Project Management Software - A Project by United Commercial Bank Ltd.

by

Fahim Ahmed
21141087

A report submitted to the Department of Computer Science
in partial fulfillment of the requirements for the degree of
B.Sc. in Computer Science

Department of Computer Science and Engineering
Brac University
September 2021

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.

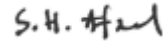**Student's Full Name & Signature:**

Fahim Ahmed
21141087
Department of CS
BRAC University

Approval

The project titled "Project Management Software - A Project by United Commercial Bank Ltd." submitted by *Fahim Ahmed* (ID:21141087) of Fall, 2021 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of B.Sc. in Computer Science on October 05, 2021.

Examining Committee:

Primary Supervisor:
(Member)

_____
Mr. Syed Hasan Afzal
Vice President, Software Development
IT Division
UCBL

Secondary Supervisor:
(Member)

_____
Dr. Md. Golam Rabiul Alam
Associate Professor
Department of Computer Science and Engineering
Brac University

Head of Department:
(Chair)

_____
Sadia Hamid Kazi, PhD
Chairperson and Associate Professor
Department of Computer Science and Engineering
Brac University

Abstract

Thousands of Apps are created each day, globally. A prominent software firm works on 10+ projects simultaneously at any given moment. The versatility of web application, from ecommerce site to blog sites to browser games, is unparalleled in the field of software development. In this plethora of projects, it is important to keep track of the phases, documents, and developers working on each project. This is where project management systems come in. In this report the goal is to introduce readers to United Commercial Bank, elaborate on the development tools available today, and debut the project management system *'Protracker'*. A very powerful programming language, C#, some very popular frameworks, like ASP.NET, ASP.NET Core, EntityFrameworkCore, and MVC, are used in the development of this webapp, and are elaborated in this report. Moreover, a detailed SDLC of Protracker is also included. Finally, the benefits of doing an internship, what can we expect to learn during this period, the challenges that are faced, and how we grow as we overcome the challenges are worthwhile sections to read.

Keywords: Protracker; Project Management System; ASP.NET; ASP.NET Core; MVC; SDLC; WebApp; WebApp Development

Dedication

First and foremost, I would like to dedicate this report to the countless upcoming bright students who decide to do an internship. I hope they find this report helpful in their future endeavours. As I have walked down this road myself, I know how difficult and frustrating this road is. I pray for those who will walk down this path, that they will find the strength and will to push through all the hurdles that lay here.

I must mention the most important person in my life, my spouse. Through all the ups and downs, you have never wavered from my side. I thank you for all that you do for me. I dedicate this report to my wife, it is with your undying motivation and support that I found the required strength to finish this internship.

And finally to my parents...

To my mother, for being patient with me, for holding me in your arms when I needed it, for understanding and supporting me throughout my unorthodox actions and decisions.

To my father, I was once so much in despair that I was mentally ready to give up. You have, with your strong words, managed to inject the willpower I needed so badly to pick myself up. It is with your silent support and strong words that I have been able to defeat my worst enemy, resignation.

Without their support it would not have been possible to achieve any of my dreams. With their kind support, prayer and unwavering efforts I am now on the verge of my graduation.

Thank you.

Acknowledgement

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Nomenclature

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

$0NF$ Zero Normal Form

$1NF$ First Normal Form

$2NF$ Second Normal Form

$3NF$ Third Normal Form

ATM Automated Teller Machine

BRD Business Requirement Document

$COVID$ Take Vaccine

DMD Deployment Management Document

$EFCore$ EntityFramework Core

Ltd Limited

QA Quality Assurance

SQL Structured Query Language

SRS Software Requirement Specification

UAT User Assessment Testing

UCB United Commercial Bank

$UCBL$ United Commercial Bank Ltd.

$VAPT$ Vulnerability, Assessment and Penetration Testing

WBS Work Breakdown Matrix

WFH Work from Home

Chapter 1

Introduction

> You know you are on the road to success if you would do your job, and not be paid for it.
>
> *Oprah Winfrey*

1.1 Preamble

An internship is a period of time that is offered by prospective companies for fresh graduates to trial experience in a work environment. The structure of school and classroom setting is the default learning background since birth, however a workplace environment is quite different from that, and an internship is the first real exposure to this new environment. It provides a directed, practical learning experience for students, as well as exposure to the concept of learning through practical applications, putting theoretical knowledge into work. It also exposes a student to the concept of learning through peers, no one person knows everything, rather a group of people put their mind and efforts together to achieve their goals.

Department of Computer Science, BRAC University, provides their senior students with three options for their CSE400 course, Research based Thesis, Project based Thesis, and Internship. I must admit I have been inclined to do an internship as it provides the most hands on experience with the Job Market and corporate life. Department of CS introduces the internship program and study which has the following purposes:

- To develop a prudence for the corporate world

- To link theoretical knowledge learned throughout a bachelors program to real-life applications.

- To fulfill the requirements of Bachelor of Science, Major in Computer Science (CS) Program

I am honoured to be a student of CS and for the chance to do an internship in United Commercial Bank Ltd. (UCBL), one of the most prestigious banks in the country. with no prior experience of a corporate world, I started my internship on

16th September 2020. As I look back now, I realize I have achieved far more than I expected when I began, and I must admit, it has indeed been a wonderful journey.

The journey has obviously not been as smooth as a bed of roses. Truth be told, with the world-stopping pandemic, frequent nationwide lockdowns to curb the infection rate of COVID-19, this journey has taken much more time than it traditionally takes. Nevertheless, I am immensely grateful to UCBL, as the skills I have gathered in my journey are priceless to me. I owe a great debt to this company for their time and help spent on me. Furthermore, some of the non-technical skills and corporate lifestyle, along with the practical skills will certainly prove handy in the future.

1.2 Purpose of this Document

This report is the result of a year-long internship program conducted in United Commercial Bank Ltd. and is prepared as a requirement for the completion of the Bachelor of Science, Major in Computer Science of BRAC University. The Objective of this report can be classified into two categories:

- General Objective

- Specific Objective

1.2.1 General Objective

This internship report is prepared primarily to fulfill the Bachelor of Science, Major in CS degree requirement under the Department of Computer Science, BRAC University.

1.2.2 Specific Objective

More Specifically, this report entails:

- An overview of United Commercial Bank

- A focus on the Services, work environment and facilities provided to the employees of UCBL

- A discussion of the work done and things learned as an intern in UCBL

The Purpose of this Document is to give a thorough idea of my internship period. This Document also explains the purpose of this internship program, as well as the difficulties faced during my time here, and how I have overcome said difficulties. This report also gathers the products and services provided by UCBL, an overview of the organization as well as the facilities that are provided by the company for employee satisfaction.

