

Exploring Modern Web Application Development: A Practical Internship Experience at TechKnowGram Ltd.

by

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

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Declaration

It is hereby declared that

1. The thesis submitted is my 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. I have acknowledged all main sources of help.

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Abstract

This internship is a necessary component of my BRACU University Bachelor of Science in Computer Science program, which I must successfully complete in order to receive my degree. This report, which is the final work to be submitted under the CSE400 Final Thesis module, will undergo a thorough evaluation. In this document, I will give a thorough summary of my internship experience, including information on the company, the working environment, and the internship's goals. I'll also talk about the training I received and go into more detail about how this time sparked my interest in business software development. There will be a summary statement at the end of the report that summarizes the main ideas covered.

Keywords: Back-end; Laravel; Database; Front-end; Software Development

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Nomenclature

The next list describes several symbols & abbreviation that will be later used within the body of the document

AI Artificial Intelligence

API Application Programming Interface

CRUD Create Read Update Delete

IDE Integrated Development Environment

OTT Over The Top

QA Quality Assurance

QC Quality Control

Chapter 1

Introduction

1.1 Preface

In today's technology-driven world, nearly all industries and businesses rely heavily on advanced systems and software, resulting in a growing demand for skilled software developers. To make meaningful contributions to this rapidly evolving landscape after completing an academic degree and acquiring the necessary technical skills, gaining hands-on experience through an internship at a reputable technology firm is invaluable. Internship programs provide students from Computer Science or related disciplines with a unique opportunity to differentiate themselves in a competitive job market. By developing practical experience and building a robust skill set, interns are better prepared to tackle real-world challenges and attract the attention of prospective employers.

Internships provide final-year students with the opportunity to bridge the gap between academic learning and practical job experience. They allow students to apply theoretical knowledge in a real-world professional setting, gaining hands-on experience in their chosen field. This transition from classroom to workplace equips students with a deeper understanding of their industry and prepares them for the demands of the professional environment. Moreover, internships enable employers to assess the strengths and potential of their interns, assigning them to projects where they can contribute most effectively. By enhancing a student's professional experience, internships significantly boost the value of their resume, paving the way for excellent career opportunities.

1.1.1 About The Internship

To earn a bachelor's degree in Computer Science or Computer Science and Engineering from BRAC University, students are required to complete a thesis, project, or internship as part of the CSE400 course. While fewer students opt for the internship route, those who receive substantial support from their host organizations are encouraged to maximize their learning opportunities during the experience. Students are free to select an internship in any relevant field, provided it aligns with their degree program. To qualify, they must have completed a minimum of 72 university credits and undertake a six-month internship with a reputable local company.

1.1.2 About The Reports

As part of the university curriculum required to earn my Bachelor of Science degree in Computer Science from BRAC University, this report serves as the final submission for the CSE400 course. It provides a comprehensive account of my internship experience, which will be graded as part of the course assessment. The report includes an overview of the host company's background, its working environment, the goals of the internship, the training system, and my journey toward developing an interest in enterprise software development. Additionally, it outlines the objectives of the internship and the outcomes achieved. A summary and concluding remarks are presented in the final chapter.

1.2 Objective

The purpose of this report is to outline the primary problem statement, the key objectives I aimed to achieve during my internship, and the accomplishments realized throughout the experience.

1.2.1 Goal

The aim of this report is to showcase the insights and experiences I gained during the internship program.

1.2.2 Key Focus Area

The key focus areas of this report would be -

- About the company
- The workplace environment
- The company's overarching goals and objectives
- Objectives of the internship program
- The Enterprise Software Sector
- Training experience
- A comprehensive overview of the skills I acquired and the responsibilities I was assigned.

1.3 Methodology

This report centers on the insights I gained during my internship at TechKnowGram Limited, emphasizing the knowledge I acquired while working with the company. The content presented is based on my personal experiences as well as information sourced from the organization's official website. The data for this report was gathered from the following resources:

1.3.1 Primary Source

Personal experience at the workplace

- Insights from my supervisor (line manager) and colleagues
- Team meetings and workshops

1.3.2 Secondary Source

TechKnowGram Limited's official website - <https://techknowgram.com/>

Chapter 2

Company Profile

2.1 Overview

TechKnowGram Limited, a premier technology firm based in Bangladesh, excels in delivering bespoke web-based solutions across a spectrum of domains. The corporate headquarters is located at 5/9 Block B, Lalmatia, Mohammadpur, Dhaka 1207, Bangladesh. This company provides ERP, AI, Data Analytics, Robotics, and Embedded Solutions with Beacon, AR, VR Applications, Gaming, and Animation-based solutions. With a strong foothold in the Japan ICT market for over two decades, TechKnowGram is also well-established in the USA and European markets. The company boasts a seasoned team with over 25 years of cumulative professional experience, committed to providing cutting-edge solutions to its global clientele. TechKnowGram Limited is distinguished by its adherence to rigorous quality standards, being ISO 9001:2015, ISO14001:2015, and ISO/IEC 27001:2013 certified. The company is an active member of several esteemed organizations, including:

- Bangladesh Association of Software and Information Services (BASIS)
- Japan-Bangladesh Chamber of Commerce & Industries (JBCCI)
- Bangladesh Computer Samity (BCS)
- Bangladesh Association of Call Centers and Outsourcing (BACCO)
- Ecommerce Association of Bangladesh (e-CAB)
- CTO Forum of Bangladesh
- SheTrades Commonwealth Program by the International Trade Centre (ITC)

This extensive network underscores TechKnowGram's commitment to excellence and innovation in the technology sector.

