

HelpHub: An Organizational Service Desk

by

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An internship report submitted to the Department of Computer Science and
Engineering in partial fulfillment of the requirements for the degree of
B.Sc. in Computer Science

Department of Computer Science and Engineering
Brac University
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Declaration

It is hereby declared that

1. The internship report submitted is my own original work while completing degree at Brac University.
2. The report does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

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Abstract

In corporate world, companies and organizations have multiple departments which ensure the smooth operation of the whole organization. These departments are operated by the employees and administrative staffs who help the organization to serve its clients. While performing their everyday tasks, both the employees and the administrators frequently face various types of issues, that require timely support from different departments of the organization to be resolved. Therefore, every organization needs a service desk to give department-wise support to the requesters in order to resolve their issues. The organization that I did my internship in, had their own online service desks for each of its major divisions. This gave me the idea to develop a web-based organizational Service Desk application named HelpHub, where the requester can ask for support from a specific department according to the issue they are facing by generating a ticket and submitting it to that particular department. Afterwards, the admins who are in charge of controlling the application, assigns the ticket to a support staff from that department, who then resolves the ticket. The requesters can be the employees, administrators, as well as the clients. HelpHub improves communication, ensures timely response and manages overall support operations of the organization and makes the service desk experience more convenient for the users.

Dedication

I want to dedicate the efforts and hardships of my academic life to my caring and loving parents. Without their support and struggles, I would not have come this far in life. I would also like to dedicate it to my older brother, whose encouragement and motivation helped me stand strong during my difficult times. I would like to thank Md. Tawhid Anwar sir for his kind guidance and supervision.

Acknowledgement

First of all, my gratitude to almighty Allah for granting me the opportunity to finish my internship without any difficulties. Secondly, I would like to thank my co-supervisor Md. Ekramul Haque Chowdhury, Assistant Vice President and the IT Infra team of NRB Bank PLC. for always being supportive and helpful towards me. Then I would like to thank my supervisor, Md. Tawhid Anwar sir for his help and guidance throughout this period. Lastly, I will always be grateful to my parents, family and friends for their constant support and prayers, without which it would have been very difficult for me to complete my internship.

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Chapter 1

Introduction

1.1 Preamble

Internship is the best way to achieve firsthand work experience from a professional work environment. It also gives individuals the opportunity to apply their academic knowledge in practical scenarios and prepares them by developing their technical and professional skills and giving them a thorough idea of the corporate responsibilities and time management so that, later on, they can work professionally in a real world work environment. Moreover, doing an internship enhances a student's perspective on making decisions to choose proper career paths of their interests.

Brac University offers Thesis/Project/Internships for the mandatory CSE400 course which carries 4 academic credits of the CSE/CS curriculum to obtain the undergraduate degree. Students can take CSE400 and do Thesis/Project/Internships only if they have completed 72 academic credits. While most of the students choose thesis for the completion of the degree, in recent years, internships are also becoming popular among students. To obtain real world professionalism, many undergraduate students decide to do internships in reputed companies. Not only does it help to gain experience, but it also adds weight to their CV. Just like Thesis, students are encouraged to do internships by the faculties of the university in reputed organizations as long as the internship studies are relevant to their major. The time period of the internship is bounded from 3-6 months by the university.

As a student of Brac University, I chose to do an internship for CSE400 to complete my undergraduate degree instead of Thesis/Project. I began the 3 months long journey of my internship starting from March 2nd to June 2nd, 2025, at the Information Technology Division of NRB Bank PLC. I am hopeful that the experience I gained from working in this company as an intern, combined with my academic knowledge, will be worthwhile and useful in my future career development.

1.2 Objective

After doing the internship at NRB Bank to complete my undergraduate degree in Computer Science (CS) program at Brac University, I am writing this report to give an overview of my workplace, the work environment, tasks I worked on, the experience I gained and the challenges I faced while doing the internship. The primary object of writing this report is to complete my undergraduate degree. Apart from that, the readers can get a thorough idea about the internship program and

its responsibilities at the IT Division of NRB Bank PLC. Moreover, this report will also provide a detailed overview of the project I did myself after completing the internship.

1.3 Document Overview

This report has been created to give a detailed concept of my internship experience at NRB Bank PLC. I have shared my work responsibilities, the office environment and briefly gave an overview of the company. I also wrote about my project HelpHub, its features, requirements and how I implemented the full application and what challenges I faced while implementing it. Moreover, this report gives a brief idea about my professional, technical and interpersonal growth. To sum up, the readers can have a thorough idea about my internship journey, the project and my overall learnings throughout this period.

1.4 Methodology

For writing this report, I gathered information from my experience at the workplace, as well as from the employees by having conversations at different relevant topics with them. Moreover, I collected data from various sources to make the report comprehensive and well-detailed. I have categorized the data in two parts. One is the Primary Data and the other is the Secondary Data. The Primary Data contains the information that was acquired from my experience while working on the tasks I was assigned in. This report is mostly written with the Primary Data. The Secondary Data includes the information I gathered from different sources. I used some Secondary Data to write the company information.

1.4.1 Primary Data

- Information gathered from co-workers
- Information gathered from direct observation
- Information gathered from communicating with Branch members
- Information gathered from meeting with Supervisor

1.4.2 Secondary Data

- Organization's official website
- Internet resources

Chapter 2

Company Profile

2.1 Overview

NRB Bank PLC is a fourth-generation bank in Bangladesh with the total number of branches and sub-branches being 99, all over the country. The head office is located at Gulshan-1, Dhaka-1212. It started the journey on 4th August, 2013, with the vision to become the top most trusted financial institution in the country for the Non-Resident Bangladeshis (NRBs) as well as for the Bangladeshi residents. Even though the organization is comparatively new in the banking sector, it is growing rapidly with its mission. It provides services such as, Retail Banking, NRB Banking, Card Services, Remittance and Treasury, SME Banking, Agent Banking, Corporate Banking, E-Banking. All these services are provided in a seamless and professional manner by the integration of modern technology in banking operations. By providing reliable services with a hospitable environment, it is building a strong relationship with the customers and investors.

2.2 First day of joining NRB Bank

I was excited and nervous at the same time on the first day of joining NRB Bank as an IT intern. The IT Division operates on the fourth floor of the corporate head office. I went to the division and introduced myself and was taken to the Assistant Vice President, Mr. Md. Ekramul Haque Chowdhury's desk. He cordially greeted me and informed me that he was going to supervise me throughout my internship. As the head of the Infrastructure Unit, he introduced me to all the team members of IT infra. Everyone was very welcoming and they greeted me with a smile on their face. The Infrastructure unit is run by eight members consisting one Assistant Vice President (AVP), one First Assistant Vice President (FAVP), two Junior Officers, three Assistant Officers and one Executive. I was specifically assigned to this unit. After the meeting and greeting, my supervisor briefly told me the company profile and gave a thorough idea about the workflow of my tasks and then he assigned one of the Junior Officers, Imran bhaia to be my mentor throughout the whole internship. Imran bhaia introduced me to all the devices, tools and software used to operate the IT division, he also created an account for me to access the NRB Bank internal Portal and other necessary tools I will work to complete my tasks as an intern. I was then provided with a laptop and an IP Phone which Avijit bhaia, an assistant officer, setup for me. He helped me a lot throughout my whole internship, since his

desk was right next to mine. After setting up my laptop, I spent rest of the time on getting familiar with the organization's internal Portal, the IT service desk and the software I will later use throughout the internship.

An attendance sheet was made for me to record my everyday arrival and departure time. Usually, the office hours of the bank is from 10 am to 6pm. Since I started my internship in the holy month of Ramadan, the office hours were from 9 am to 4 pm. Before leaving for the day, I reported everything to my supervisor and he permitted me to leave for the day. Everyone at the IT division was really friendly and helpful towards me. For the first time, I got to experience how a corporate office works.

2.3 Services

NRB Bank offers reliable services to the customers and clients for their maximum satisfaction, so that they can have a premium banking experience.

2.3.1 Retail Banking

Retail Banking of NRB Bank ensures convenient transactions, secure money depository and growth and financial support

2.3.2 SME Banking

The bank offers full range of financial solutions to the Small and Medium Enterprises (SME) [3].

2.3.3 NRB Banking

NRB Bank offers fixed deposit accounts, NRB Bonds, Quick Loan, Quick Cash, Home Loan, Non-Resident Investors Taka Account (NITA), NRB My Deposit account and NRB Horizon(a monthly saving scheme) to the non-resident Bangladeshis.

2.3.4 Cards

The bank offers both Credit and Debit card facilities to the customers that ensures their easy and secure money access.

2.3.5 NRB Click

NRB Click is the mobile banking app of NRB Bank. It offers card accessibility, mobile financial services (MFS), fund transfer, paying utility bills and other services.

