

# Mastering Full Stack Web Development: Internship Experience at BRAC IT

Internship Report on Full Stack Web Development at BRAC IT

by

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in partial fulfillment of the requirements for the degree of  
B.Sc. in Computer Science

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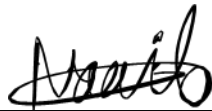
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# Declaration

It is hereby declared that

1. The thesis submitted is my/our own original work while completing degree at Brac University.
2. The thesis 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 thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. We have acknowledged all main sources of help.

**Student's Full Name & Signature:**

A handwritten signature in black ink, appearing to read 'Naavid', written over a horizontal line.

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# Approval

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# Abstract

This report is a documentation of a six-month internship I partook at BRAC IT as a full- stack web development intern, where I was responsible for creating new modules and bug fixing to quite a few projects/webapps. My key assignments included working on CSAUP (Compliance and Service Assurance Unit Portal), a microfinance web application designed for auditors to review and audit loans taken by users for different purposes, and BEP (BRAC Educational Program), an education management system handling institutes, students, teachers, teacher salaries, reports, and student fees. In CSAUP, I developed and maintained core functionalities using Angular, and Spring Boot for the frontend and backend, ensuring smooth data flow and efficient auditing processes. For BEP, I worked with AngularJS 1.2 for frontend and EJB for backed, MySQL for DBMS and Wildfly 10.0 as the server, managing the relationships between institutions, staff, teacher, students and financial operations. This internship exposed me to the complexities of full- stack development in real-world applications, where I participated in regular standups, task planning, and client reviews, honing my problem-solving and communication skills. It was an invaluable experience, expanding my expertise in Angular, JS, TS, backend development with Spring Boot, and distributed database management system. This exposure provided me with a deeper understanding of web application architecture and prepared me to take on more significant challenges as a professional web developer.

## Acknowledgement

Before I present my report, I would like to sincerely thank my supervisor, Arif Shakil Sir, for his much appreciated and valueable guidance and support during my internship at BRAC IT. His helpful feedback and practical advice helped me deal with the challenges I faced, and his patience and dedication pushed me to improve both my skills and my way of solving problems. His mentorship has had a lasting effect, and I am truly thankful for his effort in helping me grow. I would also like to give a big thanks to the whole BRAC IT team. Their willingness to share knowledge, offer help, and create a good work environment made my experience not just productive but also enjoyable. I really appreciate the teamwork and support I felt while working with them. Finally, I am very thankful to my family and friends for their support and encouragement. Their belief in me gave me the strength to finish my internship with confidence.

# Table of Contents

|                                                             |            |
|-------------------------------------------------------------|------------|
| <b>Declaration</b>                                          | <b>i</b>   |
| <b>Approval</b>                                             | <b>ii</b>  |
| <b>Abstract</b>                                             | <b>iii</b> |
| <b>Acknowledgment</b>                                       | <b>iv</b>  |
| <b>1 Introduction</b>                                       | <b>1</b>   |
| 1.1 Preamble . . . . .                                      | 1          |
| 1.2 Objectives . . . . .                                    | 1          |
| <b>2 Company Profile</b>                                    | <b>2</b>   |
| 2.1 Company Overview . . . . .                              | 2          |
| 2.2 First Day at BRAC IT . . . . .                          | 3          |
| 2.3 Services at BRAC IT . . . . .                           | 4          |
| <b>3 Workplace Details</b>                                  | <b>5</b>   |
| 3.1 Working at BRAC IT: A Developer's Perspective . . . . . | 5          |
| 3.2 Diverse, Inclusive Community . . . . .                  | 5          |
| 3.3 Learning by Doing . . . . .                             | 5          |
| 3.4 A Place Where Your Voice Matters . . . . .              | 5          |
| 3.5 Fun and Growth in Equal Measure . . . . .               | 6          |
| 3.6 A Supportive Team and Leadership . . . . .              | 6          |
| <b>4 My Contributions</b>                                   | <b>7</b>   |
| 4.1 Training Interns . . . . .                              | 7          |
| 4.2 Reactive Form (Angular) . . . . .                       | 7          |
| 4.3 Code Reduction . . . . .                                | 8          |
| 4.4 Bkash Transaction Dashboard . . . . .                   | 8          |
| 4.5 Toastr Bug Fix . . . . .                                | 8          |
| 4.6 SOLID Principle . . . . .                               | 8          |
| <b>5 Personal Growth at BRAC IT</b>                         | <b>10</b>  |
| <b>6 Conclusion</b>                                         | <b>13</b>  |
| <b>Bibliography</b>                                         | <b>14</b>  |

