ASHESI UNIVERSITY COLLEGE

RCA-CONNECT: A SOCIAL PLATFORM FOR RWANDANS IN THE DIASPORA

APPLIED PROJECT

B.Sc. Management Information Systems

Gedeon Niyonkuru

2018

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RCA-CONNECT: A SOCIAL PLATFORM FOR RWANDANS IN THE DIASPORA

APPLIED PROJECT

Applied Project submitted to the Department of Computer Science, Ashesi University College in partial fulfilment of the requirements for the award of Bachelor of Science degree in Management Information Systems

Gedeon Niyonkuru

March 2018

DECLARATION

I hereby declare that this applied project is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature:

……

Candidate's Name

……

Date: ……

I hereby declare that preparation and presentation of this applied project were supervised in accordance with the guidelines on supervision of applied project laid down by Ashesi University College.

Supervisor's Signature:

……

Supervisor's Name:

……

Date: ……

Acknowledgement

I would like to express my sincere gratitude to Mr. Francis Gatsi for the enormous support and guidance he has offered me during the implementation of this project. His pieces of advice have enormously contributed to the design and development of this project.

I am infinitely grateful to Mr. Gatete Bernadin, the president of the Rwandan Diaspora in Ghana, for collaborating with me, and giving out his time without reservation, whenever I needed him.

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Abstract

Whether formal or informal, communication is very important for any two or more parties that need to work with each other. After four years as member of Rwandan Diaspora in Ghana, I have realized that the existing channels of communication are not good enough to satisfy the unique communication needs of Rwandans living in Ghana. After a leader of the Rwandan diaspora in Ghana requested it, I started building a social platform called RCA-CONNECT for Rwandans living abroad.

This report illustrates different communication challenges faced by Rwandans living abroad, points out the inefficiencies of the existing platforms in dealing with these challenges, and then describes a proposed social platform, RCA-CONNECT.

RCA-CONNECT comes as a solution that considers the diverse backgrounds of Rwandans living abroad as well as their busy schedules. It provides functionalities that makes it a better option for Rwandans living abroad to connect with each other, as well as the government.

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RCA: Rwanda Community Abroad

RCA-CONNECT: Rwanda Community Abroad- CONNECT

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CHAPTER 1: INTRODUCTION

Time has proven that information sharing is one of the key factors that contributes to the development of different societies. Earliest humans used more primitive ways, like drums and smoke, to communicate with each other. However, today, people use telephones, Internet, and television to communicate with each other. In this evolution, the Internet has played a big role. Different platforms like Facebook and Twitter have promoted the growth of informal information sharing. However, many Rwandans living in Ghana consider these platforms to be too informal that they become reluctant to use them as a mean of exchanging sensitive information about themselves or their country. Hence, the need for a specific platform, on which specific communities or societies can communicate.

Junus (2016) mentions that organizations benefit more from knowledge sharing activities and claims that knowledge sharing helps an organization to become better at what it does. When knowledge is shared, it does not die with one person. It gets passed from generation to generation, and this allows people to use historic data to assess the present and prepare the future. This report describes a platform, RCA-CONNECT, that is designed to facilitate secure information sharing, and easy collaboration among Rwandans living abroad and the government of Rwanda. To allow easy sharing of information, RCA-CONNECT includes a forum where different members can share their thoughts and react to other people's ideas. The security of the application is also stressed by providing tight user access and activity control to make sure that the platform is truly being used only by Rwandans living abroad, and that only constructive conversations take place on the platform.

1.1 Background, and Motivation

In 2016, I was approached by Bernadin Gatete, who is the president of the Rwandan diaspora in Ghana. He asked me to develop a platform for Rwandan diaspora that can help promote cohesion among the members of the diaspora. He told me that some of the activities like meetings, gatherings and contributions to different activities are very hard to coordinate with using the existing social platforms like Facebook, and others.

1.2 Approach and Technologies Used

To understand exactly what was expected from me as a developer, I went through a series of information gathering steps.

- ***Data gathering:***

The first step was to collect data through talking to different Rwandans living abroad, especially in Ghana. I conducted a set of interviews that helped me to understand the functionalities that the social platform should have, and the interface that is suitable for the application.

While having a conversation with the leader of Rwandan Diaspora in Ghana, I asked what he expects the platform to do. According to him, below are the primary functionalities that the platform should have.

This platform would help new diaspora members to see the diaspora's past activities, and it would help them to easily connect with older diaspora members hence helping them to easily integrate in a new environment.

Apart from allowing users of the platform to exchange information, the platform should allow diasporas to keep the details of all current and past members of the organization along with their roles in the diaspora. The system should also record past, current, or possible future messages or communication to be delivered to the members of the diaspora.

The second step was to explore the strength and weakness of the existing social platforms. Different platforms like WhatsApp, Facebook, Twitter, internations.org were analyzed to see if some of their functionalities could be useful in connecting and promoting cohesion among Rwandans living abroad. The same platforms were also investigated to find out why they have been inefficient in bringing Rwandans together. This has given me ideas on what I can do better to build a successful social platform for Rwandans living abroad.

- ***Technologies used***

To deliver on different functionality requirements of the application, while making sure that the application can be accessed on both mobile and web platforms, I have used different front end and back end technologies to build RCA-CONNECT. I have used Vuejs JavaScript framework for the front-end development of the application, and I have used PHP for the backend development of the application. To make sure that the application can be launched on mobile platforms like Android, I have used Apache Cordova to easily convert the web application into a mobile application that can be easily launched on mobile app stores.

1.3 Literature Review

As confirmed by Berkman (2000), there is an inherent tendency for human beings to seek connections or to form relationships. Platforms like Facebook, WhatsApp, and Twitter are offering this possibility to people to connect with each other. The only problem with these

existing platforms is that they are not focused on a group of people. The services offered by these platforms are designed to be used by the public. As a result of this, these platforms fail to satisfy the unique communication needs of the Rwandan Community Living abroad.

Another platform that comes close to offering what would strongly benefit Rwandan community abroad is the intenations.org. This is a platform for connecting expatriates around the world. However, this platform has a long application process, which has higher chance of resulting in rejection as it is hard to verify that someone is truly an expatriate. The inability of the existing platforms to satisfy the unique social and communication needs of Rwandans Living abroad, indicates a need for a custom designed platform for this community.

RCA-CONNECT will serve as a social platform for Rwandans living abroad, and according to Kwon, S. J. et al (2014 some features like security, flow experience and availability are more critical to the success of a social networking platform. For Elliot et al (2014), perceived ease of use is the most important factor that determines how successful a social networking platform can become. Concerns raised by the above authors are indeed valid. With regards to security, Murray (2010) talks about the importance of building secure application and gives us advice on different ways to design database security to ensure protection of user's data. Murray suggests different processes to be performed on users of the application like authentication, authorization and auditing. According to him this should help developers ensure that user's data is secure. In as much as security of the application is important, many researchers have considered the ease of use of the application as the key to attracting users to a platform. Dunlap, I. H. (2006) emphasize the fact that websites should not be just user friendly, but also accessible to people with disabilities. Bernard (2006), second Dunlap views on the importance of accessibility. Bernard makes a case for people with disability and people with declining abilities

like old people. He advises developers to pay attention to text fonts they use and distractions on the web application to ensure that the web application is accessible for people with declining vision and attention span. All these design advices have been considered during the development of RCA-CONNECT. This is the reason RCA-CONNECT is designed to be a single page application to eliminate unnecessary page loading, hence improving the user experience.

CHAPTER 2: SOFTWARE REQUIREMENT SPECIFICATION

This chapter gives detailed description of the requirement specification for RCA-CONNECT social platform. This includes the description of the application itself, functional, and non-functional requirements, as well as the application's interface description.

2.1 Development Model

RCA-CONNECT is developed by using the Model View ViewModel development Model. This model provides a clean separation of concerns between the user interface controls and their logic. This model is made of three components, which are Model, View, and View Model. The view is responsible for defining the layout and appearance of what a user sees on the screen, it changes in response to data changes from the view model. Model is the implementation of the application's domain model that includes a data model along with business and validation logic. The view model acts as an intermediary between the view and the model and it is responsible for handling the view logic. The view model gets data from the model and puts it in a format that the view can easily display to the user.

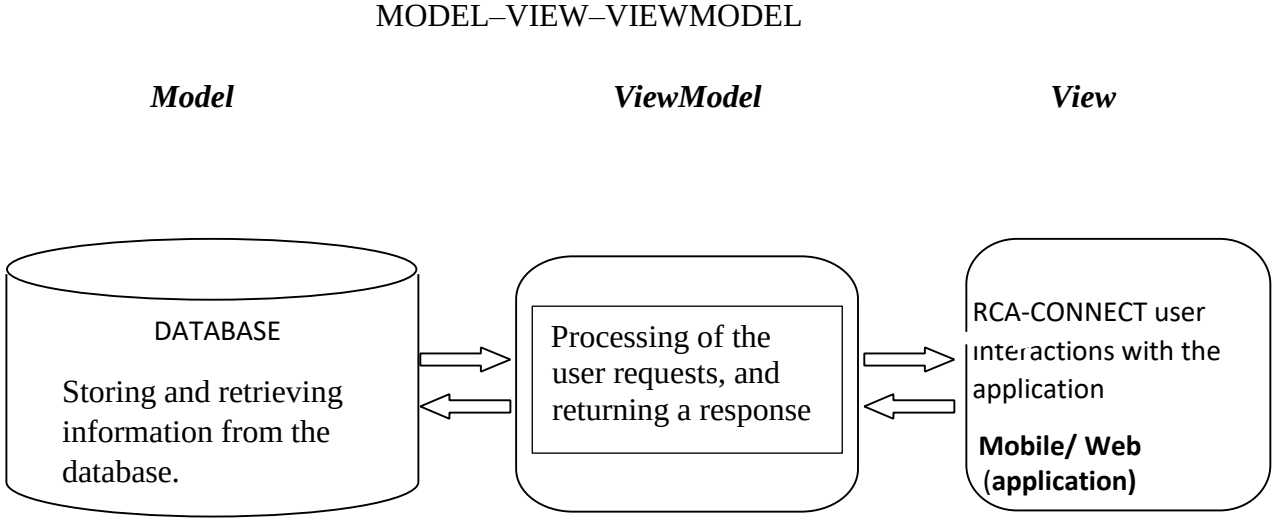


Figure 2.1 The model View ViewModel

2.1.1 Advantages of the Model View ViewModel

Since in the MVVM, components are implemented separately, it results in the following benefits:

- Components can easily be swapped with each other without breaking the full application
- Internal implementation of one component can easily be changed without affecting the others or the application as a whole
- Components can be worked on, independently.
- Isolated unit testing. Since components can easily be worked on independently, it is easy to test them independently as well.

2.2 System Requirements

This section talks about different requirement needs for RCA-CONNECT application, which includes interface, functional and non-functional requirements.

2.2.1 Interface Requirements

- ***Hardware Requirements***

The application runs on any of the browser in which JavaScript has not been disabled. A mobile application can also run on any version of Android operating system.

- ***Software Interface***

The application Interface provides login and register functionalities, which ensures that only authenticated users can gain access to the application resources like memory, data and others. For the sake of security, the interface is designed to allow access to these resources only

through specific entry points, and for only verified users. Also, depending on the role of the user in the diaspora, different interface designs will be displayed to different users.

2.2.2 Functional Requirements

This part describes the main functions of the application that will help different users to interact with the application in a useful way.

2.2.2.0 Types of Users

- ***A member of a diaspora***: This user is simply a normal user who is a Rwandan that went abroad and is trying to connect with other Rwandan living in the country in which he/she moved to.
- ***Admin***: This is a diaspora member with the ability to admit, reject, or block other users on the platform. This user can also moderate conversations among other users on RCA-CONNECT platform by accepting or rejecting bad posts.
- ***Superuser***: This is the user who has the power to see basic information like the username and phone number of every person who is using the platform. This user can also perform all the activities that an admin can do like admitting, rejecting, and blocking a user of a diaspora. A superuser can change an admin or set an admin for a diaspora, he/she can also provide statistics to the Government about Rwandans living abroad, their profession and interests.

2.2.2.1. A member of a diaspora

A member of a diaspora is a Rwandan living outside of Rwanda. This part describes the functionalities of the application that a member of the diaspora can use.

- **Viewing content on the home page**

The home page of the application contains the information on Rwanda that can help any person who is not in Rwanda to keep up with the progress and news of Rwanda. This information includes a range of statistics containing different performance indices like GDP.

- **Register**

A member can register on the platform by providing different information like phone number, names.

- **Login**

After a user has been registered, he/she can then use the chosen username and password to login in the application.

- **Update, delete, and create a profile**

A logged in user can add information like marital status, and personal interests to his/her profile.

- **Participate on a forum**

A logged in user can start a conversation on a forum by creating a post, and he/she can also react to other people's posts by commenting on them, liking or disliking them.

- **Accessing a gallery**

An authenticated user can also access a galley illustrating different events that were organized by the Rwandan diaspora in Ghana.

- **Can share his or her current location**

An authenticated user can share his or her current location with other logged in users on the platform to facilitate gatherings.

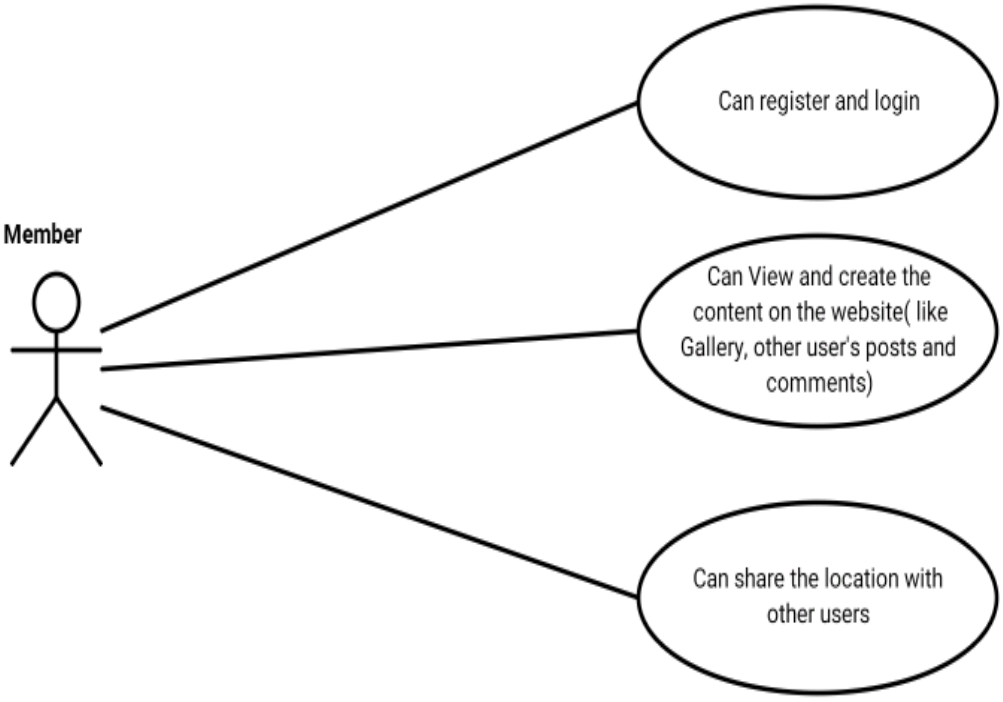


Figure 2.2.2.1 *Diaspora Member use case diagram*

2.2.2.2. An Admin of the diaspora

An admin of the diaspora is a person who is recognized as the leader of a group of Rwandan community living abroad, for example Rwandan Community Abroad- Ghana. This person must also be a member of that diaspora. This means that this person will use all the functionalities available to a member of a Diaspora, in addition to the functionalities that are only available to an admin of a diaspora. Below are the functionalities available to an admin of a diaspora.

- **Access the admin dashboard**

Through the admin dashboard, the user can see all the people who tried to join the platform and decide whether to accept or deny their join requests. The admin can also delete users from the database hence preventing them from using the platform. The admin can also play the role of a moderator, where he/she can delete reported posts.

