to manage multiple electricity accounts, receive interruption alerts, and estimate usage for budget planning. Their needs include managing accounts efficiently, receiving timely alerts, and accessing usage data for cost analysis.
- 3) Technical Staff: Technical staff from the Ceylon Electricity Board use the app to monitor and manage electricity interruptions, respond to complaints, and update outage information. Their needs include a comprehensive dashboard for monitoring, quick access to outage information, and efficient complaint management tools.
- 4) Customer Service Representatives: Customer service representatives use the app to assist users with account-related queries, process payments, and track complaint resolutions. Their needs include access to customer account details, complaint history, and payment processing tools.

2.1.2 Specific User Needs

- 1) Easy Account Management: Users need a simple and intuitive interface to manage their electricity accounts, including viewing bill information, checking payment status, and updating account details.
- 2) Timely Information: Users require timely alerts and notifications for electricity interruptions, outage updates, and payment reminders.
- 3) Efficient Complaint Resolution: Users expect a streamlined process for lodging complaints, tracking their status, and receiving updates on resolutions.
- 4) Accurate Usage Estimation: Users rely on the app to provide accurate estimates of their electricity usage to plan their consumption and budget effectively.

2.2 Product Functions

This section will discuss overall functionalities and the features of the system to be developed and updated according to new proposals and with additional features. This is the application which is from the Sri Lankan Electricity Board to manage some processes regarding the power usage of Sri Lankans. As already discussed there are a few weak points in the CEB app. This section will discuss overall functionality after upgrading the application by minimizing all the identified weak points of the app.

All the newly added (proposed) features are highlighted

1. User Authentication and Account Management

- The app allows users to register and create accounts securely
- If user credentials (**users are allowed to log in using both username and email**) are incorrect user will get an option to try again.
- If still not successful user has forgotten password option.
- **To change the password user can use both email and username.**
- System will send the user a code as a confirmation and that code will allow users to change the password and successfully log into the system.
- **Via settings and My Profile option users are allowed to change, update, notifications, and manage their accounts.**

2. Home page management

According to the existing CEB app. home page doesn't have any specific options. It just shows the option to complain. it is the only option the user has. All features are implemented separately.

3. Complaint management

- Here users are allowed to complain by using an electricity account and showing it on a map.
- Then the user can select the complaint type.
- In the attachment part user can add their additional problems.
- **After adding a complaint user can track the complaint-resolving process and what is the current stage of the problem under investigation.**
- After one complaint is resolved user can add more complaints if wants, else user can not add complaints while one complaint is processing.
- Once the complaint is resolved user can see the complaint history, rate the resolver of the problem, and reopen the complaint.

4. Outage Map

- **This part of the app shows the map of the whole country. It highlights some emergency power cuts, power cuts to be happen within 24 hours in different colors.**

5. Interruption calendar

- This calendar shows the event to have happened or events that are happening on the given date. By changing the date of the calendar user can know about events to be happened or happened on a relevant date.

6. Bill payments

- Enable users to pay their bills online.
- The Payment section shows the amount that should be paid up to the relevant date.
- Support various payment methods such as credit, debit cards, online banking, and digital wallets.
- Payment confirmation will be received via email as well as via text message. At the same time payment section of the app will update.
- The app manages a payment history. It has a detailed description of every payment including the paid amount, date, time, place, and receipt code.

7. Bill Calculator

- This feature allows you to calculate the amount of the bill by entering the starting date, end date, and number of units used within that time.

8. Electricity account

- This is a functionality that has been implemented to allow users to keep relationships with other accounts, sometimes one owner has many houses. They can have many accounts, here app allows users to subscribe to another account to keep track of those on the same device.

9. policies

- The application gives a detailed description regarding the application, privacy policies, and all the other policies, terms and conditions, rules and regulations, and all other relevant information.

10. Setting

- This is the functionality that has been implemented to give several accesses to users such as managing accounts, managing security and privacy, managing notifications, changing appearances, asking for help, and more.

In summary, this is an application that can be used to digitalize manual processes related to electricity usage within Sri Lanka. The Ceylon Electricity Board (CEB) app offers convenient bill management, real-time usage monitoring, and secure payment services. Users can report faults, access customer support, and receive energy efficiency tips. The app ensures accessibility, privacy, and seamless integration with CEB systems, providing a comprehensive solution for managing electricity services efficiently.

2.3 General constraints

Developing and maintaining a software application consists of many factors which impact the project's overall performance. These factors can affect either tangible or intangible elements in the project. Identifying these limitations, dependencies, and external factors impacting the software application is crucial in identifying the possible bottlenecks within the software. CEB care application is a government-provided application which is why there are many external environmental factors affecting its maintenance and management in addition to its development process. Several external factors limiting the CEB care application are as follows.

Inadequate funding

Inadequate funding or insufficient funding is a common and major factor affecting government software applications because global and local economic changes directly relate to these changes. Inadequate funding can lead to several problems as scope creep. Scope creep is when the scope of the project begins to increase upon the original scope agreed by the client in this case which is the government. A software application needs to be maintained and managed regularly in terms of technology therefore the government budgets being limited can reduce access to the essential access to resources that are needed to develop and maintain the software to be up-to-date.

Political and Legal Factors

The government is an organization that is not consistent and tends to change. Therefore, with new political officers replacing the old ones, the policies they implement within the organization also tend to change. Political factors limit the software applications development processes up to some extent which is why most of the government applications are lacking the new technological updates. Rules and regulations implemented by the government are also very crucial in modifying and maintaining a software application like CEB. Taxations, tariffs, employment law, intellectual property law, and more, may impact on product's priorities and decision-making.