# Chapter 1

## Introduction

### 1.1 Preamble

Universities/Colleges, in my experience and opinion, does not prepare a student for professional careers, namely corporate jobs. I view my time in BRAC university as a study of the science of Computer Science itself, to understand the field in general. It did not focus itself on a singular field, rather the concept as a whole, which derived from Electrical Engineering, which emerged from the study of Physics. Here, internship provides itself as a great opportunity to prepare myself for my passion and career of choice, programming. At BRAC IT, I have learned how to tailor my behavior to suit different kind of people, how to present myself accordingly and socialize myself with people from all walks of life. I interned under two mentors and have myself trained three interns myself. This report will explore all of these, all of my achievements and shortcomings.

### 1.2 Objectives

The main purpose of this report is to provide a detailed explanation and literate my experiences and learnings at BRAC IT. It will explore the projects I have worked on, original works I have implemented in my projects, things I have learned from my colleagues and things I have taught them as well.

# Chapter 2

## Company Profile

### 2.1 Company Overview

BRAC IT, my employer, provides a broad range of software development services tailored to meet diverse industry needs [3]. It's a well reputed IT firm in Bangladesh and abroad. We utilize a hybrid Agile and Waterfall methodology to deliver these services, combining the iterative flexibility of Agile with the structured, sequential nature of Waterfall. This hybrid approach allows us to adapt to client needs while ensuring a well-defined development process. Our offerings cover Software as a Service (SaaS), web applications, and mobile applications designed for both Android and iOS platforms. We also emphasize rigorous quality assurance processes to ensure that all solutions meet the highest standards of functionality, performance, and security. We have separate QA units which ensure the quality of our products. We have developed many applications and IT systems which are widely used.

One of our core areas of expertise lies in providing fintech and banking solutions. Given the sensitive nature of financial data and transactions, our solutions are designed with the utmost focus on security, scalability, and regulatory compliance. In BRAC IT we have expertly used multiple frameworks and stacks, which helped us provide diverse solutions to different problems. We offer end-to-end services, which means we manage everything from initial requirements gathering and system design to implementation and ongoing support. This also includes system integration, where we ensure that our solutions seamlessly interact with existing systems and infrastructures. Additionally, our expertise in artificial intelligence (AI) and data tracking allows us to provide advanced analytics, decision-making tools, and automated processes that improve efficiency and drive better business outcomes.

Our technology stack is robust and versatile, including widely adopted languages and platforms such as Java, .NET, Python, and others, enabling us to cater to different project requirements. For instance, one of our key solutions is "Meeting AtWork," a sophisticated tool designed for efficient meeting management. This tool streamlines the process of scheduling, organizing, and conducting meetings, helping businesses save time and improve productivity.

The d.School division within BRAC IT follows Human-Centered Design (HCD) principles, a methodology that places the needs, experiences, and feedback of the

end user at the centre of the design process. This approach ensures that our solutions are not only functional but also intuitive and user-friendly. The d.School provides a wide range of services, including business process design, where we help organizations map out and optimize their workflows. In addition, we offer website and mobile app design services, creating visually appealing and easy-to-navigate digital products. Our team also excels in developing go-to-market strategies, assisting companies in launching new products and services with clear plans for customer engagement, marketing, and distribution.

What sets d.School apart is its prototype-driven approach. We believe in quickly developing working prototypes that allow clients and end users to test and provide feedback early in the design process. This reduces the risk of misunderstandings and ensures that the final product aligns closely with user expectations. Our dedicated team excels at requirement collection, conducting in-depth analysis to fully understand the client's business goals and challenges before proposing solutions. Beyond design, we offer a 360-degree service package that includes development, quality assurance, and AI/data solutions, ensuring a seamless journey from concept to completion.

BRAC IT also offers comprehensive IT Managed Services, designed to support organizations in managing their IT infrastructure and software more efficiently. This service is especially beneficial for companies looking to reduce operational costs, improve scalability, and enhance flexibility. Our IT Managed Services include end-user IT support, where we provide assistance to employees and users to resolve technical issues quickly and efficiently. We also handle vendor and partner management, ensuring smooth collaboration and integration with third-party service providers. Additionally, we offer IT asset management services, helping organizations track and manage their hardware and software resources. For companies requiring additional support, we provide extra-hour services, allowing for round-the-clock availability in critical situations.