Note that the admin actions can only affect the people that are in the same diaspora as him/her

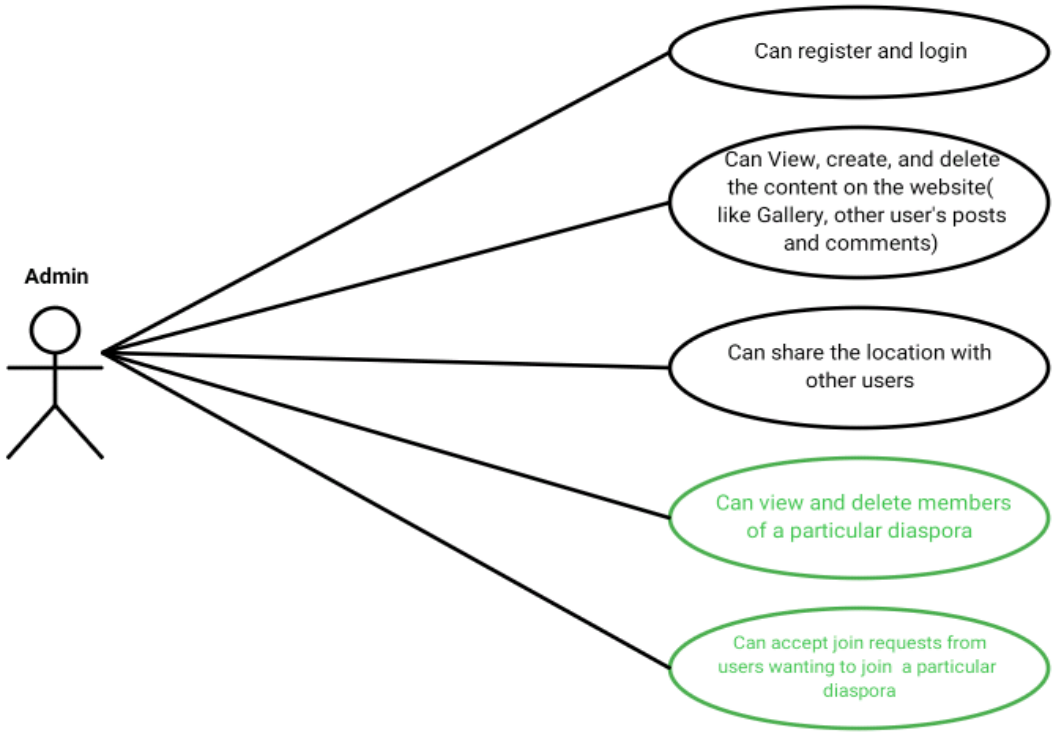


Figure 2.2.2.2 Diaspora Admin use case diagram

2.2.2.3. A Super User of the diaspora

A Super user of the diaspora is appointed by the Government of Rwanda and can legitimize a diaspora and set its leaders. In addition to these functionalities, a super user can access all the other functionalities that are performed by other users and can see credentials like names and phone number or users on the platform. This user can also compile a statistical report about Rwandans living abroad, along with their interests and skills in case that is requested by the Government.

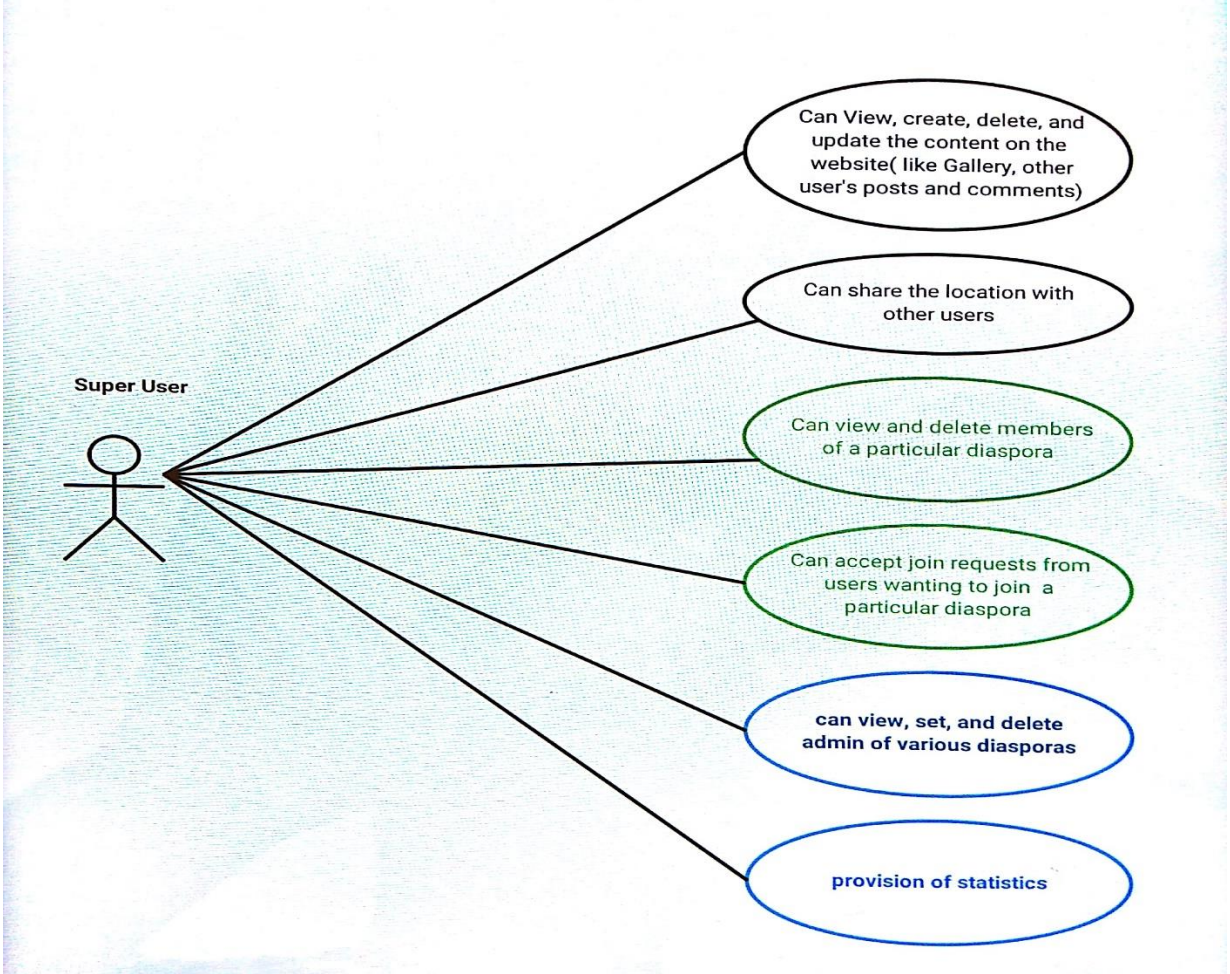


Figure 2.2.2.3 Super User use case diagram

2.2.3. Non-functional Requirements

This chapter discusses non-functional requirements of RCA-CONNECT like maintainability, security, portability and reliability.

2.2.3.1 Maintainability

The front end of the application is built using Vuejs, which is a JavaScript framework that facilitate building a modularized system by using components and modules. This has helped to better organize the code of the application, which helps to easily maintain the code. The back end is also built using PHP, which is a widely used programming language. The use of object-oriented approach in the PHP code also reduce redundancy in the code and makes maintaining the code easy.

2.2.3.2 Security

Users register to use the platform and authenticate themselves by using the login interface. unauthenticated users can only access the home page and cannot perform any operation that can alter the data in the database. Only the authenticated users can perform an action that can affect the state of data in the database.

Not everyone can register to use RCA-CONNECT. The platform is meant for Rwandans living abroad. To make sure that this is followed, the admin of a diaspora will maintain a list of people allowed to register to the platform and any other person registering for the platform who is not part of this list, will trigger a notification to the admin. This will prompt the admin to evaluate this new user.

2.2.3.3 Portability

RCA-CONNECT is a hybrid application that is built using Apache Cordova. This makes it very portable, since it can run on android, IOS, Windows and still be available as a web application.

2.2.3.4 Availability

The application is built to be a single page application. This means that it does not load. It is optimized to consume low Internet data, and it is hosted on a server that is available 99.99% of the time. All these measures were taken to ensure that the application is highly available.

2.2.3.5 Reliability

The system is built to consider many use cases and many scenarios including the case where there is no Internet. It is designed to deliver consistent results every time a user interacts with it. This makes RCA-CONNECT a very reliable platform.

2.3 Constraints

2.3.1 Design and Security Constraints

The success of this platform heavily depends on the right people being in control of the platform. This is because the platform will be joining Rwandan diasporas around the world, and the legitimacy of these diasporas will have to be confirmed by another legitimate authority which can be the government. Due to this, the application must be designed to allow different administrators to control the users and moderate interactions on the platform.

Internet connection is necessary to perform any action that might grant permission for the user to manipulating database resources like data. This implies that the application should

be built to consume less data to allow both users with high connectivity and users with low connectivity to easily connect with the application.

CHAPTER 3: ARCHITECTURE AND DESIGN

This section discusses the design and the architecture of RCA-CONNECT. It presents the architecture pattern and discusses each module in detail, and It also shows activity diagrams and the interfaces designed to represent interactivity within the system

3.1 System Overview and Architecture

RCA-CONNECT uses a client server architecture, which means that a client directly talks to the server. This architecture is characterized by a division of the application functions into two categories that can each be individually modified. RCA-CONNECT application functions are categorized into data presentation and data management functions. This results into a 2-tiers application architecture, which are the data presentation tier and data management tier.

Data Presentation & Processing /User Interface Tier **Web Application || Mobile Application**
Data Storage and retrieval- RCA-CONNECT Database

*Table 3.1 Showing the 2-Tier Architecture of RCA-CONNECT Syste*m

3.1.1 Data Presentation

This layer displays data that make the interface for the user to interact with. The mobile and the web interface are the same. They allow users to access different information depending on their details. They also give every authenticated user the ability to manipulate data from the database. Any unauthenticated user can only view information about the application and news about Rwanda that are located on the home page.

3.1.2 Data Retrieval and Storage

This layer responds to user's data manipulation requests by loading or storing data from or in the database. Along with other data manipulation function, this layer is responsible for checking the user's identity during the login process. It also loads posts and comments from the database, along with other information as requested by the user.

3.2 Activity Diagrams

These diagrams show the flow in activities of some requirement specification. The activity flow is sequential to yield result as expected.

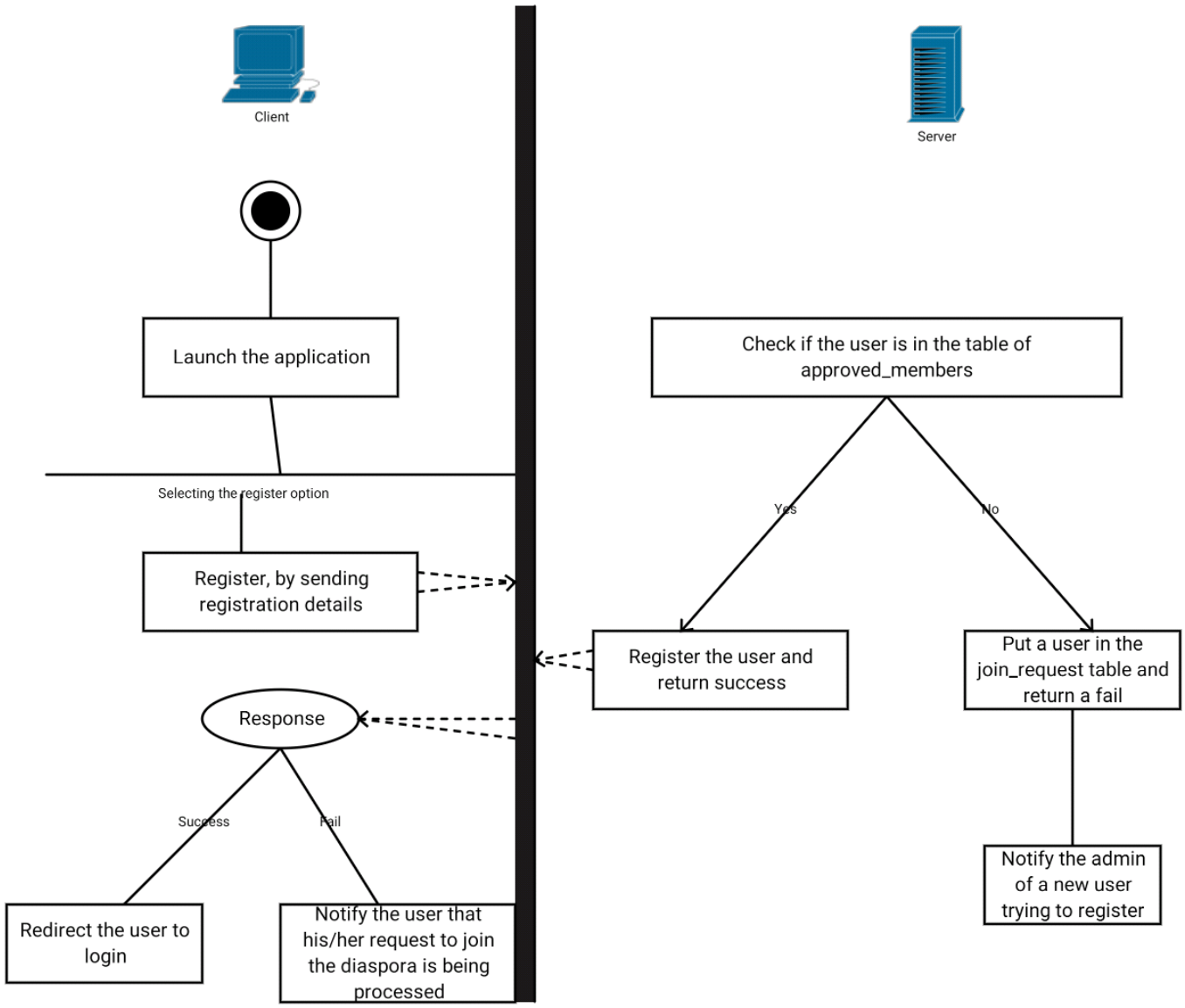


Figure 3.2. Register activity diagram

3.3 Database Design

The database stores all the information needed for RCA-CONNECT application to work properly. The following are tables in the RCA-CONNECT database, along with their attributes.

Note: a bold attribute means the primary key, and an italicized attribute means the foreign key.

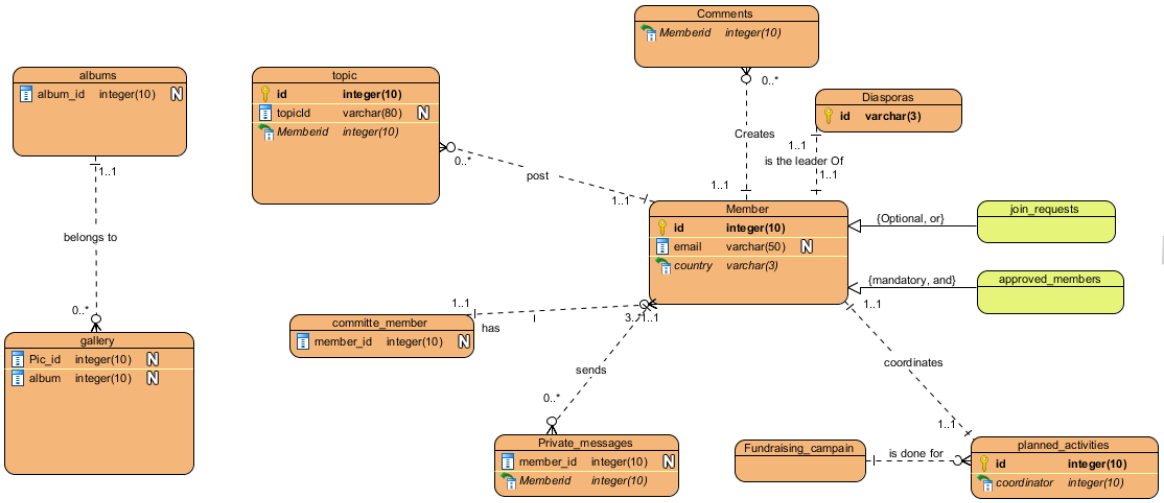


Figure 3.3. ER Diagram of RCA-CONNECT

CHAPTER 4: IMPLEMENTATION

4.1 Description

This chapter elaborates on RCA-CONNECT's implementation, and it gives more details on different technologies used during the implementation process.

4.2 Tools Used During Development

4.2.1 NPM: package manager

NPM is a JavaScript package manager for NODEJS applications. It manages different JavaScript modules. JavaScript modules are libraries that can be included in the project.

Use case: NPM was used to download and install different packages like EXPRESSJS and others

4.2.2 Cordova: a platform

Cordova is a platform that helps to build native mobile applications by using JavaScript, HTML, and CSS. This allows the application to access different native functionalities like camera, GPS and more.