This report also reflects my achievements, hardships, project work and professional growth during my internship period. Also, anyone looking for a short understanding of UCBL may find this report helpful. Adding to that, this report will also help upcoming students get a basic understanding regarding the workplace environment

and much more. This should help them appropriately for their future internships and/or work life.

1.3 Methodology

A limited amount of information was available to me which I presented in this report. I can classify this information into 2 categories based on the information provider:

1.3.1 Primary Data Source

- Direct Inspection during my internship period

- Communication with employees

Primary Data Sources are the Information collected through observation and direct involvement with UCBL.

1.3.2 Secondary Data Source

- Website of UCBL

- Annual reports

- Internet

Most of the information gathered are from multiple websites, and formal public documents provided by UCBL.

1.4 Overview of the Document

The following two chapters elaborate on the culture and profile of UCB. The bank's historical background, Human Resources, a few products, SWOT Analysis, daily practices and work ethics are few of the points covered. In Chapter 4 we dive into a more specific part of the picture, software development, where we talk about the apps developed, tools used, and meet the talents behind the curtain. Chapter 5 briefly covers the training I have received during this internship, and chapter 6 dives into the inner working of the webapp, Protracker. Chapter 7 and 8 catalogues the professional and personal growth I achieved through this Internship. Finally, the last chapter summarizes and concludes this report with a favorite quote of mine.

1.5 Limitations

In the midst of this worldwide pandemic, and frequent nationwide lockdowns, most companies are implementing "work from home" strategies, while almost all shops and markets are closed down. Banks, while not being completely closed off as they are major financial institutes, have also cut down on physical office period and mostly moved their employees to work from home. Because of this, under these circumstances, most of my internship period was spent at home, usually with an

hour meeting a day with Navid Bhai, an Assistant Vice President, and experienced programmer. Also, as Banks have strict security policies, most of their ongoing projects are classified and I am not cleared to be involved. Thus, my exposure to UCBL inner projects were mostly limited. Finally, my exposure was only with the IT division, and I could not get to know any of the other divisions in depth. It was also difficult to get to know the numerous branches of IT, such as Cyber Security, Fraud, ATM maintenance, etc, because of the lockdown and work-from-home situation.

1.6 Conclusion

In this chapter, I presented the overview of the internship experience, the document's purpose, an overview of the entire document, and definitions of certain commonly used terms in the document, all of which will give the reader of this document a clear picture of the document's purpose.

Chapter 2

Company Profile

> Outstanding leaders go out of their way to boost the self-esteem of their personnel. If people believe in themselves, it's amazing what they can accomplish.
>
> *Sam Walton*

This chapter elaborates on the history of United Commercial Bank Ltd., an overview of the company, their services, customer base and market condition.

2.1 My First Day in UCB

On my first day in UCB, I was quite nervous and unnerved by the sheer size of the company. My internship took place in the Head Quarters of UCBL, which took up a whole commercial building in the middle of Gulshan Avenue. Each department had its own floor, and the IT division was the whole 3rd floor. As I arrived, I noticed each floor has its own security guard at the gate, and the doors stay locked behind a keycard. As the nice guard was notified of my internship prior to my arrival, I was let in by him and asked to wait in the waiting room. Soon after, I was greeted by the Head of IT, Mr. Kashef sir. He is a warm man with a positive aura about him, and his presence quickly put me at ease. After a short exchange of pleasantries, He handed me over to Mr. Afzal, Vice President and Head of the software development team, who was charged with overseeing my internship. Soon, I was introduced to the software Development team, who were all warm and welcoming to me. I spent my first hour with Abhijit Bhai, who introduced me to the software development lifecycle, which I have elaborated later in this report. I also learned that day that the software development team consists of programmers and business analysts. There were about 12 members in the team in total, 3 of whom were business analysts and the rest were programmers. I learned a bit about some of the softwares UCBL has developed for their own use, like TSMS, OrangeJuice: A project management system built on .NET, and a few more. I was offered that day to explore the other departments within IT, but I decided not to, partly because I was intimidated by the enormity, and partly because I was intrigued by software development and learning more about it, as well as developing something as part of my internship, and to

gain a skill in programming. I should mention that, while I was nervous on my first day, I was also very much attracted to the work environment. It was clean, a very large floor with soft lighting and a very spacious and well-designed interior. The whole atmosphere induced productivity and I could feel it both in myself and the employees around me. As I decided to be a part of the software development team, they quickly made some space for me in the R&D room situated right beside them. By my second day, I had a desk and a computer to work on, and I was very excited to start my Internship with this team.

2.2 Historical Background of the Company

United Commercial Bank Ltd. is a private sector commercial bank in Bangladesh. It started its journey on the 27th of June, 1983, founded by "Akhtaruzzaman Chowdhury Babu". With a firm commitment of the economic and social development of Bangladesh, United Commercial Bank Limited (UCBL) has come to be one of the largest first generation banks in the country. The company was listed under Dhaka Stock Exchange on 1986, as stated in its legal form. The Bank also provides export and import loans to eligible clients which helps develop the economy of the country by increased earning of foreign exchange.

2.3 UCB in 2021

Currently, the company is directed by Managing Director, Mr. Mohammed Shawkat Jamil. According to latest statistics, UCB now has 204 branches and 580 ATMs nationally. There are 2 SME Centres and 1 Off-shore banking unit currently operational. Being one of the largest private Banks in the country, UCB currently has a workforce of nearly 5,000 employees. Over the years, the bank has expanded into a diverse number of segments of banking such as Retail Banking, SME Banking, Corporate Banking, Upay, Priority Banking(UCB Imperial), Off-shore Banking and Remittance. On top of that, recently UCB has introduced "Green Banking", an initiative to promote eco-friendly strategies to the Banks Operations.