2.4 Vision and Mission

The vision of NRB Bank PLC is to be the leading financial institution for NRBs to invest in Bangladesh and for Bangladeshi individuals and corporates to access international markets. [1] NRB Bank aims to be the preferred provider of targeted financial services as a conduit for investment to and from Bangladesh for our

Bangladeshi communities both domestically and internationally, to accelerate the industrialization of Bangladesh. [1]

2.5 Organizational Structure

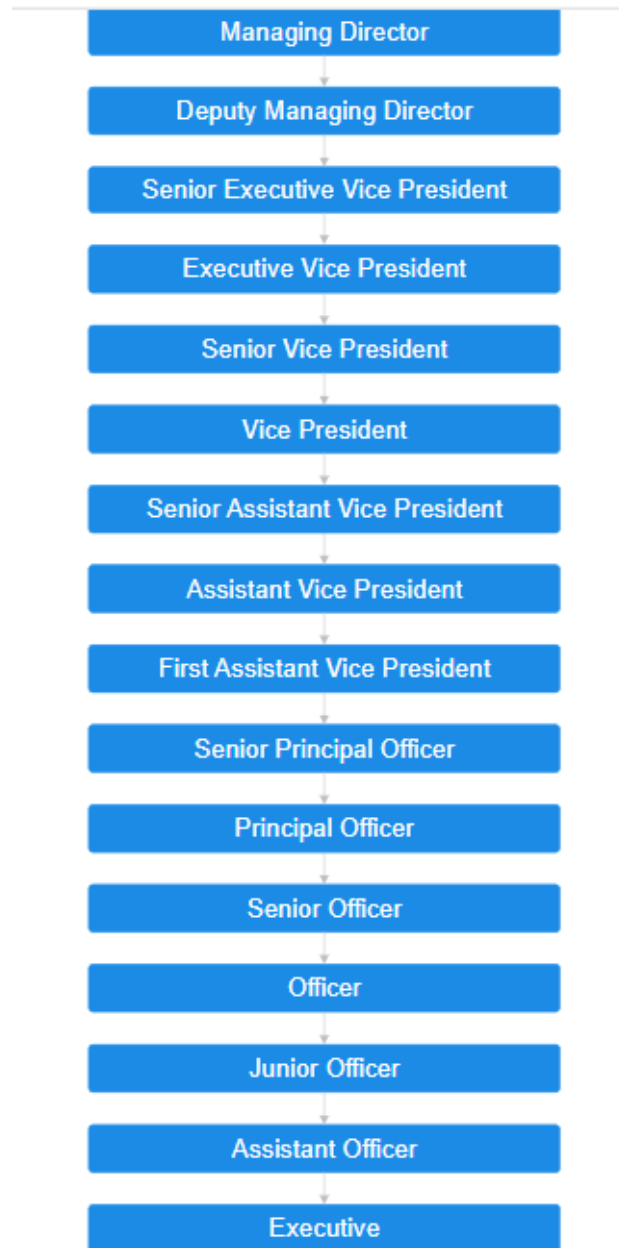


Figure 2.1: Hierarchy of NRB Bank

2.6 Departmental Overview

The head of the IT Division is Mr. Md. Aktaruzzaman Sarker, Executive Vice President (EVP). The IT Division has 4 major units that maintain its efficiency and continuity. The 4 major wings are:

1. The Network unit
2. The Security unit
3. The Application unit
4. The Infrastructure unit.

The security unit is responsible for protecting the digital systems and data of the bank from threats and unauthorized outbreaks. The network unit maintains the internal networks and the communication systems for an effortless, constant and secure connectivity. The application unit is in charge of the bank's software applications maintenance. Finally, the Infrastructure unit is in control of the data centers, servers, storage, hardware maintenance and IT asset managements.

Chapter 3

Workplace Details

3.1 My Responsibilities

My responsibilities as an IT intern at NRB Bank can be categorized into two major parts- IT Asset management and Endpoint Security System Management. The first two months I worked on the asset management task and the final month I worked on the Security system management task. After my supervisor instructed me on the workflow (fig:3.1) of my tasks, I started to work on knowing about the IT assets, software such as Trellix Endpoint Security, Virtual Network Computing (VNC), NRB Bank internal portal and the ManageEngine IT Service Desk. As soon as I was done knowing how they work, I started working on the asset verification task. I made sure every employee across all the branches had their assigned IT assets and listed out the mismatched employee names with their assets. Subsequently, for the reconciliation process, I started assigning the employees with the assets they were using, from the service desk. Then I sent the newly generated asset reports to all the branches. After completing the asset management tasks, I started working on managing the inactive devices and for that I had to communicate with the branch operation managers of all the branches and ask them to activate the devices that haven't been used for a long time which led to my next task, the software malfunction resolution. Some of the PC and laptops had outdated or corrupted Trellix Agents. I reinstalled and updated all of them remotely via VNC. While completing this step, I found out some of the endpoint devices had outdated operating systems, which were interrupting in setting up the security systems. I listed out those devices and reported to my mentor who was in charge of the Endpoint security system management.



Figure 3.1: Work Flow

3.2 Communication and Meetings

The organization uses Microsoft outlook for official communication, however, for everyday communication, the IT division uses the WhatsApp group chat system. The employees have to notify everyone in the group chat if they need a leave or if they will be late on that day. Apart from the email system, the group chat is also used for giving reminders, sharing information and announcements. The company's monthly meetings with the MD are held via Zoom meeting, which is arranged by the IT division. It is mandatory for employees of all the branches, sub branches and head office to attend the meeting.

I had meetings with my supervisor at the end of every week. These meetings were held basically to keep track of the workflow. I was given the freedom to do the tasks in my own way and also had feedback on my work process by my supervisor that helped me to do the work more accurately. Moreover, every day before leaving, I reported to my supervisor about what I did the whole day and the problems I faced. Whenever I was uncertain about something or needed assistance, I asked the members of my team and they helped me regardless of their busy schedule. I was able to make a good relationship with the members of my team, as well as with many members of the other teams of the IT Division. They also helped me through my entire internship.

3.3 Workplace Facilities

3.3.1 Cafeteria and Kitchen

NRB Bank has a cafeteria with a large dining area on the top floor of the head office. Beside the Cafeteria, there is a kitchen where the food is prepared for the employees. They can either buy their lunch from the cafeteria or bring their own food from home, reheat it in the kitchen and have lunch in the dining area. The lunch time usually starts from 1.30 pm, after the Dhuhr prayer. Everyone has lunch together in the dining area at their convenient time.

3.3.2 Tea and Snack time

Every morning and evening, employees are served with tea and snacks, which helps them to start the morning in a refreshing way and remain energetic in the evening (fig:3.2). Usually, biscuits, samosas and peanuts are served during tea time, but on special occasions, special desserts and snacks are served (fig:3.3). During tea time, the employees have pleasantries with one another, that help them to get rid of boredom and boost their mood.



Figure 3.2: Evening Tea



Figure 3.3: Snacks

3.3.3 Prayer Room

NRB Bank has prayer rooms for both male and female employees and a separate place for wudu, next to the prayer room. The employees usually perform their Dhuhr and Asr prayers there.

3.3.4 Sustainability

NRB Bank PLC. follows Green Banking for environment sustainability which enhances its standard and encourages other businesses to follow environment sustainability. Since the establishment of the bank, it initiated Green Transformation of Internal Operations and launched Green Banking services, such as, Internet Banking, Online Banking, E-Statement and NRB Click (mobile app). The goal is to minimize carbon emission by reducing paper work and sustain energy and water as much as possible.

During the year 2015, NRB Bank PLC formed the Green Banking Unit which is in charge of designing, evaluating and administering Green Banking related activities of the Bank and issued “Green Banking Policy” as per the guidelines of Bangladesh Bank. The bank has released ‘Green Office Guide’ in 2016 and ‘Green Marketing Policy’ in 2020 to meet its mainstream Banking operations. [2]



Figure 3.4: Green Workspace initiative

3.3.5 Women’s Day celebration

Every year on March 8th, the bank celebrates International Women’s day. I had the opportunity to be a part of the celebration, since I was doing my internship at that time. The Managing Director of NRB Bank, Md. Tarek Riaz Khan and a group of senior officials of the organization visited each division and presented roses to all the female employees (fig:3.5).