Use case: Cordova was used to download and install different plugins like the camera plugin for them to be used in the application

4.2.3 Nodejs: Framework

Nodejs is an open source server-side JavaScript framework that can be used to read, write, and edit data in the database. This framework was used to create a server that makes client server communication easy.

Use case: Nodejs was used to create a JavaScript server that handles bi-directional communication between the client and the server.

4.2.4 Vuejs: Framework

Vuejs is progressive framework for building user interfaces.

Use case: All front-end components were built using Vuejs

4.2.5 JavaScript: Language

JavaScript is an object-oriented computer programming language that is used to create interactive websites or application that can responds to user's event.

Use case: Manipulating the Document Object Model (DOM), which is a programming interface for HTML and XML.

4.2.6 PHP: Programming language

PHP stands for Hypertext Preprocessor, and it is an open source general purpose scripting language that can help to perform data management functions.

Use case: PHP was used as a backend language that handles data storage and manipulation function.

4.2.7 HTML: Markup Language

HTML stands for Hyper Text Markup Language, it is a language that helps to design the structure of content to be displayed on the World Wide Web.

4.2.8 CSS: Style Sheet Language

CSS stands for Cascading Style Sheet and it helps to manipulate how HTML elements are displayed on the on the screen.

4.3 Libraries and Specific Technologies Used

- **Buefy** is a Lightweight UI component for Vue.js.

Use case: different components like navbar from Buefy were used to develop the framework

- **AJAX**: JavaScript technology

AJAX stands for Asynchronous JavaScript and XML, it is a technique of creating faster, more interactive web applications.

Use case: AJAX was mainly used to send requests to the server and receive responses simultaneously, hence displaying content.

- **Socket.io**: Library

Socket.io is a JavaScript library that allow easy implementation of web sockets. WebSockets are an advanced technology that makes it possible to open an interactive communication session between the user's browser and a server.

Use case: Socket.io have enabled me to implement live updates on the forum, which allow each user of RCA-CONNECT to receive live updates of posts and comments on the forum.

4.3 Classes and Methods

This section describes different classes and methods used to build RCA-CONNECT application.

4.3.1 Database Class

This class establishes a connection to the database. It uses PHP Data Objects(PDO) to create an instance of PDO base class. And it accepts different parameters like the username, password, and the name of the application to connect to.

4.3.2 ApplicationFunctions Class

This class contains all the core data processing and retrieval functions that make the application work.

- Main functions
  - registerUser(): This function registers a user
  - logmeIn(): This function logs a user in
  - postRegister(): This function registers a post created by a user on a forum
  - commentRegister(): This function registers a comment created by a user on a forum
  - loadTopics(): This function retrieves topics that were created by users, along with their comments.

4.4 Front End Components of the Application

Front end components are JavaScript pages built with Vuejs, whereby each page handles a functionality.

- *Forum component of the application*: This component contains all the data presentation functions that are related to the presentation of data on the forum.

- *Register component of the application*: This component contains all the functions that allow the collection of user details and validation of user details.
- *Dashboard*: This component handles all the functions that represent data to different admins of diasporas and ensures that they can easily manipulate data.
- *User*: This component handles the display of user's information and allow the user to change those information
- *Gallery*: This component handles the display of pictures and videos to different authenticated users.
- *Report*: This component ensures that a google map containing locations of authenticated users that have shared their locations can be displayed.

4.5 Interfaces

4.5.1 Home Page

The application's home page contains information about RCA-CONNECT application, along with a set of statistics and data on an event. The picture below shows a graph containing GDP growth rate information from 2000 to 2017

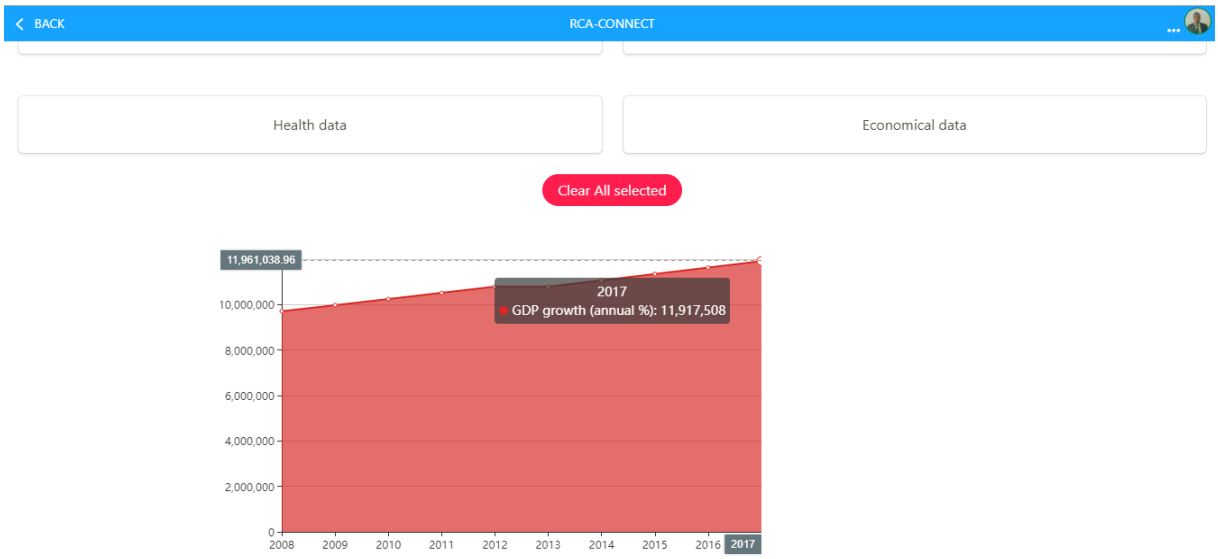


Figure 4.5.1 Home Page

4.5.2 Signup Page

The signup page asks users to provide information about themselves, so that they can be registered in the database.

Figure 4.5.2 Signup page

4.5.3 Login Page

Login page requires users of the platform to provide username and password for authentication purposes.

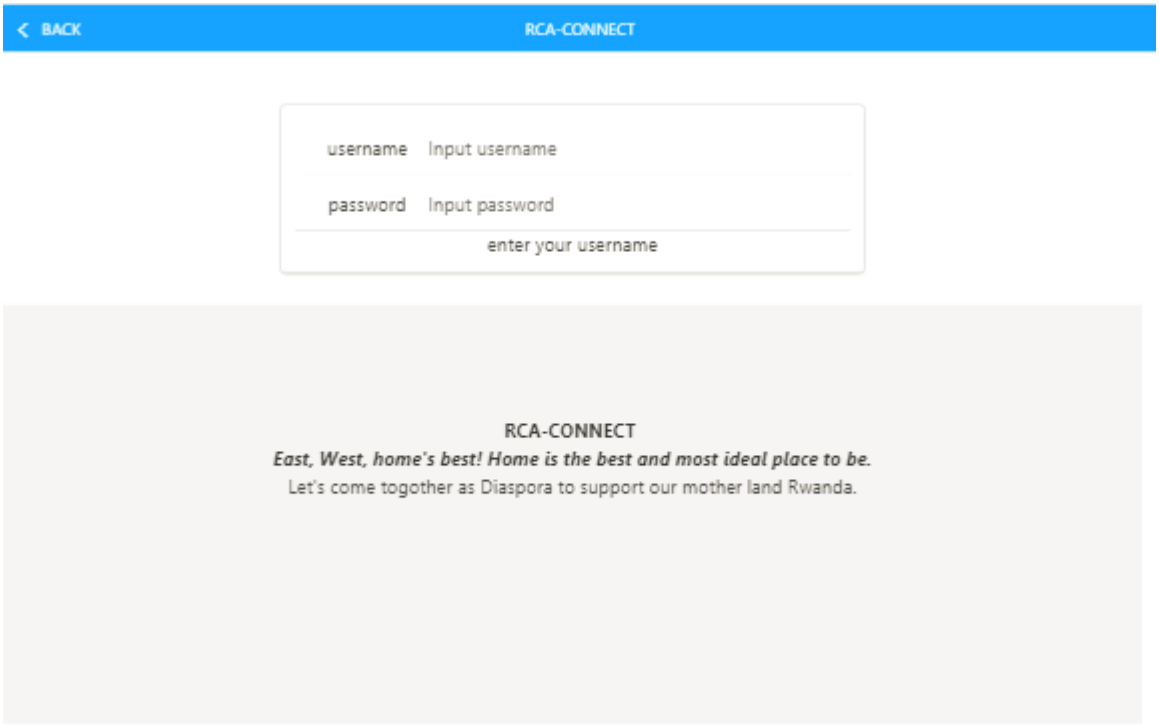


Figure 4.5.3 Login Page

4.5.4 Forum Page

On the forum page an authenticated user can view different posts created by others and react to them. Post on a forum are loaded depending on how much they are liked by users.

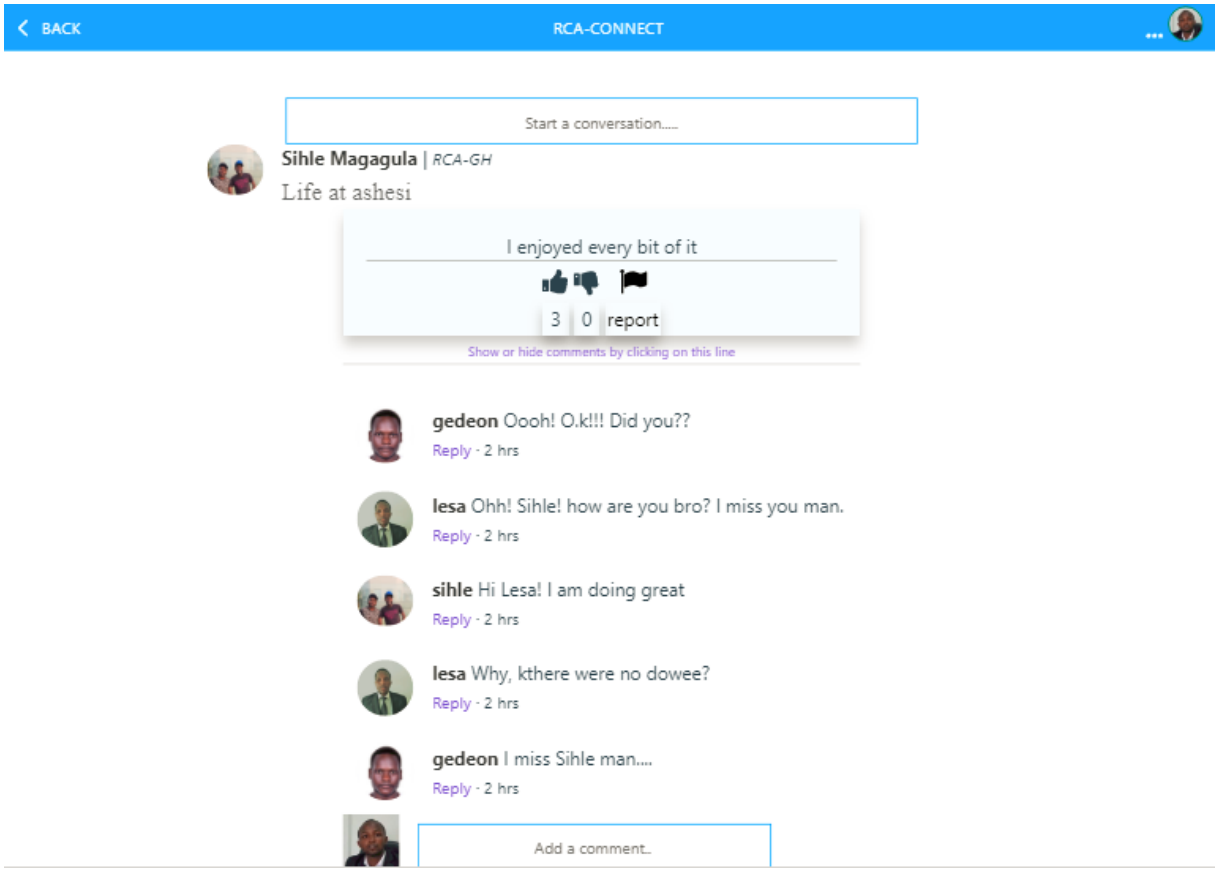


Figure 4.5.4.1 Forum page

❖ Creating a Post

A user has an option to creates a topic and can also provide a description of that post.

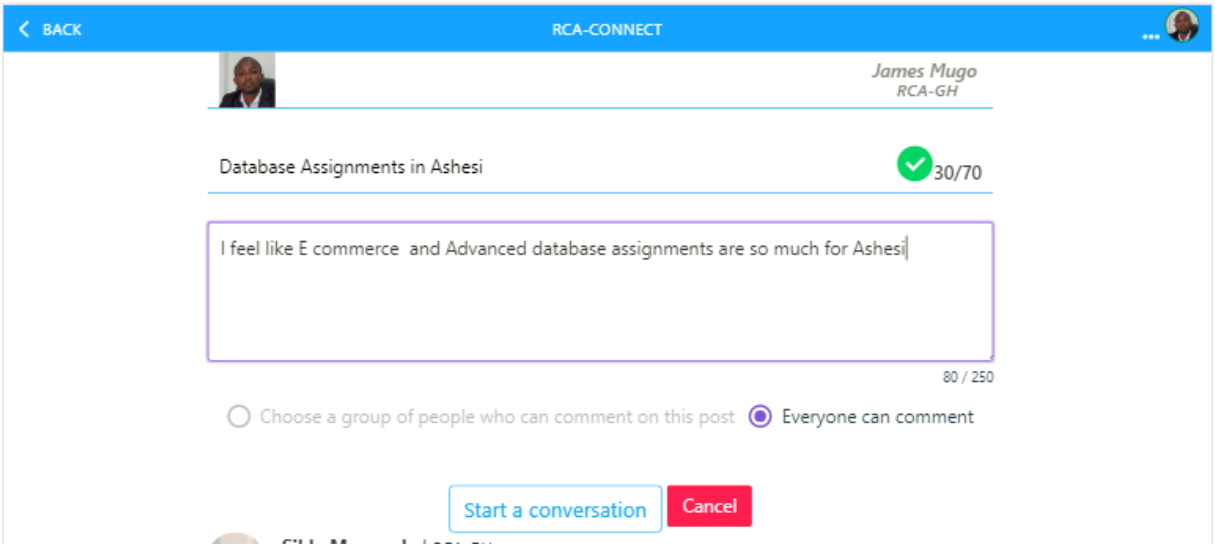


Figure 4.5.4.2 Creating a post

- **Liking, disliking, and reporting a post**

  A user can like or dislike a post and report a post that is considered to be bad.