2.2 Vision of The Company

TechKnowGram Limited is dedicated to delivering high-quality products and services that drive dynamic change and provide significant client value through ethical practices. The company focuses on offering enterprise-level, industry-standard software solutions to both domestic and international markets. Its long-term goal is to

become a reputable leader in the software industry, renowned for its commitment to quality and customer satisfaction.

2.3 Mission of The Company

TechKnowGram Limited aims to expand globally by offering enterprise-level, industry-standard software solutions to clients locally and abroad. Their goal is to become the top rival in Japan and to dominate the worldwide software market.

2.4 TechKnowGram Limited's Methods of Operation

A business needs to have the greatest setup and resources to guarantee high-quality software services. The basic operation of the company is outlined below:

2.4.1 Partnership and Sponsorship

TechKnowGram Limited, under the leadership of CEO AKM Ahmedul Islam BABU, independently generates its revenue, which is subsequently managed and distributed by him.

2.4.2 Client Base

Ownership of the product is transferred to the customer upon delivery, and TechKnowGram Limited provides post-release maintenance services based on the client's needs. Additionally, the company offers a range of in-house products that customers can subscribe to, ensuring personalized ownership and adaptable, subscription-based access to cutting-edge technologies.

2.4.3 Product Ownership

Ownership of the product is passed to the client upon delivery. TechKnowGram then provides customized post-release maintenance services. Additionally, TechKnowGram offers ready-made products via a subscription model, allowing users to access high-quality, ready-to-deploy solutions without upfront costs. Both ownership and subscription models are supported by strong, ongoing maintenance and customer support.

2.4.4 DevOps

TechKnowGram follows a DevOps framework integrating software development and IT operations to accelerate the system development lifecycle and deliver high-quality software continuously. Our company is organized into several specialized DevOps teams, responsible for the entire development process, from initial development to deployment, testing, release, and operations.

2.4.5 Quality Assurance

Quality assurance (QA) is an essential process ensuring that software services and products adhere to the highest standards of quality. A dedicated QA team is responsible for maintaining TechKnowGram Limited's commitment to excellence in software delivery.

2.5 Services by TechKnowGram Limited

TechKnowGram specializes in web-based customized solutions across multiple domains, including ERP, AI, Data Analytics, Robotics, Embedded Solutions, AR, VR Applications, Gaming, and Animation.

2.5.1 Data Centre Solutions

TechKnowGram offers state-of-the-art modular data center solutions, ensuring mission-critical data is protected with the highest levels of security and operational reliability.

2.5.2 Cloud & DevOps

We provide cloud and DevOps consulting services that aid in process automation and standardization, improving deployment quality and operational efficiency.

2.5.3 IT Security Services

Through comprehensive threat audits, we identify infrastructure vulnerabilities and implement encryption and security measures to ensure system safety.

2.5.4 AI & Machine Learning

We offer AI and machine learning software development services to assist businesses in gaining insights and automating processes.

2.5.5 Custom Software Development

Our team of analysts and developers design tools and applications to solve unique business challenges by closely collaborating with clients.

2.5.6 Skill Migration Education Investment to Japan, Malaysia

We facilitate education investment in skill migration for Bangladeshi workers to Japan, Malaysia, and Canada, with access to thousands of CVs from Japanese employees.

2.5.7 AI, AR, VR, Big Data, Robotics, IoT in Malaysia

TechKnowGram develops AI, IoT, AR, VR, Big Data applications, and solutions to meet the demands of the Fourth Industrial Revolution.

2.6 Products

TechKnowGram Limited has developed various successful products:

2.6.1 TKG ERP

A customizable enterprise resource planning solution developed with the latest 4IR technology, suitable for multiple industries including manufacturing, education, and construction.

2.6.2 Prostuti - An Exam Management Platform

Prostuti, developed by TechKnowGram, revolutionizes exam management by automating traditionally cumbersome processes. The platform simplifies exam planning, administration, and attendance, offering a seamless experience for both examiners and examinees. Here's how Prostuti enhances efficiency and convenience:

- **Automated Procedures:** Prostuti eliminates manual tasks associated with exam management, such as scheduling exams and managing attendance records. This automation reduces administrative burden and minimizes the likelihood of errors.
- **Streamlined Administration:** The platform centralizes all exam-related activities, making it easier for administrators to oversee multiple exams simultaneously. From setting up exam timetables to monitoring progress, Prostuti ensures smooth administration.
- **Enhanced User-Friendliness:** Designed with user experience in mind, Prostuti offers an intuitive interface that is easy to navigate for both examiners and examinees. This accessibility fosters a positive experience and encourages adoption across various educational institutions.
- **Improved Efficiency:** By digitizing processes that were once manual, Prostuti increases overall efficiency in exam management. Institutions can allocate resources more effectively, focusing on educational outcomes rather than administrative logistics.
- **Comprehensive Support:** TechKnowGram provides robust support to institutions implementing Prostuti, ensuring a seamless transition and ongoing assistance. This support enhances reliability and trust in the platform's capabilities.