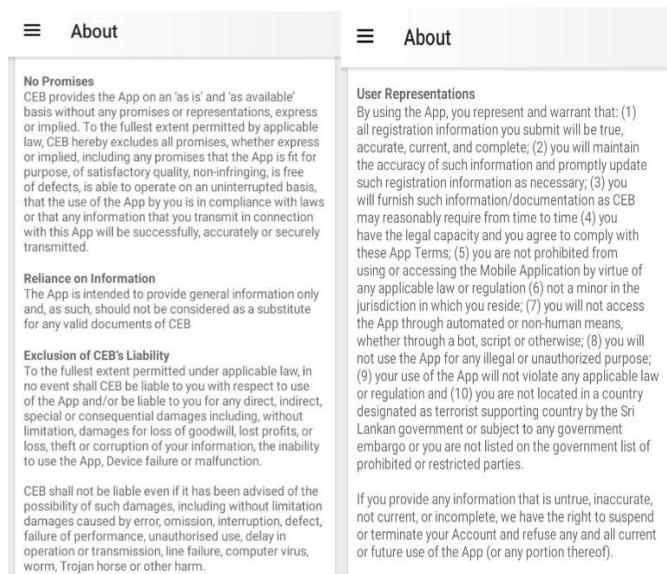


Figure 2.3.1 – Rules regulations and limitations currently provided in the CEB care app description

Public scrutiny and accountability

Evolving technological development has led to an increase in many social platforms that are accessed by nearly every other citizen in a country. These social media platforms are currently playing a crucial role in impacting local government decisions and publishing personal and organizational opinions on political and government operations. Government-managed software is purposely subject to public scrutiny and accountability which leads to building pressure and can add constraints to the application's overall performance.

Security and privacy concerns

Security and privacy constraints are important factors in a government software application. Integrated systems can be easily used to manipulate or misuse data which can be critical to government software because it contains privacy properties of citizens of the country. Ensuring that their data is safe in the software is a must when maintaining and developing a software application by government organizations.

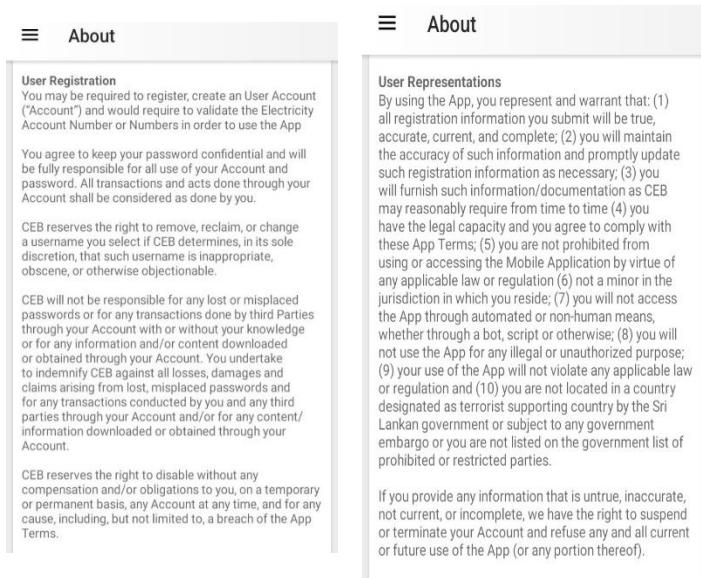


Figure 2.3.2– CEB care application descrofn about how currently these security concerns are managed by the application.

Challenging interoperability [6]

Government software often requires to be integrated into existing systems within a department or with several departments which often results in adding limitations to the new software to add functions. Integrating with different platforms, protocols, and technologies can be very challenging for government applications with related lengthy procedures.