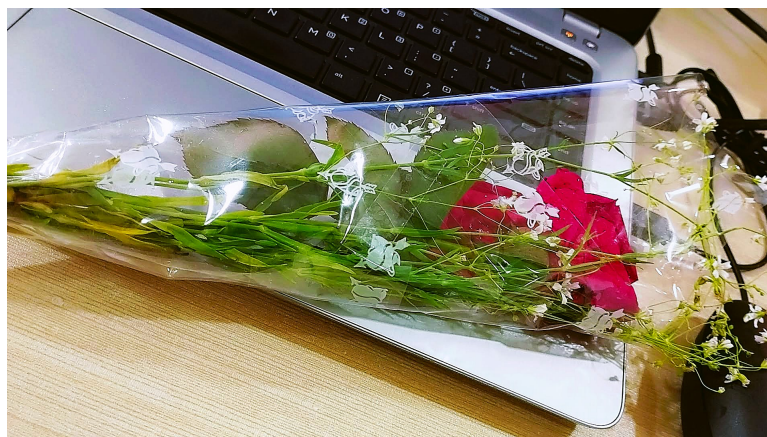


Figure 3.5: Women’s Day Gift

3.3.6 Eid Celebration

NRB Bank celebrates both Eids in a grand manner. During my internship, I got to experience the post Eid-ul-Fitr celebration at the office. On the first workday after the Eid vacation, a grand party was organized by the bank on the top floor of the head office. Fuchka, Chotpoti (fig:3.6) and Shemai were served at the party. All the employees came to the office wearing their Eid outfits. The whole office had a festive atmosphere.



Figure 3.6: Post Eid celebration refreshment

3.3.7 Bengali New Year Celebration

Every year Bengali New Year is celebrated in a grand manner at NRB Bank. Since the first day of the new year is a public holiday, NRB Bank celebrated “Noboborsho” on 15th April (fig: 3.7 and 3.8), on the second day of the new year. Everyone wore traditional outfits (saree and punjabi) to celebrate the day. Various types of food were served, music was playing and all the employees and officials were greeting each other with a smile on their face. Everyone had a jolly mood all day long. For me, it was a great experience to celebrate the Noboborsho in a corporate office for the first time and I really enjoyed the day.



Figure 3.7: Bengali New Year Celebration at NRB Bank



Figure 3.8: Bengali New Year Decorations

3.4 Conclusion

As a fourth-Generation bank of Bangladesh, NRB Bank PLC. is an outstanding organization. The work environment here is great. The company offers proper workplace facilities for the employees. The employees of this bank are very helpful and welcoming. Everyone here maintains professionalism and work ethics.

Chapter 4

My Solo Project

4.1 Project Overview

Since I did my internship in the IT division of a bank which basically focuses on Core Banking System (CBS), I did not receive much guidance in software development, therefore, I decided to build HelpHub as a solo project. HelpHub is a role-based service desk application where the requester can ask for support from any department of the organization just by creating a ticket describing their issue and submitting it to the required department. The goal of this project is to make the communication between the requester and the support staff smoother by adding relevant features. Moreover, it aims to improve user satisfaction by ensuring that support is provided in a timely manner and delays are reduced in resolving issues.

The requirements of HelpHub are listed below:

- An Authentication page for every user (Admin, Requester and support staff), users can sign up for the first time and their role will automatically be set to “requester”.
- Create a dashboard for each of the users (Admin, Requester and support staff) where the admin will have most of the authority.
- Admins can create, edit and delete departments.
- Admins also can view users, create and delete users and assign user roles.
- Tickets can be viewed and assigned by admins.
- Requesters should be able to create new tickets and submit them, view their own tickets, the ticket status and comment on it.
- The create ticket page will have a title of the issue, a description box, a drop-down list of departments and a drop-down list of priority
- Support Staff can view assigned tickets, update ticket status, reassign tickets and add comments to their assigned tickets.
- All users can edit their username, email, update their password and also upload/update profile picture.
- All users will get notification about the changes of their relevant tickets.

4.2 System Analysis and Design

HelpHub functions based on the following flow chart (fig:4.1).

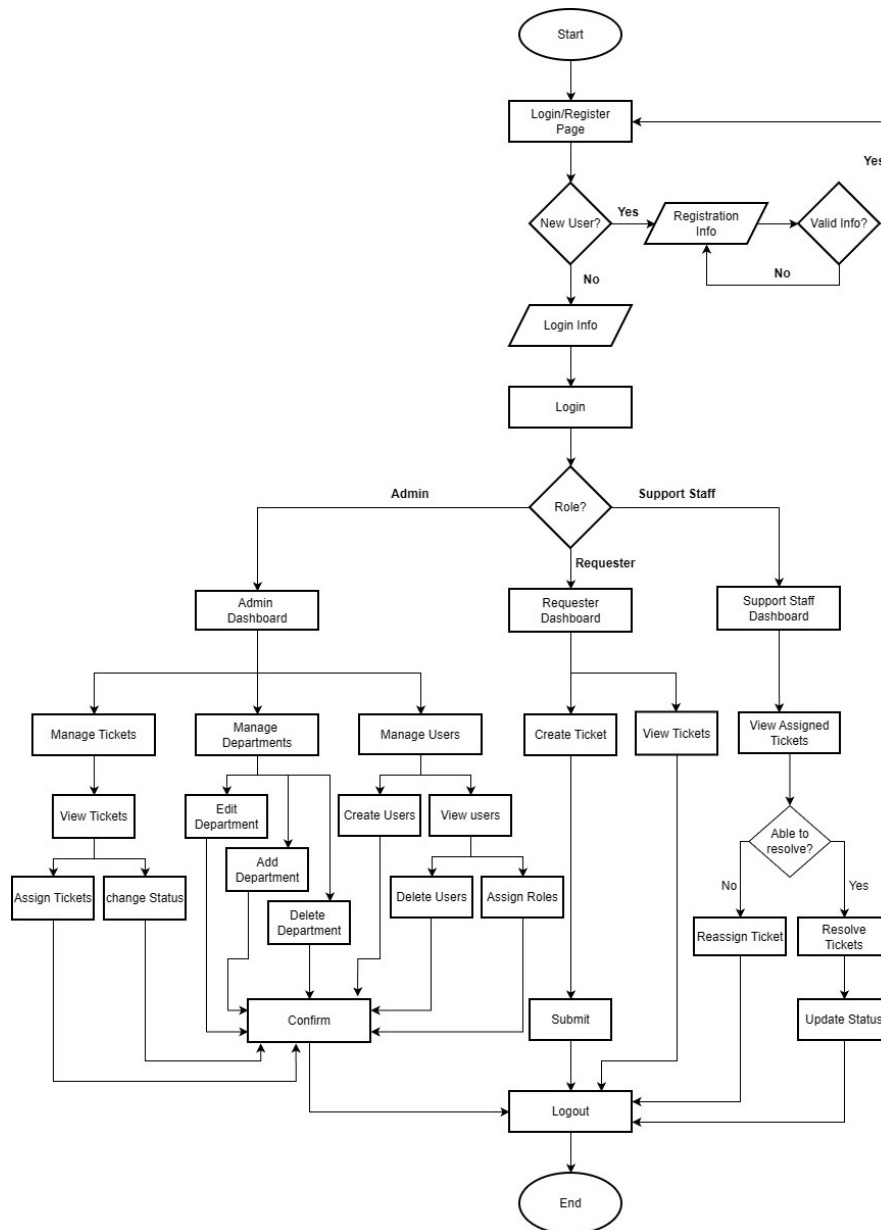


Figure 4.1: Flow Chart of HelpHub

Since HelpHub is a role-based ticketing system, the main functionalities of the web app should be:

- Requester creates and submits tickets, also can view their own tickets and comments on them if needed.
- Admin manages departments, users and tickets and comments on them if needed.
- Support Staff views assigned tickets and comments on them if needed, updates ticket status.

The following figure (fig:4.2) shows the use cases of HelpHub.

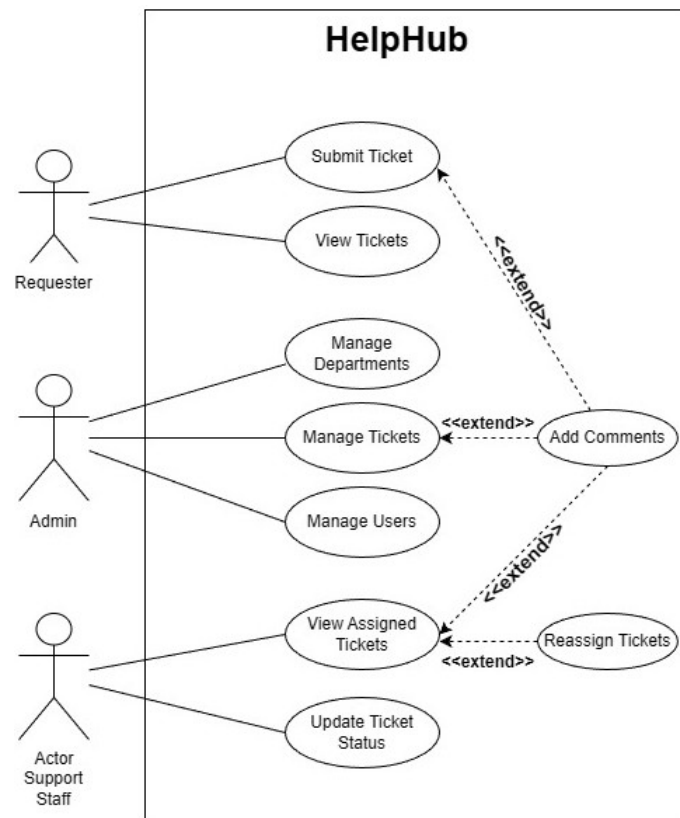


Figure 4.2: Use Case Diagram of HelpHub

The following Activity diagram (fig:4.3) demonstrates after successfully login, how a requester creates a ticket and submits it, an admin manages the ticket and a support staff handles the ticket he was assigned to, by the admin. The primary focus of this project is categorized in three parts based on the user type. Firstly, the requesters generate a ticket with a title, by describing their issue in a description box and choose a department where they want to submit the ticket. Secondly, the admin assigns the ticket to a support staff from that particular department the ticket was submitted to. Thirdly, the support staff views the ticket and resolves it if possible, otherwise, reassigns it to another staff. After resolving, they update the status of the tickets.