In conclusion, Prostuti by TechKnowGram is a transformative tool that modernizes exam management, offering automation, efficiency, and user-friendliness. It represents a significant advancement in educational technology, promising to elevate the experience for all stakeholders involved in the examination process.

2.6.3 KHOZ - Beacon-based Indoor Navigation System

newly developed Beacon-based Indoor Navigation System leveraging IoT technology.

- **Core Functionality:** It provides precise and up-to-date location data to users navigating indoor environments.
- **Technology Used:** The system uses beacons, which are small, cost-effective, and battery-powered devices emitting a Bluetooth signal.
- **Device Compatibility:** Mobile devices such as smartphones can detect these Bluetooth signals.
- **Ideal Use Case:** This solution is perfect for event management in supermarkets, aiding in both location tracking and promotional activities.

Chapter 3

Enterprise Software Development

3.1 Internship Objectives and Outcomes

The phrase “Internship Objectives and Outcomes” As a Software Engineering intern at TechKnowGram Limited, I anticipate a comprehensive and rigorous training program designed to enhance my skills and provide practical insights into backend development. This program aims to give me hands-on experience with real-world projects, all while being guided by seasoned mentors and industry experts.

These technologies have historically been implemented on-site as full-featured enterprise resource planning (ERP) suites from well-known software vendors such as Microsoft, IBM, SAP, and Oracle. This also includes industry-specific solutions, which are frequently created as custom applications. To guarantee smooth functioning throughout the company, IT professionals usually link these specialist systems with more general corporate applications or ERP suites.[1]

Enterprise software development is the process of creating and implementing specialized systems and applications that are suited to the particular requirements of companies. It is essential for improving workflows, simplifying operations, and facilitating data-driven decision-making, all of which promote success and growth. Building solutions that easily integrate with an organization’s current workflows, procedures, and infrastructure is the main goal of enterprise software development. It increases total productivity by automating repetitive operations, reducing human error, and optimizing efficiency. Enterprise software is also essential for increasing operational efficiency and encouraging cooperation inside the company.

Enterprise software development is a potent instrument that aids businesses in improving productivity, streamlining processes, and achieving sustained success. It reduces the possibility of fines and damage to one’s reputation by guaranteeing adherence to industry-specific standards and compliance regulations. Businesses may streamline their operations and keep a competitive advantage in the fast-paced market of today with the help of this specialist area of software development.[3]

3.2 Popular Technologies

From creation to implementation, enterprise software development involves a wide range of technologies. Here are some well-known ones that are utilized in business software development:

3.2.1 PHP-Laravel Framework

The popular PHP framework Laravel was created to make web application development easier with its robust syntax and developer-friendly features. It gained popularity by emphasizing ease of use, adaptability, and a robust ecosystem, including capabilities like routing, authentication, and unconventional database administration. Developers, startups, and large corporations all utilize Laravel to create safe, scalable online apps. MVC architecture, integrated security features, and smooth database transfer are some of its strong aspects. Laravel is a great option for full-stack development since it integrates PHP, MySQL, and JavaScript, guaranteeing both front-end and back-end functionality.

3.2.2 Node.js

Developers can utilize JavaScript for server-side programming with Node.js, a JavaScript runtime based on Chrome's V8 engine. It gained popularity because of its event-driven, non-blocking architecture, which is perfect for large web applications and can handle several requests at once. Node.js is used by big businesses like Netflix, LinkedIn, and Walmart because of its effectiveness in real-time applications. It is lightweight and quick because of the combination of technologies including JavaScript, the V8 engine, and asynchronous programming. Scalability, great performance, and a large library ecosystem through npm, which facilitates rapid and effective development, are some of its strong characteristics.

3.2.3 SQL

SQL (Structured Query Language) was created specifically for relational database administration. It became well-liked because of how easy and effective it was at managing big datasets. Database administrators, developers, and data analysts utilize SQL to query, update, and manage data. Its ease of use, scalability, and versatility are among its advantages. Because of its strong integration with enterprise systems, web apps, and data analytics platforms, SQL is crucial in a wide range of industries.

3.2.4 Tailwind CSS

Tailwind CSS is a utility-first framework that streamlines web design by enabling quick, custom styling directly in HTML. Its popularity grew due to its modular structure, widely adopted by developers for its flexibility. It combines CSS, HTML, and JavaScript, offering rapid development, responsive design, and easy customization.

3.2.5 React and React Native

Facebook created the well-known JavaScript package React to create dynamic user interfaces. Businesses like Facebook, Instagram, and Airbnb have embraced it broadly due to its component-based architecture, virtual DOM, and effective rendering. React easily combines with JavaScript, HTML, and CSS. React Native is a popular open-source framework developed by Facebook for building mobile apps using JavaScript and React. Its capacity to produce cross-platform apps for iOS

and Android using a single codebase contributed to its rise in popularity. Its performance, quick development, and code reuse make it a popular choice for businesses like Facebook, Instagram, and Airbnb. It combines native mobile platform features with the component-based architecture of React.