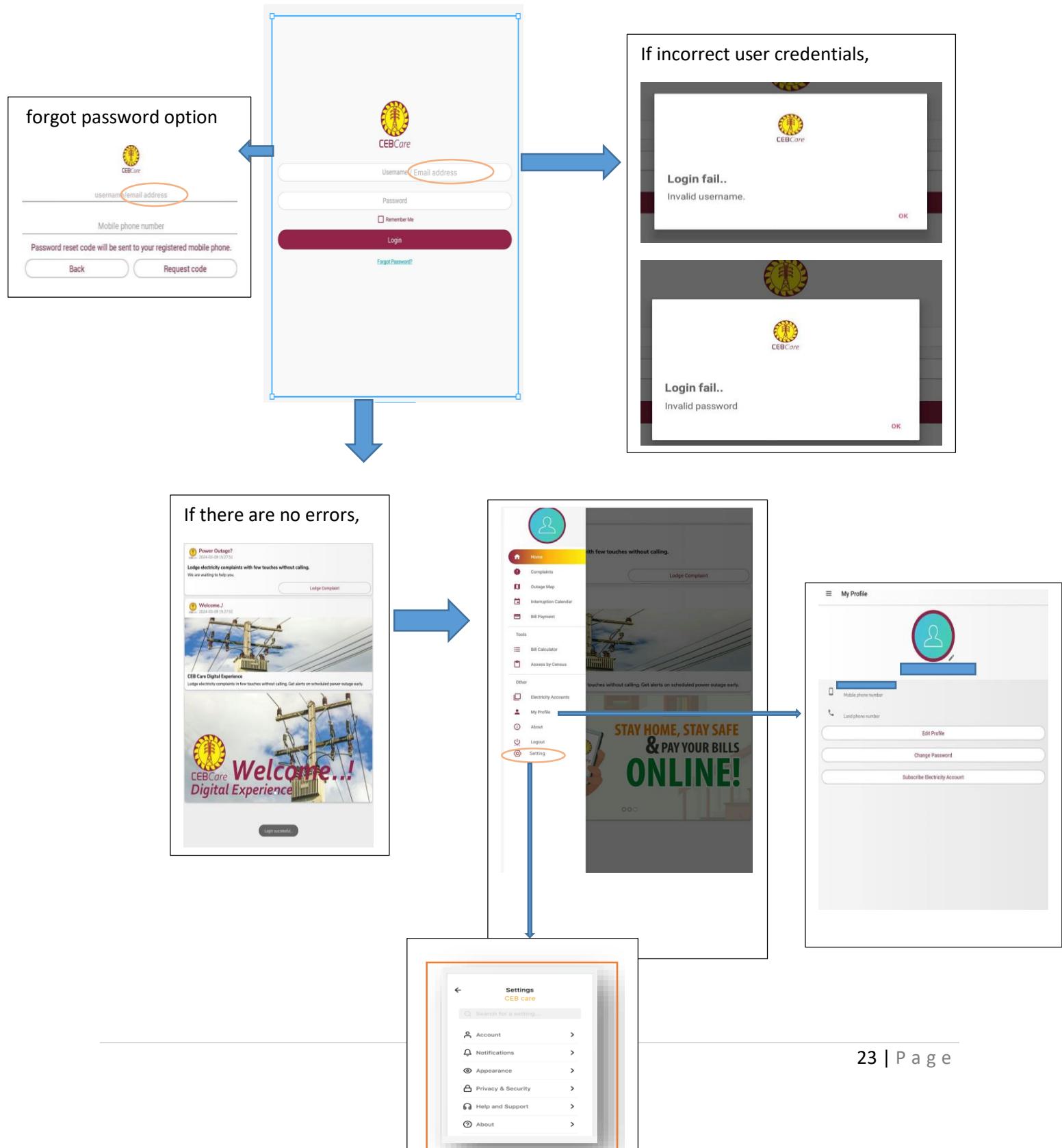
Dependencies / external factors [7]

- External vendors and contractors
- Legacy systems
- Public organizations
- User expectations