With extensive experience in industries such as banking and public health, BRAC IT ensures that its IT operations are effective and reliable. We take a proactive approach to problem-solving, identifying and addressing issues before they impact operations. Moreover, we maintain robust backup systems, ensuring business continuity and minimizing downtime in case of system failures. Our technology stack for IT Managed Services includes cloud-based solutions like Google Cloud, containerization with Docker, and data protection with Acronis, providing cutting-edge tools to enhance our clients' IT capabilities. For more information about BRAC IT and our services, you can visit our website at [www.bracits.com](http://www.bracits.com).

## **2.2 First Day at BRAC IT**

An HR trainee at BRAC IT informed me via mail to come to office. I waited for a few minutes at the lounge, then got called at the Head of Applications at BRAC IT's office, Apreel Bhai, who is also my supervisor for this internship from company side and also acted as my line manager. I had a lot of questions in mind that I wanted to ask. I was offered tea, and as I was having tea, I got acquainted with Apreel Bhai

and BRAC IT in general. I learnt that BRAC IT, due to having many projects from many clients, mostly serving to BRAC, BRAC University and BRAC BANK, dealt with a plethora of tech stacks. MERN, Django, Full stack with JAVA and Angular/AngularJS, Dot NET, Laravel, Codeigniter and quite a few more. Since I worked with latest version of JAVA, I was used to many latest JAVA features, for example Records. I asked, does BRAC IT works with JAVA 21 or latest JAVA versions. I was given a longwinded and very diplomatic answer, that BRAC IT has experience working with all kinds of JAVA versions. I found it entertaining and gained some insight into the corporate world. This a common tactic to handle clients when requirements are too difficult or cannot be met, flow of conversations are usually diverted tactfully and dealt with. Later that day, I met my team, it was full of people of various personalities, my team lead was Fatema Apa, a much experienced and charismatic woman. I took my leave for the day and hoped to integrate into my team and start working.

## 2.3 Services at BRAC IT

- **Webapp Development:** BRAC IT develops complex webapps for Enterprise Resource Planning.
- **Application Scaling:** Here BRAC IT works on adding new features to existing projects.
- **Legacy Support:** As BRAC IT maintains projects for BRAC, lot of support and maintenance for Legacy Applications are needed.

# Chapter 3

## Workplace Details

### 3.1 Working at BRAC IT: A Developer's Perspective

As an employee at BRAC IT for a year, I have first-hand experience how it provides a dynamic and supportive environment. It fuelled both my personal and professional growth. The balance between innovation, collaboration, and a sense of community is what makes working here truly special. Here every day a is new opportunity to grow and contribute.

### 3.2 Diverse, Inclusive Community

In BRAC IT diversity is embraced. We have female workers who come from different background, religion and indigenous people. This creates an inclusive environment where different perspectives blend in to create innovative solutions. This diversity helps enhance the projects we handle, ranging from fintech applications to public health solutions this offering unique challenges and opportunities.

### 3.3 Learning by Doing

One of the core values adapted at BRAC IT is continuous learning and improving. Here we developers are encouraged to explore, experiment, and even fail fast to learn fast. The "learning by doing" approach is how we operate and develop. During my work, I've had the opportunity to dive into real-world projects. These projects use cutting-edge technologies like Spring Boot, Flutter, and Angular. I had the freedom to experiment, make mistakes, and learn from them. This hands-on experience in these projects have fastened my development skills and helped me grow as a full-stack developer.

### 3.4 A Place Where Your Voice Matters

BRAC IT has an open-door culture where everyone's ideas, concerns, and feedback are valued with respect. It's not just about following orders only. It's about actively participating in projects and contributing innovative ideas. During team meetings

or in casual conversations, employees are encouraged to speak up and share their thoughts. The leadership team's willingness to listen has created a space where communication flows freely.

### **3.5 Fun and Growth in Equal Measure**

The work environment at BRAC IT is a perfect balance between professionalism and fun. The company organizes events that allow employees to connect and enjoy their time together. This practice in workplace culture generates job satisfaction and builds a strong sense of belonging among us.

### **3.6 A Supportive Team and Leadership**

The mentorship I've received at BRAC IT has been the most resourceful to grow my skills. Senior developers and team leads are always willing to share their knowledge with us. They supported us to overcome challenges. Working under a mentor and supervisor has allowed me to improve my technical skills. They taught me how to manage time, handle project complexities and deliver high-quality solutions. The collective approach here makes sure no one is alone to tackle challenges. It promotes a culture of support and collective achievement between us.