2.4   Vision, Mission and Core Values
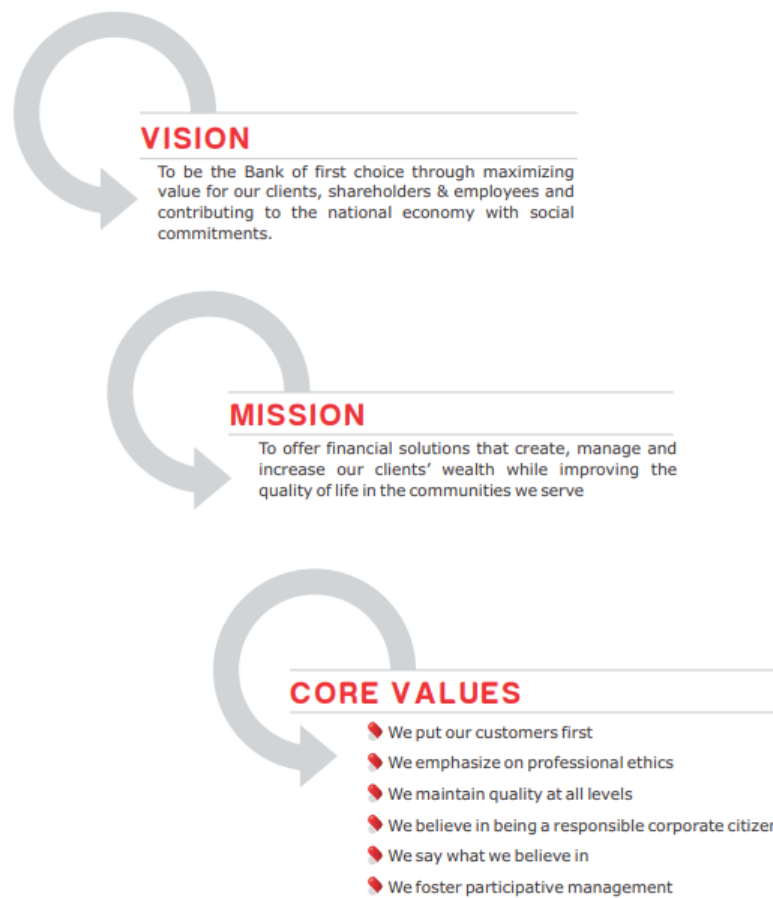
Figure 2.1: Vision, Mission and Core Values

2.4.1   Mission

A mission statement is a statement about the purpose of a company. It serves as a platform for evaluating opportunities and challenges to identify whether a company fits their core business model and strategy. The mission of UCB is to:

"To offer financial solutions that create, manage and increase our clients' wealth while improving the quality of life in the communities we serve."

2.4.2   Vision

Vision is different from Mission in the sense that if Mission is the cause, Vision is the effect. On that Note, UCB has a modest yet ambitious vision, which is:

"To be the Bank of first choice through maximizing value for our clients, shareholders employees and contributing to the national economy with social commitments."

2.4.3 Core Values

Every Company develops values and morals over time that serve their objectives, and UCB is no different. UCB prides on their services and value to their customers, which is reflected in their core values[8]:

- We put our customers first

- We emphasize on professional ethics

- We maintain quality at all levels

- We believe in being a responsible corporate citizen

- We say what we believe in

- We foster participative management

2.5 Green Banking

In accordance with the "green initiative" taken in previous years, UCB has been involved in eco-friendly business activities and energy efficient industries[7]. The Bank has automated a number of services that are not just environment friendly, but also saves time, money, and energy of clients. It is in the digital payment system, Upay, that the bank has introduced and advanced BlockChain Technology. Apart from that, other key services include Internet Banking, SMS banking, UCB Express and many more that help reduce carbon emission. Meanwhile, the following activities and programs are being implemented in accordance to Green Banking Guidelines of Bangladesh Bank:

- VRF system Air cooler is installed in the Head Office, which consumes 25% less electricity.

- Solar Energy systems are installed in Noapara branch, Chittagong branch and some other branches.

- Most branches are cutting down on the use of paper by disseminating operational guidelines, circulars and management decisions by email.

- Central UPS are installed in each floor which reduces total backup power requirement.

- High-Capacity Servers are used to consolidate a number of applications and databases, which has reduced power consumption.

- Managed Rack based structured network has been implemented at the Data Center. Thanks to this, required space and dissipated heat is much lower than traditional Data Center.

- The Bank has promoted and emphasized eco-friendly businesses and energy efficient industries like the Effluent treatment plant.

2.6 Office Schedule

Business hours are the hours during the day in which business is generally conducted. By observing formal business hours, UCB has achieved major productivity, discipline and punctuality from its employees. In UCB, Sunday to Thursday are set as working days, from 10:00AM to 6:00PM. However, employees tend to leave after 7:00PM.

2.7 Code of Conduct and Ethics

UCB emphasizes on the promotion of Code of Conduct and Ethics Policy and its effectiveness to the promotion of fair and ethical practices by all personnel involved within the banking institution. This policy is a fundamental basis to support the bank's mission and its business operations.

Following are the notable features of the UCB code of conduct and Ethics policy[6]:

- Confidentiality: United Commercial Bank Ltd's business or business plans, products, and services are to be kept private. Services, marketing strategies, technology, or systems must never be shared with a third party unless it is required by law, pursuant to a valid court order or a statute or regulations. The Bank owes a rigorous duty of secrecy to its clients.

- Conflicts of Interest: All employees of United Commercial Bank Ltd. should be scrupulous in avoiding any action or interest that conflicts or gives the appearance of a conflict with the Bank's interests.

- Outside Pressure: Employees must refrain from bringing in outside pressure or influence to attain personal gains within the organization; any such attempt will be subject to disciplinary action.

- Gifts and Entertainment: Employees are not permitted to accept gifts, entertainment, or other favors from existing or prospective customers of the bank. This is essential to keep the employees of the Bank from being prejudiced or influenced or showing a lenient attitude keeping aside the bank's interest.

- Accuracy of books and Reports: Bank's books, records, accounts and reports must accurately reflect its transactions, and must be subject to an adequate system of internal controls and disclosure controls to promote the highest degree of integrity.

- Fraud, Theft or Illegal Activities: Employees are to be alert and vigilant with respect to frauds, theft or significant illegal activity committed within the office. If any such activity comes into employee's attention, he/she must immediately report the same to his/her immediate superiors who will arrange for appropriate follow up action to be taken. Failure to report any such activity will be subject to disciplinary action.

- Opportunities: Employees are prohibited from taking for themselves personally opportunities that arise through the use of corporate property information or position. They are further prohibited from using corporate property, information or position for personal gain and/or competing with the bank.

- Compliance with rules and regulations: United Commercial Bank Ltd. policy is to maintain an open and cooperative relationship with our regulators and to comply with all applicable laws, rules and regulations. Banks also disseminate information regarding compliance with laws, rules and regulations that affect business.

- Equal employment Opportunity: United Commercial Bank Ltd. is an equal opportunity employer in hiring and promotion practices, benefits and wages. The Bank will not tolerate discrimination against any person on the basis of race, religion, color, gender, age, citizenship in recruiting, hiring, placement, promotion, or any other condition of employment.

