2023-10-22

# An Undergraduate Internship/Project on developing a Web-Application 'MyBrac' for Brac

Musarrat, Syeda Muntaqa

Independent University, Bangladesh

# An Undergraduate Internship/Project on Topic

By

**Syeda Muntaqa Musarrat**

Student ID: **1810021**

**Summer, 2023**

Supervisor:

**Marzan Binte Hassan**

**Adjunct Lecturer**

Department of Computer Science & Engineering

Independent University, Bangladesh

**October 22, 2023**

**Dissertation submitted in partial fulfillment for the degree of Bachelor of Science in Computer Science**

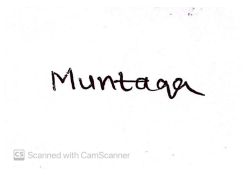
**Department of Computer Science & Engineering**

**Independent University, Bangladesh**

# Attestation

I, Syeda Muntaqa Musarrat, officially attest that no work in this report has been plagiarized or duplicated from another source. Any resources consulted are referenced in the report's reference section. No assistance from a third-party organization was requested during the report's completion, except for the one for which I interned for the last three months. For further information, please contact Md Nazmul Hasan, the internship supervisor at my firm, BracIT, at 01787688623.

Sincerely,
Syeda Muntaqa Musarrat




18/10/23

Signature

Date

Syeda Muntaqa Musarrat

Name

# Acknowledgement

I want to begin by expressing my heartfelt gratitude to Almighty Allah, whose unwavering love and grace provided me with the determination and strength to excel during my internship. I extend my sincere thanks to Independent University, Bangladesh (IUB) for affording me the invaluable opportunity to participate in their internship program.

I am deeply appreciative of all those who contributed to the successful completion of this report. Special recognition goes to my supervisor, Marzan Binte Hassan, a dedicated adjunct faculty at Independent University, Bangladesh, whose invaluable guidance and insightful ideas significantly facilitated the completion of my report.

I am profoundly thankful to Nazmul Hasan, a senior software engineer at BracIT and my mentor, for his continuous guidance, counsel, and motivation that fueled my hard work throughout this internship. His direction was instrumental in my growth, and I will forever cherish his support.

My internship experience at BracIT granted me the privilege of collaborating with a talented team of software engineers, allowing me to gain insights into the company's interactions with other businesses and the depth of engineering expertise required in this field.

Lastly, I extend my heartfelt appreciation to my parents, extended family members, and friends for their unwavering encouragement and steadfast support.

# Letter of Transmittal

15th September, 2023
Marzan Binte Hassan
Internship Supervisor and Adjunct Lecturer
Department of Computer Science and Engineering
Independent University, Bangladesh

Subject: Internship report on 'myBrac', a product for BRAC.

Dear Ma'am,
I am extremely grateful for the chance to submit an internship report to you on 'MyBrac' a web application developed for Brac. This report is based on my three- month internship at BracIT and the project on which I worked. This report is based on my experiences and the work I completed during my internship at BracIT. Throughout my internship with the organization, I discovered that I acquired and used a variety ofnew skills and technology. I would be delighted if the report I have written served its intended purpose. I am indebted to you for your time, knowledge, direction, and support. I have attempted to complete the report as accurately as feasible. I genuinely hope and pray that you will accept the report.

Thank you for your co-operation and assistance throughout the semester.

Yours sincerely,
Syeda Muntaqa Musarrat
ID: 1810021

# Evaluation Committee

Supervision Panel

| | |
|---|---|
| .....<br>Academic Supervisor<br>Name: Marzan Binte Hasan | .....<br>Industry Supervisor<br>Name: Md. Nazmul Hasan |

Panel Members

| | |
|---|---|
| .....<br>Panel Member-1<br>Name: Sanzar Adnan Alam | .....<br>Panel Member-2<br>Name: Mohammad Motiur Rahman |

Panel Members

| | |
|---|---|
| .....<br>Panel Member-3<br>Name: Md. Mahmudul Peyal | .....<br>Panel Member-4<br>Name: Mahir Al Kamal |

Office Use

| | |
|---|---|
| .....<br>Program Coordinator<br>Name: Subrata Kumar Dey | .....<br>Head of Department<br>Computer Science & Engineering<br>Name: Mahady Hasan |

# Abstract

To address various challenges faced by BRAC's legacy applications, the organization aims to embark on a comprehensive modernization project. The primary objectives include cost reduction, improved performance, and enhanced data security. By transforming the applications in a strategic manner, BRAC seeks to optimize resources and deliver a better user experience.

To achieve this high-level vision, the project will involve several key approaches. Firstly, merging or grouping similar apps will eliminate redundancy, leading to cost savings and increased user efficiency. Secondly, updating the technology stack will ensure compatibility with current market demands and mitigate potential performance issues. A facelift of the applications' user interface and experience will enhance usability, with contributions from BRAC's Technology division and implementation by the IT department.

Moreover, transitioning to free tools, components, and open-source operating systems will significantly reduce unnecessary expenditures. The focus on reusable development resources will lead to long-term cost savings for all BRAC projects. Additionally, a collaborative software development platform will centralize vendor access and resource management.

The project's initial approach entails a priority-based checklist for converting legacy applications. Applications heavily used by BRAC employees will receive the highest priority, followed by those requiring Windows operating systems and extensive support. Identifying applications with similar purposes and merging them will further optimize expenses. Applications using deprecated technology stacks will be converted to bolster security and performance. Additionally, quick wins within the scope of the project will be addressed promptly to demonstrate the project's impact and secure future support.

For each new application, specific requirements must be met, such as employing open-source operating systems and databases, implementing an audit trail for significant features, and enabling feature usage and user behavior analysis. Access control will be available at a granular level, and applications will be registered under BRAC's Analyt-

ics service. Dark mode, mobile, and tab views, as well as browser notifications, will be supported. Furthermore, the applications will be containerized for scalability, and code components will be reusable and well-documented.

By adhering to these guidelines and milestones, BRAC aims to repurpose its existing app "myBrac". The new version of myBrac will feature a facelift, increased efficiency, and the addition of new user-friendly functionalities. The organization will continuously assess and adapt its approach to achieve the project's ultimate goals efficiently.

In conclusion, the modernization of legacy apps is crucial for BRAC to achieve cost savings, enhance performance, and bolster data security. The outlined high-level vision, initial approach, and development checklist provide a comprehensive strategy for efficiently executing this critical project.

# Contents

# List of Tables

# List of Figures

# Chapter 1

# Introduction

## 1.1 Overview/Background of the Work

At the center of BRAC's operations, a multidimensional platform called myBrac serves personnel from multiple departments, job roles, and geographical regions. As a modernized application, myBrac has a number of important features. By streamlining procedures for everything from hiring and onboarding to leave administration and performance reviews, it streamlines human resources management and makes employee access to HR-related information easier. Furthermore, myBrac provides strong financial management tools that enable financial accountability and transparency through features like expense reporting, budget tracking, and procurement. Additionally, it promotes a culture of continual learning and development by functioning as a center for knowledge sharing and a repository for best practices, policy documents, and training materials. Through report viewing, file sharing, and project management capabilities, the platform's collaboration and communication features foster seamless communication among BRAC employees, regardless of where they are physically located. MyBrac places a high priority on data security since it understands how crucial it is to protect sensitive data with strict security procedures. Finally, it guarantees a user-friendly interface that is responsive and accessible on a variety of devices. In essence, myBrac plays a critical role in streamlining BRAC's business processes, fostering teamwork, and increasing productivity, all in line with the organization's overarching goal of empowering communities and fostering positive social change by providing its staff with the vital assets and resources they need to succeed.