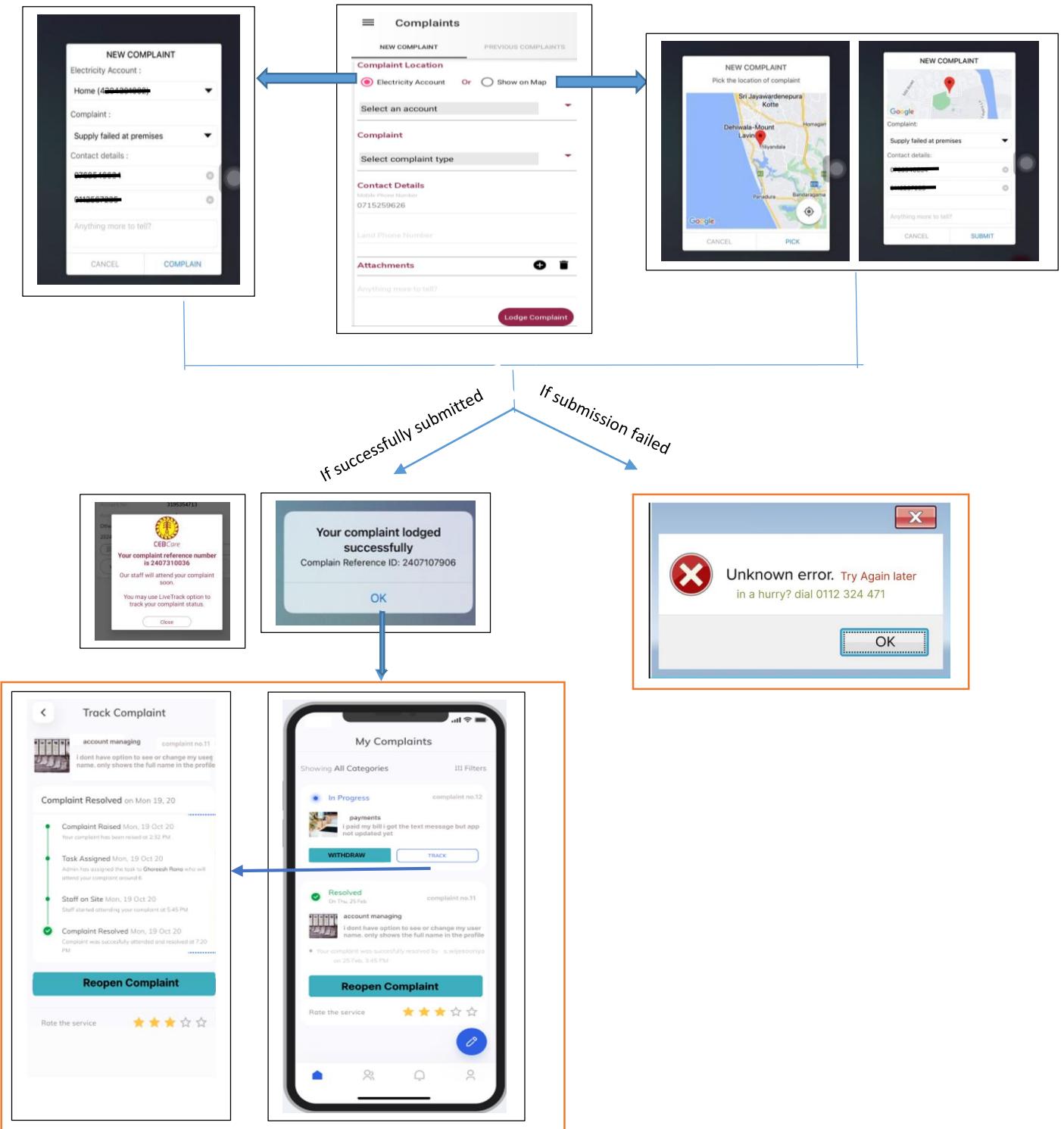
3. User Interfaces

All the newly added (proposed) features are highlighted

1- Account creation, registration, login, account setting and profile management interfaces.



2- Interfaces for complaint Filing, complaint withdrawal, complaint history, track complaint.



3- interfaces for outage map

Frame 2

★ outage areas

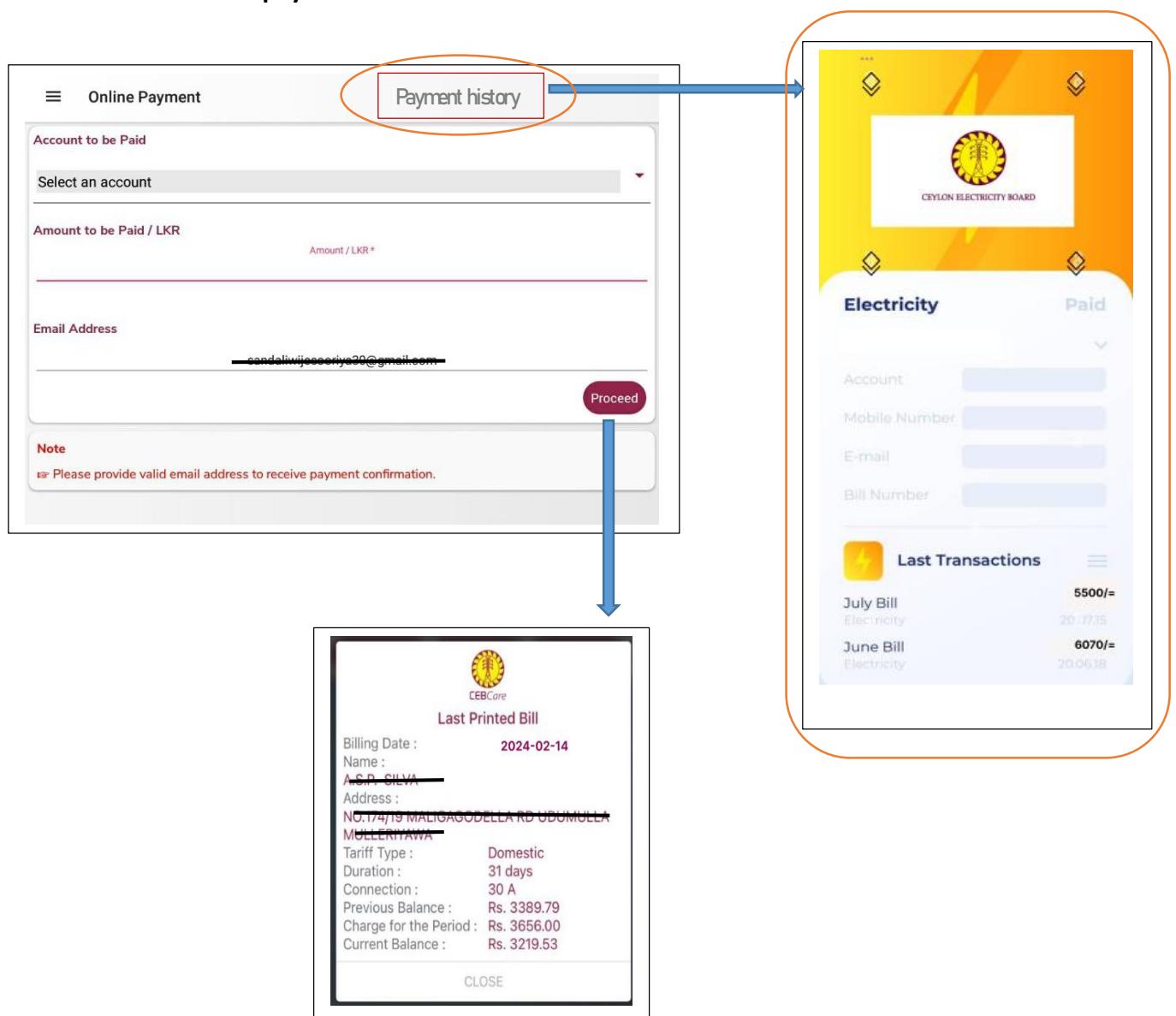
- Street: 5 Boswella Place, 05
- City: Colombo
- State/province/area: Colombo
- Phone number: (+94) (011) 2360797
- Country calling code: +94
- Country: Sri Lanka
- Street: 101, R A De Mel Mawatha
- City: Colombo
- State/province/area: Colombo
- Phone number: (+94) (011) 2239319
- Country calling code: +94
- Country: Sri Lanka
- Street: 12 3rd Cross Street, 11
- City: Colombo
- State/province/area: Colombo
- Phone

The map shows Sri Lanka with its provinces and major cities. The provinces are color-coded: Northern (light green), North Central (light purple), North Western (light blue), Central (yellow), Eastern (pink), Southern (orange), and Western (light green). Major cities are marked with black dots. Red stars indicate 'outage areas' where there are power cuts due to repairs. A legend at the bottom left identifies the symbols: a red line for International Boundary, a green circle for Province Boundary, a blue star for Country Capital, a red star for Province Capital, and a black dot for Major Cities. An inset map in the bottom left corner shows Sri Lanka's location in Asia. A callout box in the bottom right corner highlights the red stars with the text: 'areas with power cuts due to repaires'.