3.3 Beginning Steps Towards Enterprise Software Development

It takes a mix of technical understanding, strategic thinking, and practical experience to learn enterprise software development. The steps I've learned are as follows:

1. To build a strong programming foundation, start by learning languages commonly used in corporate software development, such as Java, C#, Python, or JavaScript. Focus on mastering the basics of object-oriented programming, including key concepts like data structures, algorithms, and design patterns.
2. Develop an understanding of key corporate architectural patterns like client-server, service-oriented (SOA), microservices, and event-driven architectures. Learn the fundamental concepts behind these structures and how they contribute to creating scalable and resilient enterprise-level applications.
3. Enhance your understanding of data management and databases by familiarizing yourself with concepts such as data modeling, SQL (Structured Query Language), and relational databases. Since effective data management is crucial for developing software solutions for businesses, focus on learning how to design and optimize databases tailored for various business applications.
4. Grasping the intricacies of the internet is essential, as it involves understanding networking basics and web protocols. To effectively engage in both client-side and server-side programming, a comprehensive knowledge of these concepts is necessary.
5. Achieving expertise in web development technologies is crucial. Familiarize yourself with essential tools like HTML, CSS, Laravel, and Node.js. Develop your skills in backend frameworks and libraries such as Node.js or Laravel, along with frontend frameworks like Angular, and React since contemporary enterprise applications typically feature web-based user interfaces.
6. Explore backend development by gaining insights into technologies like Node.js, which are pivotal for building server-side components of enterprise applications. Familiarize yourself with web services, including SOAP and REST, as well as APIs, server-side frameworks, and security protocols.
7. Analyze frameworks for business applications: Explore corporate software frameworks like Node.js, Laravel, and Django (Python), which offer robust tools and libraries for creating scalable and adaptable enterprise applications.
8. Learn how to use company-oriented applications: Familiarize yourself with the development tools commonly employed in enterprise software development, such as integrated development environments (IDEs) and version control systems like Git.

To effectively learn enterprise software development, it's essential to tackle various aspects simultaneously rather than following a strict sequence. For instance, gaining an understanding of web fundamentals, Java programming, setting up the Spring framework, and establishing a basic server can all be pursued in parallel. Once I grasp the foundational concepts, it's crucial to embark on a project that provides real world experience, allowing me to encounter challenges and learn to overcome them. As I progress, I will gradually build proficiency in frameworks, libraries, integrated development environments (IDEs), and version control systems. In the following section, I will outline my approach to starting out in enterprise software development. [2]

To stay current with the latest trends, best practices, and emerging technologies in enterprise software development, I actively engage with industry blogs, forums, and groups. Continuous learning and self-improvement are essential in this ever-evolving field.

Chapter 4

Internship Objectives and Outcomes

As a Software Engineering intern at TechKnowGram Limited, I anticipate a comprehensive and rigorous training program designed to enhance my skills and provide practical insights into backend development. This program aims to give me hands-on experience with real-world projects, all while being guided by seasoned mentors and industry experts.

4.1 Technical Training & Practical Experience

The internship offers practical, hands-on experience in backend engineering, allowing participants to work on real-world projects alongside experienced professionals. Interns will gain insight into industry best practices while applying their academic knowledge to practical situations. This experience helps build a strong foundation in backend development, along with exposure to front-end technologies.

4.2 Skill Development

The internship program aims to enhance technical skills in both backend and front-end engineering. Interns will have the chance to learn and apply various programming languages, frameworks, databases, and other critical technologies. TechKnowGram Limited is committed to equipping interns with the expertise necessary to develop robust and scalable backend systems.

4.3 Collaboration and Team Work

The internship at TechKnowGram Limited emphasizes the significance of collaboration and teamwork within a professional environment. Interns have the opportunity to work closely with expert engineers and cross-functional teams while directly engaging with the backend development team. This experience aims to enhance effective communication, foster teamwork, and build the ability to work harmoniously in a collaborative setting.

4.4 Mentorship and Guidance

At TechKnowGram Limited, we prioritize the development of our interns by offering dedicated support and supervision throughout their internship. Each intern is paired with a mentor who provides ongoing guidance, encouragement, and constructive feedback. The mentor's role includes helping interns establish their learning objectives, navigate challenges, and gain valuable insights into the industry. This approach ensures that interns receive personalized attention and can fully leverage their mentors' expertise and experience.

4.5 Developing a Professional Network

Interns at TechKnowGram Limited can build professional connections by collaborating with diverse experts and participating in various organizational activities.

4.6 Exposure to Work Processes

During the internship program, participants gain valuable insights into industry standards and practices in backend engineering. They will explore various aspects of the software development lifecycle, engage in code reviews, and become familiar with version control systems and other best practices commonly used in the field. This experience ensures that interns are well-prepared for their future careers as backend developers, equipped with a solid understanding of the industry's expectations.