## 1.2 Objectives

MyBrac's main goal is to completely modernize the program in order to create a cutting-edge platform that excels in user-friendliness, provides a wide range of fun features, and

places a high priority on strong security measures. This modernization effort aims to redesign myBrac so that it complies with modern technological standards and provides a better user experience. The front-end and back-end components of myBrac should be updated to reflect the most recent technical developments. Another important goal is to improve the user experience by redesigning the user interface and implementing intuitive design concepts. Furthermore, it aims to roll out a variety of intriguing and useful features that address the various needs of BRAC employees, prioritize data security with strong safeguards, ensure scalability to accommodate BRAC's growth, make myBrac accessible to all BRAC community members, optimize performance even under heavy loads, align with industry best practices and compliance requirements, and establish a framework for continuous improvement through ongoing improvements. In conclusion, myBrac's goal is to develop into a cutting-edge, user-centric, and secure platform with a variety of features that improve cooperation and productivity within the BRAC organization, supporting BRAC's purpose of empowerment and constructive social change.

## 1.3 Scopes

Some scopes of myBrac:

1. Knowledge Sharing
2. Financial Management
3. Collaboration and Communication
4. Human Resources Management
5. Security of Data User-Friendly Interface
6. Accessibility and Scalability
7. Continuous Improvement
8. Compliance
9. Performance Optimization

# Chapter 2

# Literature Review

Numerous studies on application modernization emphasize how crucial it is to update legacy systems to handle new difficulties. Legacy programs, which are frequently created using antiquated technology, cause compatibility problems and expensive maintenance. Updates to the technology stack, better user interfaces, and increased program performance are the main focuses of modernization activities.
Utilizing cutting-edge technologies to improve user interfaces and offer seamless experiences is crucial in the field of front-end development. React, a flexible JavaScript toolkit, is notable for its capacity to build responsive and interactive online apps. React's component-based architecture makes it possible to reuse code and render pages quickly and effectively, which leads to better speed.
A key component of legacy applications is security. Organizations are vulnerable to security breaches due to flaws in outdated software and the use of outdated technology stacks. Data protection is strengthened by modernizing applications to remove these vulnerabilities.
Studies also show that a well-planned modernization approach results in significant cost savings. Eliminating redundancy, improving resource usage, and lowering operational costs can all be achieved by consolidating and integrating related applications.

## 2.1 Relationship with Undergraduate Studies

Introduction to computer programming, CSC101:
The basics of programming, such as variable definition, iteration, and conditionals, are covered in this course along with the introduction of a brand-new programming language. Iteration, variable declaration, and conditions, functions, switch-case, expressions, and arrays are the basic components of programming.

Object Oriented Programming, CSE213:
By introducing the ideas of classes and objects, variables inside the classes, and different types of classes in object-oriented programming, the course goes a step further.

System Analysis and Design, CSE307:
The techniques and tools required to correctly assess information systems and design a system are covered in this course. Systems and models, project management, methods for identifying system requirements, data flow diagrams, six element analysis, feasibility analysis, and UML diagrams are a few of the subjects covered.

Database Management, CSE303:
Project planning and design were covered for the first time in this course. The System Development Life Cycle, Rich Pictures, Requirement Analysis, Relationship Diagram, Business Process Model, and Notation Diagram, among other popular planning and strategy tools, were discussed. These techniques helped with the project's planning and strategy formulation.

Web Application and Internet, CSE309:
In-depth knowledge of web-related technologies and their applications is provided by this course. The course talks cover the back-end languages, PHP and MySQL, as well as the front-end languages, HTML and Cascading Style Sheet (CSS). The responsiveness of jQuery on devices of various sizes is also a part of this course.

## 2.2 Related works

**Shopify:** Leading US e-commerce company Shopify encountered considerable problems with their 3 million line monolithic program due to its size. Due to its strong connection and hazy boundaries, this monolith was prone to fragility, with minor code changes generating unforeseen issues in unrelated areas. The architecture could restrict scalability, and testing was complicated and time-consuming.

Shopify chose a modernization strategy other than the popular microservices trend to address these problems. The development and testing procedures were improved by adopting a more sophisticated modular strategy rather than splitting the program up into several microservices. With the use of this tactic, functionalities might be added quickly without causing any disturbances.

The monolithic architecture's vulnerability, which hampered stability and development

effectiveness, made modernization essential. Testing complexity slowed down development even more, and scalability issues became clear. The modular strategy sought to increase robustness, agility, and scalability while reducing disruptive development issues.

**QuickBooks:** Due to ongoing product modernization, prominent US accounting software vendor QuickBooks has maintained its leadership position in its sector for almost four decades. Notably, they were early adopters of cloud computing and have excelled at supporting a variety of accounting market groups, from huge corporations to solopreneurs. Their success has been significantly influenced by their capacity to adapt to changing technology.

By providing nine different products, each catered to a different user requirement, QuickBooks has further proven its modernizing prowess. By strategically diversifying, feature oversaturation and user misunderstanding are avoided. For instance, whereas QuickBooks Self-Employed caters to small LLCs and DBAs with streamlined operations, QuickBooks Online targets corporations and SMBs with extensive functionality.

In summary, QuickBooks shows that modernization can involve developing unique solutions to satisfy a range of market demands rather than always requiring a core product to be modified. This approach has helped QuickBooks maintain its leadership position in the business by allowing it to respond to technology changes, remain relevant, and efficiently serve a variety of consumer segments.

# Chapter 3

# Project Management & Financing

## 3.1 Work Breakdown Structure

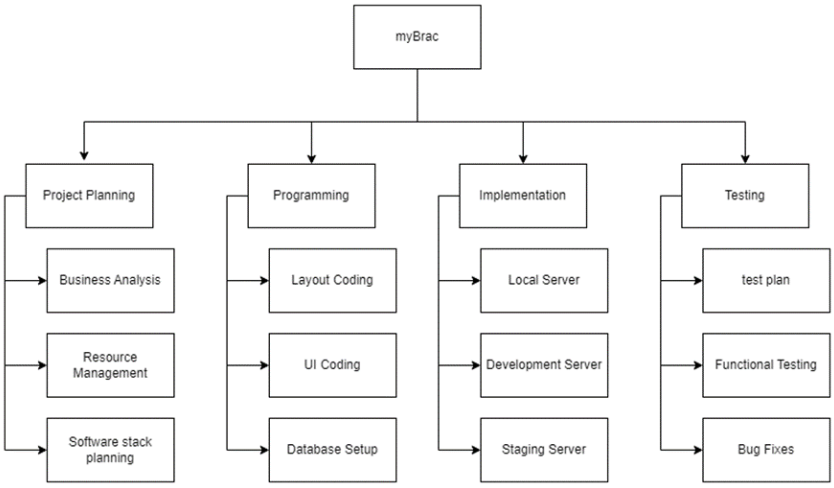



Figure 3.1: Work Breakdown Structure of myBrac

## 3.2 Process/Activity wise Time Distribution

Table 3.1: Process/Activity wise Time Distribution Table.

| **Activity** | **Start Time** | **End Time** | **Duration (days)** |
|---|---|---|---|
| **Planning** | 24-Apr-23 | 02-May-23 | 8 |
| **Requirement Analysis** | 03-May-23 | 16-May-23 | 13 |
| **UI Design** | 17-May-23 | 23-May-23 | 6 |
| **Implementation** | 24-May-23 | 17-Aug-23 | 85 |
| **Testing** | 20-Aug-23 | 24-Aug-23 | 4 |
| **Bug Fixes** | 27-Aug-23 | 06-Sep-23 | 10 |