4- interruption calendar interface

≡ Interruption Calendar						
M	T	W	T	F	S	S
4	5	6	7	8	9	10
11	12	13	14	15	16	17
14 Thu						
No events						
15 Fri						
No events						
16 Sat						
No events						
17 Sun						
No events						
18 Mon						
No events						
19 Tue						
No events						
20 Wed						
No events						
21 Thu						
No events						

5- Interfaces for online payments



6- interface for bill calculations

≡ Bill Calculator

Tariff : Domestic (11,16)

Self-Generation : Non

Units:

Number of Days _____

Pick Start and End Dates

Start date _____ End date _____

Import Charge

0.00 LKR

Fixed Charge

0.00 LKR

Total Charge

0.00 LKR

S.S.C. Levy

0.00 LKR

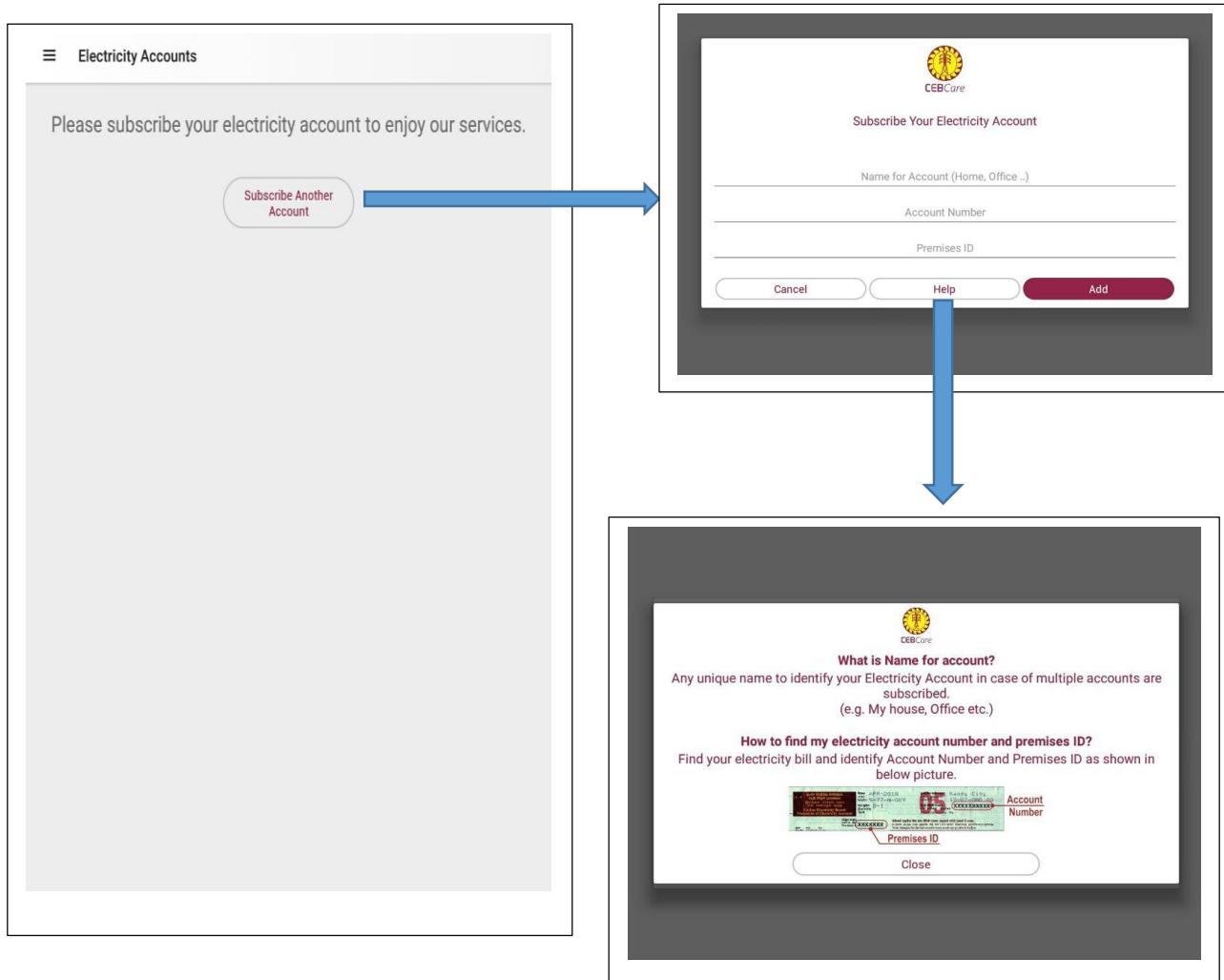
Note

All bill calculations are based on the latest Electricity Tariff approved by the Public Utility Commission of Sri Lanka.