4.7 Development on Both a Personal and Professional Level

TechKnowGram Limited internship program is designed to foster both personal and professional growth in its interns. Participants will have the opportunity to enhance not only their technical skills but also essential soft skills such as communication, problem-solving, and time management. This approach ensures that interns emerge from the program with a well-rounded skill set and a sense of accomplishment in their personal and professional development.

Chapter 5

Training Experience

5.1 Overview

Securing an opportunity to work in an IT company marks a significant milestone for a newcomer like myself. The importance of internships in the software development industry cannot be overstated. Experience in IT is not merely advantageous; it is essential. Internships offer the most effective pathway to acquire such experience.

Internship programs tailored for IT graduates and students play a pivotal role in launching a successful career. Throughout these programs, students receive mentoring from seasoned industry professionals. This mentorship is invaluable, offering opportunities to learn essential skills and gain firsthand experience in the field.

Participating in an internship designed for aspiring IT professionals establishes a robust foundation for future growth and achievement within the industry. At Tech-KnowGram Limited, I have been assigned to a project management team. Although interns are not permitted to work directly on live projects, they are given analogous practice projects that mirror the actual products. This approach ensures that interns are regularly monitored, supported, and guided by a Senior Software Engineer who acts as a mentor, thereby providing newcomers with an industry-standard experience.

Initially, my training involved engaging with theoretical references and tutorials, predominantly at the beginning of the internship. These resources were instrumental in developing a comprehensive understanding of the foundational concepts required for effective project management and software development. The structured guidance provided by the senior mentor was invaluable in contextualizing these theoretical insights within practical applications.

The resources provided encompassed a variety of formats, including:

- **Documentation:** Detailed technical manuals and process documents helped in understanding the company's methodologies and best practices.
- **Online Courses:** These were essential in covering the latest tools and technologies used in the industry, providing a hands-on learning experience through interactive modules and exercises.
- **Industry Case Studies:** These offered real-world examples of project management challenges and solutions, facilitating the application of theoretical knowledge to practical scenarios.

My experience at TechKnowGram Limited has been profoundly enriching. The combination of theoretical learning and practical application, underpinned by continuous mentorship, has significantly enhanced my competencies in project management within the IT domain. This internship not only prepared me for future professional endeavors but also instilled a deep appreciation for the structured and meticulous approach required in the technology sector.

5.2 Introduction to the Basics of Software Development

I received comprehensive training on the fundamentals of software development. This included an in-depth understanding of how the web operates, practical tools, and software for tracking data flow, among other essential topics. Below, I will outline the key areas of knowledge covered during this training.

5.2.1 Learning How Data Flows on the Web

My mentor recommended that I deepen my understanding of backend development by learning about the basic data flow across different network layers. Consequently, I was provided with materials on network models, the HTTP protocol, and related topics. My primary focus was on understanding how HTTP requests are made, what they contain, how HTTP responses are returned, and their contents.

5.2.2 TCP/IP

The Transmission Control Protocol/Internet Protocol (TCP/IP) suite encompasses a group of communication protocols used for interconnecting network devices on the Internet. TCP/IP also serves as the communication mechanism for private computer networks, such as intranets and extranets. While TCP and IP are the most prominent protocols within the suite, it includes a variety of other protocols as well. The TCP/IP protocol suite functions as an abstraction layer, bridging the gap between internet applications and the underlying routing and switching fabric.

5.2.3 API and Postman Software

APIs enable independent programs to transfer and share data seamlessly, eliminating the need for a graphical user interface to execute actions for users. For developers, APIs offer a straightforward method to leverage and test various software features. However, managing and testing multiple APIs daily can be challenging due to the need to remember specific request addresses, headers, authorization credentials, and other details. This complexity also complicates the process of testing APIs for usability, security, and error handling.

Postman, an API client, addresses these challenges by allowing developers to create, distribute, test, and document APIs easily. This open-source application enables users to generate both simple and complex HTTP/s queries, store them, and review the results efficiently.

There are various benefits to using the open-source, free Postman tool for API testing, such as:

- With cloud-based accessibility, tests using the Postman API can be executed anytime, anywhere.
- Collaboration is enhanced with Postman's import and export features, facilitating closer team communication by simplifying the process of sharing files with other team members.
- Testing is streamlined with Postman, allowing the inclusion of test checkpoints in API calls, such as verifying successful HTTP response statuses. This feature enables teams to achieve more comprehensive test coverage.
- Automated testing of APIs can be achieved using Postman's tools like Collection Runner, enabling significant time and resource savings. easier bug fixing, the Postman console aids teams in verifying retrieved data, thereby simplifying API test debugging.

5.3 First Task

My first task was to build an API in Laravel.

5.3.1 Technologies Used

- **Xampp** - XAMPP serves as an all-in-one development platform that enables the creation of PHP and Perl-based server-side scripting applications without relying on a remote web server. This local server setup accelerates the development process, enhances security, and allows for offline work. Equipped with crucial components like Apache, MySQL, PHP, and Perl, XAMPP streamlines the development process. Developers can build, test, and perfect their applications in a secure, controlled environment, ensuring they perform optimally before being deployed.
- **MySQL** - MySQL is a widely-used relational database management system (RDBMS) that organizes data into separate tables rather than consolidating all information into a single, large repository. This approach not only enhances data organization but also optimizes query performance and data retrieval speed. Each table within the database can be related to others through keys, facilitating efficient data management and complex queries. The physical structure of a MySQL database is meticulously optimized for performance, employing various indexing and storage techniques to ensure rapid data access and manipulation. MySQL supports multiple storage engines, such as InnoDB and MyISAM, allowing users to choose the best fit for their specific use cases. Other than Xampp, I have used this with the Laravel framework.