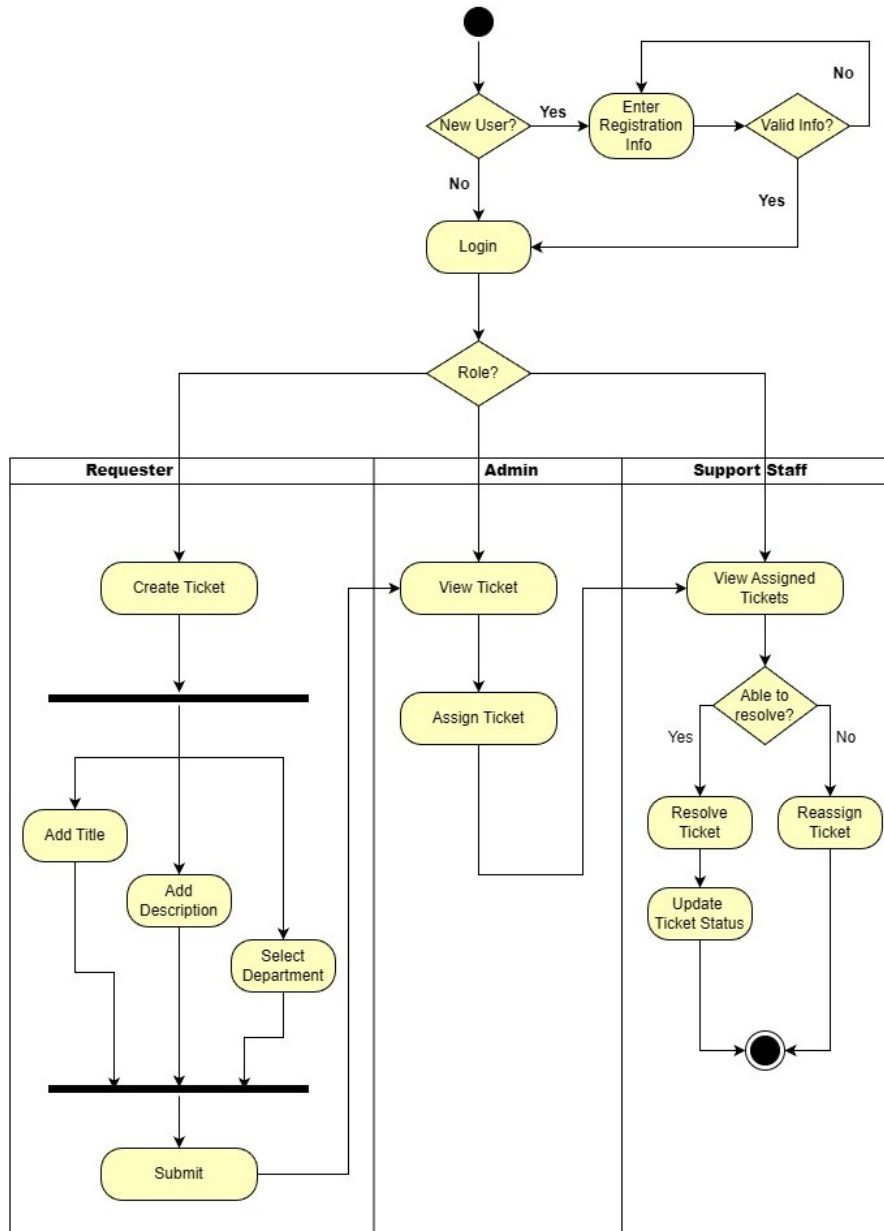


Figure 4.3: Activity Diagram of HelpHub

For this project, I have designed the following ER Diagram (fig:4.4) to establish the database.

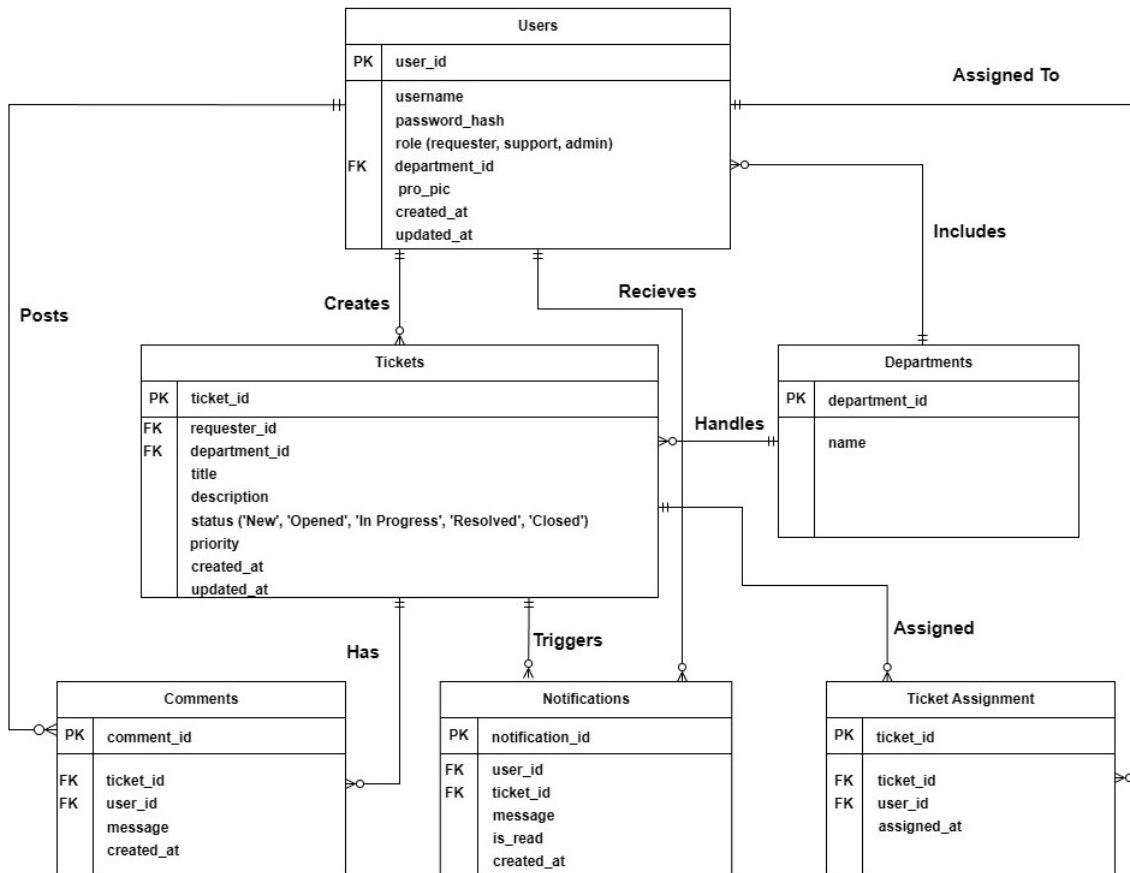


Figure 4.4: Entity Relationship Diagram of HelpHub

4.3 Implementation

4.3.1 Frontend

For the frontend framework, I used React with Vite as the frontend bundler. React Router DOM was used for frontend routing. For UI Styling, I used CSS, React icons and SweetAlert2 (for alert dialogs). Since I have used graphs and charts in the admin dashboard, I used Recharts for Data visualization. Finally, as the HTTP client library, I used Axios for fetching APIs.