# Chapter 4

## My Contributions

### 4.1 Training Interns

As I has experience working with flutter in cross platform mobile app development, I enjoyed a fast and steady progress in web development even if web development was quite new to me. After 2nd month, I was asked to take on two interns while I was an intern myself since my mentor was quite busy. I took on two interns who were 3 years and 1 year younger than me, a male and a female. The female intern I trained had a keen sense of learning, and tried her best to gather as much information as possible. Training/tutoring her was straightforward, I gave her instructions, she followed and gave my feedback, and I gave further instructions. She did not find it difficult to approach me to ask for help. This was not the same for the male intern, he was quite shy and did not speak much. He would not give me feedback even I asked him to. Repeating several times did not improve this scenario. Then I decided a new approach, I gave him instruction, did not wait for him to give me feedback, I just gave him as much space and time as I could. He finished his work at his pace, during this process, he himself came to me and asked for help and shared his thought. He got his work done the same as the female intern. I would assume training the male intern was more difficult as he was much younger, had a very introverted personality, and needed space and time to ease into the corporate setting. Near the end, I took several exams on OOP and basic frontend development for both of them. I made them make a singleton class to solve a problem and also had them make a calculator app with HTML, CSS, JS with no help of built in JavaScript functions. This served as a very good RegEx practice as well.

### 4.2 Reactive Form (Angular)

Introduced Angular's own reactive form to CSAUP[4]. This allowed to keep the exact same object structure in both frontend and backend. This also mean that an object creation by hand without structure is no longer needed and old system of template driven form which is less flexible is avoided as well. I also figured out a way to globally handle from validation and bound it to reactive form.

## 4.3 Code Reduction

I have reduced on average 30-50 lines of codes by refactoring, removing unnecessary stuffs, converting 15 lines of if else to enhanced switch case, converted some control flow operations to class inheritance etc.

## 4.4 Bkash Transaction Dashboard

In BEP, my greatest challenge was to add two more dropdown options to a search field chain which will GET two tables, two bar chart and a pie chart. Such a simple task took me 4 days as there was no business logic written anywhere, nothing was documented, and the methods was so jumbled that one method upon table completion, called another method for pie chart, which called a method for 2 bar chart and then finally 1 table. Further CR (Change Request) complicated this even more. This was completed by me and took 4 working days.

## 4.5 Toastr Bug Fix

In CSAUP, we had a toastr (alert) which was to show in the top middle of the component. It did that, except when scrolled, the toastr would not scroll with the component, it would get left behind. A simple solution was to read the changelog from Angular 14 to latter versions which the previous resource did not do. One simple line moved from this file to that file, and voila, a 7-month long problem is fixed in the span of 5 minutes.

## 4.6 SOLID Principle

I have learnt the basics of SOLID principle in programming and read Clean Code by Uncle Bob, both of which massively increased the quality of my code and made them readable, clean, extensible, efficient and consistent.

Here, I shall describe in small details the principles of SOLID:

1. **Single Responsibility Principle (SRP):** A class should have only one reason to change, meaning it should only have one job or responsibility. This helps in reducing the complexity of the class and makes it easier to maintain.
2. **Open/Closed Principle (OCP):** Software entities (like classes, modules, functions) should be open for extension but closed for modification. This means you can add new functionality without altering existing code, reducing the risk of introducing bugs.
3. **Liskov Substitution Principle (LSP):** Subtypes must be substitutable for their base types without altering the correctness of the program. Essentially, if you replace a base class with a derived class, the program should still function correctly.

4. **Interface Segregation Principle (ISP):** Clients should not be forced to depend on interfaces they do not use. Instead of one large interface, multiple smaller, specific interfaces are preferred, allowing for more flexibility and easier implementation.
5. **Dependency Inversion Principle (DIP):** High-level modules should not depend on low-level modules; both should depend on abstractions. This encourages the use of interfaces or abstract classes to decouple components, making the system easier to manage and extend.

# Chapter 5

## Personal Growth at BRAC IT

During my year at BRAC IT, I've developed a strong ability to write production-level code. I've used a diverse range of technologies and frameworks. I've worked 6 months as an intern and 6 months as a full paid employee. My work includes three key aspects: scalability, security, and maintainability.

**Scalability:** In my projects and applications I had to make sure they can handle increasing user demands and data loads without performance degradation. I've had to develop cross platform applications which run across all possible devices. I was encouraged to write readable and modular codes. I had made use of flexible architectures that can grow alongside the business. For example, even though I do not work with flutter in my work, in personal projects using Flutter, I've structured the code to allow for easy feature expansions for the future. These are things I have picked up from web development. I made severe optimizations to accommodate future updates or a growing user base.