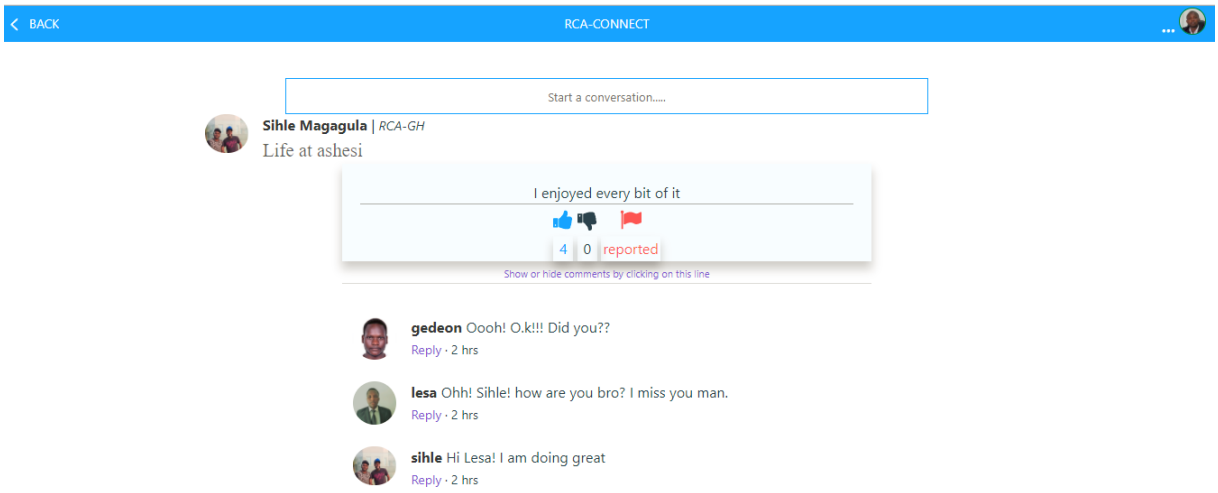


Figure 4.5.4.3 Liking, disliking and reporting a post

❖ **Commenting on a post**

Every logged in user can comment on a post

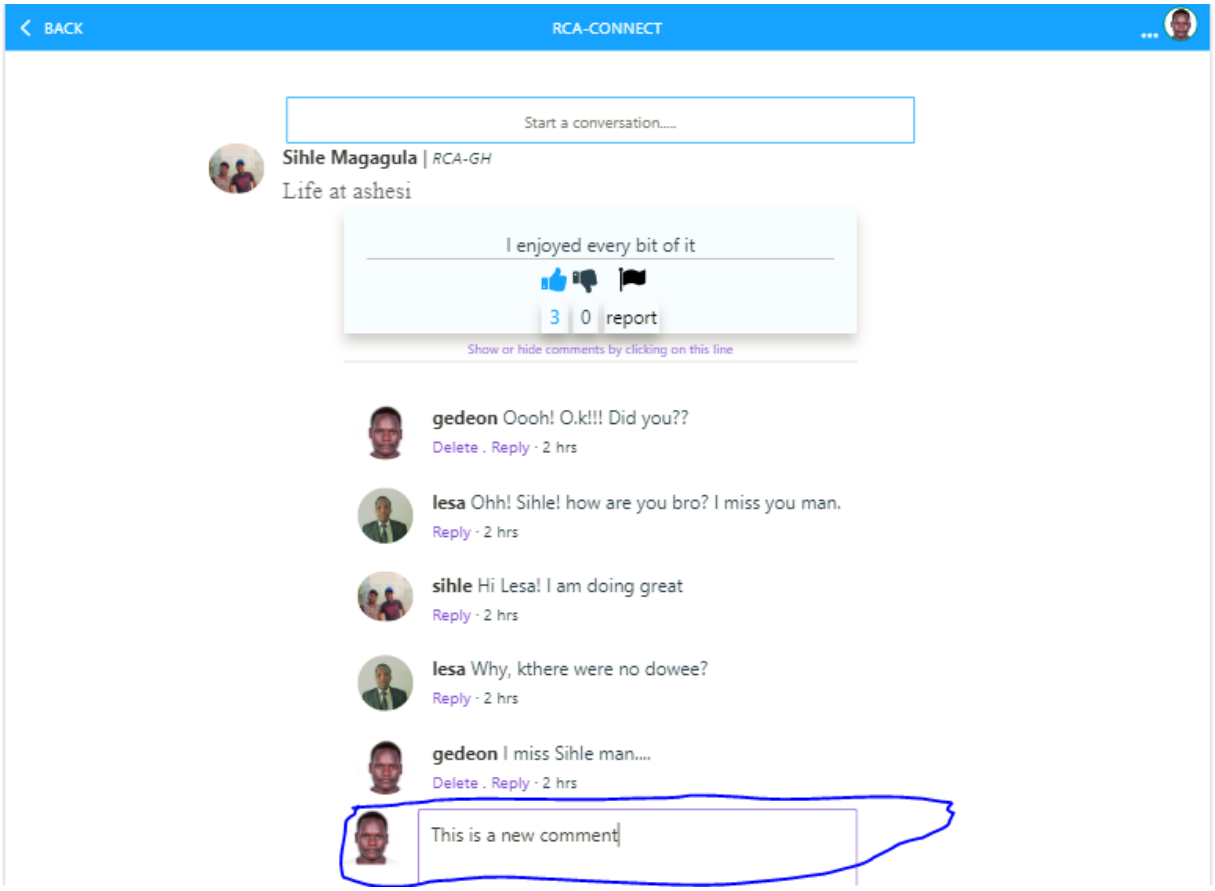


Figure 4.5.4.4 commenting on a post

A user can reply to comments made by other users or delete them

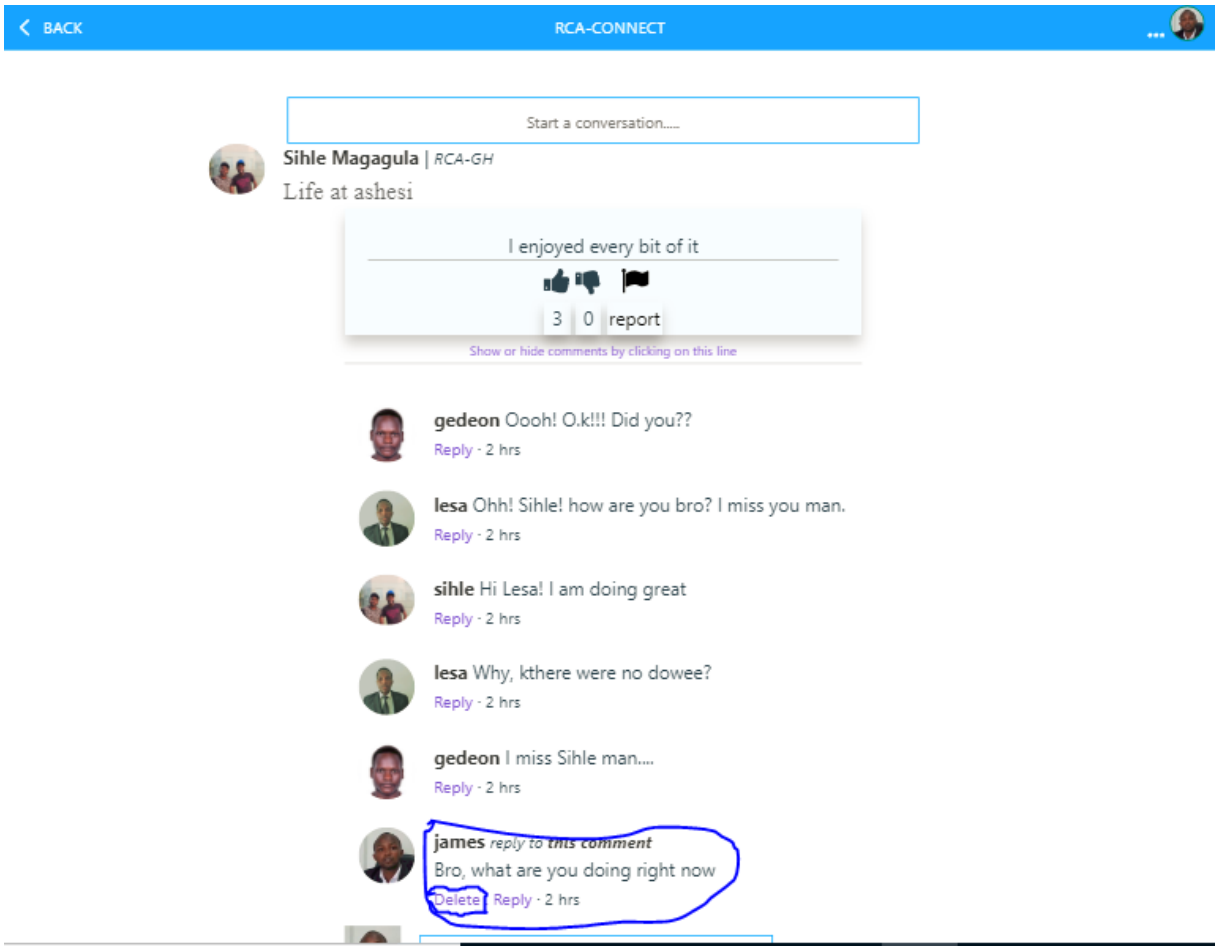


Figure 4.5.4.5 comment posted with delete option

4.5.5 User Profile

A user can edit information on his or her profile.

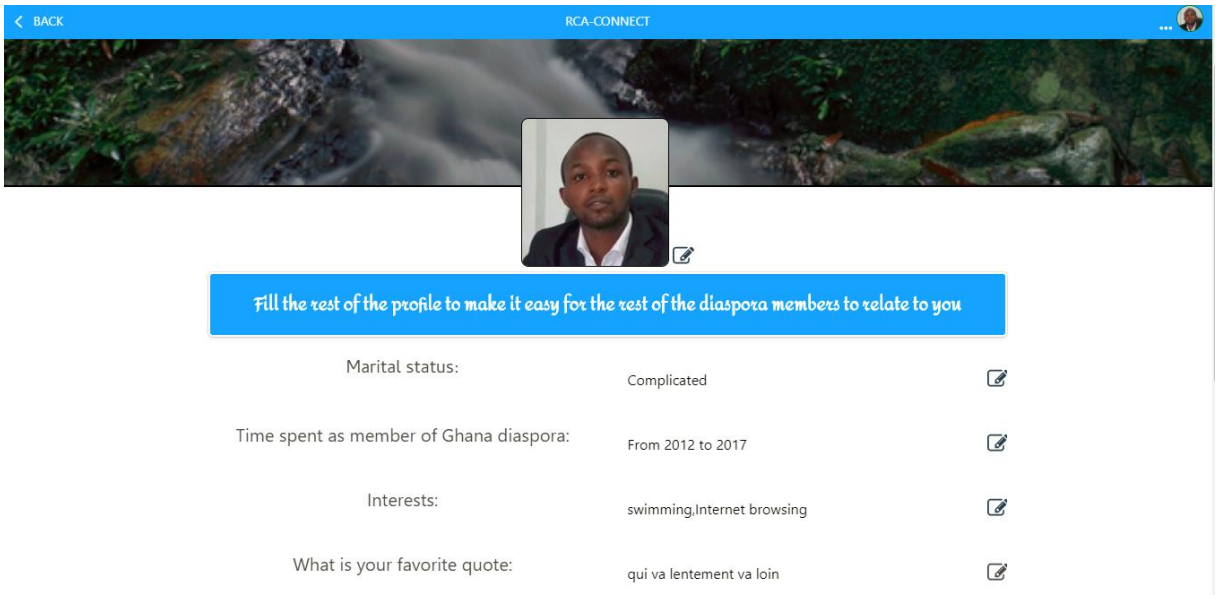


Figure 4.5.5.1 User Profile

A user can edit information on his or her profile

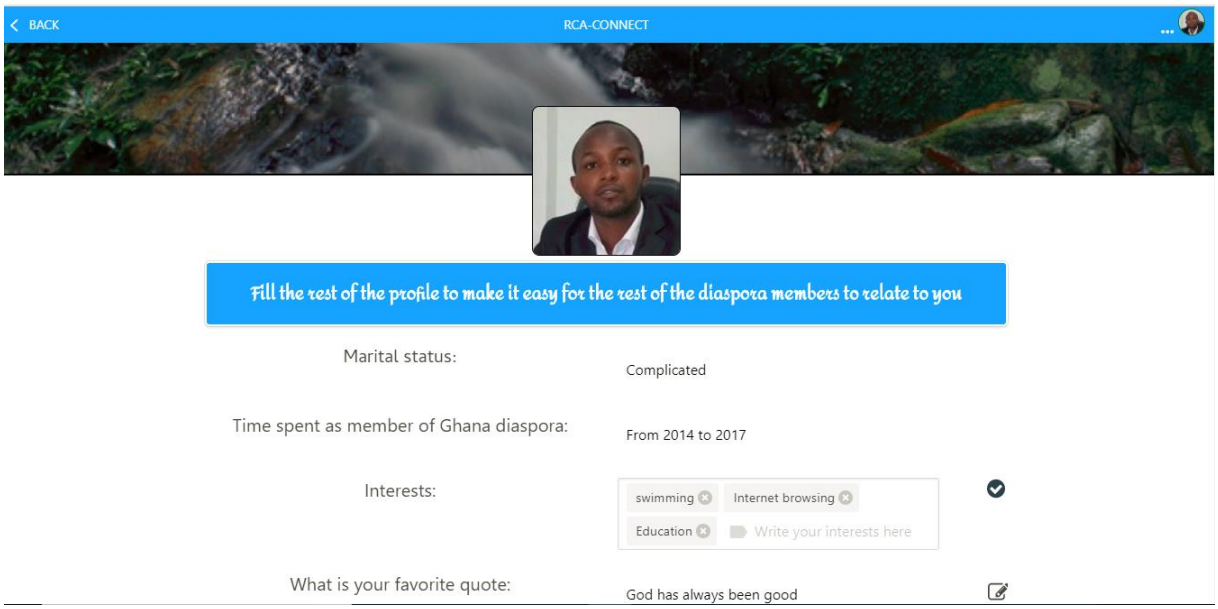


Figure 4.5.5.2 User Profile editing process

4.5.6 Dashboard

4.5.6.1 A Superuser's dashboard and Admin dashboard

- **A Superuser can view all users**

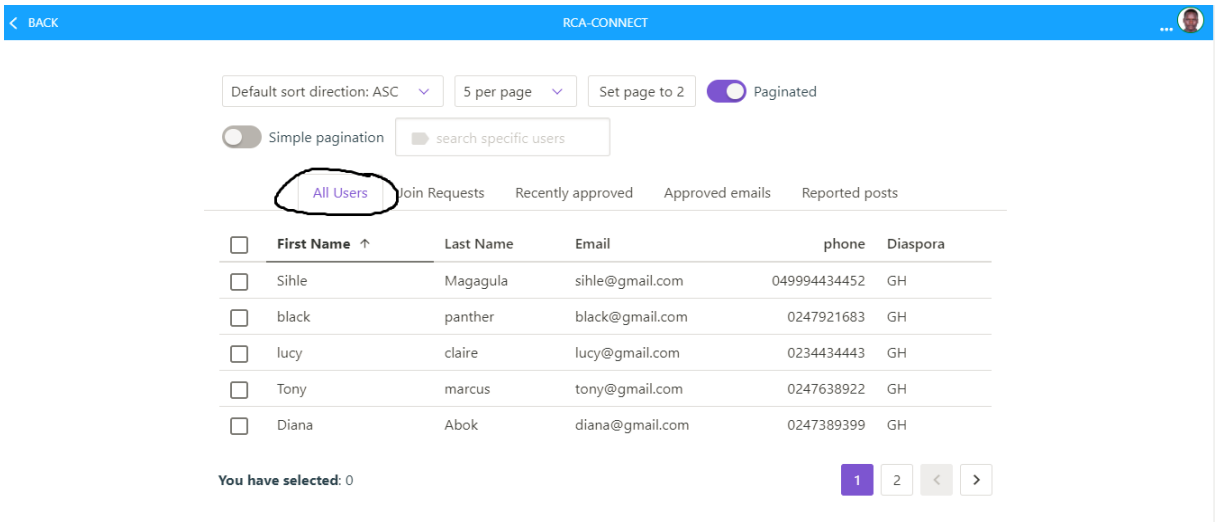


Figure 4.5.6.1 Superuser's dashboard

❖ **A Superuser can search a user**

A superuser can search information about a specific user on the platform.