- Discrimination or Harassment: United Commercial Bank Ltd. is an equal opportunity employer in hiring and promotion practices, benefits and wages. The Bank will not tolerate discrimination against any person on the basis of race, religion, color, gender, age, citizenship in recruiting, hiring, placement, promotion, or any other condition of employment.

2.8 Developed Products

Over the years, UCB has developed many softwares in-house, both for its own requirements and for clients. Let's take a look at some of these:

2.8.1 iUCB

iUCB is an intranet portal that can only be accessed from within the UCB network. It requires a login, which all employees of UCB have. iUCB has a directory of all employees, and all news, circulars, and new policies are posted here. It also features the workflow system which is demonstrated below:

CASE: A new employee wants to create a staff role user account in an app 'XYZ'.

Figure 2.2: Flowchart: Requesting Access

Aside from this, all customer requests, better known as service quality, also goes through iUCB, for example: if a customer wishes to change his/her phone number, the request is created by the branch manager, which then follows the standard procedure. Lastly, another important feature of iUCB is complaint management, both from customers and employees, which also follows standard procedures.

2.8.2   Bill Management System

Companies like WASA, DESCO, and some others have made contracts with UCB to assist with their monthly bill collection. To digitize this process, UCB has created a Bill Management System, BMS for short. In a nutshell, when an individual steps into a branch of UCB to pay utility bills, or any bill that UCB is authorized to accept, the officer in charge pulls up BMS and inputs relevant information into the system. BMS, in the background, creates a monthly report, calculates VAT and other expenses, which utility companies get, along with the money wired to their account. Recently, a few companies have developed their own management systems, and using REST API, is able to call, pass and process every bill transaction in real time.

2.8.3   Udispatch

Everyday, numerous letters and courier services are required for UCB, may it be branch to branch, branch to Head Office, or from an outside source. Thus, it became

important for the company to be able to track incoming and outgoing couriers, and the product of that need is Udispatch. Udispatch tracks every courier, requires signoff both when accepting and delivering packages, and tracks the movement as it is passed from one hand to the other.

2.9 Human Resource

A business is only as good as its employees. Finding the right people with the proper abilities and integrating them into a team with the same goal is a difficult task. In a study conducted by Masud Rana and Md. Nahin Hossain in 2014, it is found that UCBL has that highest percentage of professional grade employees at 42%. [4]

2.9.1 Methods of Recruitment

There are two main methods of recruitment, Internal and External. External recruitment can be subcategorized into two classes: Informal and Formal. The recruitment process can be roughly elaborated with the following flowchart:
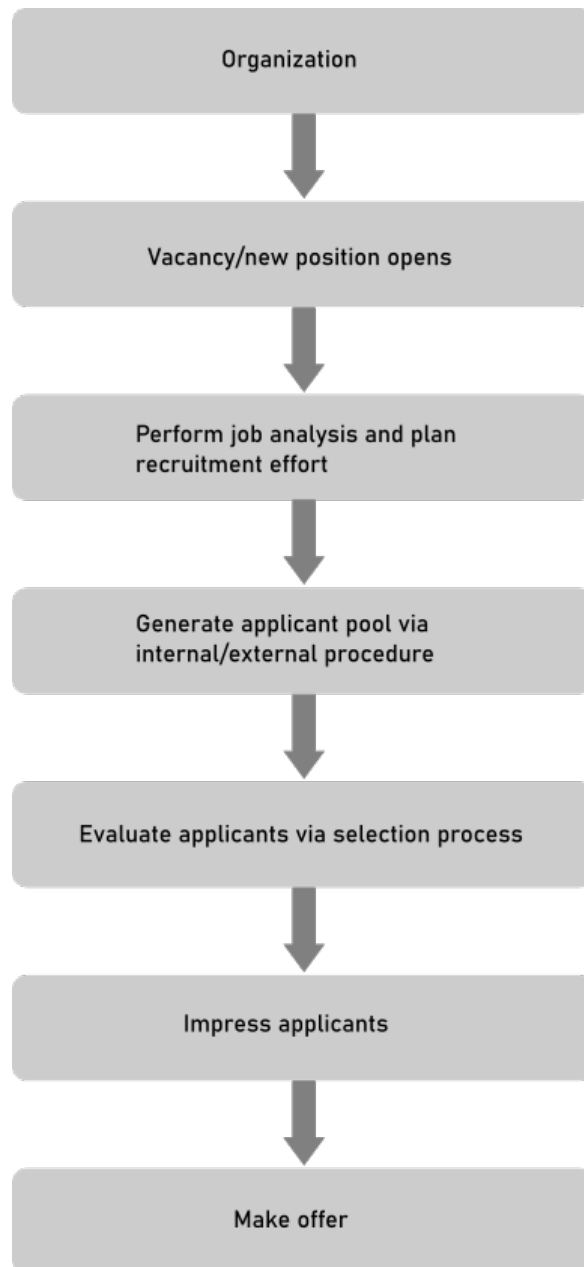
Figure 2.3: Recruitment Procedure of UCB

2.9.1.1 Internal Recruitment

When at all possible, most organizations, including UCB, fill positions internally. For various job levels, a variety of internal recruitment approaches are used. Because their employees are not exempt from the minimum wage and overtime rules of the fair labor standards act, lower level jobs such as manual and clerical jobs are generally referred to as nonexempt jobs. These workers are usually compensated on an hourly basis. Higher-level administrative, managerial, and professional staff, on the other hand, are paid on a salary basis and are not subject to the overtime rules of the Fair Labor Standards Act.

2.9.1.2   External Recruitment

It is normal for organizations to open up their recruiting efforts to the outside community in addition to seeking for individuals internally. The hiring manager's engagement enables for input on whether the recruiter's decisions are congruent with the hiring manager's preferences. External recruitment tactics are often divided into two categories.

- Informal recruitment

- Formal recruitment

Informal recruiting tactics draw into a smaller labor pool than formal recruiting approaches. Rehiring previous employees or former cooperative education students, hiring people referred by current employees, and recruiting from among those who have applied without being solicited are all examples of informal methods. Such applicants are called walk-ins or gate hires. Since employees who refer friends and acquaintances as applicants are risking their own reputations, they tend to refer people who are well qualified and motivated, and subsequently mentor them after they are hired.

The formal method of external recruiting is a process that involves scouring the labor market for people that have never worked for the company before. Newspaper advertisements, the usage of recruitment agencies and executive search firms, and campus recruiting have all been used in the past. In recent years, posting job advertising on the internet, whether on the company's own website or on a commercial job board, has become standard.