5.3.2 Tools and Software Used

- **Visual Studio Code** - I was instructed to begin the task using Visual Studio Code, a robust, free coding tool designed to enhance development speed and efficiency. Created by Microsoft, Visual Studio Code supports a wide array of programming languages, including Python, Java, C++, and JavaScript,

allowing seamless coding without the need to switch editors. This versatile editor is compatible with both Windows and Linux, making it an excellent choice for developers across different platforms.

- **Postman** - An open-source API testing software, as mentioned in the previous section, is a valuable tool for developers seeking to ensure the reliability and performance of their APIs. This software facilitates comprehensive testing and debugging, enabling developers to identify and resolve issues efficiently. Its open-source nature allows for continuous improvement and customization, aligning with the diverse needs of various projects and development environments.

The initial two weeks focused on the first task proceeded satisfactorily, resulting in the successful and timely submission of the mini-project. This training phase's main lessons learned were: –

- Gaining a comprehensive understanding of API functionality
- Clearly understanding HTTP requests and responses
- Acquiring familiarity with development tools and software
- Becoming proficient with the Laravel framework.
- Getting Learning how a full-stack enterprise-grade software system operates.

5.4 Getting Introduced to Enterprise Software Development

5.4.1 The Beginning

My introduction to Laravel, a PHP framework, began under the guidance of my mentor who recommended online tutorials and the official Laravel documentation to initiate my journey. Laravel is extensively utilized at TechKnowGram Limited across a wide array of projects. I have been tasked with developing a Blog website, focusing initially on the server-side implementation using Laravel. This phase involves integrating a relational database management system, starting with MySQL via XAMPP. Following the completion of the backend, the subsequent step will involve the development of the front end to create a comprehensive solution that addresses real-world requirements and leverages Laravel effectively. This project aims to impart practical experience in building functional web applications tailored to specific technological stacks and feature sets.

5.4.2 The First Project

I was assigned the responsibility of creating a Blog Management System using a specific tech stack and feature set. The goal was to gain hands-on experience with Laravel by building a practical project that addresses real-world needs. Initially, I focused on developing the front end, followed by the server-side implementation, which involved setting up a relational database management system.

5.5 Web Application: developing a Blog website

Blog websites achieved global connectivity due to the confluence of software programming advancements and the ubiquitous reach of the internet. Programming websites, serving as incubators for technical expertise and innovative tools, empowered individuals globally to create and customize blogs. These platforms democratized content creation, fostering a diverse array of voices and interests. Simultaneously, the expanding internet infrastructure facilitated seamless access and dissemination of blog content worldwide. As a result, blog websites evolved from niche platforms to influential mediums, enriching cultural exchange, knowledge sharing, and societal discourse on a global scale.

The application comprises three primary components: User management, Blog post functionality, and Post management. Users are able to register and log into the system. They possess full control over blog posts through CRUD operations (Create, Read, Update, Delete), enabling them to add, edit, and remove posts. Each user can manage their account settings, including account creation, modification, and deletion. Furthermore, users have exclusive access to view, modify, and delete posts associated with their unique user ID.

5.5.1 Feature Requirements

Blog websites have gained global connectivity thanks to advancements in software programming and the widespread availability of the internet. Programming websites have acted as catalysts for developing technical skills and innovative tools, allowing individuals around the world to create and personalize their own blogs. This shift has democratized content creation, leading to a rich diversity of voices and interests being represented online. Concurrently, the growing internet infrastructure has made it easier for people to access and share blog content worldwide. Consequently, blog websites have transformed from niche platforms into significant mediums for cultural exchange, knowledge sharing, and societal discussion on a global scale.

The application is built around three main components: user management, blog post functionality, and post management. Users can register and log into the system, gaining full control over their blog posts through various operations (Create, Read, Update, Delete). This functionality allows them to add, edit, or remove posts as they see fit. Additionally, users can manage their account settings, which include creating, modifying, and deleting their accounts. Importantly, users have exclusive rights to view, edit, and delete posts that are linked to their unique user ID. My supervisor gave me a list of features. These are listed below : My supervisor gave me a list of features. These are listed below -

- As a new user, I would like the ability to create an account in the Blog Management System. This would enable me to access the platform and manage my blog account information effectively.
- As a registered user, I would like the option to log into the Blog Management System so that I can access the platform and carry out the necessary actions.

- As a user, I want to have access to a dashboard where I can manage Blog post data within the Blog Management System.
- As a user, I want to have access to a dashboard where I can view and manage my account information within the Blog Management System.
- As a user, I want to have secure access to my user information within the Blog Management System, so that I can efficiently manage and update Blog posts or ID data.
- As a user, I expect the Blog Management System to implement robust authentication and authorization processes to guarantee the security of my data.