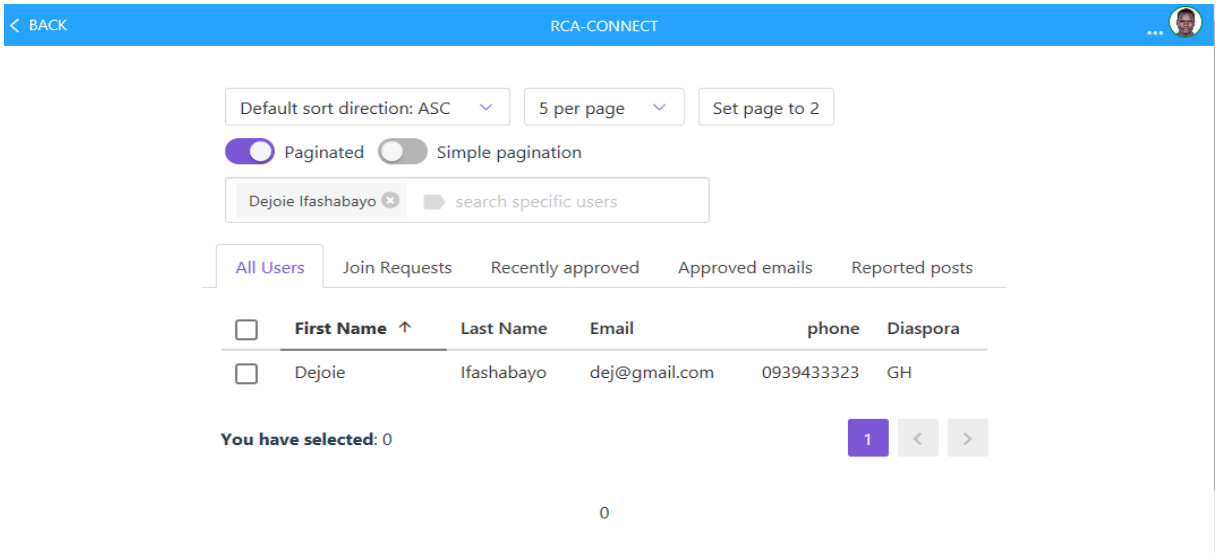


Figure 4.5.6.2 Superuser's search capability

❖ **A Superuser and Admin can see all join requests, and approve or reject these requests**

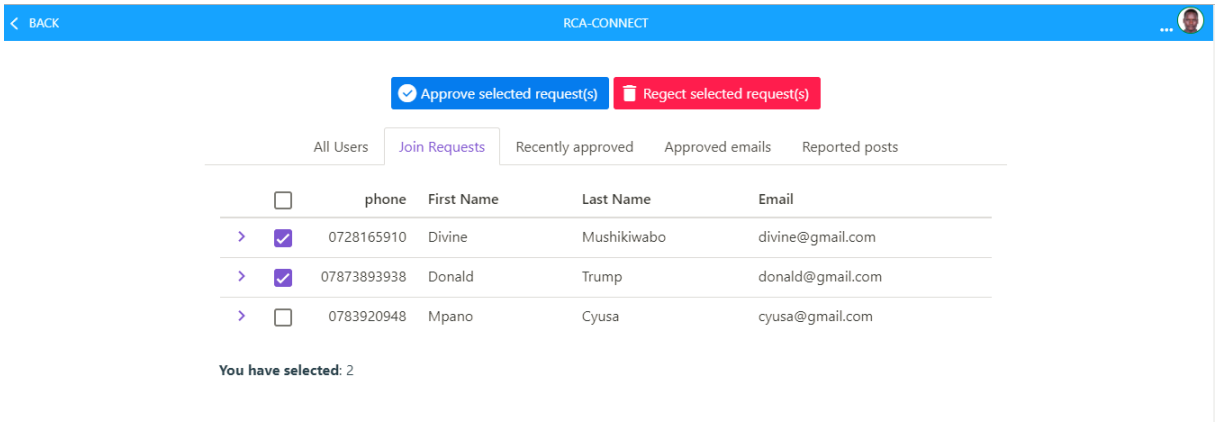


Figure 4.5.6.3 admin manipulating join requests

❖ **A Superuser and admin can see the most recently approved emails**

The system keeps track of recently approved emails of people to join the platform. The admin can choose to clear the list of those recently approved

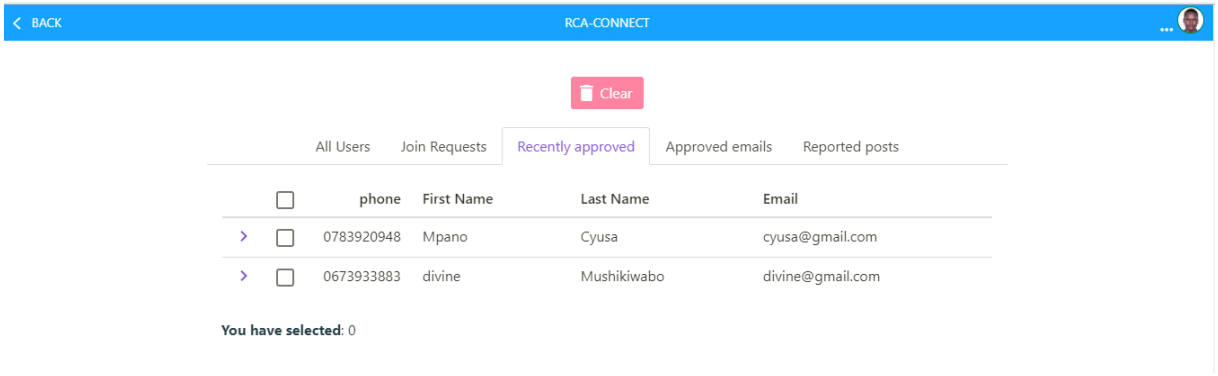


Figure 4.5.6.4 admin manipulating recently approved members

- **A Superuser and admin can see the list of approved emails**

  The System keeps track of all the users' emails that have been accepted to join the platform. Only users whose emails are in the approved emails' list can register for the platform.

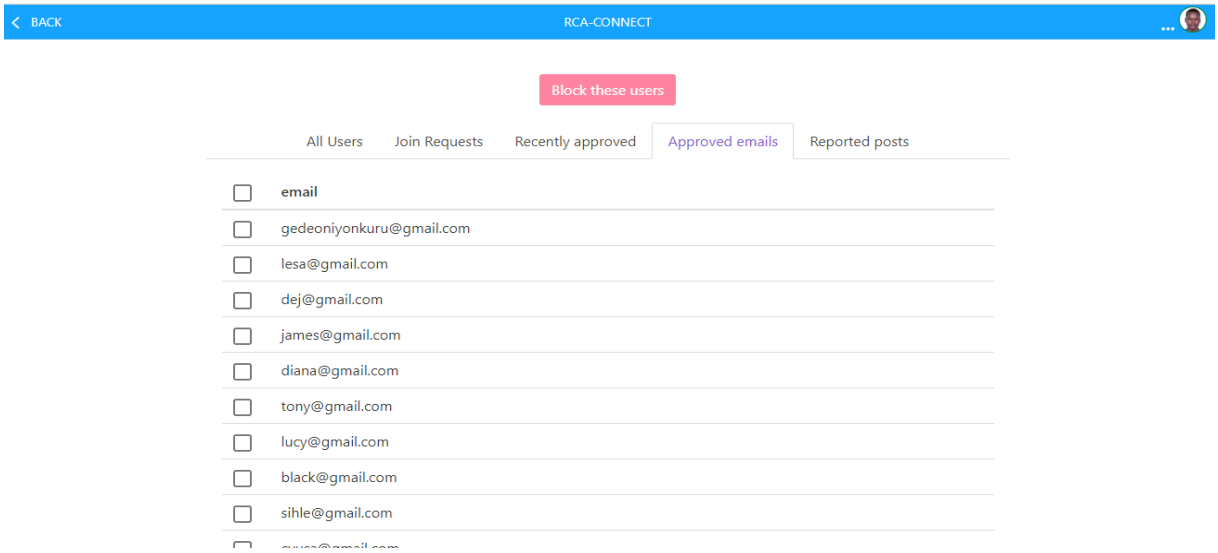


Figure 4.5.6.5 admin manipulating approved emails

- **A Superuser and admin can see a list of reported posts**

A reported post is a post that is bad or abusive. An admin or Superuser can choose to either approve the report. Accepting a report can results in the deletion from the database of the post that was reported. The admin can also choose to Deny the report, and this will delete the report only from a list of reported posts.

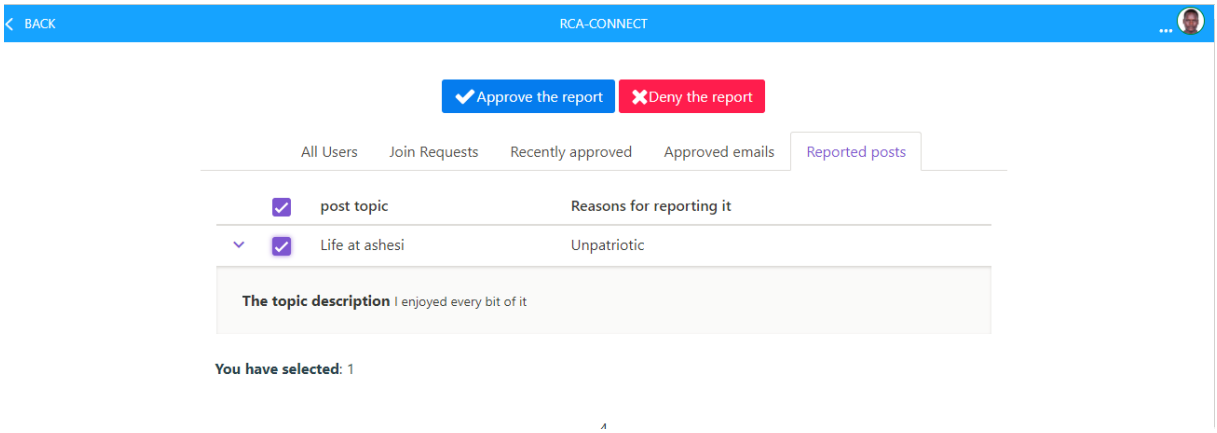


Figure 4.5.6.6 admin manipulating reported posts

4.5.7 Location Sharing

- A logged in user can share his or her location with other logged in users and a map indicating where these users are located is displayed, along with a table showing their usernames with the names of their locations.

  The following screen shots show a case when two users have shared their locations. The screen shots below show a case where two users have shared their locations.

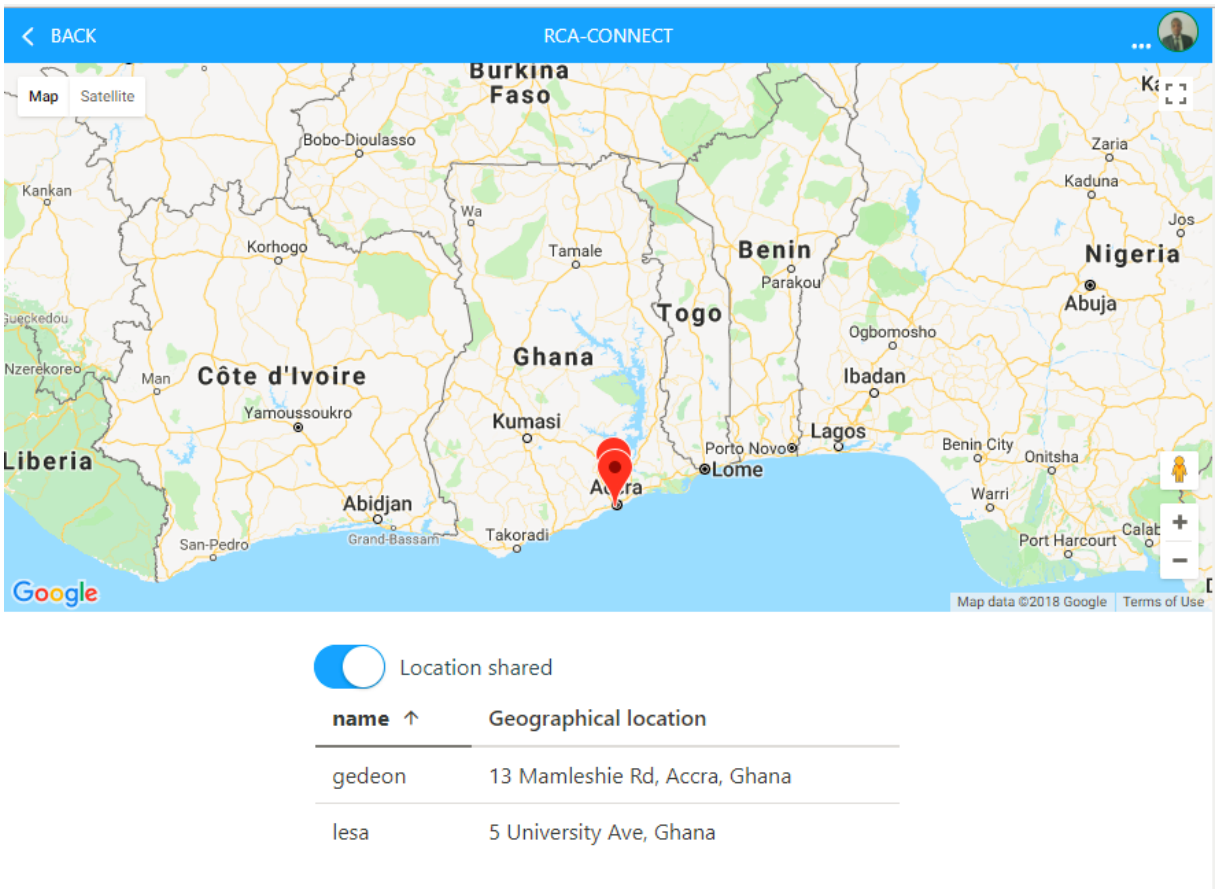


Figure 4.5.7.1 location sharing

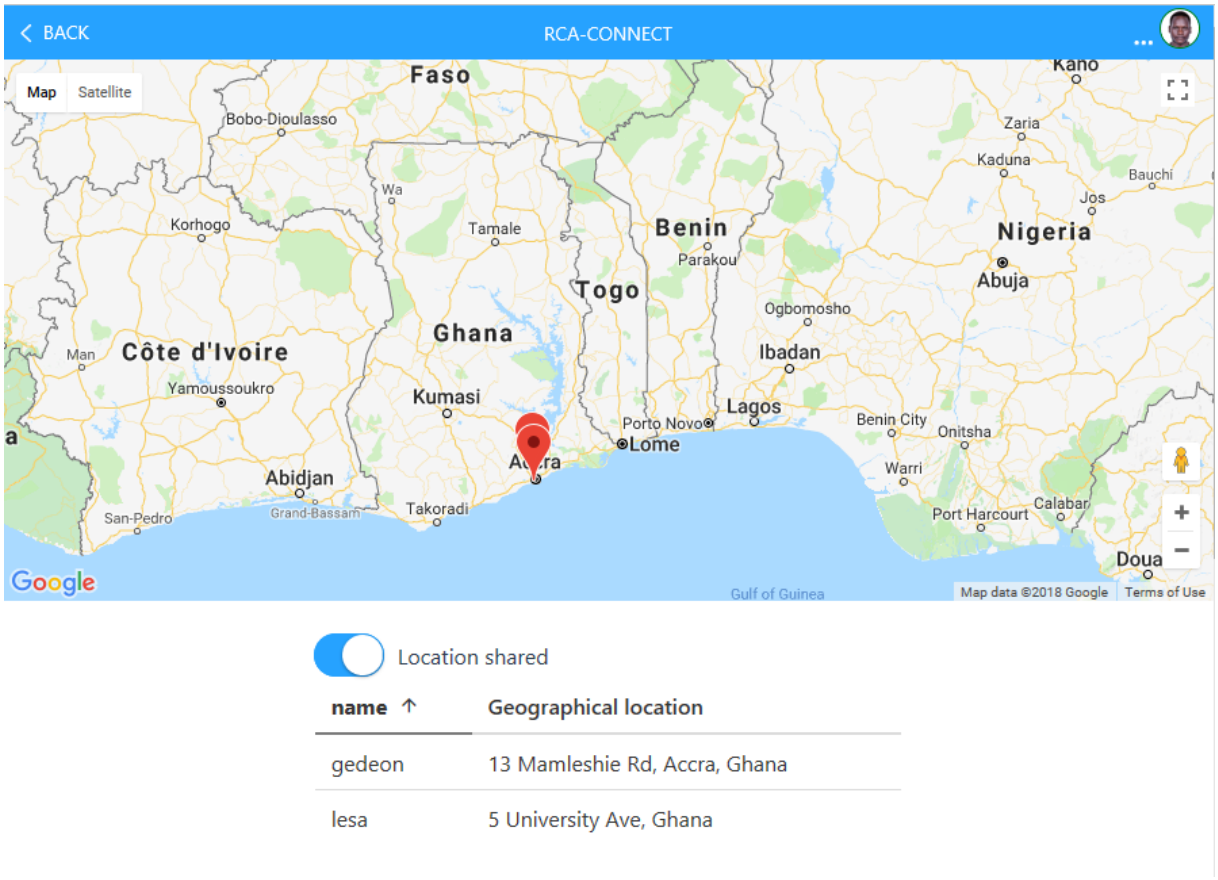


Figure 4.5.7.2 location sharing

4.5.8 Gallery

The RCA-CONNECT gallery is made of a collection of pictures or videos that were taken over different years, on different occasions. Any authenticated user can access and view pictures or videos from the gallery.