7- Assess by Census interface

Assess by Census				
Appliance	Qty.	h/Day	P/W	kWh/Day
<input type="checkbox"/> Incandescent	0	4.0	75	0.00
<input type="checkbox"/> CFL/LED	0	4.0	15	0.00
<input type="checkbox"/> Fluorescent	0	4.0	40	0.00
<input type="checkbox"/> Ceiling fan	0	8.0	75	0.00
<input type="checkbox"/> Pedestal fan	0	8.0	40	0.00
<input type="checkbox"/> TV (B&W)	0	4.0	40	0.00
<input type="checkbox"/> TV	0	4.0	100	0.00
<input type="checkbox"/> TV (LED/LCD)	0	4.0	60	0.00
<input type="checkbox"/> Refrigerator	0	16.0	100	0.00
<input type="checkbox"/> Deep freezer	0	16.0	120	0.00
<input type="checkbox"/> Cassette player	0	4.0	20	0.00
<input type="checkbox"/> Audio setup	0	4.0	60	0.00
<input type="checkbox"/> Rice cooker	0	0.5	600	0.00
<input type="checkbox"/> Cooker	0	1.5	4000	0.00
<input type="checkbox"/> Water kettle	0	0.5	1500	0.00
<input type="checkbox"/> Water heater	0	0.5	1000	0.00
<input type="checkbox"/> Oven	0	0.5	150	0.00
<input type="checkbox"/> Blender	0	0.25	250	0.00
<input type="checkbox"/> AC	0	8.0	2500	0.00
<input type="checkbox"/> Vacuum cleaner	0	0.25	850	0.00
<input type="checkbox"/> Floor polisher	0	0.25	500	0.00
Units Per Period			0	
Units Per Day			0.00	
Days Per Period			30	

8- Interface to subscribe to Electricity Accounts



9- Interfaces to describe policies, rules, regulators, terms and conditions.

About

 CEB Care
Version : 1.3.2
Build : 92

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Contact Us
If you have any questions regarding our App, you can email us cebcare@ceb.lk

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IT Branch

4. SPECIFIC REQUIREMENTS

4.1 Functional requirements

Functional requirements are crucial for software applications as they specify the application's functions and outputs for consumers during runtime. These functional requirements involve application features that are obvious to customers. The functional requirements of the proposed CEB application development and modification are as follows.

User	<p>Receive a notification email upon a completed bill payment within 3 to 10 seconds after payment.</p> <p>Create a new password upon forgetting the password.</p> <p>User-friendly interface with easily accessible features.</p> <ul style="list-style-type: none">• Navigation bar to search for options.• Interface with the provided username with the option to change it.• Change settings and manage permission. <p>Login with fingerprint embedded with the device.</p> <p>Real-time help assistant.</p>
System	<p>Update overdue concurrently with bill payments.</p> <p>Secure customers' payment details related with the application.</p> <p>Send an error message with instructions to follow upon login failures or network issues.</p> <p>Resiliency to network traffic.</p>

4.2 Non-functional-requirements

Non-functional requirements are as crucial as functional requirements in government applications like CEB which must meet standardized proportions to represent the country.

Scalability	<ul style="list-style-type: none">• Support multiple platforms and provide the same functions in every other.
Availability	<ul style="list-style-type: none">• Recover within less than 10 seconds upon network failures.
Security	<ul style="list-style-type: none">• Secure login and payment details.
Compliance	<ul style="list-style-type: none">• The application should comply with relevant laws, rules, regulations, and industrial standards related to data protection.
Reliability	<ul style="list-style-type: none">• Users should be able to interact and use the application constantly without any interruptions.

4.3 Quality Attributes

Adding modifications to a government-managed application is not an easy task, as maintaining the quality of the product is crucial. The project has improved the following quality attributes by providing improvised service.

Design quality attributes

- Usability - Provide ease of navigation to customers.
- Flexibility - Ability to adapt to new technologies with integration of cross-platform development.

Runtime quality attributes

- Performance – Provide real-time quick-response messages.
- Interoperability – operate successfully by communicating with bank databases to update payment information.