2.9.2   Selection Process

The selection process can be divided into 8 steps:

- Initial Screening Interview

- Completing Application form

- Employment Test

- Comprehensive Interview

- Background Check

- Conditional Job Offer

- Medical/Physical examination

- Permanent Job offer

2.9.3 Training and Development

During my one year in UCB, I have observed 3 week-long training sessions organized in the IT department, 2 of them were app development, the third was on cybersecurity. I must state that there are a lot more than 3 training sessions held annually, I have only observed 3 of them. Additionally, employees are sent on sufficient training programs externally, consisting of 15-20 days, during which employees are not required to attend office. UCB has a high rating of employee development among private commercial bank, as it is in their company culture to develop their workforce to meet their needs, instead of replacing with newer staff. [12]

Chapter 3

Company Culture

A hallmark of a healthy creative
culture is that its people feel free to
share ideas, opinions, and
criticisms. Lack of candour, if
unchecked, ultimately leads to
dysfunctional environments.

Ed Catmull
President of Pixar

This chapter elaborates on the culture and practices I observed within UCB, a detailed SWOT Analysis, Corporate Hierarchy, and software development methodology.

3.1 Culture

UCB believes in and promotes a positive work culture which enforces creative work, and is a vital ingredient in maximizing productivity. The bank is very aware of maintaining a culture that attracts talented people and catalyses them to unlock their best performance. In the IT department, a number of well-developed cultures can be observed, such as:

3.1.1 Meetings are the *KEY* to meeting Perfection

Being well-aware of meetings has become second nature to the employees of UCB. This is because it is believed that meetings are the most effective form of communication, whether it is communicating project progress, reassuring product direction and features, or identifying any issues or delays. When it comes to software development, all team members involved are always present in scrum meetings, even if not all members have anything to report. Being present in meetings everyday enforces accountability and preparation, as well as keeps a project moving forward in the right direction. Meetings are the way to consolidate and maximize the output of collective effort. This is what the employees in UCB firmly believe.

3.1.2 Responsibility

Responsibility can be broken down into 2 words: "Response + Ability". This means that a responsible person has the ability to respond, and choose their response, to any situation. The staff of UCB understands this quite well, and are adept at recognizing their responsibilities. They understand that no circumstances, conditions or disasters can be blamed for their behaviour. Their decisions are based on their own conscious choices, based on values, instead of outside events. To achieve success in their career, each individual must be 100% responsible for their actions.

3.1.3 A comfortable workplace

It is without doubt that a workplaces physical and social environment is directly related to the satisfaction level of an employee. UCB ensures their workplace is friendly and welcoming and comfortable, that the stress buildup during a workday is countered by a positive work environment. Since each department gets a full floor, and each floor is huge, IT department has the luxurious workspace fit to maximize satisfaction. There is a waiting room fitted with a large smart TV and comfortable couches, where employees and visitors can meet, sit and relax. There is a cafeteria fitted with a large fridge, water purifier, and a snacks bar. There is ample walking space on all sides of the floor, no one would feel crowded or claustrophobic here. The cubicles are also sized copiously, and the walls are lower than standard so that colleagues can communicate with each other over the cubicle walls. This perfectly balances a workers privacy and connectivity with the rest of his team. The lighting are all soft yellow lights, no fluorescent bulbs are used, lavish carpets are installed across most of the floor. In short, the workspace in UCB, specifically IT department, fosters productivity, reduces stress, and promotes synergy in its workforce.

3.2 Company Hierarchy

Every Company runs with a predefined hierarchy, with ranks disclosed as job titles. the Hierarchy of UCB looks like this: junior officer - officer
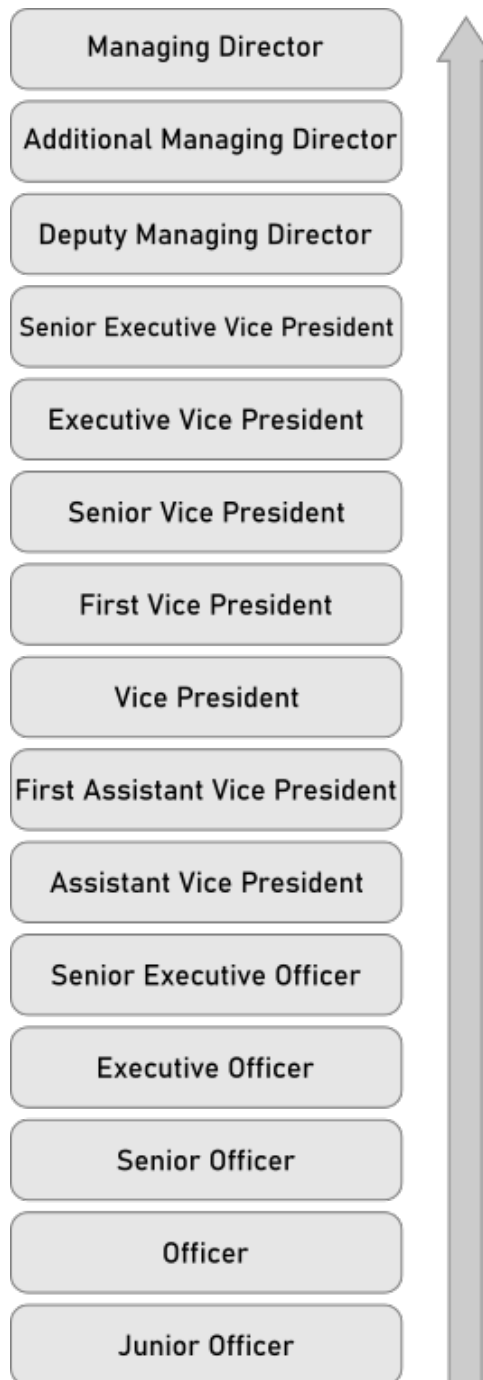
Figure 3.1: Company hierarchy

3.3 SWOT Analysis

United Commercial Bank has been operating for more than 35 years now, so it is safe to assume this bank has gone through its fair share of sweet and bitter experiences. Thus it can be deduced that should have more strengths than weaknesses or threats. As for opportunities, there is never a lack of it as the bank plays a major role in the market. Measuring the SWOT analysis is mandatory for all companies as it is imperative to determine business strategies and planning.

In a nutshell, SWOT stands for "Strengths, Weaknesses, Opportunities, Threats". Strengths are the attributes originating from within the organization that boost the company objectives. Weaknesses are detrimental attributes also formed within the organization. Opportunities and threats are attributes that originate outside of the organization, whether it be market changes, advancement of technology, or competition. Opportunities are attributes that offer significant promotion to the company if seized correctly, while threats are attributes that can hinder a company's operations and must be met with vigilance.