Command for starting the Vite development server on `http://localhost:5173`: `npm run dev`

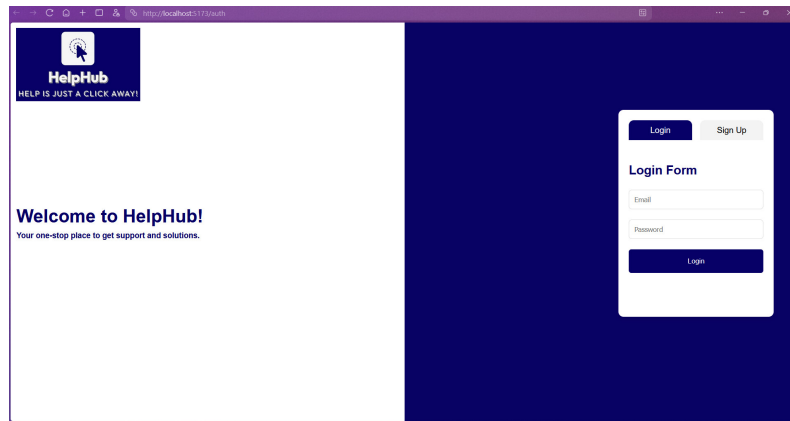


Figure 4.5: Authentication Page

Figure 4.5 shows the authentication page where users can Login using their email and password. New users have to signup first by providing their email and password, their role will automatically be set to “requester”. Staff and admin accounts can only be created by admins.

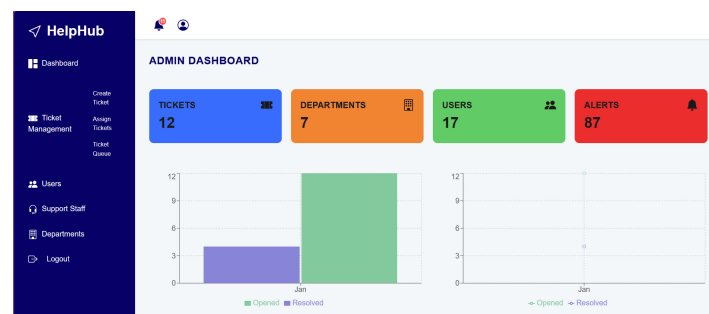


Figure 4.6: Admin Dashboard

The admin can view the overall condition of the system from their dashboard (fig:4.6). There are four different cards (Tickets, Departments, Users, Alerts) which show dynamic data of the system. The bar chart and line chart show the statistics of tickets opened and resolved. The sidebar is a navigation area for managing Tickets, Users and departments. The header of the dashboard contains the User Profile and notifications.

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ACTIVE TICKET QUEUE Search by ID, title, requester, or date... 3 Active Tickets

ID	Title	Requester	Assigned Staff	Priority	Status (Edit)	Created At	Updated At	Action
#10	Printer Issue	Nancy Wheeler	Steve Harrington	MEDIUM	Open	1/18/2026	1/18/2026	View
#3	Visual	Mehnaz Missal	Toge Inumaki	MEDIUM	In Progress	1/13/2026	1/18/2026	View
#2	Video	Mehnaz Missal	Satoru Gojo	LOW	Open	1/13/2026	1/13/2026	View

Figure 4.7: Ticket Queue

The admin can view all the active tickets and their details (fig:4.8) by clicking the view button from the Active Ticket Queue page (fig:4.7), commenting option is also available here. Admins can also search tickets from the queue by ticket id, title, requester or date.

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#10 - Printer Issue OPEN

Description

My printer is jammed. Please look into the matter.

Discussion (1)

Super Admin

Assigned to Steve, ID: 3

1/18/2026, 4:19:07 PM

Type your reply here...

Post Comment

Ticket Info

Priority

MEDIUM

Department

IT

Requester

Nancy Wheeler

Assigned To

Steve Harrington

Created

1/18/2026

Figure 4.8: Ticket Details

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ASSIGN TICKETS TO STAFF

ID	ISSUE / SUBJECT	REQUESTER	DEPT	SELECT SUPPORT STAFF	ACTION
#9	Notification test 2	Mehnaz Missal	Marketing	-- Choose Staff --	Assign
#13	Test New Ticket	Mehnaz Missal	IT	-- Choose Staff --	Assign

Figure 4.9: Ticket Assignment page for admin

From this page (fig:4.9), admins assign the tickets to the staff from the relevant department. The drop-down menu contains the list of all staff names and their departments.

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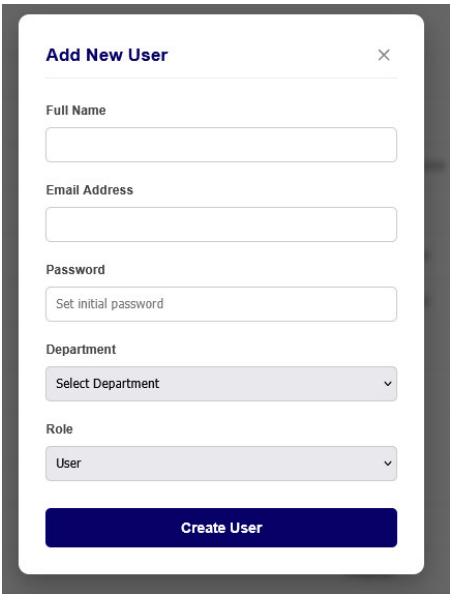
USER MANAGEMENT

ID	NAME	EMAIL	DEPARTMENT	ROLE	ACTIONS
1	Super Admin	admin@helphub.com	N/A	Admin	✎ ✖
10	Ashley Wilson	ashley@gmail.com	N/A	User	✎ ✖
18	John Peterson	john@gmail.com	N/A	User	✎ ✖
4	Satara Gopi	satara@helphub.com	Marketing	Staff	✎ ✖
14	Ted Walker	ted@helphub.com	Human Resource	Staff	✎ ✖
17	Alison	alison@gmail.com	N/A	User	✎ ✖
6	Togo Iremali	togo@helphub.com	Digital Division	Staff	✎ ✖
8	Missal	mehnaz@helphub.com	Digital Division	Staff	✎ ✖
9	Mehnaz Missal	mehnazmissal@gmail.com	N/A	User	✎ ✖
11	Secord Admin	admin@helphub.com	N/A	Admin	✎ ✖
15	Nancy Wheeler	nancy@gmail.com	N/A	User	✎ ✖
2	Dustin Henderson	dustin@helphub.com	IT	Staff	✎ ✖
3	Steve Harrington	steve@helphub.com	IT	Staff	✎ ✖
16	Eddie Munson	eddie@helphub.com	Finance	Staff	✎ ✖

Add New User

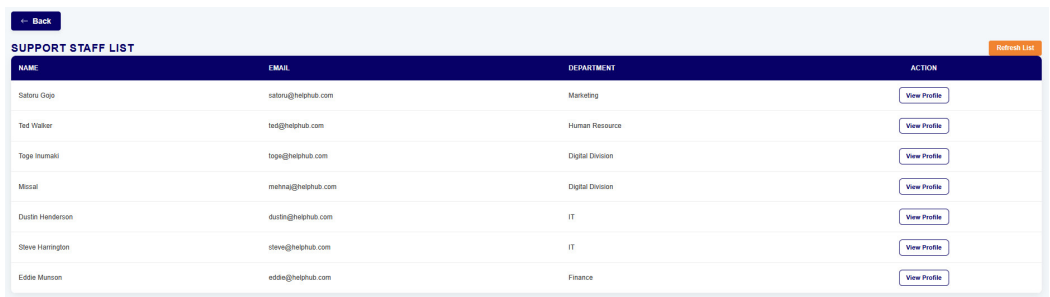
Figure 4.10: User Management page

In the user management page (fig:4.10), admin can view all the registered users, edit their user information or delete them. Admins can also add/create new users by clicking the Add New User button (fig:4.11). Staff and admin accounts are usually made from here.



The 'Add New User' form is a modal window with a dark blue header and a close button (X) in the top right corner. It contains several input fields: 'Full Name' (text), 'Email Address' (text), 'Password' (text with a placeholder 'Set initial password'), 'Department' (dropdown menu with 'Select Department' as the selected option), and 'Role' (dropdown menu with 'User' as the selected option). At the bottom of the form is a dark blue button labeled 'Create User'.

Figure 4.11: Add new user box



The 'Support Staff List' table is a table with a dark blue header and a light blue body. It has a 'Back' button in the top left corner and a 'Refresh List' button in the top right corner. The table has four columns: 'NAME', 'EMAIL', 'DEPARTMENT', and 'ACTION'. The data rows are as follows:

NAME	EMAIL	DEPARTMENT	ACTION
Satomi Goto	satomi@helphub.com	Marketing	View Profile
Ted Walter	ted@helphub.com	Human Resource	View Profile
Topi Inumali	topi@helphub.com	Digital Division	View Profile
Miscel	mehoa@helphub.com	Digital Division	View Profile
Dustin Handerson	dustin@helphub.com	IT	View Profile
Steve Harrington	steve@helphub.com	IT	View Profile
Eddie Munson	eddie@helphub.com	Finance	View Profile

Figure 4.12: Support Staff List for admin

The support staff list page (fig:4.12) shows the details of all the registered support staff details from the system. This page is also only accessible by the admins.