1. **User Registration and Authentication:**

- User registration with basic details like name, email address, password.
- Secure authentication mechanism to verify user credentials during login(Laravel IN-BUILT mechanism used).

2. **User Profile Management:**

- Ability for Bloggers to manage their profile information, such as name, contact details, profile picture, and Blog posts.
- Option to update and modify personal information.

3. **User Dashboard:**

- Access to view, add, update, and delete Blog posts.
- Search Search functionality to find specific posts.

4. **Security and Data Privacy:**

- Establish effective security protocols to safeguard user information and maintain data privacy.
- The login and logout functionalities must be highly secured to prevent any unauthorized access. Implement encryption for sensitive information and comply with data protection regulations.

5.5.2 Tools and Technology Stack

1.

1. Laravel
2. Xampp
3. Visual Studio Code
4. Postman
5. Local Server

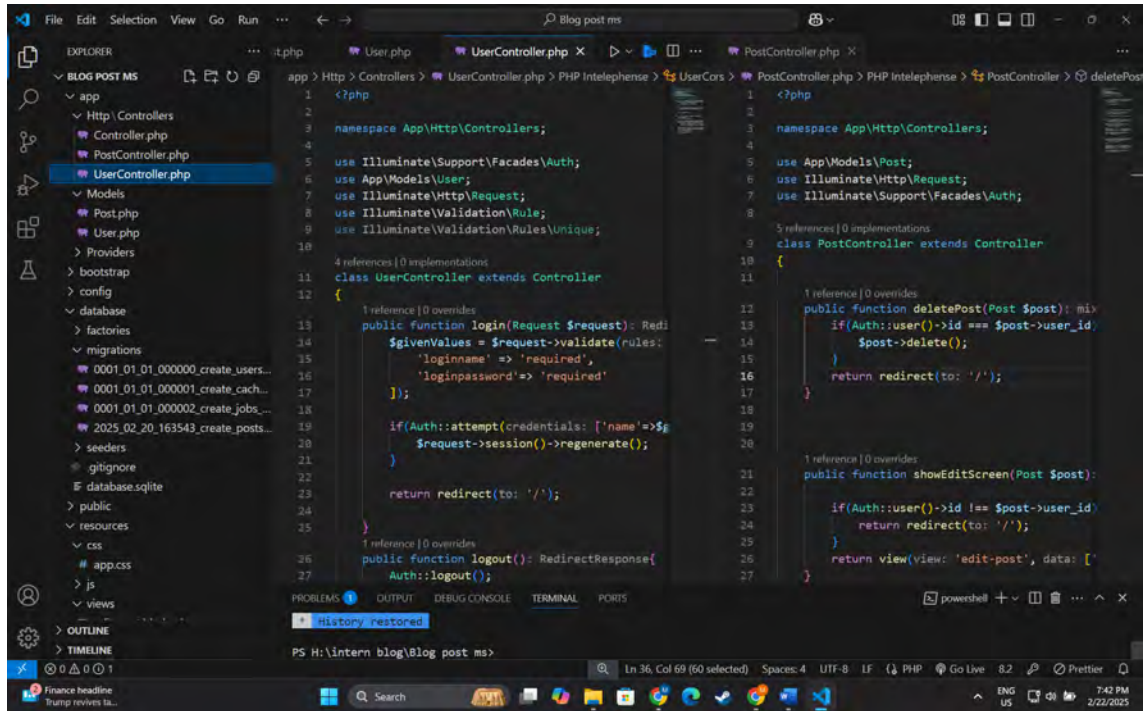


Figure 5.1: Blog post website on Visual Studio Code

Figure 5.2: Apache Tomcat Server Running- IntelliJ Spring Boot

5.5.3 Project Architecture

The project adhered to a defined architectural structure based on given guidelines. I was instructed to implement the Model-View-Controller (MVC) pattern for server side/back-end development. In the *Blog Management System* project at Tech-KnowGram Ltd., data traversed multiple layers throughout its lifecycle. Under the guidance of my supervisor, I was instructed to implement Laravel with its built-in authentication system. The project architecture was structured into distinct layers, ensuring efficient data flow and system functionality.

1. Presentation
2. Persistence
3. Database

I was instructed to implement the Model-View-Controller (MVC) design pattern in the project. This architecture consisted of three key components: “Models”, which formed the foundation of the project by managing data and business logic; “Views”, responsible for processing and rendering the final output sent to the client; and “Controllers”, which directed data flow and executed the necessary logic. The project’s file structure within Visual Studio Code is illustrated in the snapshots on the following page.