## 3.3 Gantt Chart

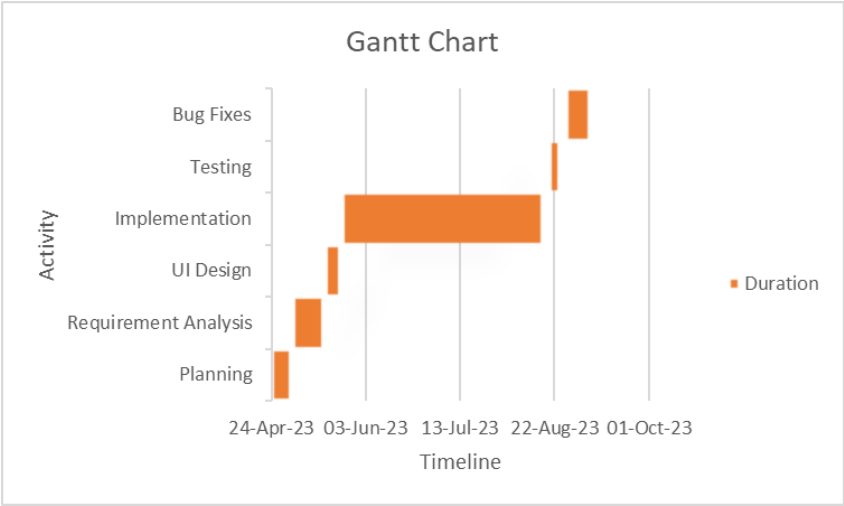



Figure 3.2: Gantt Chart of myBrac

## 3.4 Process/Activity wise Resource Allocation

Table 3.2: Process/Activity wise Resource Allocation Table.

| **Activity** | **Start Time** | **End Time** | **Duration (days)** | **Percentage** |
|---|---|---|---|---|
| **Planning** | 24-Apr-23 | 02-May-23 | 8 | 8.9% |
| **Requirement Analysis** | 03-May-23 | 16-May-23 | 13 | 14.45% |
| **UI Design** | 17-May-23 | 23-May-23 | 6 | 6.6% |
| **Implementation** | 24-May-23 | 17-Aug-23 | 85 | 65.7% |
| **Testing** | 20-Aug-23 | 24-Aug-23 | 4 | 4.4% |
| **Bug Fixes** | 27-Aug-23 | 06-Sep-23 | 10 | |

## 3.5 Estimated Costing

Table 3.3: Estimated Costing Table.

| **No** | **Requirements** | **Amount (BDT)** |
|---|---|---|
| 1 | Internet Bill | 8,000 |
| 2 | Electricity Bill | 17,000 |
| 3 | Development | 4,80,000 |
| **Total** | | 5,05,000 |

# Chapter 4

# Methodology

Modernizing In order to provide a smooth transition from the historical system to the improved version, myBrac follows a systematic and agile methodology. Important stages include:

Requirement Gathering: Obtaining detailed requirements from all parties, including end users, the BRAC Technology Division, and the IT Department.

Legacy Application Analysis: Conducting vulnerability assessments while carefully examining the current myBrac application to comprehend its architecture, technological stack, and performance issues.

Strategic Planning: Creating a modernization plan with a focus on important features, security updates, and interface upgrades.

Upgrade of the technology stack: Using relevant open-source technologies to replace the outmoded ones in a way that ensures compatibility, scalability, and affordability.

User Interface Enhancement: Based on suggestions from BRAC's Technology section, redesigning the user interface and experience using a user-centric approach for improved intuitiveness.

Responsiveness: To meet the increasing number of mobile and tablet users, responsive design ensures full responsiveness across different devices and screen sizes.

Security measures: Using secure coding procedures, encryption methods, and access control systems to address security flaws discovered during analysis.

Feature consolidation: Identifying and combining related applications, optimizing pro-

cesses, and eliminating duplication are all examples of feature consolidation.

Testing and Quality Assurance: To meet functional and security requirements, thorough testing and quality assurance must be carried out throughout the modernization process. User acceptance testing that incorporates end-user feedback should also be conducted.

Deployment and Training: To acquaint BRAC staff with the updated myBrac application's new features and improvements, the application will be deployed in a controlled environment.

Continuous Improvement: Recognizing that the modernization process requires constant updates and enhancements to fulfill future needs, consider user feedback, and adapt to changing technological environments.

With the use of this methodology, BracIT can successfully upgrade myBrac, resulting in financial savings as well as greater user experience, performance, and data security. The agile methodology offers flexibility and adaptability, ensuring that the application stays applicable and efficient in meeting BRAC's expanding requirements.

# Chapter 5

# Body of the Project

## 5.1 Work Description

I worked as a developer on the myBrac modernization project, and I was in charge of the application's front end. React was the tool utilized for front-end development. In addition to my front-end development duties, I oversaw QA testing the program to fix bugs before each sprint meeting.

## 5.2 System Analysis

MyBrac's system analysis for modernisation entails a thorough assessment of the architecture, technology stack, and performance of the existing application. At BracIT, we work closely with users to understand their needs and gather specific requirements. A thorough assessment is conducted to detect vulnerabilities and improve data protection procedures with a strong emphasis on security. In order to determine whether a project is viable, a feasibility study evaluates its technical, economic, operational, timetable, resource, legal, and cultural aspects. The components and interactions of the program are described in a high-level design framework, and performance testing identifies areas that need to be optimized for responsiveness and scalability. In order to create a change management plan for easy user adoption, we examine potential impacts on users and processes. The effective shift to a modernized myBrac application that is in line with changing demands and difficulties is made possible by clear documentation that offers direction for developers, designers, and stakeholders.

### 5.2.1 Six Element Analysis

Table 5.1: Six Element Analysis Table.

| Process | Human | Non Hardware | Computing Hardware | Software | Database | Network |
|---|---|---|---|---|---|---|
| Login | Admin, Employee | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| View and Edit User Profile | Admin, Employee | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Search User Profile | Admin, Employee | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Search MyBRAC | Admin, Employee | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| View & Download Reports | Admin, Employee | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| View Tax Rebate | Admin, Employee | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Set Menu and Sub-Menu | Admin | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Set Images | Admin | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Set Facts | Admin | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Set Events | Admin | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Set News | Admin | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |
| Set Important Contacts | Admin | N/A | Mobile, Desktop | Web App | Postgre SQL | Internet |

### 5.2.2 Feasibility Analysis

A crucial stage in determining the project's profitability and usefulness is the feasibility analysis for modernizing myBrac. To make sure that the modernization effort is in line with BRAC's objectives, resources, and capabilities, it entails analyzing a number of factors. The myBrac modernization feasibility analysis is broken down as follows:

1. Technical Feasibility:

- Current System Assessment: Evaluation of the Current System Analyze the coding, technology stack, and architecture of the current myBrac application. Determine any technical restrictions, performance lags, and compatibility problems.

- Modernization Strategy: Determine whether updating the technology stack to conform to industry standards is technically feasible. Ascertain whether moving to newer technologies—like React—is possible without interfering with essential features.

2. Economic Feasibility:

- Cost-Benefit Analysis: Determine the overall cost of modernization, taking into account costs for development, testing, training, and deployment. Compare these expenses to the expected advantages, such as lower maintenance costs, greater effectiveness, and more user happiness.

- Return on Investment (ROI) Calculation: Calculate the ROI by taking into account the anticipated cost savings, higher productivity, and potential revenue growth brought on by the upgraded myBrac application.

3. Operational Feasibility:

- User Acceptance: Examine if the updated application will satisfy end users' requirements and expectations, including those of BRAC staff. To determine whether stakeholders are willing to use the new system, get their feedback.

- Integration: Consider how the updated myBrac will operate with current workflows, procedures, and systems. Make that the modernization endeavor complies with the operational needs of BRAC.

4. Schedule Feasibility:

- Project Timeline: Estimate the time needed for each stage of the modernisation process, from requirement collection to deployment, in order to determine the schedule feasibility. Check to see if the schedule fits with BRAC's expansion plans and urgent requirements.

- Risks and Delays: Determine the risks and the circumstances that can cause project delays. Create a contingency plan to reduce these risks and guarantee the timely completion of the project.

5. Resource Feasibility:

- Experienced Workforce: Determine whether there are any experienced front-end designers and developers with experience in technologies like React. Ascertain that the project can receive the required resources without jeopardizing other important initiatives.