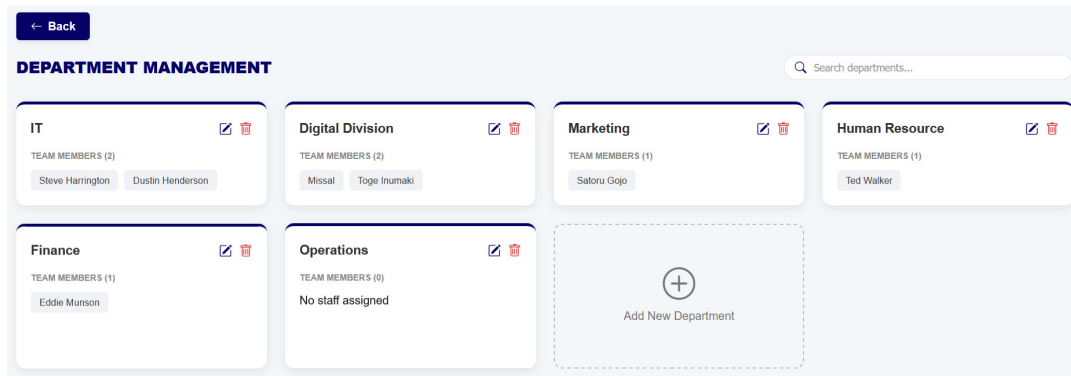


Figure 4.13: The Department Management Page

The 'Create New Department' modal form is displayed. It features a title 'Create New Department'. Below the title is a 'Department Name' label followed by a text input field containing the placeholder 'e.g. IT Support'. Underneath is the 'Assign Staff' label, followed by a dropdown menu with a person icon and the text 'Select a staff member...'. Below the dropdown is the text 'No staff selected yet.'. At the bottom are two buttons: 'Cancel' and 'Save Department'.

Figure 4.14: Create New Department

The admins can edit a department name, assign or remove staff to that department, delete a department or create new departments (fig:4.14) from the Department Management page (fig:4.13). They can also search a department by its name.

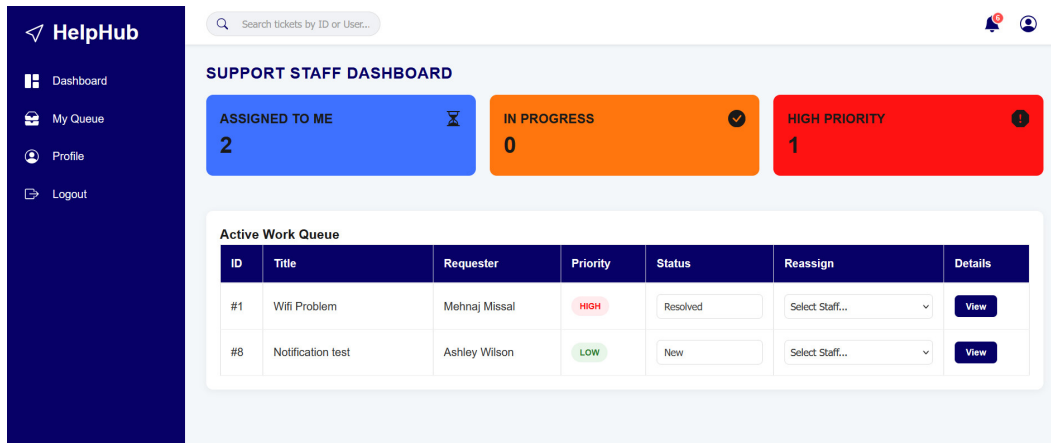


Figure 4.15: Support Staff Dashboard

The support staff dashboard (fig:4.15) contains dynamic cards for the assigned ticket count, running ticket count, and high priority ticket count. There is a table for the tickets that were assigned to the staff from where the staff can see the ticket details by clicking the view button and comment on it from there if needed. The staff can change the ticket status, as well as reassign the ticket to another staff member from the same department if he is already occupied with other tasks.

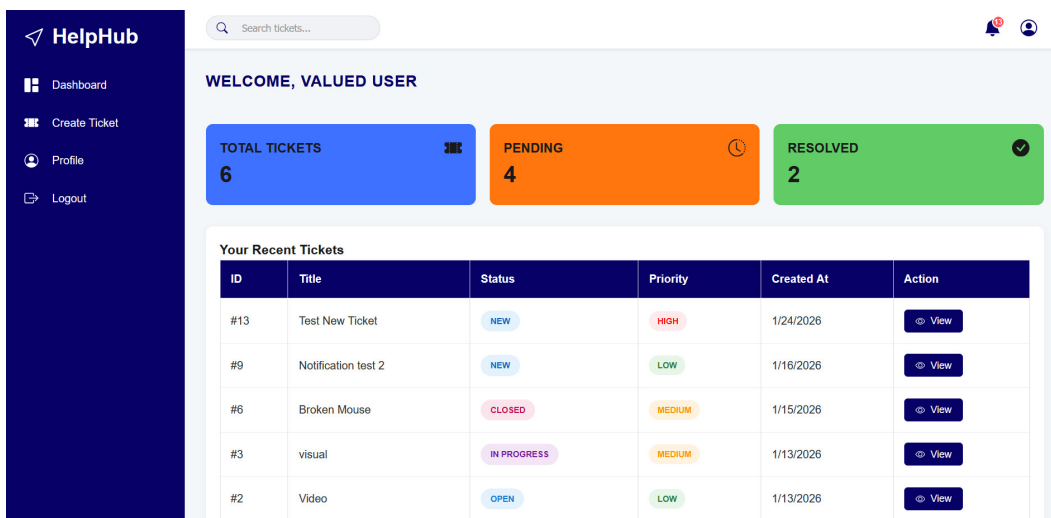
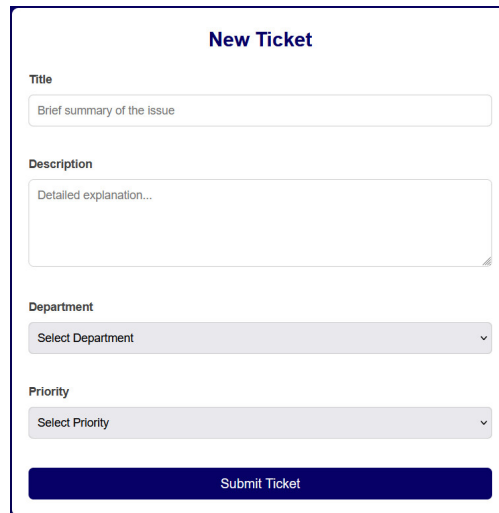


Figure 4.16: Requester Dashboard

The Requester dashboard (fig:4.16) has 3 different cards for the total ticket created count, pending ticket count and the number of resolved tickets. The dashboard also contains the table of the active tickets that requester created and see the ticket details of own tickets by clicking the view button. Moreover, from the sidebar the requester can navigate to the create ticket page and generate a new ticket from there.



New Ticket

Title
Brief summary of the issue

Description
Detailed explanation...

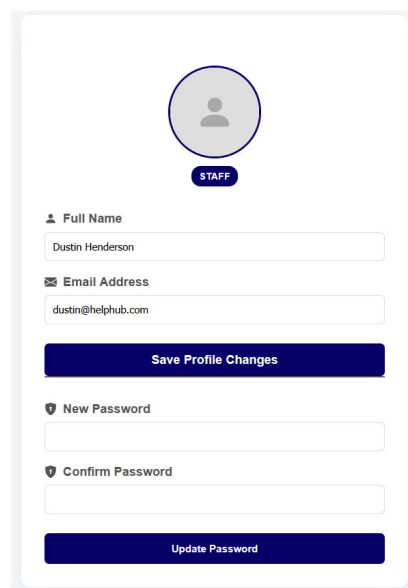
Department
Select Department

Priority
Select Priority

Submit Ticket

Figure 4.17: Create New ticket page

Requesters can generate a new ticket by adding a title, describing the issue, selecting a department to submit the ticket to and setting a priority from the drop-down menus (fig:4.17). After submitting the ticket, it will get listed in the Ticket Queue and Assign ticket pages only accessed by admins.



STAFF

Full Name
Dustin Henderson

Email Address
dustin@helphub.com

Save Profile Changes

New Password

Confirm Password

Update Password

Figure 4.18: User Profile Update page

All the users can update their user info, as well as add profile pictures from the User Profile page (fig:4.18).