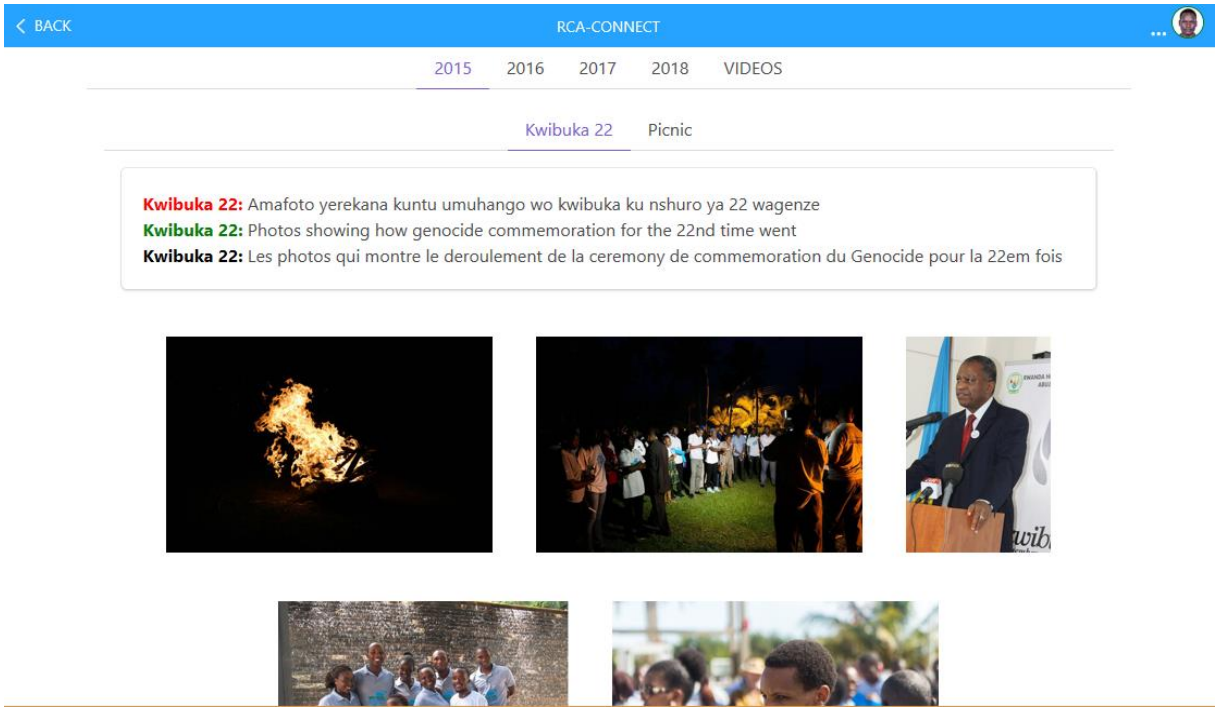


Figure 4.5.8.1 gallery01

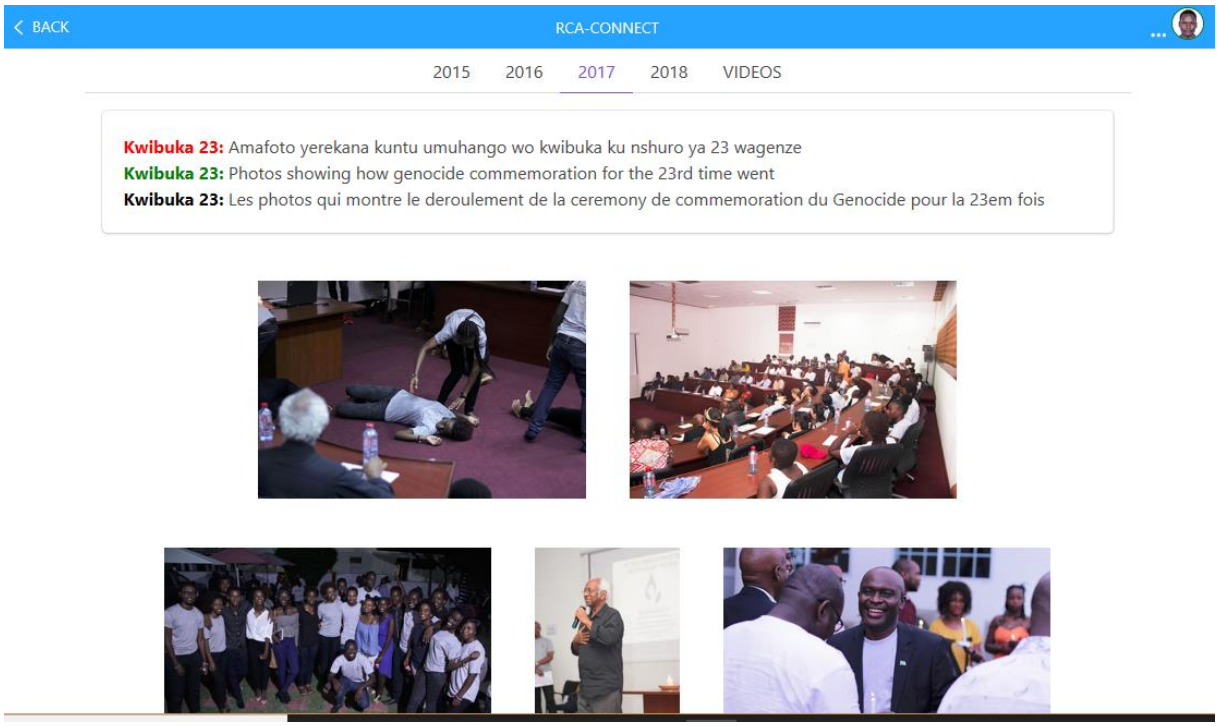


Figure 4.5.8.2 gallery02

CHAPTER 5: TESTING

This chapter describes a series of actions taken to verify if the RCA-CONNECT satisfy both functional and non-function requirements, as well as user expectations.

5.1 Development Testing

The following types of testing have been used to find and remove bugs from the system.

Unit Testing

PHP Unit testing was used to test different class functions that register, and login a user. As well as functions that handles user data manipulation. The following PHP methods have been tested:

Class	Method	Pass/Fail
ApplicationFunctions	Login() Register() LoadTopics() commentRegister() TopicRegister()	Pass Pass Pass Pass Pass

Component Testing

In this method the testing of different components is done separately. Login, register and forum components were tested differently.

The picture below shows the testing of the mentioned different components

- **Register:** The image below shows the registration process

The user gets real time notification of whether the username is taken or not

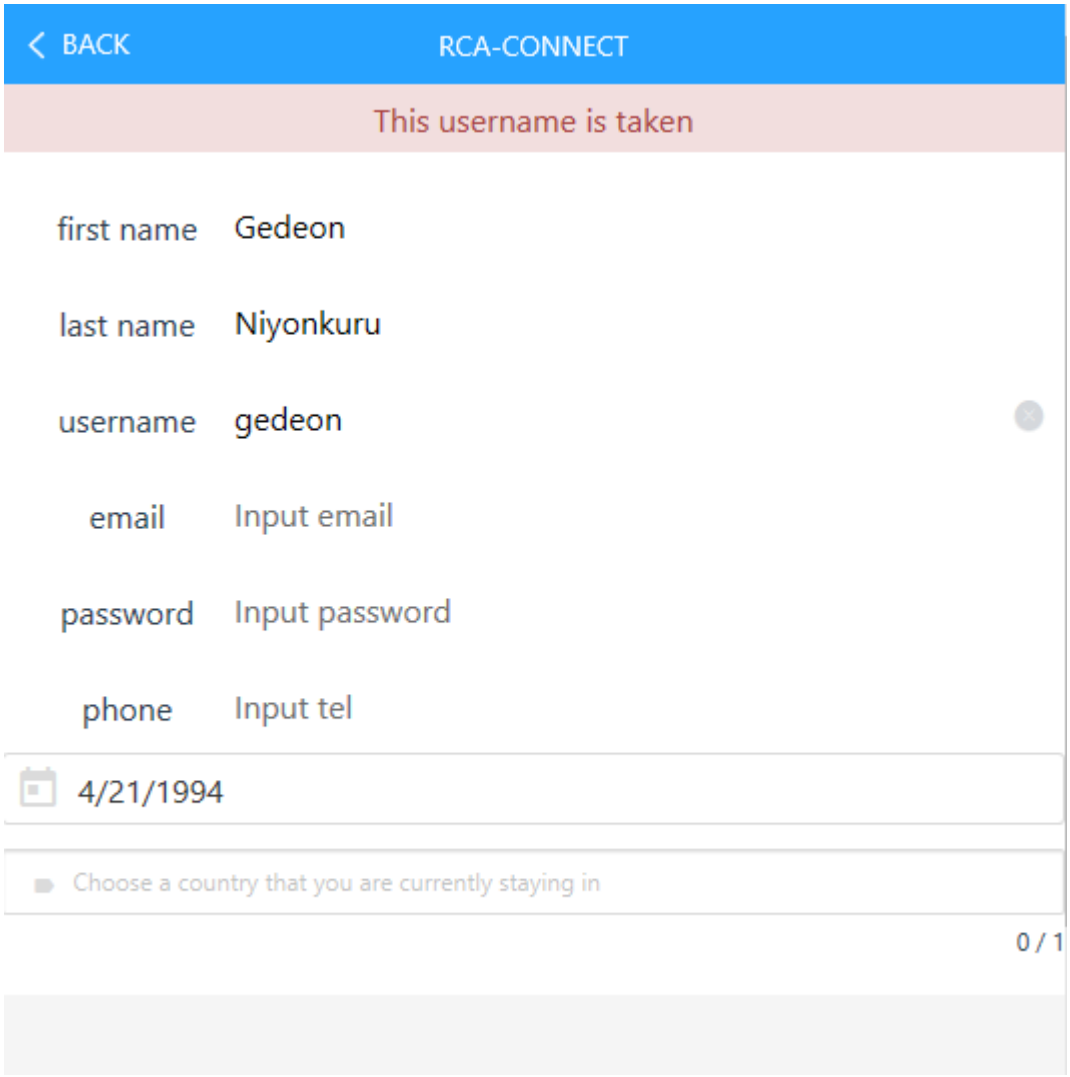


Figure 5.1.1 register testing

The user gets notification to check if the password is strong enough

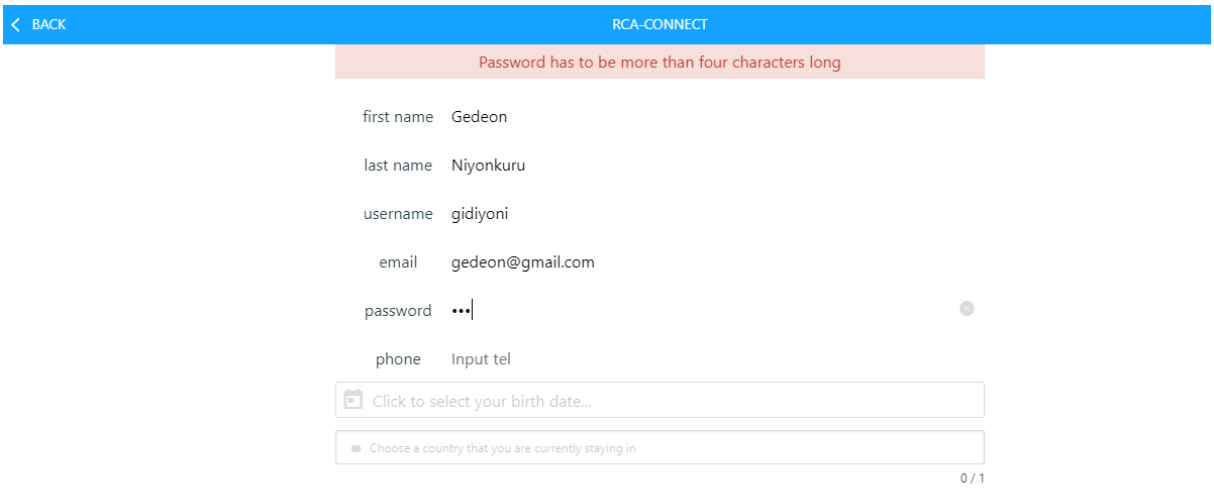


Figure 5.1.2 register testing

The user gets notification in case any field has not been well written.

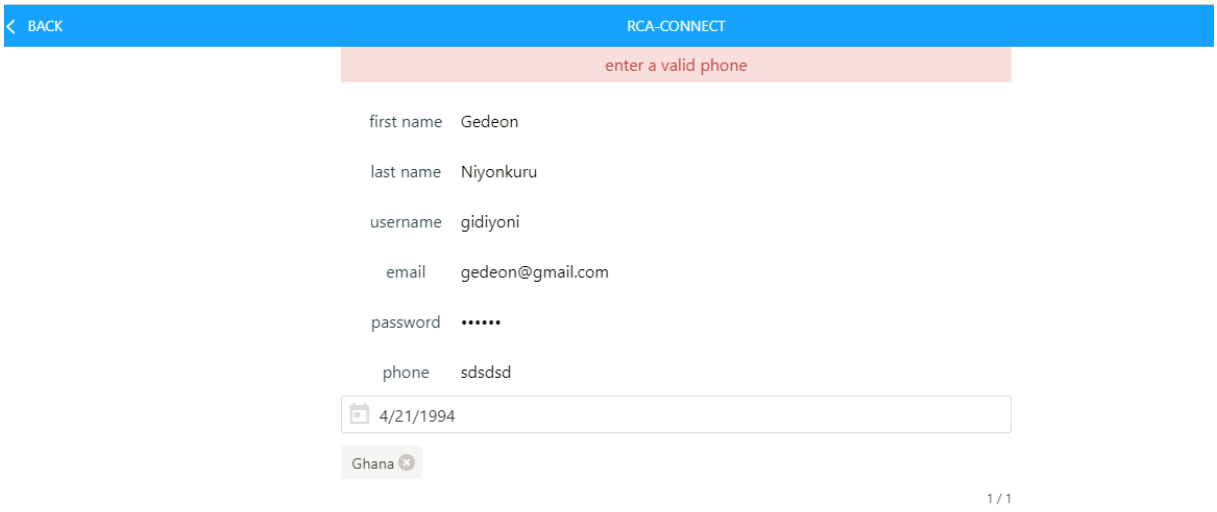


Figure 5.1.3 register validation testing

The submit button will show only if the user has filled the register form correctly