- Infrastructure: Examine whether the modernisation process has access to the necessary hardware, software, and infrastructure. This covers testing facilities, deployment systems, and development environments.

6. Legal and Regulatory Feasibility:

- Data Privacy and Security: Consider the legal and regulatory requirements pertaining to data protection and security. Make that the updated myBrac application complies with all relevant regulations and industry standards.

7. Cultural and Organizational Feasibility:

- Change management: Evaluate how well-prepared and adaptable the organization is for change and the modernized application. Think about how it will affect the workflow, processes, and duties of the staff.

### 5.2.3 Problem Solution Analysis

By using a methodical approach that makes use of current technologies and best practices, the myBrac modernization project seeks to overcome the difficulties the legacy application faces. Here is a thorough evaluation of how the suggested remedies solve the noted issues:

**Problem 1:** Out-of-date technology stack
**Solution:** Upgrade of the technology stack
**Analysis:** Performance bottlenecks, high maintenance expenses, and compatibility problems are all caused by myBrac's antiquated technological stack. The program can gain enhanced performance, scalability, and compatibility with contemporary hardware and software by updating the technological stack to conform to current industry standards. By addressing the underlying causes of the technical constraints, this solution positions myBrac to satisfy both present and future technology expectations.

**Problem 2:** Subpar user interface
**Solution:** Responsive Design and User Interface Enhancement
**Analysis:** User discontent and inefficiency with myBrac are a result of the bad user interface, according to the analysis. The user interface will be improved, utilizing suggestions

from BRAC's Technology division, making the program more simple to use. Additionally, the use of responsive design principles guarantees that myBrac is usable and accessible on a variety of devices with different screen sizes. By improving the user experience, this solution hopes to increase user satisfaction and productivity.

**Problem 3:** A lack of reliable features
**Solution:** Feature consolidation and strategic planning
**Analysis:** MyBrac's ability to accommodate the changing needs of BRAC personnel is hampered by the lack of substantial features. MyBrac may prioritize crucial features that have the greatest impact by consolidating or merging related applications and creating a strategic modernization plan based on stakeholder feedback. This solution fills in the missing features and guarantees that the updated application complies with the various demands of BRAC's expanding activities.

**Problem 4:** Security Vulnerabilities
**Solution:** Implementing security measures
**Analysis:** The sensitive data held by BRAC is significantly at risk due to myBrac's susceptibility to security risks. These weaknesses are addressed by putting in place security measures such secure coding procedures, encryption methods, and access control systems. This solution improves data protection, ensuring the integrity and confidentiality of sensitive data, protecting BRAC's reputation, and ensuring compliance with data privacy laws.

**Problem 5:** Higher Maintenance Costs
**Solution:** Modernization can reduce costs.
**Analysis:** MyBrac's maintenance costs are greater as a result of the old technological stack and subpar performance. By removing compatibility problems and enhancing program performance, the modernization effort can, over time, result in significant cost savings. Additionally, in line with BRAC's cost-cutting objectives, the consolidation of redundant systems and the use of effective technologies help to maximize resource usage and lower operational costs.

**Problem 6:** ineffective load handling
**Solution:** Modernization to Improve Performance
**Analysis:** MyBrac's inability to handle the increased strain brought on by BRAC's expansion presents a problem. The upgraded myBrac can effectively handle growing user demand by modernizing the technology stack, reducing performance bottlenecks, and implementing a responsive design. With the help of this technology, the application will scale up efficiently to handle the increasing demands of BRAC's expanding activities.

### 5.2.4 Effect and Constraints Analysis

**Effect and Constraints Analysis of myBrac Modernization**

Before embarking on the myBrac modernization project, it's essential to conduct a thorough analysis of the potential effects and constraints associated with the endeavor. This analysis helps in understanding the project's impact and identifying any limitations that might arise during the modernization process. Here's an overview of the effects and constraints related to the myBrac modernization project:

**Effects:**

1. Improved User Experience: A better user experience will emerge from modernizing myBrac because it will have a better user interface and responsive design. As a result, using and accessing the program will be more effectively and with an improved user experience.

2. Improved Performance: The technological stack can be upgraded, and performance bottlenecks can be optimized to improve application performance. Response times will be quicker as a result, and interactions will go more smoothly.

3. Data Security: By using security measures including secure coding procedures and encryption methods, data security will be greatly improved. This will ensure compliance with data protection laws and safeguard sensitive information from any security breaches.

4. Cost Savings: Over time, the modernisation project may result in cost savings by removing compatibility problems, lowering maintenance expenses, and improving resource use. Operating costs can be decreased by combining redundant systems and increasing efficiency.

5. Scalability: The updated myBrac program will be more capable of accommodating growing user demand and expanding BRAC. This scalability makes sure that the program keeps working as the business expands.

6. Alignment with Industry Standards: MyBrac now complies with current industry standards thanks to an upgrade to the technological stack. This guarantees that the application will always be current and work with new technology.

**Constraints:**

1. Availability of personnel: The speed and effectiveness of the modernisation process

will depend on the availability of qualified developers, designers, and other technical personnel. Potentially, delays could result from a lack of competence.

2. Integration Issues: The upgraded myBrac application may have trouble integrating with current systems, procedures, and workflows. It is essential to guarantee seamless integration without interfering with ongoing operations.

3. Change management: MyBrac users who are used to the old program may be resistant to change. To ensure a smooth transfer, adequate change management techniques and user training will be necessary.

4. Migration of Legacy Data: This process of moving data from an older application to a newer one can be difficult and time-consuming. It is crucial to guarantee data accuracy and integrity while migrating.

5. Project Delays: Unexpected technical difficulties, scope modifications, or resource shortages may cause project delays. To prevent delays, effective project management and risk reduction techniques are required.

6. Budget Restrictions: The cost of modernization, which includes costs for development, testing, and training, must be in line with the funds allotted. The feasibility of the project may be impacted by ignoring financial restrictions.

7. User Acceptance: The success of the upgraded myBrac application depends on ensuring that it satisfies user requirements and expectations. Adoption might be hampered by low user acceptance, which can cause discontent.

## 5.3 System Design

### 5.3.1 Rich Picture

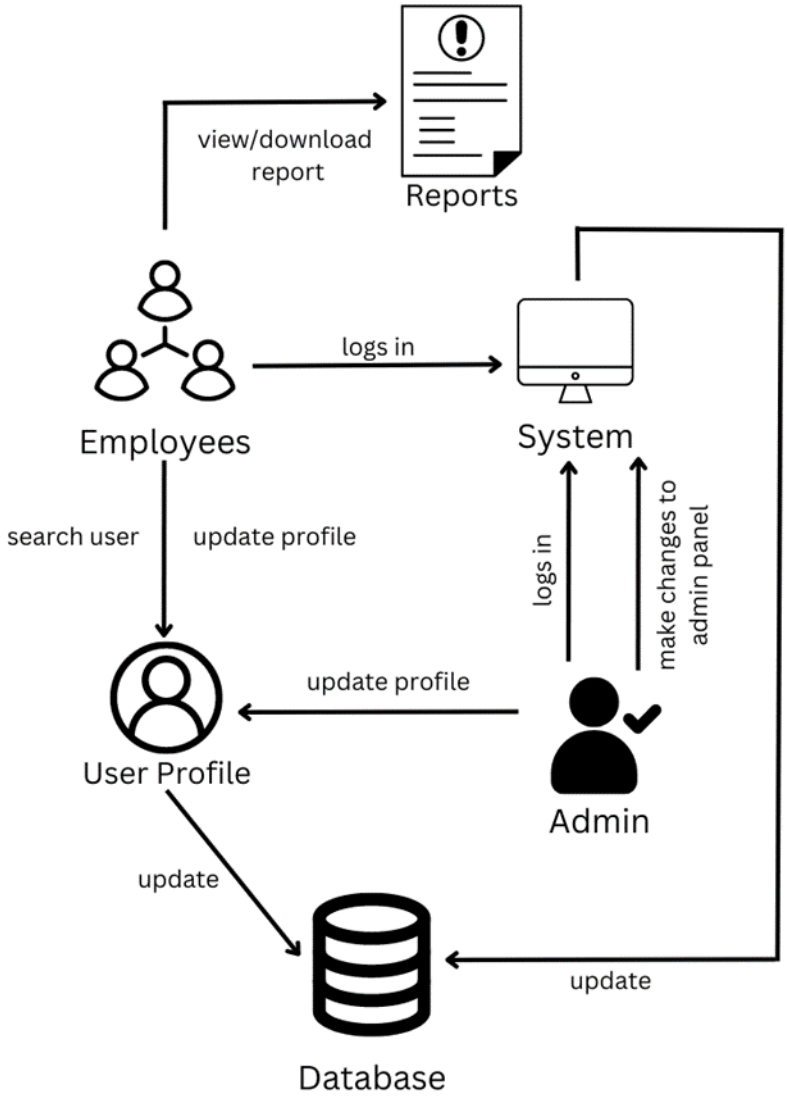



Figure 5.1: Rich picture of myBrac

### 5.3.2 UML Diagrams

Activity Diagram:

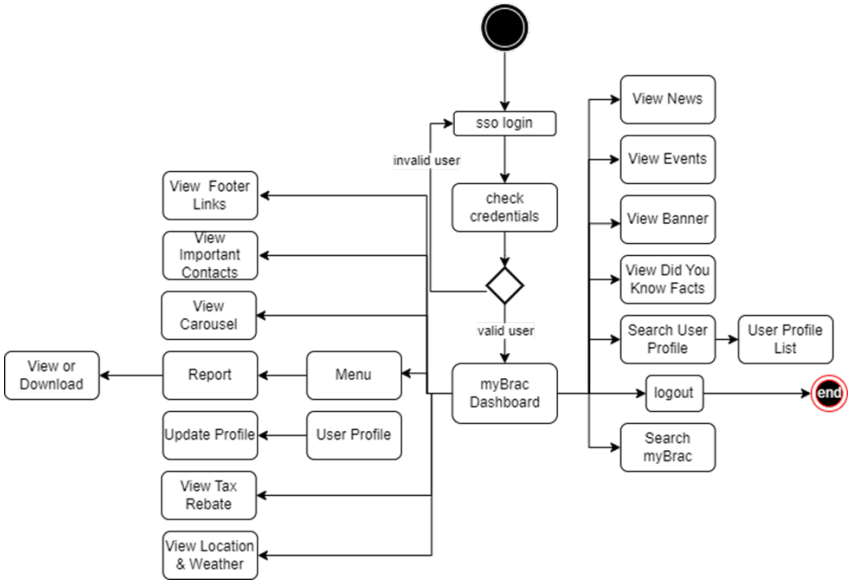



Figure 5.2: User activity diagram of myBrac

Use Case Diagram:

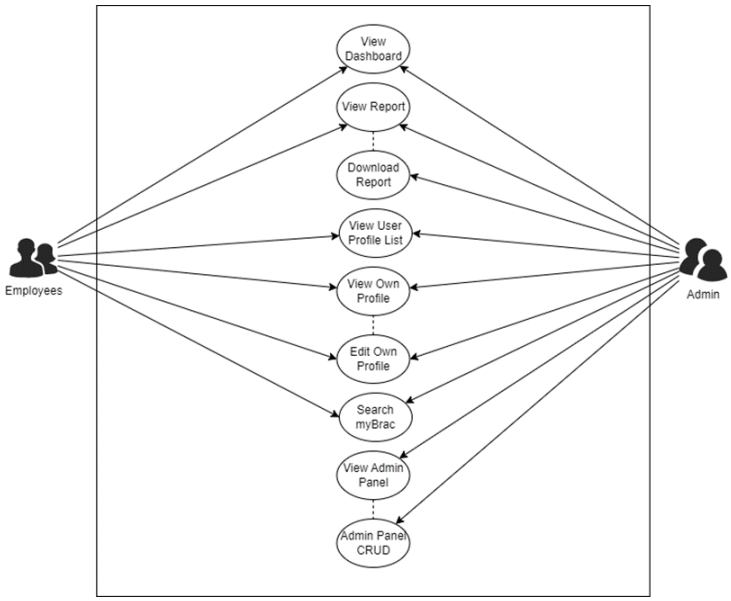



Figure 5.3: User activity diagram of myBrac

### 5.3.3 Functional and Non-Functional Requirements

**Functional Requirements**

1. User Authentication and Authorization:

- Users must be able to safely log in using their own credentials.
- Role-based access control, which makes sure that different user roles are properly authorized.

2. User Dashboard:
   - A tailored dashboard that presents pertinent data and updates based on user roles.
3. Document Management:
   - Secure document management capabilities, including the ability to upload, store, and manage documents.
   - Assistance with efficiently categorizing and searching materials.
4. Task Management:
   - Within the program, users may create, assign, and monitor tasks.
   - Task-related notifications and reminders.
5. Collaboration and Communication:
   - Internal communication messaging and alert system.
   - The ability to work together on tasks and projects inside the application.
6. Reporting and Analytics:
   - Creation of a variety of user-role-specific reports and analytics.
   - Visualization of data insights and trends.
7. Integration with Third-Party Systems:
   - Integration for data sharing with pre-existing BRAC systems and databases.
   - Support for external service API interactions.
8. Data Migration:
   - The transfer of current data from the legacy system to the modernized application with little disruption.
9. Multi-Language Support:
   - Support for many languages to accommodate a wide range of users

**Non-Functional Requirements:**

1. Performance:
   - Even with a high user load, responses are quick and interactions are seamless.
   - Effective management of many user sessions.
2. Safety:
   - Data encryption for confidential data.
   - Secure mechanisms for authentication and authorization.
   - Recurrent vulnerability and security audits.
3. User Experience and Usability:
   - A user-friendly and intuitive UI.
   - For a smooth user experience, navigation and layout must be consistent.
4. Scalability:
   - The capacity to scale horizontally in order to meet growing customer demands.
   - Making sure performance doesn't change as the user base expands.
5. Reliability:
   - High system uptime with little need for maintenance downtime.
   - Regular backup and recovery from disaster processes.
6. Compatibility:
   - Support for current web browsers and gadgets, such as smartphones and tablets.
7. Regulatory Compliance:
   - Adherence to industry norms and laws governing data protection.
8. Accessibility:
   - Accessibility features to make sure people with impairments can use the application.
9. Training and Documentation:
   - Detailed user guides and training resources for quick user onboarding.