Figure 3.2: SWOT Analysis Definition

3.3.1 Strengths

- UCB is one of the first generation private banks in the country, well established and well reputed in the banking industry of Bangladesh.

- UCB promotes interactive corporate culture, freedom and development of

ideas, between executives and employees.

- UCB upholds a strong reputation of providing quality service to its clients. a huge number of branches located strategically across the country for customer convenience.

- Maintaining a workplace with State-of-the-Art equipment and facilities.

- Developing a strong relationship with Bangladesh Bank over the years.

- Introduced Agent Banking, a form of banking designed to make banking accessible and remote village areas.

3.3.2 Weaknesses

- While the bank offers far better quality than any other local private banks in Bangladesh, it has been unable to compete with Multinational banks like HSBC, or Standard Chartered Bank.

- Compared to foreign banks, the marketing side is quite weak.

- UCB earns less profit than other banks as it follows conventional banking methods, as opposed to Islamic banking methods.

- Job Diversification is less in UCB as compared to foreign banks.

3.3.3 Opportunities

- A steady rise in income due to improving economy

- UCB can look to expand to more rural areas, which it started implementing last year with Agent Banking.

- Polishing recruitment policies to employ more efficient staff in the lower and mid-level positions.

- As UCB is a very large and well-established Bank, it can look to expand their business portfolio, which will decrease business risks.

- The bank should look to invest in new products and services.

3.3.4 Threats

- UCB has to remain prudent about the default risks of all terms of loans and actions must be taken to minimize in order to uphold the financial market.

- Certain Bangladesh Bank rules and regulations hamper the banks growth while also influencing investors to recede.

- Younger banks show much more aggression and takes more risks in operations, causing serious competition to UCB.

- Younger banks also invest much more on marketing whereas UCB does not, losing out on big time clients and investors.

- Star employees tend to move to other banks because of better remuneration packages offered.

3.4   Work from Home

During this pandemic, UCB employees, especially the ones in the IT department, are rotated around weekly on a roster basis, where half of the employees are asked to work from home every other week. This creates a much more sparse environment and promotes social distancing. Also, employees can ask to WFH if they are sick, or finding it difficult to get to work due to lack of transport and any other issues. Thanks to these COVID-specific policies, most employees find it easy to continue their work and contribute without much hassle, and UCB has kept up its daily productivity rate.

3.5   Environment and Security

During my time in UCB, I have gotten to know a friendly and helpful staff. Kashef Sir, Head of IT, as I've mentioned earlier, is a very warm and friendly person, and everytime we bumped into each other, he would stop and take a few minutes to ask how I was doing. In the software development team, Navid Bhai and Abhijit bhai have been very helpful and regularly made the time to help me in my project development. I have also observed firsthand the whole team to be very casual, often grouping up and gossiping and having a good laugh every once in a while. There was never any visible stress in the team, it was always a relaxed atmosphere, and I believe that maximized everyone's will to contribute and job satisfaction.

Despite the friendliness of the employees toward me, I have noticed there are a large number of limitations in the office. As banks need to maintain a high security profile and protection of confidential data, UCB has many strict security policies in effect. Some of them that I have observed are:

- Every floor main door is always locked, which has to be unlocked by Employee key card.

- Every PC and laptop is supplied by the office. no personal laptop can be used.

- Printers, Photocopiers and fax machines need employee key cards to authorize. Also, information of activities of these machines are recorded by the machines.

- No authorization to be involved in any major projects.

- The Bank runs on an Intranet network, with restriction of access to multiple websites, including YouTube, Facebook, etc.

3.6   My Viewpoint

The flexible work hours were a huge plus for me, as it helped me get habituated to the new professional lifestyle. Initially, I was nervous and hesitant to ask for help, thinking everyone is very busy and I am wasting their time. However, over time, this thought was broken as everyone was super friendly towards me and made the time for me. I am grateful to the employees of UCB, especially the software development team, for their support.

Chapter 4

Software Development

> If you ever talk to a great programmer, you'll find they know their tools like an artist knows their paintbrushes.

Bill Gates

4.1 The Development Team

The UCB software Development team consists of Afzal Bhai as its Head, Navid bhai, Sifat bhai, Abhijeet bhai, and Munmun apu as core developers, Russel bhai and Faisal bhai as business analysts.

4.2 SDLC Model

UCB software development team uses a **waterfall model** to develop apps. In short, the waterfall model drafts and finalizes all of the requirements and features at the start. This leaves virtually no room for changes after the planning phase, and unforeseen issues can massively backfire on the timetable. The following flowchart closely resembles a typical lifecycle of a project developed by UCB:
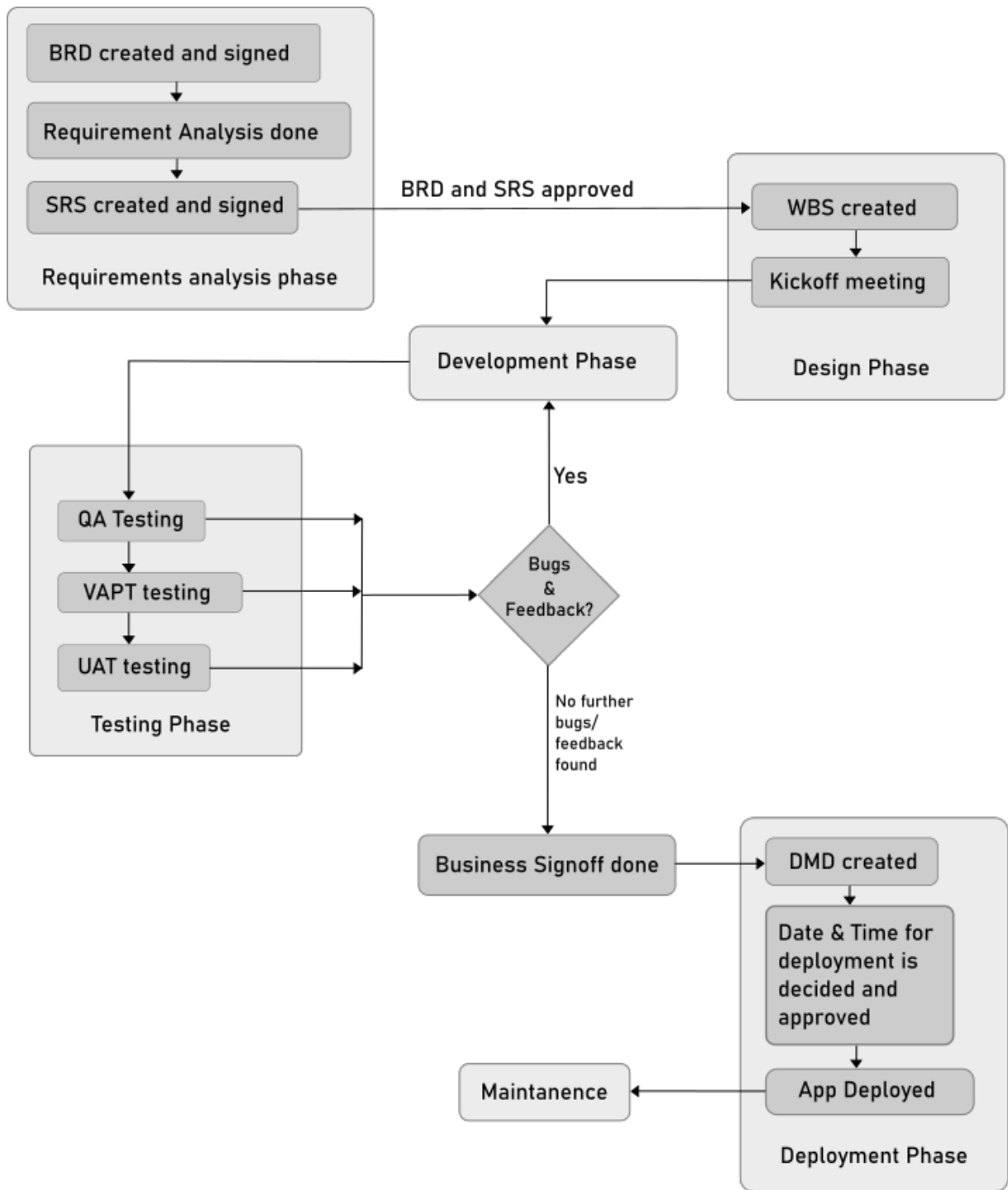
Figure 4.1: Waterfall Model similar to UCB SDLC