System quality attributes

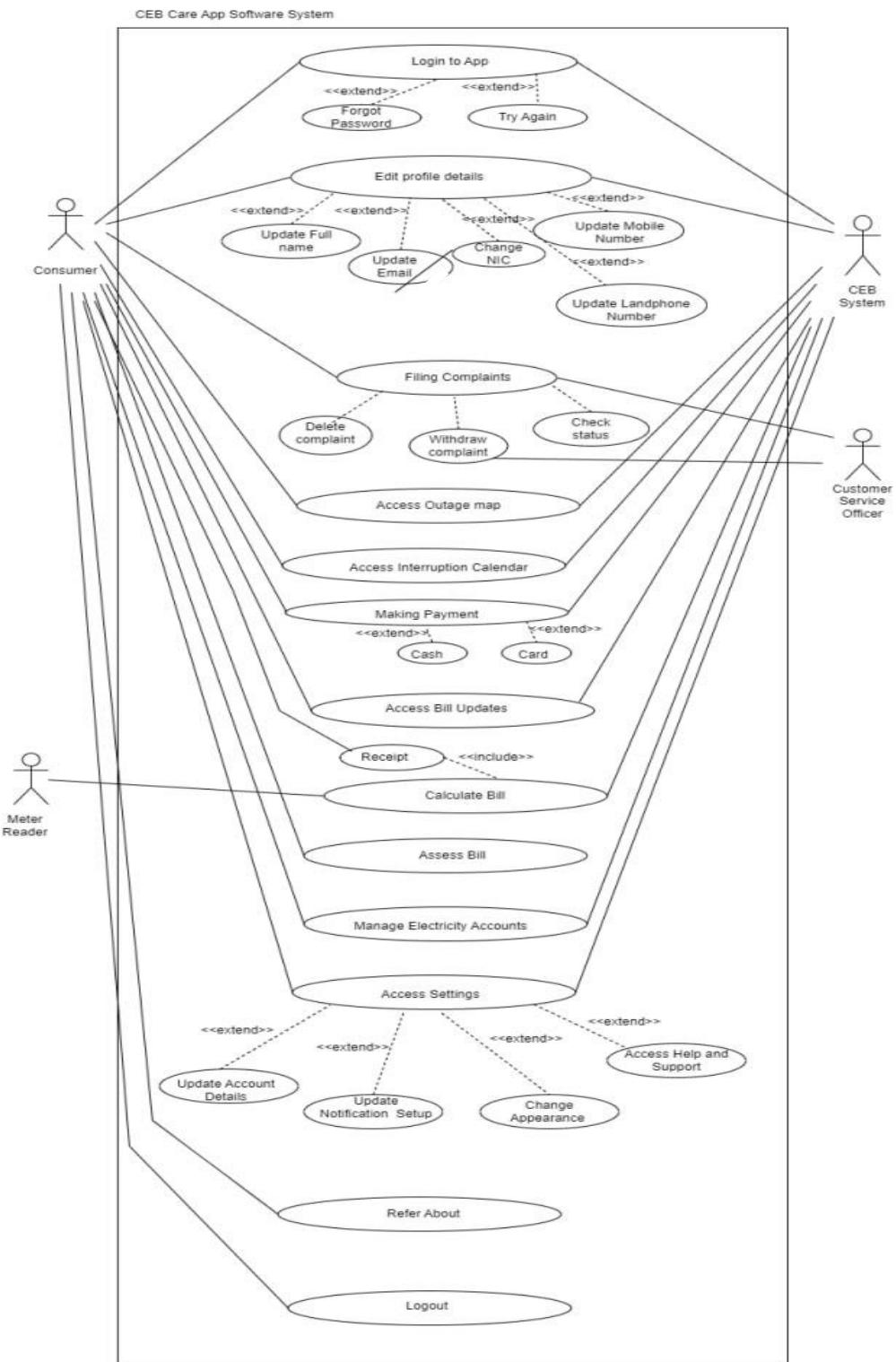
- Modifiability – Support integrations of new technologies.
- Supportability – Provide helpful information to resolve interruption issues by

Business quality attributes

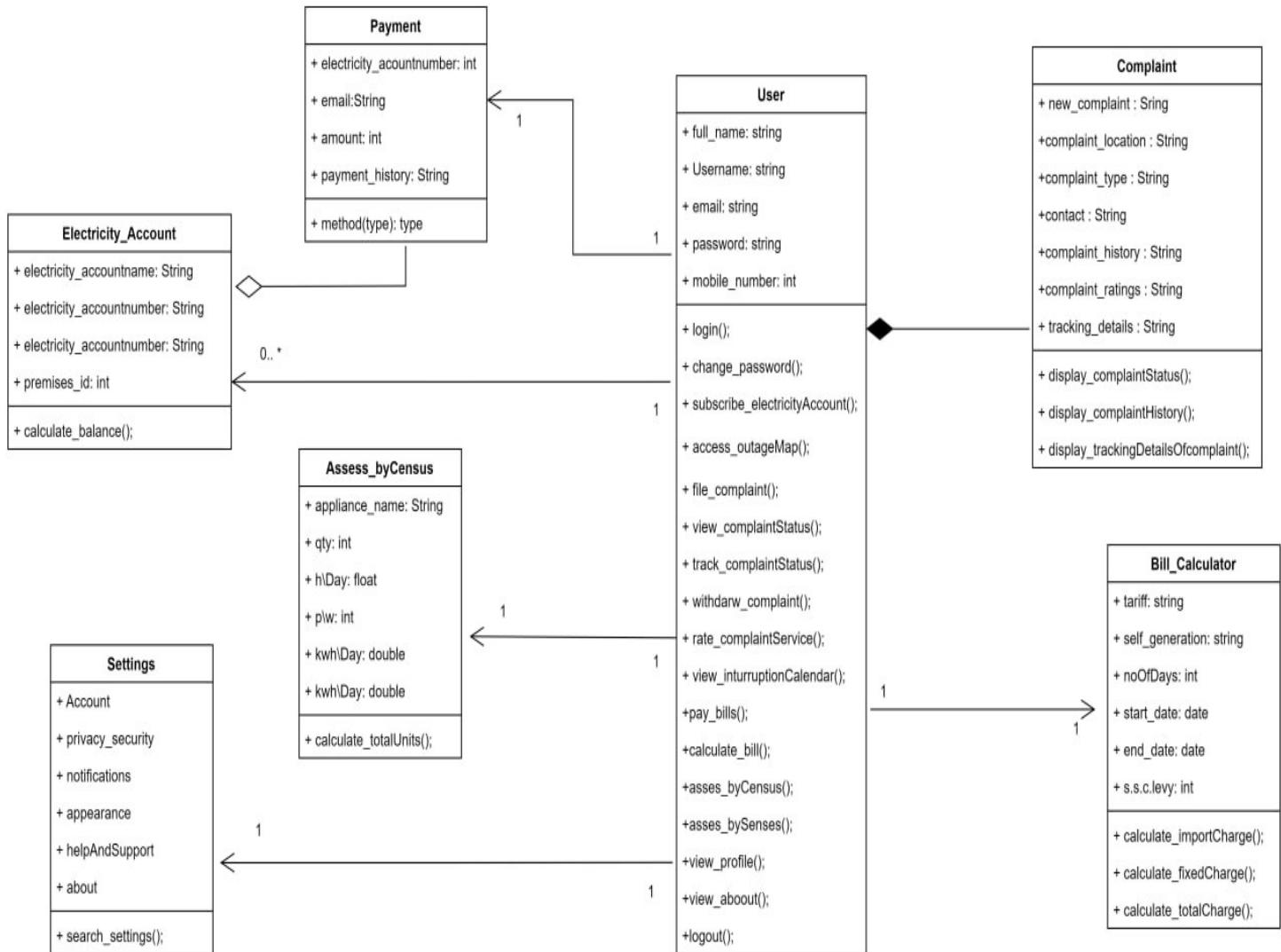
- Marketability – improved system with an error-free environment concerning technological development.