## 5.4 Product Features

### 5.4.1 Input

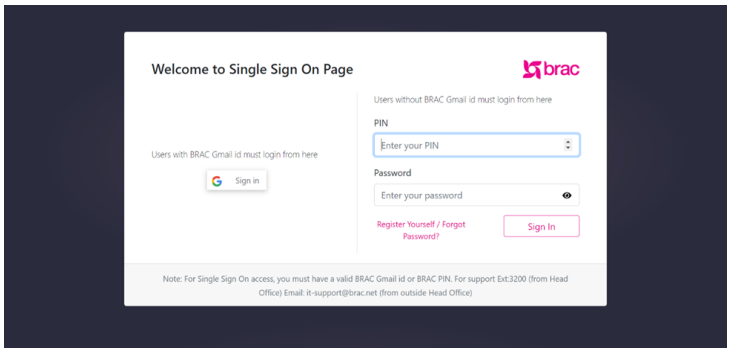



Figure 5.4: Login page of myBrac

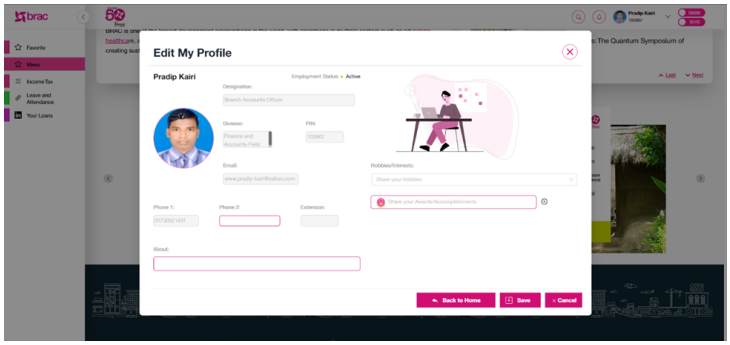



Figure 5.5: User profile of myBrac

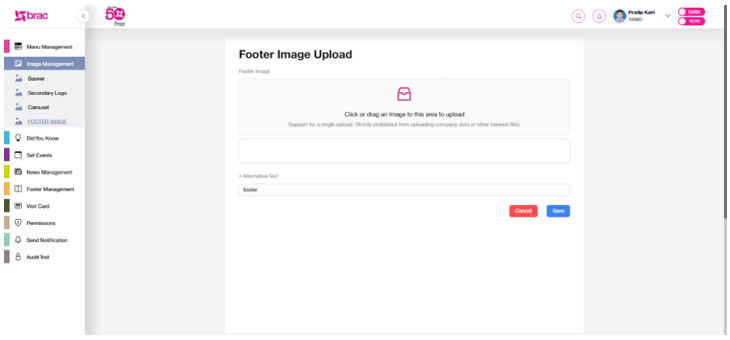



Figure 5.6: Footer image form of myBrac

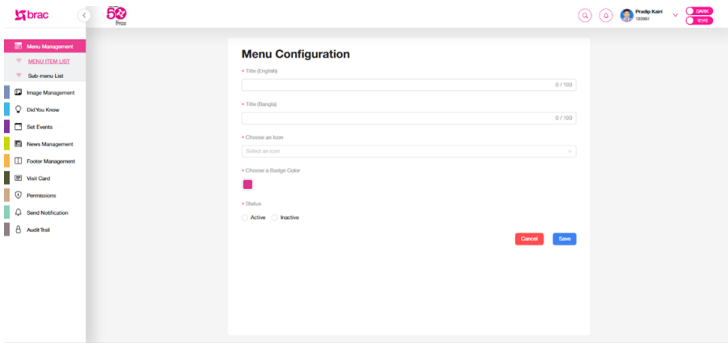



Figure 5.7: Menu item form of myBrac

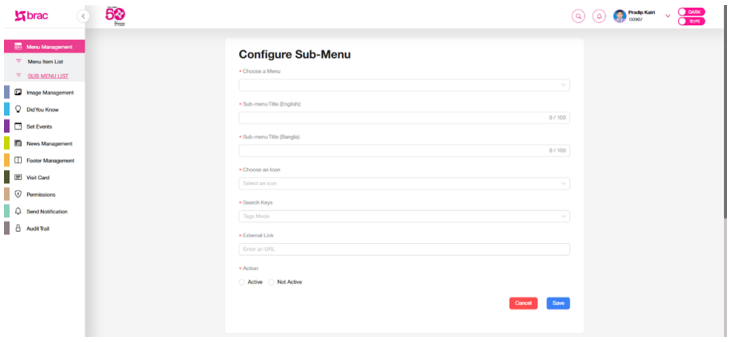



Figure 5.8: Sub-menu item form of myBrac

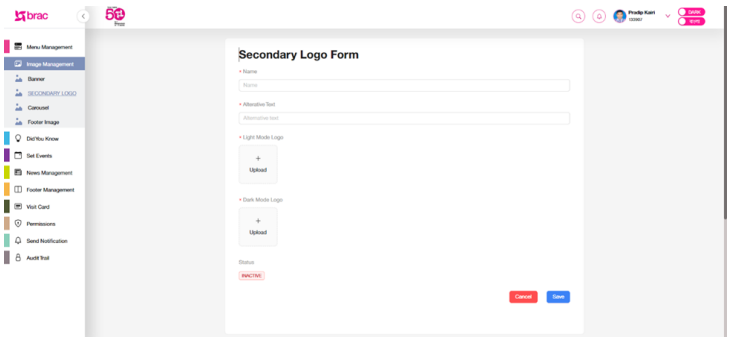



Figure 5.9: Secondary logo form of myBrac

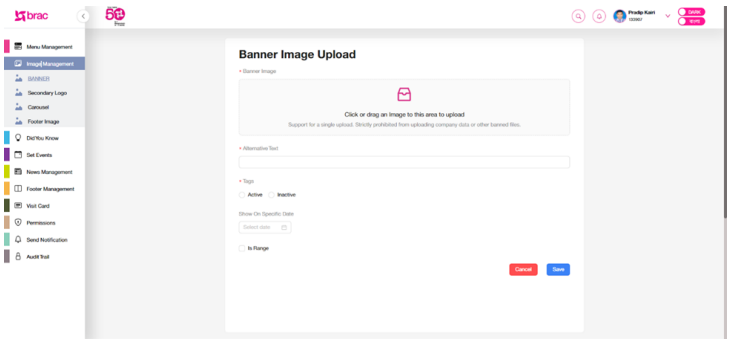



Figure 5.10: Banner image form of myBrac

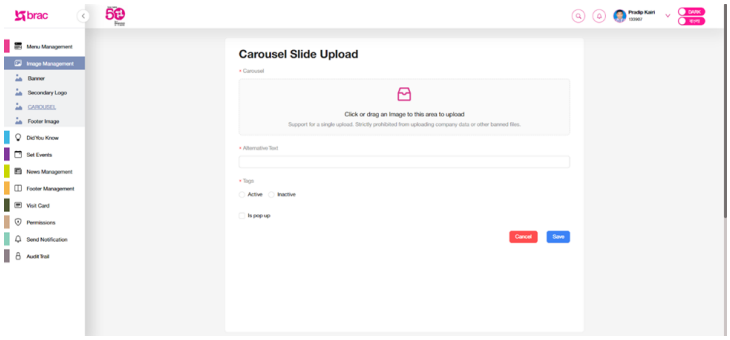



Figure 5.11: Carousel image form of myBrac

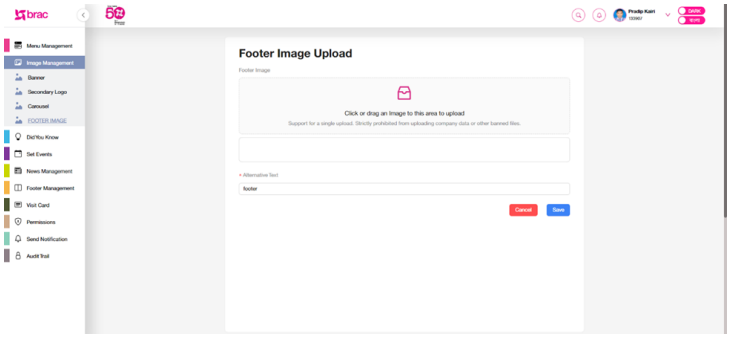



Figure 5.12: Footer image form of myBrac

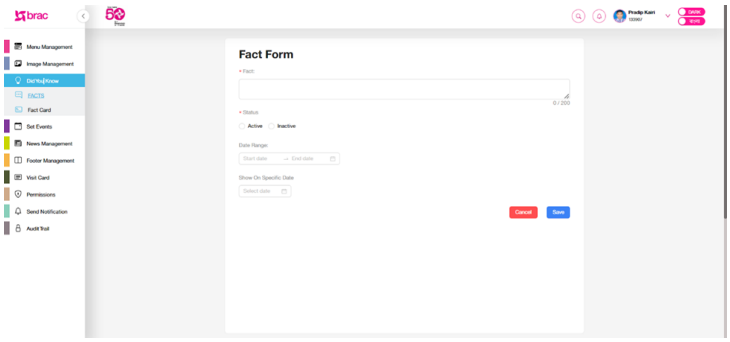



Figure 5.13: Fact form of myBrac

### 5.4.2 Output

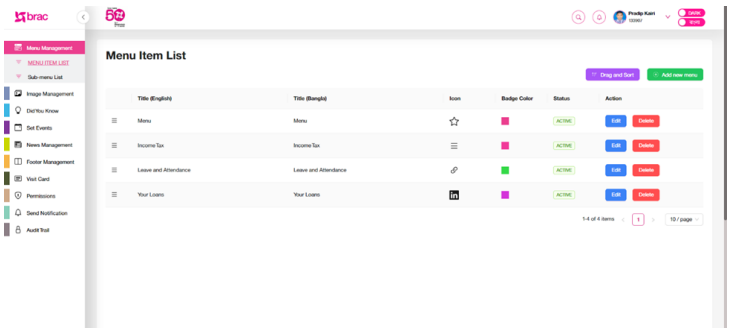



Figure 5.14: Menu item list of myBrac

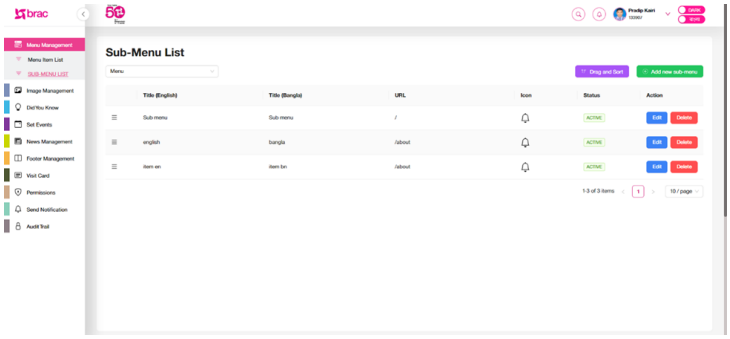



Figure 5.15: Sub-menu item list of myBrac

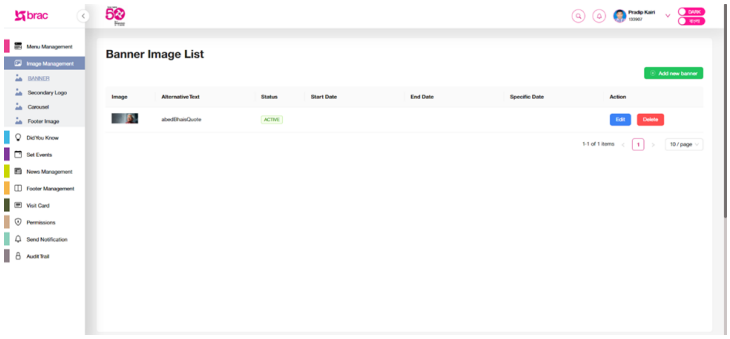



Figure 5.16: Banner list of myBrac

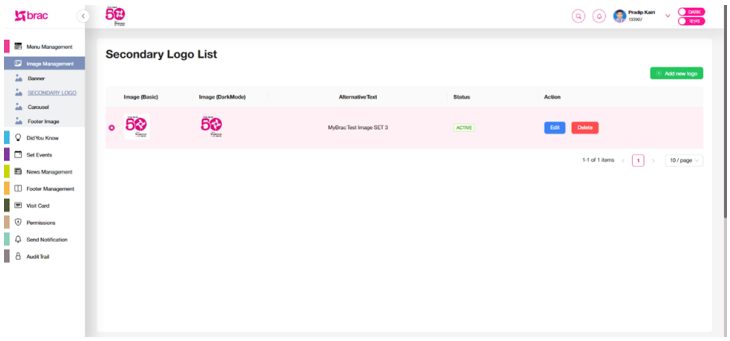



Figure 5.17: Secondary logo list of myBrac

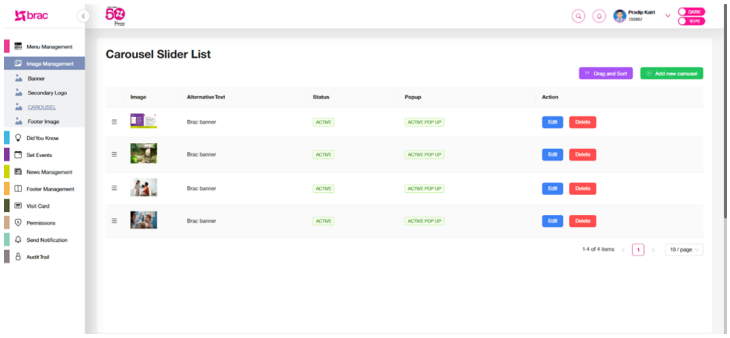



Figure 5.18: Carousel slider of myBrac

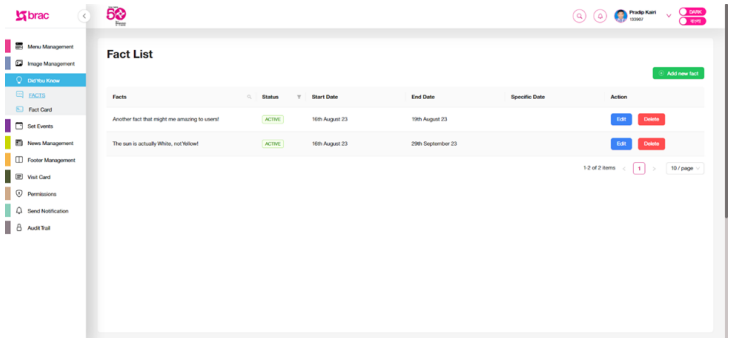



Figure 5.19: Fact list of myBrac

### 5.4.3 Architecture

MyBrac's architecture is created to offer a stable and scalable base for the upgrading of the application. It has a component-based, modular design that promotes flexibility and ease of maintenance. With separate layers for presentation, business logic, and data administration, the architecture places a strong emphasis on the separation of concerns. The architecture assures interoperability, scalability, and effective communication between diverse components by utilizing cutting-edge technologies and open-source frameworks. Each layer includes security measures such as encryption, access controls, and authentication methods to