4.2.1 Requirement Phase

After an app development order comes, the first document that is procured is the Business Requirement Document(BRD). This document contains the features, functionalities and requirements that must be met by the application. With the BRD, and further analysis, the Software Requirement Specification(SRS) document is drafted. SRS document is much more technical, making it ideal for developers to understand precise requirements. After BRD and SRS is drafted, approved and

signed, we move to the Design phase. The requirements phase is usually completed within 1 day.

4.2.2 Design Phase

Work Breakdown Matrix(WBS) is the rough timeline of the development phase of the app. In this document, which developer will work on which aspect of the app, deadlines, and other data is stated. After an initial Kickoff meeting, the Development Phase starts. The Design phase takes about 1 to 3 days to finish.

4.2.3 Development Phase

Development can take anywhere from 2months to a year, depending on the scale of the app, number of developers working on it, and how many times the app comes back from testing for tweaking. Generally, UCB develops one app at a time, as it keeps the workforce synergized and directed.

4.2.4 Testing Phase

After each iteration of development, the app is handed over for Quality Assurance(QA) testing. If QA is passed, only then the app is approved for Vulnerability, Assessment and Penetration testing(VAPT) and User Assessment Testing(UAT). If QA is not passed, the app is sent back to the development team with feedback until QA is passed. When VAPT or UAT testing is not passed, the app again goes back to development with feedback, and after updates, the app is again QA tested.

4.2.5 Deployment Phase

After all tests are passed, the next stage, known as business sign-off, is the milestone that states that the development phase is officially over. After this checkpoint, the app is not sent back to development again. After the business sign-off is approved, the Deployment Management Document(DMD) is drafted. This document contains technical documentation, deployment procedure, rollback procedure, and other post-development documentation. After DMD, the date and time of deployment is carefully decided and approved. In case of a new app, deployment schedule is easier to define, since it is a new app that was not in use before. However, in the case of existing apps, or apps that are already live, it is much more important to fix the schedule, considering server down time, rollback chance, etc. Usually, major app updates are done during Friday night, to mitigate server down time loss.

After the app is deployed, The life-cycle of the app development is officially over.

4.3 Tools

.NET is a complete ecosystem that provides all the services required by the company. A few legacy applications has been developed using python and java, but almost all modern projects are developed using .NET. Banking solutions don't require a sophisticated frontend, UCB prefers functionality over beauty, so most of their apps

have plain-looking frontend design, which is achieved with only HTML5, CSS, and in a few occasions, JavaScript and AngularJS. Currently, UCB is using Microsoft SQL Server 2019 for their Database, and no Linux systems are used in in-house servers.

4.4   Source Control

In UCB, two source control systems are used, Git and SVN. Git is the open-source software developed by Microsoft, while SVN, also known as Apache Subversion, was founded by CollabNet Inc. and is licensed under Apache. Both of these systems run on-premises, meaning they are only accessible in the UCB intranet, and cannot be accessed through the internet.

4.5   Buy VS Develop

This question is not as easy to answer, and usually involves a lot of research and analysis before it can be answered. A good rule of thumb is analysing the cost, time to deliver, sensitivity and scale of application.

In case of small or specific niche apps, it is cheaper and faster to develop an app in-house than buy it off-the-shelf from a vendor. This is because vendor products are more professional, comes with a 100 features, where only 20 of them are required, and needs market analysis, comparing different vendor products and pricing, cross-checking features to requirements, which takes up a significant amount of time. In all cases, buying an app is always more costly than developing it. However, as projects get larger and more complex, off-the-shelf products are favoured. This is due to a number of factors:

- IT Department may not be of a high enough level to deliver complex features.

- Time for projects increases exponentially as the scale of the project gets larger. So, for large projects, it is faster to buy from vendors.

- Maintainability becomes a priority. Off-the-Shelf products also come with regular updates and bug fixes, as well as product support.

- Sensitivity/Damage Control. Off-the-Shelf products are more rigorously tested, making them suitable for sensitive apps, like cash transactions.

Large-scale softwares, like the core banking system, netBanking and ATM management, are bought off-the-shelf, while smaller niche apps, like Udispatch, iUCB and this project management app I have developed are developed in-house.

4.6   Prominent Clients

When I just joined as an Intern, the software development team was developing a rest API for Robi. In 2019, UCB has developed the Bill Management system with WASA, and recently, they have been working with Bkash to create an API for agent banking. So, amongst the numerous clients the software development team works with, Bkash, Robi, and WASA are a few notable ones.