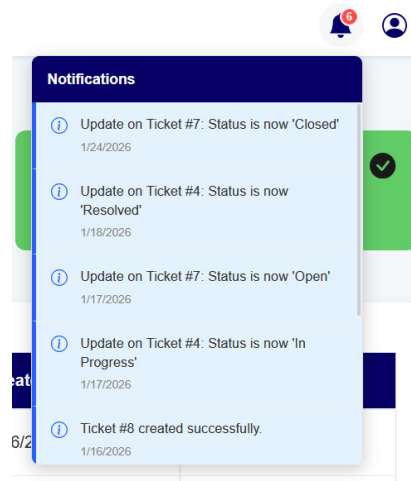


Figure 4.19: Notification Panel

```
function App() {
  return (
    <div>
      <Router>
        <Route path="/" element={<Navigate to="/auth" replace />} />
        <Route path="/auth" element={<Login />} />
        <Route path="/unauthorized" element={<Unauthorized />} />
        <Route
          path="/admin-dashboard"
          element={
            <ProtectedRoute allowedRoles={["admin"]}
              <Dashboard />
            </ProtectedRoute>
          }
        />
        <Route
          path="/department"
          element={
            <ProtectedRoute allowedRoles={["admin"]}
              <Department />
            </ProtectedRoute>
          }
        />
        <Route
          path="/assign-tickets"
          element={
            <ProtectedRoute allowedRoles={["admin"]}
              <AssignTickets />
            </ProtectedRoute>
          }
        />
      </Router>
    </div>
  )
}
```

Figure 4.20: App.jsx code for Frontend Routers

4.3.2 Backend

For the Backend Framework, I used FastAPI which is a fast and modern python web framework. In the initial planning of creating HelpHub, I decided to use MySQL since I already learnt it, but later I learnt a new DBMS called PostgreSQL and thought this project would be the perfect way to implement it. Therefore, I used PostgreSQL along with its management tool pgAdmin 4 for the DBMS. I used ORM for this project since it allows users to create database tables just by writing python classes instead of writing complex SQL queries and for that I used SQLAlchemy models. For schema and migration, I used Alembic, since it's more convenient to edit or change databases automatically according to the python code instead of manually changing it from the database. Before connecting the frontend and backend, I used SwaggerUI for API testing and for running the ASGI server, I used uvicorn.

Command for starting the ASGI server on `http://127.0.0.1:8000`:
`uvicorn app.main:app --reload`

API Endpoints: I have created separate necessary endpoints for the system to function accurately. The login endpoint uses the POST method. The “users” endpoint has three different POST methods for creating users by signing up, by admin and for uploading profile pictures. It also has four GET methods accessed by different roles. There are two PATCH methods, one for updating user info (accessed by all roles), another for updating user roles (only accessed by admins). Moreover, there is a DELETE and a PUT method for deleting and updating users, only accessed by admin. The department endpoint has the GET, POST, PATCH and DELETE methods. All of these methods are only accessible by the admins. For ticket management, I have created the ticket endpoint which has POST, GET and PATCH methods. For methods used for commenting are also included in this endpoint. The notifications endpoint has two GET methods, one for reading own notifications and the other for getting unread notifications. It also has a PATCH method for marking them as read. For the stats and charts in the admin dashboard, I have created a separate “admin” endpoint containing two different GET methods for stats and charts.

The whole backend part was tested using these methods from SwaggerUI before connecting it with the frontend part (fig:4.21 and 4.22).

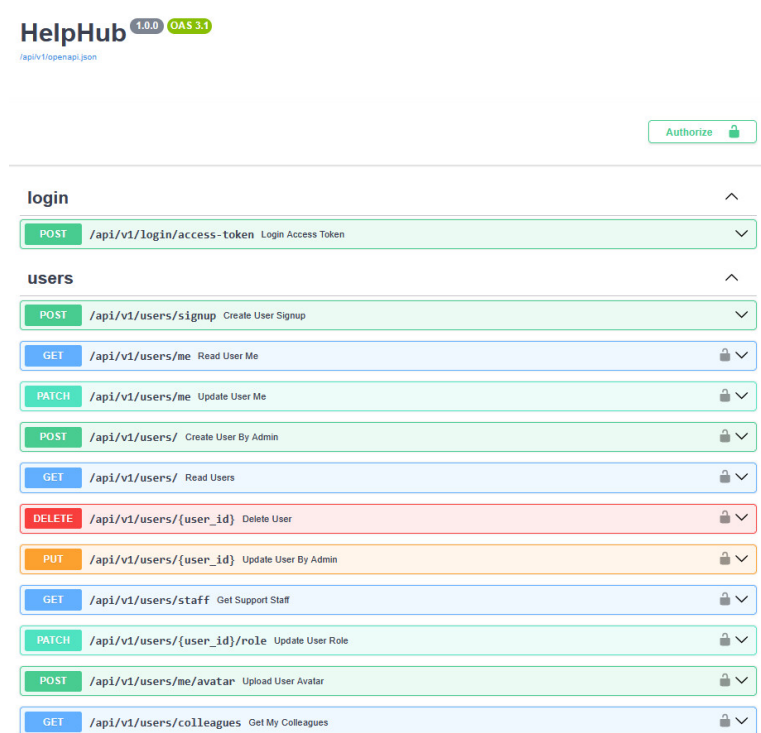


Figure 4.21: API endpoints and methods from SwaggerUI

departments			^
GET	/api/v1/departments/	Read Departments	✓
POST	/api/v1/departments/	Create Department	✓
PATCH	/api/v1/departments/{dept_id}	Update Department	✓
DELETE	/api/v1/departments/{dept_id}	Delete Department	✓
tickets			^
POST	/api/v1/tickets/	Create Ticket	✓
GET	/api/v1/tickets/	Read Tickets	✓
GET	/api/v1/tickets/me	Read My Tickets	✓
GET	/api/v1/tickets/unsigned	Get Unassigned Tickets	✓
PATCH	/api/v1/tickets/{ticket_id}	Update Ticket	✓
GET	/api/v1/tickets/{ticket_id}	Read Ticket Details	✓
POST	/api/v1/tickets/{ticket_id}/comments	Create Comment	✓
GET	/api/v1/tickets/{ticket_id}/comments	Read Comments	✓
notifications			^
GET	/api/v1/notifications/	Read My Notifications	✓
PATCH	/api/v1/notifications/{notification_id}/read	Mark Notification As Read	✓
GET	/api/v1/notifications/unread-counts	Get Unread Counts	✓
admin			^
GET	/api/v1/admin/stats	Get Admin Stats	✓
GET	/api/v1/admin/charts	Get Admin Charts	✓

Figure 4.22: API endpoints and methods from SwaggerUI

Authentication Flow:

LOGIN

Enter email and password → POST method from login API endpoint gets triggered
→ looks for email by CRUD → verifies password using bcrypt hashing → creates and returns JWT access token to frontend → frontend stores token in localStorage
→ redirects user to their dashboard

SIGN UP

Enter email, password and confirm password → POST method from user/signup API endpoint gets triggered → checks if user exists → if not, creates hashed password
→ creates user with role “requester” in database → success

Query

Query History

1

SELECT * FROM helphub.users

2

ORDER BY id ASC

Data Output

Messages

Notifications

Showing rows 1 to 14

Page 1

id	name	email	hashed_password	role	profile_pic	department_id
[PK] integer	character varying	character varying	character varying	character varying	character varying	integer
1	Super Admin	admin@helphub.com	\$2b\$12\$0w1LHX9X50WAF...	admin	[null]	[null]
2	Dustin Henderson	dustin@helphub.com	\$2b\$12\$ooYBEKx3Tt1oYL3N...	staff	[null]	[null]
3	Steve Harrington	steve@helphub.com	\$2b\$12\$wZojJMF3mq4BnF...	staff	[null]	[null]
4	Satoru Gojo	satoru@helphub.com	\$2b\$12\$Gu5eJ.PKwbh90IM...	staff	[null]	[null]
5	Toge Inumaki	toge@helphub.com	\$2b\$12\$enG2zeCaWkt5Gw...	staff	[null]	[null]
6	Missal	mehsal@gmail.com	\$2b\$12\$Gxd8jX.UKWV1aP5...	staff	[null]	[null]
7	Mehsal Missal	mehsalmissal@gmail.c...	\$2b\$12\$GvmwnhCX0kves5...	requester	uploaded_images/2a80a...	[null]
8	Ashley Wilson	ashly@gmail.com	\$2b\$12\$2z6tWbN9N5faLUw...	requester	uploaded_images/User_1...	[null]
9	Second Admin	admin@helphub.com	\$2b\$12\$687Jrua6LgY0dEAY...	admin	uploaded_images/5012d...	[null]
10	Ted Walker	ted@helphub.com	\$2b\$12\$gVjY5Q4whRnKUT0...	staff	[null]	[null]
11	Nancy Wheeler	nancy@gmail.com	\$2b\$12\$7oCJpwStr.C7K7wSSG...	requester	[null]	[null]
12	Eddie Munson	eddie@helphub.com	\$2b\$12\$9VJSH8dE86uY7J6R...	staff	[null]	[null]
13	Allison	allison@gmail.com	\$2b\$12\$qq30S2/ja/asit9VATV...	requester	uploaded_images/r986ef...	[null]
14	John Peterson	john@gmail.com	\$2b\$12\$1Ba.1VKbMt0QMGsP...	requester	uploaded_images/Baf46f...	[null]