protect sensitive data. Through well defined APIs, the design also facilitates easy integration with already-existing systems and external services. In general, myBrac's design is carefully thought out to fulfill the requirements of contemporary software development, ensuring improved performance, user experience, and security.

# Chapter 6

# Results & Analysis

**Result:**
MyBrac's modernisation, which achieved excellent results, has successfully combined React for the front-end and PostgreSQL for the back-end. The completion of all expected functionality is a significant accomplishment that demonstrates how thoroughly the old program has been altered. Thorough QA testing was done on the functionality, performance, and security aspects of the project. The rigorous bug-fixing approach used to find and remove errors demonstrates the commitment to creating high-quality products.

**Analysis:** Examining this stage shows how effective React is as a front-end framework. The creation of responsive and interactive user interfaces has been accelerated by the use of React's component-based architecture. The application's overall efficiency has increased as a result of the efficient data management and retrieval made possible by this, as well as the robust backend capabilities of PostgreSQL.
The thorough QA testing and subsequent bug fixes demonstrate a proactive approach to delivering a great user experience. Early bug patches have increased software stability and decreased the likelihood of problems after launch.

This phase can be followed by the deployment and user training phases if it is successfully finished. This culmination of effort demonstrates the project's accomplishment of its objectives and confirms the dedication to modernizing myBrac in a way that enhances performance, user pleasure, and data security.

# Chapter 7

# Project as Engineering Problem Analysis

## 7.1 Sustainability of the Project/Work

Community, financial, and organizational sustainability are three important aspects of myBrac's sustainability.