6. DIAGRAMS

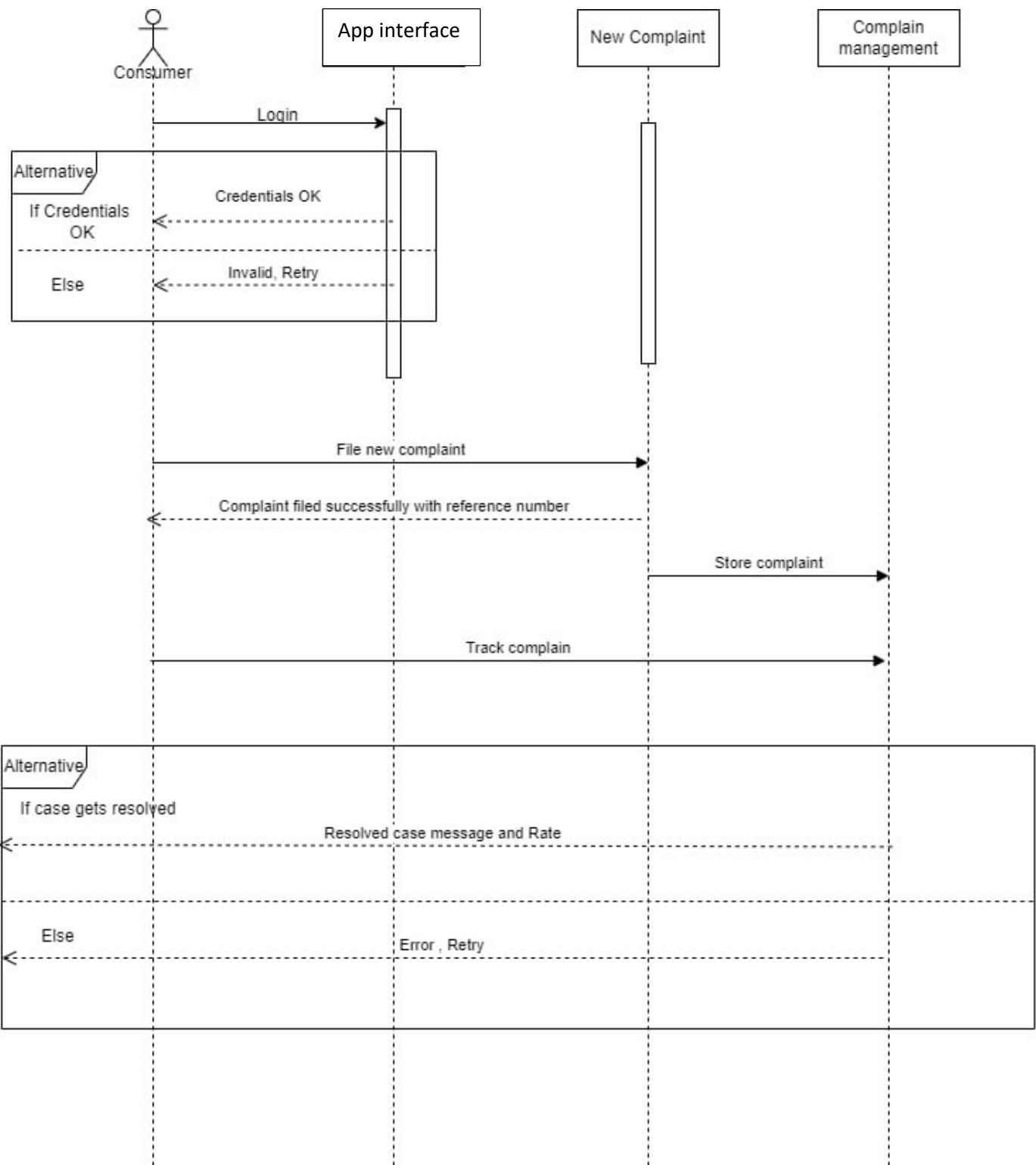
6.1 Use Case Diagram



6.2 Class Diagram



6.3 Sequence Diagram(complaint filing scenario)



7. REFERENCES

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