**Security:** In backend projects where I've worked extensively with Spring Boot, security was a major aspect. I have implemented security modules from the Spring Security library for authentication and authorization [2]. I integrated features like JWT (JSON Web Tokens) for secure access control. I used multiple encryption techniques like Bcrypt to safeguard sensitive data. I was encouraged to use best practices for preventing common vulnerabilities like SQL injection, cross-site scripting (XSS) and cross-site request forgery (CSRF).

**Maintainability:** I focus on writing clean, modular and well-documented code. To ensure long-term maintainability of the codes, this practice was particularly beneficial. While working on frontend projects using Angular, I've built reusable components and services. I focused on creating scalable component hierarchies using state management techniques like RxJs. Efficient data flow made the frontend both performant and maintainable as the project grew [5]. The most significant aspects of my growth at BRAC IT is the opportunity to work with a wide range of tools and technologies. This has helped me become a versatile developer. For instance, I've contributed to Angular projects by building feature-rich, web mobile applications. These focus on responsive design and high performance. This experience has enhanced my ability to deliver web applications that provide a smooth user experience across different devices and operating systems.

I've worked on multiple Spring Boot projects which has further developed my back-end development skills. Spring Boot helps you to create stand-alone, production-grade Spring-based Applications that you can run. [1]. When it comes to integrating security best practices, handling APIs, and managing databases, I've learned a lot, I can structure robust, RESTful web services that can efficiently serve client applications thanks to my experience. I can develop applications which can be web-based, mobile or hybrid.

For frontend development, I have been working with Angular which allowed me to craft rich, interactive user interfaces. During my time I've developed single-page applications (SPAs) that offer dynamic user experiences. They ensure smooth interaction and real-time feedback. By utilizing Angular's capabilities, I've been able to build applications that are not only visually appealing but also highly performant and responsive to use.

In BRAC IT I've had the privilege of working under the guidance of both a mentor and a supervisor. While being an integral part of a collaborative team, they have helped me learn. My mentor and supervisor have played a crucial role in shaping my technical skills which include code optimization, system architecture and mastering new technologies now and then. I've received invaluable one-on-one feedback. It helped me improve my coding practices. They also helped me grow a deeper understanding of best practices in software design, security and performance tuning.

After finishing my internship period at BRAC, I was assigned a supervisor. It has been vital in aligning my work with the broader objectives of the projects and the organization. They've guided me on project management where I had to meet deadlines, adhere to requirements, and maintain a high standard of quality in the solutions. My supervisor has also helped me prioritize tasks and manage the complexity of multiple projects simultaneously. Thus, reinforcing my ability to work efficiently in a fast-paced, dynamic environment.

I've worked in several projects, especially with CSAUP and BEP. My work on these web apps demonstrates my expertise in developing systems for large-scale management and financial auditing.

The CSAUP project focuses on micromanaging microfinance. It provides critical insights to auditors which helped them manage loans efficiently and track late payments. The scale and financial accuracy required in this application helped me learn about microfinance and backend auditing systems.

The BEP project seems like a comprehensive educational management system. It handled everything from student enrolment to teacher payments and classroom management across thousands of schools. Integrating bKash transactions added a layer of complexity, making it an excellent example of my experience in managing both educational and financial systems at a national level.

This mentorship and teamwork have been extremely valuable when I was work-

ing on projects. I've honed my skills in Flutter, Spring Boot and Angular under my mentor's guidance. During this time, I've refined my ability to write clean, scalable code in these technologies. My supervisor made sure that my effort contributes to the larger project goals.

I had the opportunity to learn from experienced professionals and collaborate within a supportive team. It has been essential for helping me grow, both technically and professionally. I've cultivated an ability to think critically about software development challenges and solutions. Here I'm improving not only my technical output but also my strategic decision-making in project execution.

Overall, my experience at BRAC IT has been outstanding. I have honed my technical expertise across Flutter, Spring Boot, and Angular. All of them while also deepening my understanding of how to build secure, scalable, and maintainable applications. These diverse experiences have given me a well-rounded perspective on full-stack development. It has me to contribute effectively to complex projects across different domains.

# Chapter 6

## Conclusion

During my time I have learned BRAC IT is not just a workplace. It is a thriving community of professionals who are passionate about technology and innovation. We have endless opportunities for growth, learning and contribution. If you're a seasoned professional or just starting out in your career, BRAC IT offers a supportive environment where you can truly develop.

With that being said, my growth as a professional web developer will not stunt itself on one organization alone, there still are much to learn and to explore other aspects of programming.

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