**Community Sustainability:** The longevity of myBrac ultimately depends on its applicability and worth to the BRAC community. We make sure that myBrac continues to be a valuable tool by regularly communicating with users, learning about their changing needs, and taking their comments into account while developing the platform. This user-centric strategy also ensures inclusivity by making myBrac available to all members of the BRAC community, regardless of their ability. Additionally, we enable members of the community to make the most of myBrac by providing localized material and continuing training programs, promoting an environment of learning and development. Assuring data security and privacy demonstrates our dedication to upholding the BRAC community's trust.

**Financial Sustainability:**
Prudent budgeting is essential to ensuring myBrac's long-term financial viability. Budgetary restraints must not be allowed to compromise the project's stability, therefore adequate resources must be supplied for routine upkeep, updates, and improvements. It's crucial to strike a balance between providing a high-quality product and reducing costs. Investigating cost-sharing or sustainable income models can offset ongoing costs while maintaining myBrac's usability. Financial sustainability is strengthened through smart resource allocation that prioritizes important areas like security and user support and is cost-effectively led.

**Organizational Sustainability:**
MyBrac's organizational viability depends on transparent governance frameworks, decision-making procedures, and accountability measures. These assure adherence to the strategic vision and overarching aims of BRAC. The project team has to be invested in skill development and training since it keeps them up to date on the newest information and best practices. Strong knowledge transfer and succession planning techniques can minimize disruptions in the case of team turnover. By encouraging feedback and learning from prior experiences, a business can strengthen its culture of continuous improvement, allowing sustainability methods to be improved. Effective change management facilitates buy-in and myBrac's incorporation into BRAC's everyday operations while navigating organizational upheavals.

## 7.2 Social and Environmental Effects and Analysis

**Social Effects**
The introduction of myBrac has had a number of beneficial social implications on the BRAC community. It has dramatically increased employee collaboration at BRAC, promoting better teamwork and production. Employees now have more power thanks to access to useful resources like training materials and knowledge bases that give them the knowledge they need to flourish in their jobs. MyBrac also contributed significantly to staff members' professional growth by providing training courses and educational materials. The platform's accessibility features are crucial because they encourage inclusivity by making sure that everyone in the BRAC community can use it, regardless of their ability.

**Environmental Effect**
MyBrac has not only had positive effects on society but on the environment. The decrease in paper use is one of the most important contributions. MyBrac has assisted BRAC in reducing its use of paper by digitizing a number of processes and enabling online access to papers and resources, in line with environmental sustainability objectives. Because these facilities are built to maximize energy usage, the platform's hosting on energy-efficient servers and data centers contributes to energy efficiency. Additionally, some employees have been able to work remotely because to myBrac's accessibility, which lessens the need for commuting and its accompanying greenhouse gas emissions. The platform also encourages sustainable habits by making it easier to share knowledge and best practices around sustainability, environmental conservation, and ethical corporate conduct. MyBrac's environmental effect has been reduced by choosing environmentally friendly data centers that follow sustainable data management principles. These synergistic social and

environmental consequences show how myBrac benefits the BRAC community as well as environmental sustainability.

## 7.3 Addressing Ethics and Ethical Issues

To maintain the greatest levels of integrity, privacy, and user trust while myBrac is modernized, ethical considerations are still at the forefront of our strategy. Every stage of the project, from its conception to current management, is based on ethical values.
User privacy and transparency: MyBrac's development is guided by transparency, one of the fundamental ethical principles. The trust of our users is of the utmost importance, and we are dedicated to upholding this trust by being open and honest about the data we gather, how it is used, and who has access to it. All users are given access to clear privacy policies and terms of use, assuring informed consent.

Private user information: User data is gathered and handled strictly in accordance with applicable data protection laws and regulations. Sensitive data is protected by strong security measures, and access control systems are in place to guarantee that user information is kept private.

Using a user-centered strategy: Our user-centric strategy is permeated with ethics. We place a high value on inclusion and user experience. Regardless of their ability, all BRAC community members can use the program, supporting inclusion as an ethical requirement.

Ongoing feedback loop: The ongoing feedback loop with users is also essential. We aggressively seek out and answer their issues and insights. Through this iterative method, myBrac is made to adapt in a way that adheres to the moral precept of being user responsive.

Environmental responsibility and data ethics: MyBrac's modernization has significantly reduced the amount of paper used while also maximizing energy usage through the use of servers and data centers that are energy efficient. These ethical criteria for sustainability and reducing environmental damage are in line with these green practices.

Time management and achieving work-life harmony: MyBrac supports work-life balance and time management from an ethical perspective. We understand how crucial it is to keep our team members from burning out and to look out for their wellbeing. Our dedication to ethical work practices is reflected in the lesson on the value of effective time management that we learnt throughout the internship.

In conclusion, myBrac's modernity is braided with ethical principles. Our strategy is centered on transparency, user centricity, data ethics, environmental responsibility, and staff wellbeing. By adhering to these moral guidelines, myBrac strives to be both a technologically and morally sophisticated application that puts the needs of its users and the larger community first.

# Chapter 8

# Lesson Learned

My learning journey at bracIT while my internship was rewarding and challenged me to experiment with and adjust to new technology. In-depth tutorials on JavaScript, TypeScript, and React JS took up the first two weeks of the course, giving me the chance to become familiar with these programming languages and frameworks. This immersion experience provided a difficult yet valuable basis for my professional development.

The value of time management and managing deadlines was one of the most important things I discovered while working at bracIT. It proved to be a considerable struggle to finish the tasks that were assigned before each sprint meeting with the client at the conclusion of each week. This frequently prompted me to put in extra time, which was draining. However, it gave me invaluable knowledge of effective working methods, organization, and priority.

Overall, bracIT's internship gave me a high learning curve that allowed me to hone my technical abilities and gain understanding of the expectations placed on the sector in the real world. Although it was a tough experience, I definitely gained technical knowledge and time management skills that would help me in my future ventures.

# Chapter 9

# Future Work & Conclusion

## 9.1 Future Works

MyBrac, which is almost finished and has successfully incorporated all intended features, is on the verge of becoming a comprehensive solution for BRAC employees. However, the following future activities have been identified to further improve its operation and fix recognized issues:

1. Integration of the Income Tax Statement API: The establishment of a single API for the report of the Income Tax Statement.

2. Bug fixes and Issue Resolution: A complete QA test will be conducted prior to distribution, and bug corrections will be made.

There are many other legacy applications of Brac that will go through similar modernization phase in the future.

## 9.2 Conclusion

Being a part of the important initiative "myBrac" during my internship at BracIT, in particular, has been a priceless journey of development and learning. During this time, I was exposed to a vast amount of knowledge and the practical application of my talents, which has enriched my professional development.

I owe a great deal of gratitude to my bosses and coworkers for their constant mentoring, direction, and support throughout this internship. My development and my grasp of the IT sector have been greatly influenced by their knowledge and willingness to share it.
In addition to the technical knowledge, I've gained throughout this internship, I also take

with me the life-changing insights and experiences that will certainly influence my future endeavors. This internship has served as a steppingstone in my career, and I am eager to use the knowledge and insights I have learned to contribute significantly to my future professional endeavors.

# Bibliography

[1] Mayfield, Dayana. "Software Modernization." Devsqaud, 21 Oct. 2022, https://devsquad.com/blog/software-modernization.

[2] Müller, Philip. "Under Deconstruction: The State of Shopify's Monolith." Shopify.Engineering, 16 Sept. 2020, https://shopify.engineering/shopify-monolith

# An Undergraduate Internship-Project on MyBrac, a Legacy App Modernization Project

By

**Syeda Muntaqa Musarrat**

Student ID: **1810021**

**Summer, 2023**

## Consent from Supervisor

The student modified the internship final report as per the recommendations made by his/her academic supervisor and/or panel members during and/or before final viva, and the department can use this version for archiving as well as the OBE course material for CSE499.

This internship report is checked with Turnitin and/or Ithenticate plagiarism checker, and the score is:

Turnitin Score (%) : 9%

Marzan

Marzan Binte Hassan

Department of Computer Science & Engineering

Independent University, Bangladesh