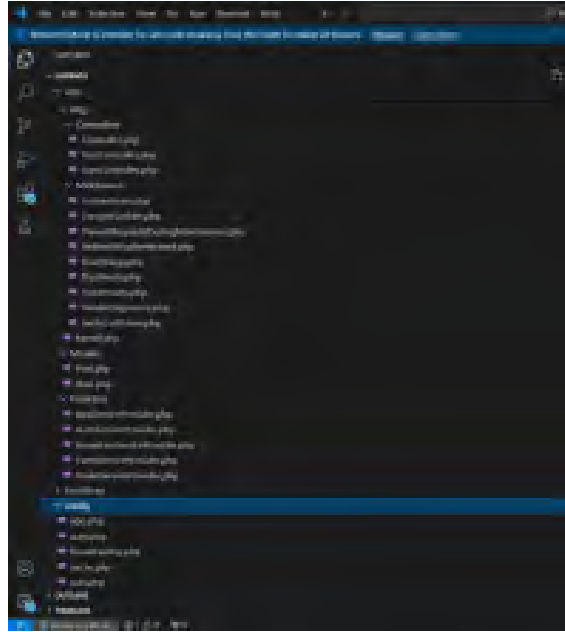


Figure 5.3: File arrangement denoting the project architecture

5.5.4 Challenges

- Integrating MySQL through XAMPP with the Laravel PHP framework, along with HTML and CSS, requires setting up the correct build process and configuring the project structure to work seamlessly together. This process can be challenging, especially for someone like me who was not initially familiar with either system, making it difficult to run the projects smoothly.
- As a developer new to both PHP and Laravel, I found that getting familiar with these technologies involved a substantial learning curve, requiring considerable time and effort to understand their core principles.
- Implementing proper security measures, including authentication and authorization, for both the front end and backend proved to be quite challenging. To ensure functionality, I opted for the most straightforward approach.
- I primarily used Postman for testing to validate functionality, and retrieve, and update data. Establishing seamless communication between frontend components and the Laravel API was challenging for me, particularly in handling authentication, data validation, and error management.
- To enhance the user experience, I streamlined the code by removing unnecessary lines and simplifying it, opting for more direct methods and APIs.

5.5.5 API Testing

Laravel applications frequently interact with a backend API to retrieve and update data. Ensuring seamless communication between frontend components and the Laravel backend can be challenging, especially when dealing with tasks like authentication, data validation, and error handling.

Chapter 6

Internship Outcomes and Takeaways

6.1 Learning

During my internship, I had the opportunity to translate theoretical knowledge from my studies into practical applications in real-world scenarios, while also honing valuable skills in Enterprise Software Development.

6.2 Understanding Enterprise Software Development

A primary objective of my internship was to familiarize myself with the concepts and practices involved in enterprise software development. I gained insights into the challenges and considerations of building large-scale, robust, and scalable systems. This included understanding the importance of modular architecture, efficient data management, security protocols, and integration with existing corporate systems.

6.3 Practical Experience with Modern Technologies

While I was an intern, I gained exposure to a wide range of modern technologies and methodologies employed in corporate software development. I had the opportunity to work with advanced frameworks, databases, and development environments, which allowed me to refine my technical skills and build expertise in enterprise software development tools such as PHP, JavaScript, Node.js, MySQL, Git, and more.

6.4 Engaging in Cross-Functional Team Collaboration

Participating in an enterprise software development project required effective collaboration with cross-functional teams. I had the chance to work closely with product managers, business analysts, UX/UI designers, and quality assurance engineers.

This experience enhanced my understanding of the importance of clear communication, teamwork, and aligning technical solutions with business objectives.

6.5 Agile Development Methodologies

During my internship, I gained practical experience with agile methodologies like Scrum. This helped me understand the importance of iterative development, continuous integration and deployment, and using project management tools.

6.6 Troubleshooting and Problem Solving

I had the chance to work through a variety of complex technical challenges and resolve issues that arose during the development process. I learned how to systematically approach problems, conduct thorough root-cause analyses, and implement effective solutions. This practical experience significantly enhanced my critical thinking and troubleshooting abilities.

6.7 Continuous Learning and Personal Development

Throughout my internship, I recognized the importance of continuous learning and personal development. I took the initiative by exploring various resources, enrolling in online courses, and reading relevant publications. This dedication to staying informed helped me keep up with emerging technologies and industry trends.

Chapter 7

Conclusion

My journey in the software industry began with an internship at TechKnowGram Limited. Within two months, I became comfortable with the work environment, although the routine of office hours, often spent in front of the computer, led to occasional boredom. However, I now feel confident in my understanding of the fundamentals of software development and am prepared to tackle more complex systems and challenges.

One of the most valuable lessons I've learned is the importance of approaching problems from multiple perspectives. By analyzing a single issue in various ways, I've been able to uncover insights that I might have otherwise missed. Additionally, I've realized the significance of thoroughly testing every feature—just because something works as expected doesn't mean it's free of errors. Even small, seemingly obvious mistakes can easily be overlooked, which emphasizes the need for patience and attention to detail. Rushing through tasks can lead to unnecessary setbacks, and success in this field requires a methodical and patient approach.

Most of the projects I've worked on during my internship have been practice assignments. Observing the work of senior team members, I've come to understand that software development, particularly enterprise-level product development, is far from simple. It requires a blend of perseverance, focus, and patience. The competitive nature of the industry, combined with the need for continuous learning and self-improvement, can make even minor issues take days to resolve.

My internship, which started in December 2023 and lasted six months, ending in May 2024, has been an invaluable experience. To fulfill the requirements of the CSE400 course module (Final Thesis), I have documented the five months of my learning and experiences in this report. Through this process, I've gained deeper insights into both the technical and personal demands of a career in software development.

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