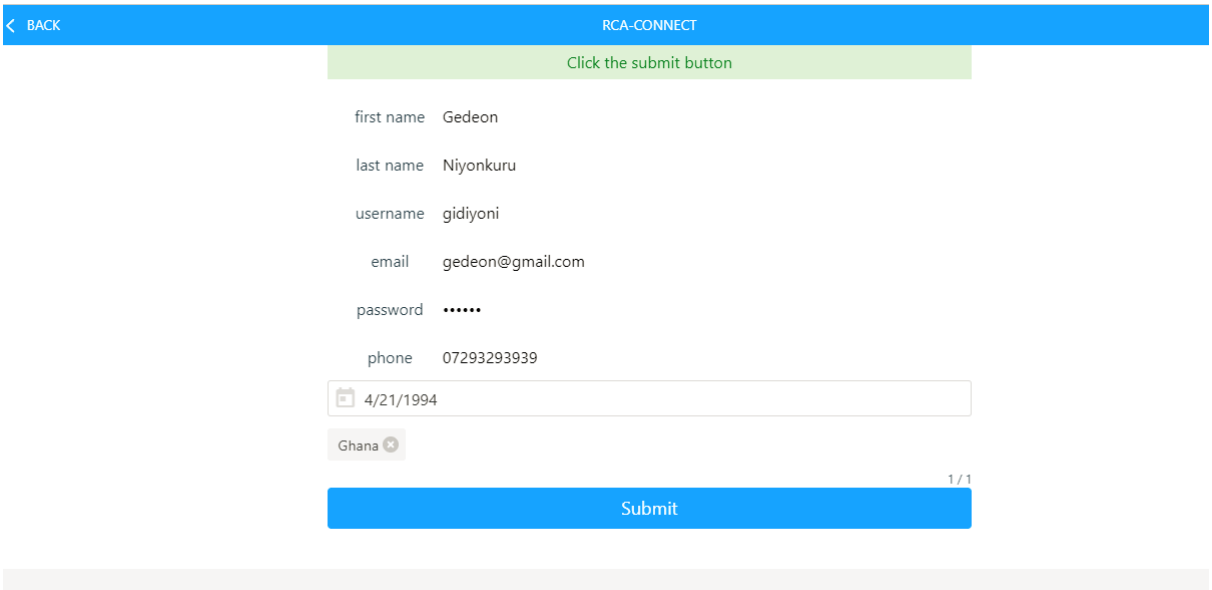
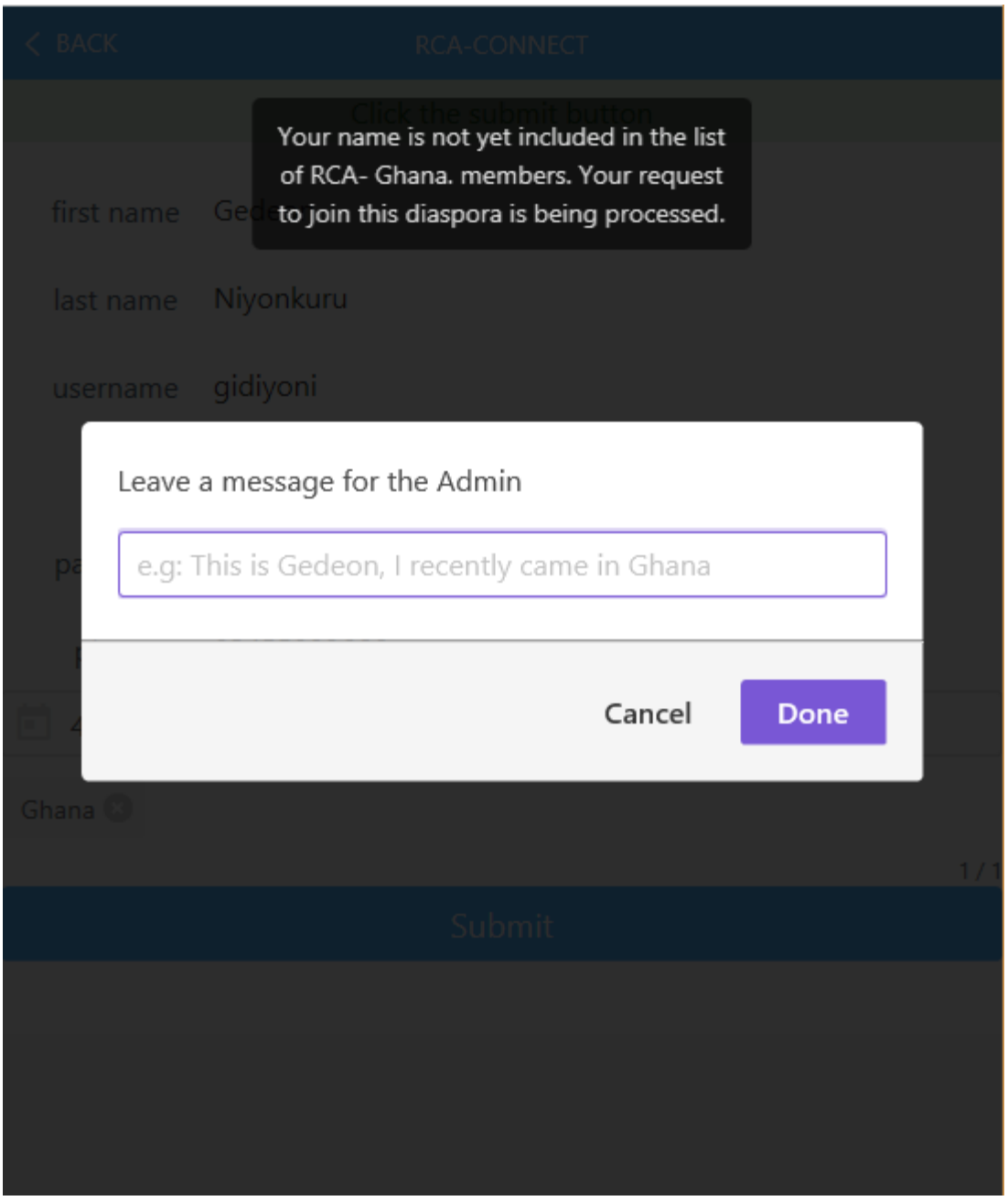


Figure 5.1.4 register submit testing

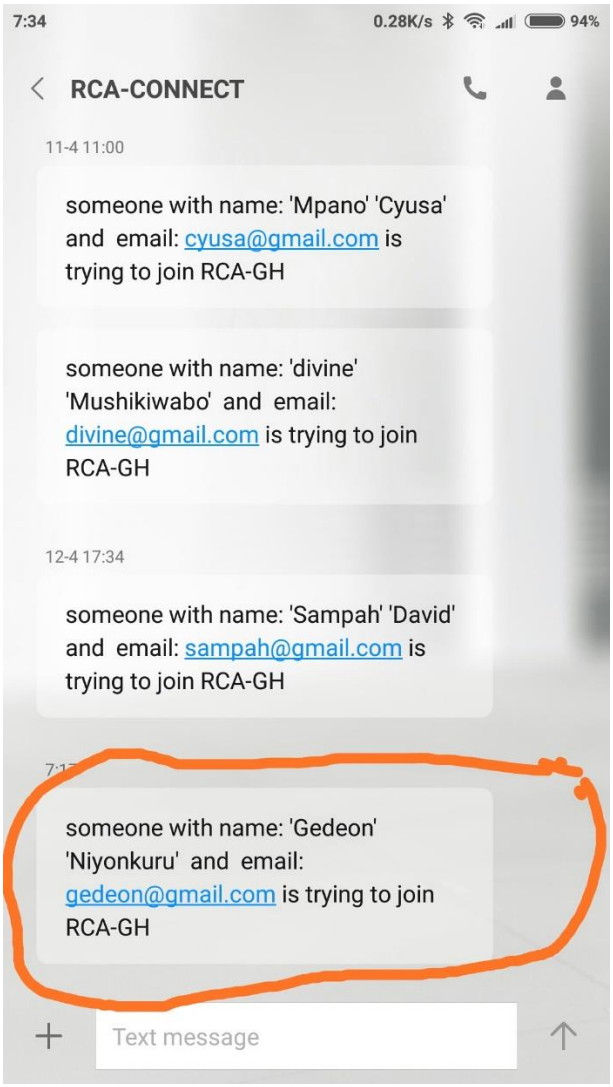
- Registration for a new member

  The user is asked to leave a message for the admin in order to help the admin recognize that he is a member of the diaspora



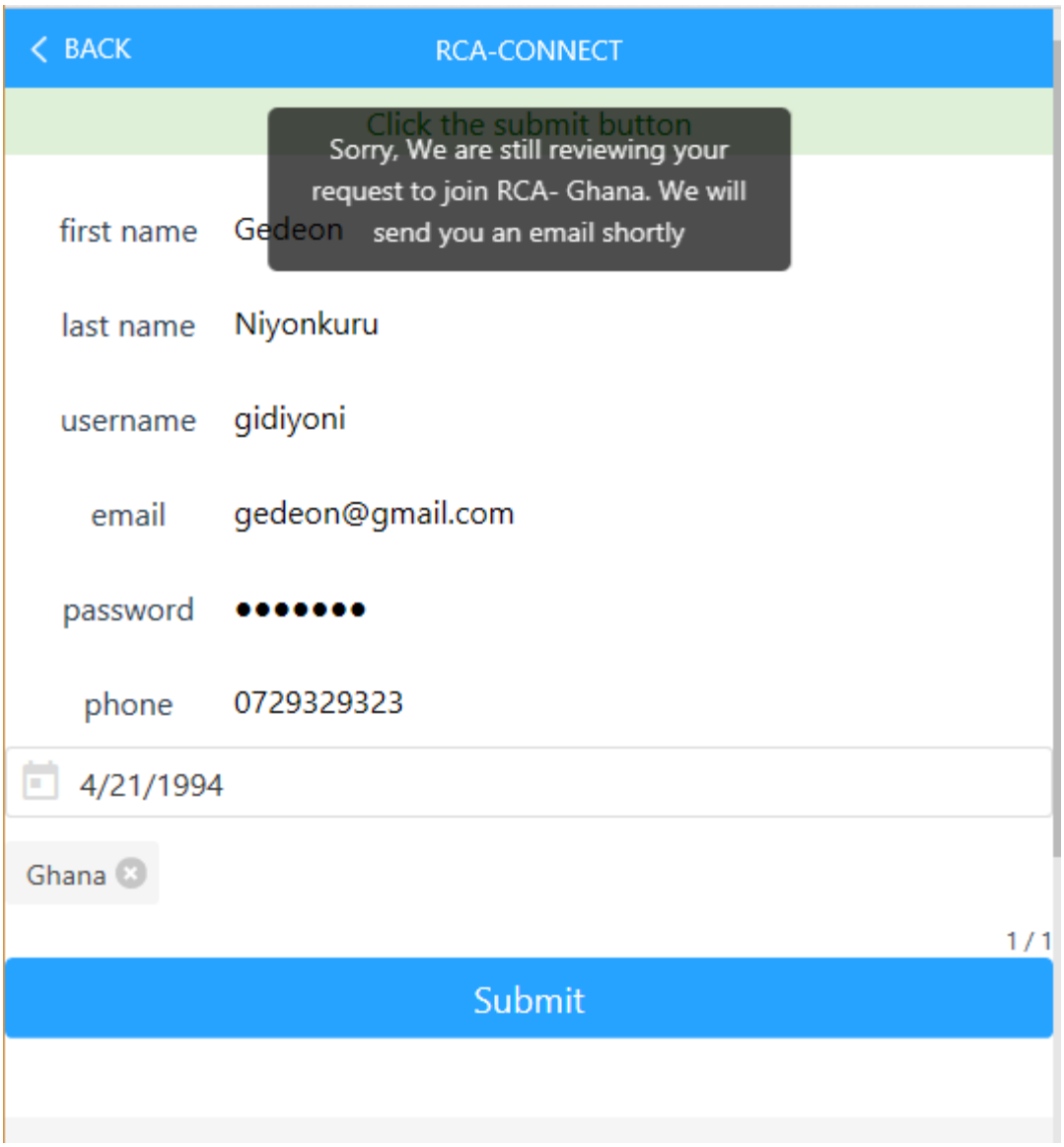
- The admin is notified

  An SMS is sent to the admin to notify him or her that someone who is not in the database is trying to join the platform



- Subsequent attempts to join the Diaspora

  If the admin has not confirmed that the user is indeed part of the diaspora, subsequent attempts by the user to join the platform will result in a notification telling him that his request to join the platform is still being processed



After the admin confirm the user by approving the request in the dashboard, the user can register successfully and gets redirected to login.

- Login: Component testing of the login

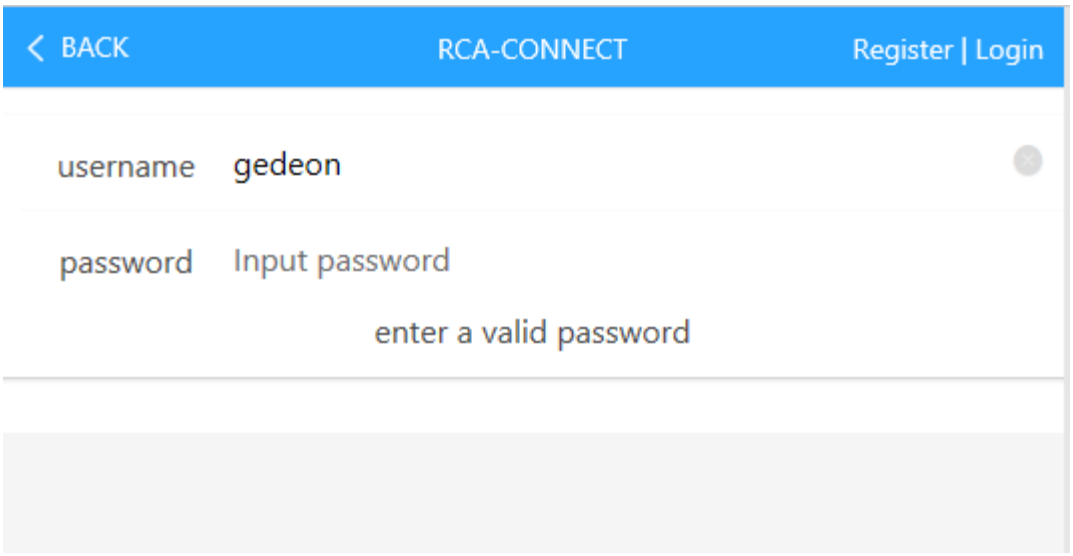


Figure 5.1.5 login validation testing

The submit button shows only if the suitable information is entered

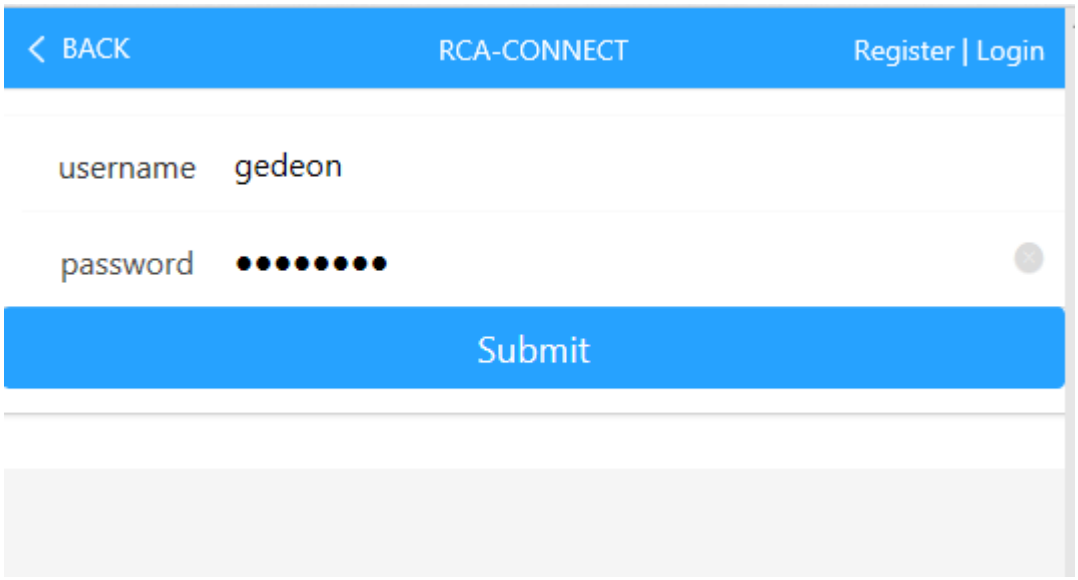


Figure 5.1.6 login submit testing

- Creating a post on a forum: A user trying to create a post

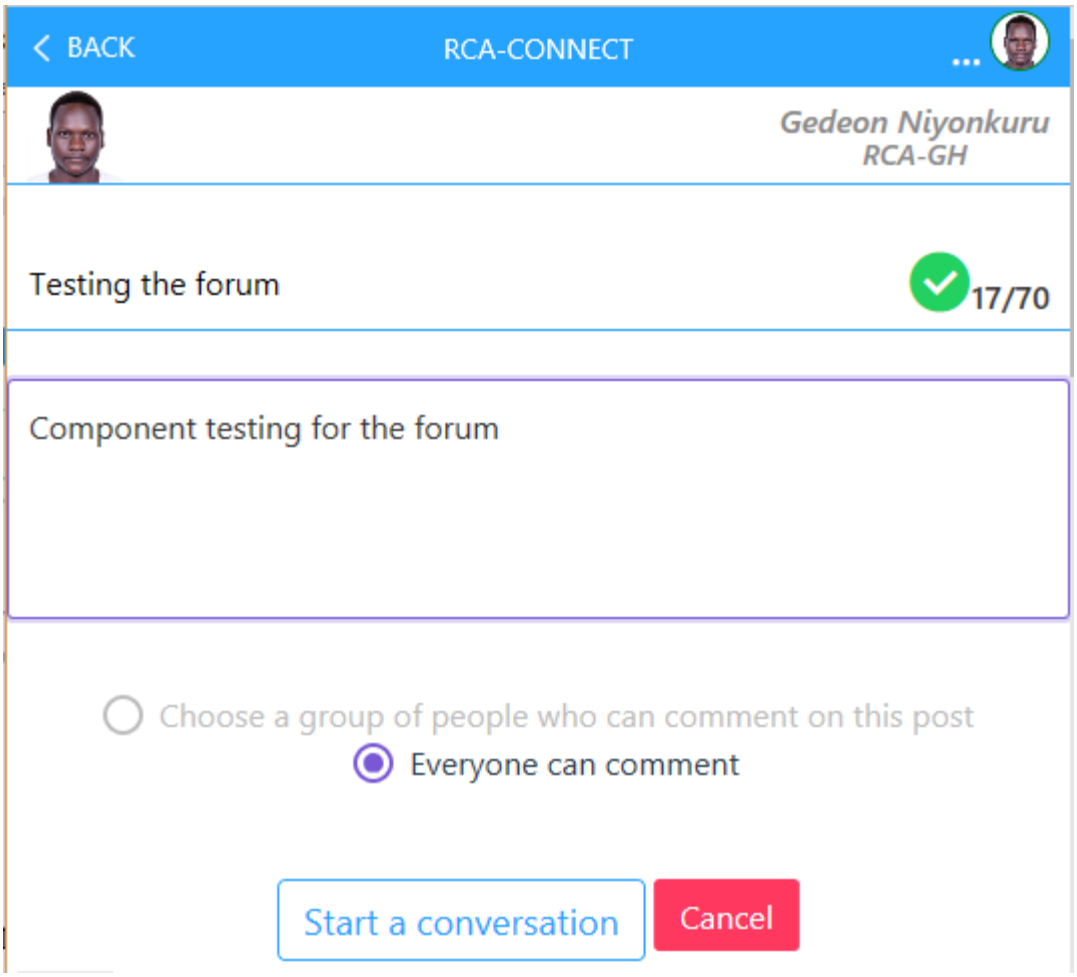


Figure 5.1.7 test creating a post

- Creating a post on a forum: A post is created after hitting the start a conversation button