Query Query History

```

1 SELECT * FROM helpdesk.tickets
2 ORDER BY id ASC

```

Data Output Messages Notifications

id	title	description	status	priority	created_at	updated_at	requester_id	department_id	assigned_to_id
[PK] integer	text	text	character varying (50)	character varying (50)	timestamp without time zone	timestamp without time zone	integer	integer	integer
1	Wifi Problem	wifi not working	Resolved	High	2026-01-13 22:27:48...	2026-01-13 22:56:49...	9	1	2
2	Video	too long	Open	low	2026-01-13 22:28:42...	2026-01-13 22:48:25...	9	2	4
3	visual	UI UX don't meet ...	In Progress	Medium	2026-01-13 22:30:59...	2026-01-18 02:48:49...	9	3	6
4	My first Ticket	Test Ticket	Resolved	new	2026-01-15 02:51:42...	2026-01-18 05:08:37...	10	1	3
5	Second Ticket	Correction Ticket	new	Low	2026-01-15 02:57:15...	2026-01-15 12:27:40...	10	3	6
6	Broken Mouse	Loose wire, does ...	Closed	Medium	2026-01-15 12:37:36...	2026-01-17 02:55:00...	9	1	3
7	Old Monitor	change it	Closed	High	2026-01-15 14:05:01...	2026-01-24 20:38:43...	10	1	3
8	Notification test	Creating this tick...	new	Low	2026-01-16 17:11:54...	2026-01-24 20:38:54...	10	1	2
9	Notification test 2	Testing notificati...	new	Low	2026-01-16 17:38:40...	2026-01-16 17:38:40...	9	2	[null]
10	Printer Issue	My printer is jam...	Open	Medium	2026-01-18 15:59:41...	2026-01-18 16:22:45...	15	1	3
11	Wifi Problem	Connected, but n...	Closed	High	2026-01-18 16:36:15...	2026-01-18 16:47:14...	17	1	3

Showing rows: 1 to 13 Page No: 1 of 1

The screenshot shows the SQL query editor with the following query:

```
SELECT * FROM helphub.departments
ORDER BY id ASC
```

Below the query editor, the results are displayed in a table with the following columns: Data Output, Messages, and Notifications. The table contains 6 rows of data:

	id [PK] integer	name character varying
1	1	IT
2	2	Marketing
3	3	Digital Division
4	5	Human Resource
5	6	Finance
6	8	Operations


```

from fastapi import APIRouter

from app.api.v1.endpoints import login, users, departments, tickets, notifications, admin

api_router = APIRouter()

api_router.include_router(login.router, tags=["login"])
api_router.include_router(users.router, prefix="/users", tags=["users"])
api_router.include_router(departments.router, prefix="/departments", tags=["departments"])
api_router.include_router(tickets.router, prefix="/tickets", tags=["tickets"])
api_router.include_router(notifications.router, prefix="/notifications", tags=["notifications"])
api_router.include_router(admin.router, prefix="/admin", tags=["admin"])

```

Figure 4.26: API routing from Backend

4.4 Challenges

Since this was my first project where I worked as a full stack developer, I faced several difficulties while creating this web app. First of all, planning and designing the whole application was challenging since it is a role-based application. Narrowing down which role should have what features took me quite some time. For that, I had to research similar ticketing system web apps which helped me a lot to get a clear vision to work on the features. I came across my second challenge when I started working on the frontend after planning and designing. Since I already knew how to use ReactJS, implementing the codes for static pages was not that difficult but after the backend was ready, it was quite challenging to connect the backend with the frontend to make it dynamic. In some cases, I had to change some parts of the backend codes (mostly endpoints) as well for the frontend to work properly. I watched multiple tutorials on connecting React based frontend and FastAPI based backend to solve the problems. I used Axios to fetch the APIs from the backend and connect the two. Thirdly, maintaining the accessibility of all the pages according to the relevant roles was quite a challenge. I had to strictly implement the user roles in the endpoint codes to make sure which role can access what methods. Moreover, I had to ensure the user gets appropriate error messages while accessing a method where they don't have the permission. Finally, port unavailability was the most troublesome issue I faced while testing the application. Sometimes, windows firewall blocks the 8000 port or other processes use the port, so I had to use different ports like 8080 to start the backend server and change all the HTTP method requests from the frontend src codes.

Chapter 5

Growth

5.1 Professional Growth

5.1.1 Corporate Environment

Doing internship in a reputed organization like NRB Bank PLC. has taught me how corporate offices work. I have learnt how to communicate with colleagues and seniors in a professional way. Socializing in a corporate office is a new experience I achieved. Overall, I learnt a lot about corporate culture after completing my internship.

5.1.2 Team Work

Team work is the key to achieve success in the corporate world. During my internship, collaborating with the executives and assistant officers made my work responsibilities easier and learnt to work under pressure. Whenever I got confused about something, I immediately asked my seniors and they always helped me with everything. When a new intern joined the IT infra team two months after me joining, we immediately became a team and performed many tasks together and completed them smoothly. Our supervisor was very pleased with our work pace.

5.1.3 Time Management

Time management is a crucial part of the corporate responsibilities. Everyone at the offices follows strict schedules to complete their everyday work. I was assigned to the IT asset reconciliation which is directly connected to IT auditing, needed to be completed within a specific time period before the IT auditing begins in every branch. Completion of the asset reconciliation process within the fixed time period, taught me how important time management is in the corporate world.

5.2 Technical Growth

I got to know about some new software, their functionalities and usage, while doing my internship. Moreover, the project I built helped me to get first-hand experience on using different technologies that are very popular in modern day web app development. I believe that learning these new technologies will help me in the future to work on new projects.

5.2.1 PostgreSQL

Previously I worked on DBMS like MySQL, so my initial plan was to build HelpHub using it. Later I found out about PostgreSQL that it is an advanced open source database and can handle more complex applications, also it is currently more popular among developers. Therefore, I started learning it at the beginning of the backend development of this project and used it as the DBMS for my web app.

5.2.2 Object Relational Mapping (ORM)

ORM is a very efficient and professional technique for creating databases. It works as a translator between the backend code and the database. Instead of manually writing complex SQL queries, we can just define some classes in python and it will automatically translate them into a database table. I have used SQLAlchemy as the ORM library for this project.

5.2.3 Trellix Endpoint Security

During my internship I worked on the endpoint security system to ensure the security of the endpoint devices across all the branches. To ensure the endpoint security, NRB Bank uses Trellix endpoint security. This software ensures multi-layered endpoint protection spanning your on-premises, cloud, and disconnected environments in a single agent, and managed from a single source, ensuring all security components work seamlessly to provide robust protection across all vectors.[8] Trellix is the merged version of the endpoint security tool of FireEye and McAfee Enterprise. It was previously known as McAfee.

5.3 Interpersonal Growth

5.3.1 Communication skill

This internship taught me how to professionally communicate with employees in a corporate environment. Proper communication can make any problem easily solvable. Whenever I faced any difficulties while performing my tasks, I asked my mentor about it and he gave me ideas on how to solve it. Moreover, if I had any questions regarding my tasks I asked the assistant officer whose desk was next to mine. All the IT infra team members were really helpful towards me which made my internship a pleasant journey.

5.3.2 Socializing Skill

Through this internship, I have built good relationships with many of the IT team members. Especially with the executive of the IT Infra team Jubery apu, who joined 4 days after I joined. We worked on many problems together during the asset reconciliation process. Apart from the IT infra team, I also built a good relationship with a few assistant officers of the application team and the Digital division. We used to have lunch together every day at the dining area, also we used to go out for tea on tea breaks. Socializing with all of them helps me improve my socializing skills.

Chapter 6

Conclusion

6.1 Conclusion

Although I did this internship to complete my undergraduate degree at Brac University, I was highly benefitted by this opportunity in developing technical and interpersonal skills. I was able to apply my academic knowledge into solving real time problems through various tasks and learnings. I had the opportunity to learn about and use new software and tools. Moreover, it taught me about organizational workflow and work environment. This internship especially helped me to improve my communication skills and taught me to work under pressure. By the guidance of my supervisor and the support and friendly behavior of the officers of my team, I was able to complete my 3 months long journey smoothly. I believe this experience will help me in my future career. Although I could not do any software development tasks at my internship, since it was at the IT division of a bank and their main focus is on Core Banking System, I decided to build my solo project HelpHub. HelpHub is designed as a very basic level service desk web app with minimal functionalities. My sole purpose of doing this project was to introduce myself to Full Stack web development and learn how the system works. I took this opportunity to improve my skills in both frontend and backend, including databases and server logic and get fully familiar with the full process from its core.

6.2 Recommendation

NRB Bank PLC. is a reputed organization to acquire first-hand corporate experience. It is an employee friendly organization that maintains professional work ethics as well as provides necessary workplace facilities. Doing an internship in this reputed bank can be a huge leap to build a corporate career. They also offer jobs to interns who perform well in all aspects during their internship. I would definitely recommend this company to the freshly graduates or students who are looking for internships to build a strong career.

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