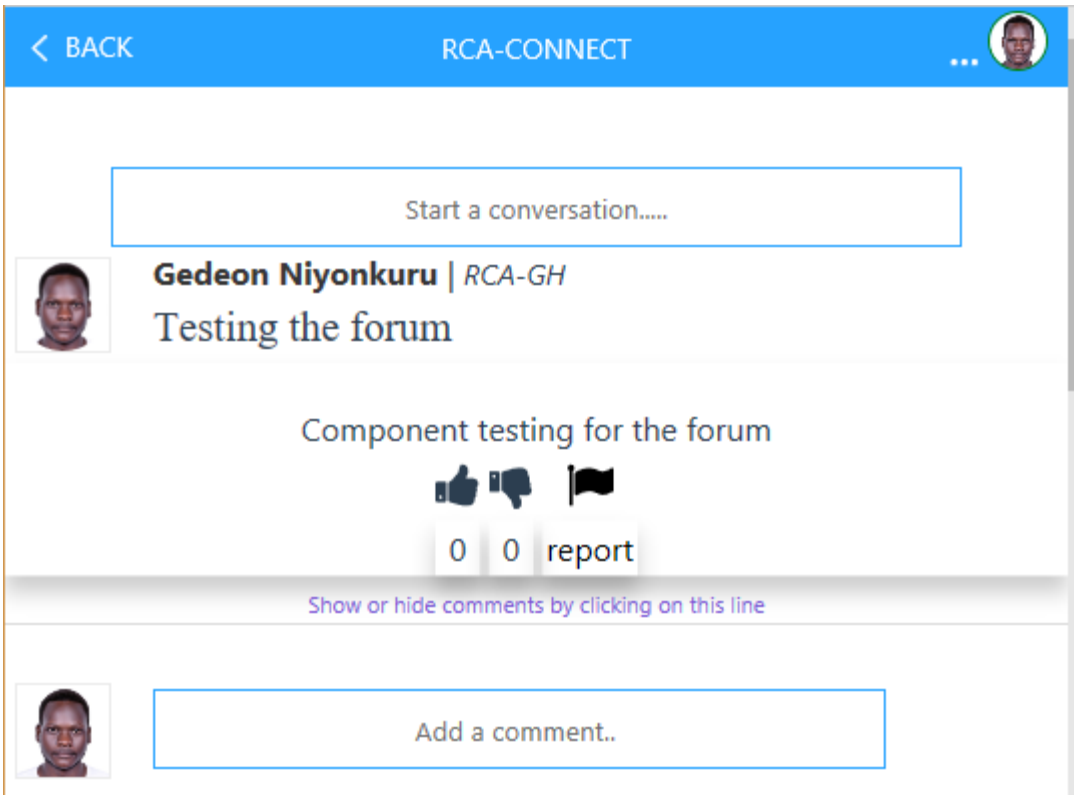


Figure 5.1.8 successful post creation on a forum

- Forum: commenting on a topic

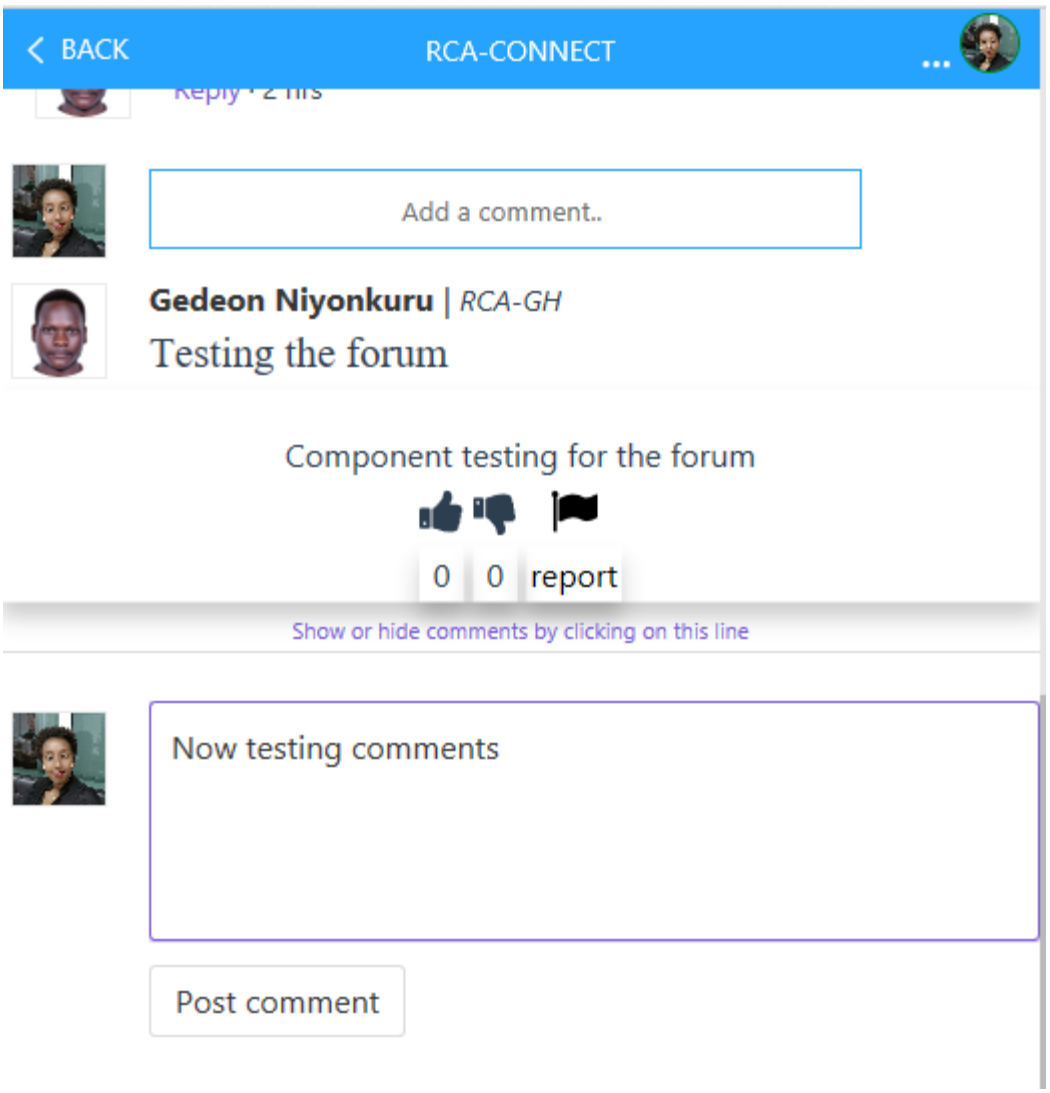


Figure 5.1.9 test commenting on a forum

Comment is displayed after hitting the post comment button

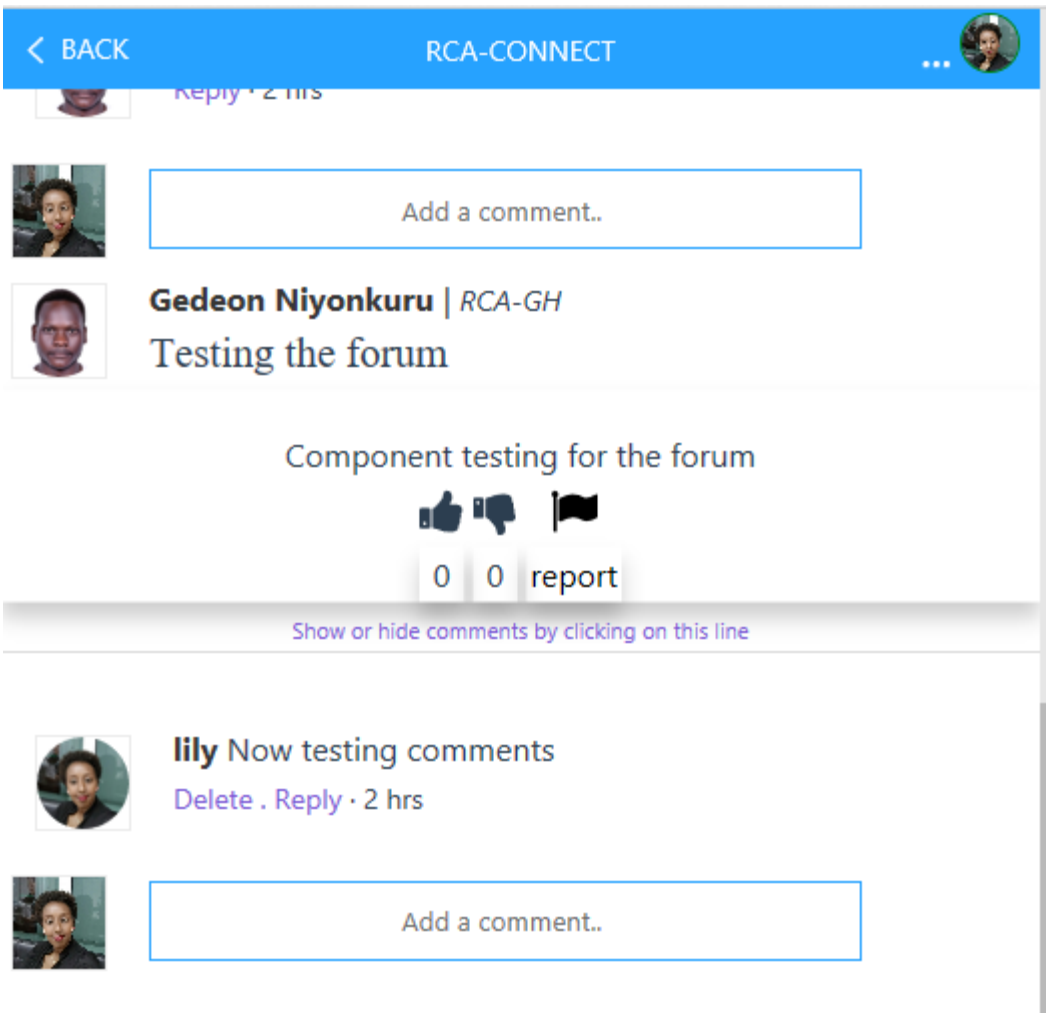


Figure 5.1.10 successful commenting on a forum

System Testing

In this type of testing the components are combined and the system is tested.

This involved the combination of different components to ensure that the system runs properly. During this stage, Functional and non-functional requirements were tested.

User Testing

User testing is a process that involves allowing users who are unfamiliar with the application to use the application to identify loopholes or design mistakes so that the application can be improved.

This application was given to 10 Rwandan Diaspora Members who are in Ghana, and below was the feedback that they gave.

Feedback

- **Functionalities**

- Include a functionality that can help new users to see all the members of a diaspora and find a way of informing users members that can be more helpful in certain areas.
- Add a functionality that allows people to share pictures on the forum
- Show when a user is online and notify other connected users.

- **Design**

- Improve the design of the application to make sure that it is aesthetically pleasing.
- Improve the user experience on the home page where users are trying to access and view statistics on Rwanda.

CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The report above has described the project of building RCA-CONNECT, a social platform for the Rwandan Community living abroad. It has described the origin of the idea and its implementation, as well as the technologies used to develop it.

The developed application allows any user to view data and statistics on Rwanda located on the homepage. It allows a verified member of the diaspora to login and register. It also allows an authenticated user to interact on a forum, to create a profile, to share location, and to visit photo gallery. All these functionalities fulfill functional and non-functional requirements as elicited by the user.

The knowledge fetched from different computer science courses like Mobile Web Development, Web Technologies, Software Engineering and Database Management System has significantly helped to develop all the necessary functionalities of RCA-CONNECT application like the forum, gallery, dashboard, and location sharing.

6.2 Limitations

RCA-CONNECT requires its users to be connected to the internet. Rwandans living abroad with no access to the Internet connection cannot use RCA-CONNECT application. The application can also be used only by a known group of Rwandans living abroad. Unknown new Rwandans entering a country must apply first before they can become members of the diaspora, hence successfully registering on the platform. For the platform to be well monitored, the government of Rwanda needs to be brought on board to ensure that the Diasporas registered on

the platform, and administrators of those diasporas are officially recognized as legitimate Diasporas and leaders of Diasporas.

6.3 Recommendations

As the feedback of the user testing suggests, the application can be improved by implementing a private messaging functionality on the platform. The private messaging functionality would help users to have a better experience on the platform. This would also improve connectivity among users.

Adding monetary activities tracking functionality. Users have suggested that additions of some functionalities that allow diaspora members to launch fundraising campaign to finance different events organized by Rwandans living abroad. This would allow Rwandans living abroad to better organize their activities and events.

6.4 Future plans: To be carried out in a period of three months

Adding functionalities that allow the system to efficiently keep records of all current and future monetary contribution of its members towards the preparation of different events.

Testing different front design to achieve the most attractive design for RCA-CONNECT platform.

Expanding the application to be used not just by Rwandan Community in Ghana, but by any Rwandan Community abroad.

Launching the RCA-CONNECT application in Rwanda and seeking Rwandan Government Recognition and support.

APPENDICES

Table showing different tables and other data types of RCA-CONNECT database

Table Name	**Field Name**	**Data Types**	**Field Description**
Member	**id**, username, fname, lname, profile_pic, email, pass, phone, birthdate, organization, status, function, marital_status, years_of_stay, interests, quote	Int Primary Key Varchar Varchar Varchar Varchar Varchar Varchar Varchar Date Varchar Int Int Varchar Varchar Varchar Varchar	This table keeps the details of Rwandans living Abroad, who have registered to use the platform.
Diasporas	**id,** country, leaders_email, leaders_phone, *committee_id*	Int Primary Key Varchar Varchar Varchar Int foreign Key	This table contains all the diasporas that are recognized by Rwanda.
Committee	*member*, role, country	Int primary Key Varchar Varchar	This table keeps record of the committee members of a diaspora.
Private_messages	*sender_id*, *receiver_id*, read, date	Int Foreign Key Int Foreign Key Boolean date	This table keeps all the messages exchanged between users of the platform.
Topics	id, *creator*, link, title, body, status, tags,	Int Primary key Int Foreign key Varchar Varchar text Varchar Varchar	This table contains all the topics discussed on the forum

	likes, closedOrOpen, deleted_at, created_at, updated_at	Int Boolean Date Timestamp Date	
comments	**id,** *user_id,* *topic_id,* content, likes, deleted_at, created_at, updated_at	Int primary Key Int foreign Key Int foreign Key Text Int Date Timestamp Date	This table contains all comments that users have put on different topics.
Planned_activities	event_name, *coordinator*, place, **time**	Varchar Int foreign Key Varchar Date	This table contains a list of activities that the diaspora is planning to do.
Fundraising_campain	***event***, targetAmount, reachedAmount	Varchar foreign primary int int	This table tracks contributions on a event
Contributors	**id**, event_id, *contributor* amount	Int Primary Key Int foreign id Int foreign Id Int	This table keeps track of everyone who has contributed, along with the contributed amount.
join_requests	**email**, first_name, last_name, phoneNumber, country, message	Varchar Varchar Varchar Varchar Varchar Varchar	This table keeps the details of people who have requested to join the platform.
approved_members	***email***, country	Varchar Primary Key Varchar	This table keeps email address of people who are either registered or can register for the platform

Albums	Album_id Alb_name year	Int(11) Primary Key Varchar (50) Date	This table contains different albums of galleries
Gallery	**pic_id** **album** **src** **likes**	Int Int Varchar Int	This table stores links to images to be used

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