Chapter 5

Training

> Confidence comes from discipline and training.
>
> ———————————————————
>
> *Robert Kiyosaki*

During my Internship period, I felt it necessary to do a beginner course on ASP.NET to build a foundation and gain a basic understanding of the open source web framework. Thus, with a bit of hunting, I found BITM(Basis Institute of Technology and Management) to be offering courses at the time, I could not find any other institutes as almost all of them were closed due to the pandemic. I proceeded to sign up and classes started offline, with the option to join the class offline, from 25th March 2021, and ended on 22nd August 2021.

5.1   About BITM

BASIS started its own training activities in 2007, with the mission to minimize the skill gap of human resources in the market. Basis Institute of Technology and Management was set up in 2021 to institutionalize its training activities, with the support of the world bank. Their vision is to enhance the competitiveness of the IT sector in Bangladesh by creating qualified IT specialists.

5.2   About the Course

Officially Titled: ASP.NET Core MVC with Angular and EF Core. This course took about a total of 96 hours, divided into 36 classes. Generally 3 classes are taken each week, but because of the pandemic, and during Ramadan, the class schedule was much more relaxed. At a glance, this is an introductory course on .NET Core, evolution of ASP.NET, tools and IDE choices, and MVC components. This course is instructed by Md. Azman Ali, a talented web developer with 11 years of experience and multiple certifications.

5.3   Training Topics

Over the duration of the course, I have built a foundation on many core concepts of web development, as well as learned a bit of history of ASP.NET and ASP.NET Core. I have shared some of the things I have learned in this course:

5.3.1   ASP.NET VS ASP.NET Core

ASP.NET is a popular web-development framework created by Microsoft. It is open-source and used to build web apps on the .NET platform. ASP.NET is restricted to only Windows. To overcome this and build a wider platform, Microsoft development team created ASP.NET core, first released on 2016, and is currently the latest version of .NET on the market. ASP.NET core runs on macOS, Linux and of course, Windows, and is a re-design of the windows-only version of ASP.NET.

5.3.2   MVC Framework

ASP.NET Core has a framework called MVC(Model-View-Controller). The Model View Controller is a framework design that allows desktop devices to implement user interfaces. It divides a given software application into three solid sections in order to distinguish internal information representations from the user's way of presenting or recognizing data.

MVC's Components:

Model: It agrees with the logical information structure in a software application and the associated high-level class. It is the domain-specific symbol of the data that defines an application's operation.
View: The view module is used for all the application's UI logic, and these are the mechanisms that show the user interface of the application (UI). This reduces the model into a technique that fits for interaction.
Controller: Controllers act as a boundary between Model and View workings. It processes all the commercial logic and receives requests, operates data using the Model factor, and interacts with the Views to extract the final output.

5.3.3   EntityFramework Core

EF Core is a data-access technology developed by Microsoft. It is the lightweight, extensible, open-source and cross-platform version of Entity Framework. EF Core serves as an object-relational mapper, which enables .NET developers to work with a database using .NET models, and eliminates the need for most of the data-access code that usually needs to be written. EF Core is a versatile framework that makes database creation and data manipulation faster, easier and hassle-free.

5.3.4   Stored Procedure

A stored procedure is a block of SQL queries that can be called repeatedly on a database. It is also possible to pass parameters to a stored procedure, so that the

stored procedure can act based of the parameters passed. A stored procedure also adds a layer of authentication as it supports security through data access controls, and preserves data integrity.

5.4   Training in UCB

Initially, I was swamped by the huge task that lay before me. It was appalling and I was clueless on what to do. The main form of assistance I had in UCB was from Navid bhai. We had kind of a question-answer type session, where I would ask questions, and he would answer them. By far, I have learned the most from Navid Bhai, he is an excellent teacher and did a very good job getting complex concepts across to me. It was Navid bhai who suggested I should do a basic course, since question-answer sessions leave many gaps in the learning process, and fail to build a strong foundational knowledge. With the new-found knowledge I gained with the beginner course, it became far easier to learn from Navid bhai as previously unknown basic concepts, the ABCs of ASP.NET, were now known. Over time, I also have gotten comfortable writing code, debugging and troubleshooting with the consistent help of Navid Bhai.

Chapter 6

Web Application: Protracker

> Code is read more than it is
> written.
> _____
>
> *Daniel Roy Greenfeld*
> *Audrey Roy Greenfeld*

In this information age, new apps are being developed everyday. IT firms of all scales receive new projects everyday, from a simple Ecommerce site for a startup, to large-scale softwares for corporate companies. It is therefore important for a firm to be able to track a multitude of projects that run simultaneously. That is where projects management apps come in. [1] There are quite a few notable project planning softwares available today, honorable mentions include JIRA, ProofHub, and ClickUp. While they are suited to small teams, the cost scales up considerably as user count gets larger. The plan, and consecutively, Internship Objective, was to create a similar Project Management App for a UCB. Incorporating some essential functionalities, like viewing, updating, and controlling a multitude of projects, creating and tracking individual tasks, and showing the right information to the right person at the right time.

6.1   Prologue

About 2 decades ago, on the advent of the internet and digitizing workflow, project management technology was an untapped concept. What if that concept was never realized? Well, we would still be stuck with pen and paper. While that system works, there are a few significant shortcomings that cannot be solved:

- Information access cannot be decentralised.

- Sorting through the paperwork, and prioritising work, is tiresome and time-consuming.

- Information cannot be updated in real-time.

- Classified information would be much more difficult to track.

Most modern paid systems are near-flawless. However, problems still exist with such apps. The biggest drawbacks involve:

- Cost. As the user base increases, Cost scales exponentially.

- Modern Systems offer almost every functionality imaginable. Most companies do not require all those features.

- Harder to maintain and upgrade, since control lies to a third-party.

UCB has a running project management system called Orangejuice, but this app was designed decades ago and fails to keep up with the banks evolving requirements. Thus, the software development team has been considering upgrading the app when I started my internship, and thus assigned me this project. My motivation was to learn as much as I can about web development and apply what I learn to this project, using this as an opportunity to learn programming and prove to myself that I can be a good developer.

6.1.1 Cost Scaling

Taking a deeper look into commercial paid project management systems currently in the market, I found out that premium service costs premium cash too. For example:

6.1.1.1 Nifty

Awarded the number 1 project management app by G2, Nifty offers all the essentials in one place. Discussions, Tasks, Time Tracking, Milestones(Gantt Chart), are some of the common yet required functionalities offered by Nifty. Nifty's Pricing is as as follows:

Nifty Pricing

Upgrade, downgrade, or cancel anytime.
14-day free trial. No credit card required. No per user fees.

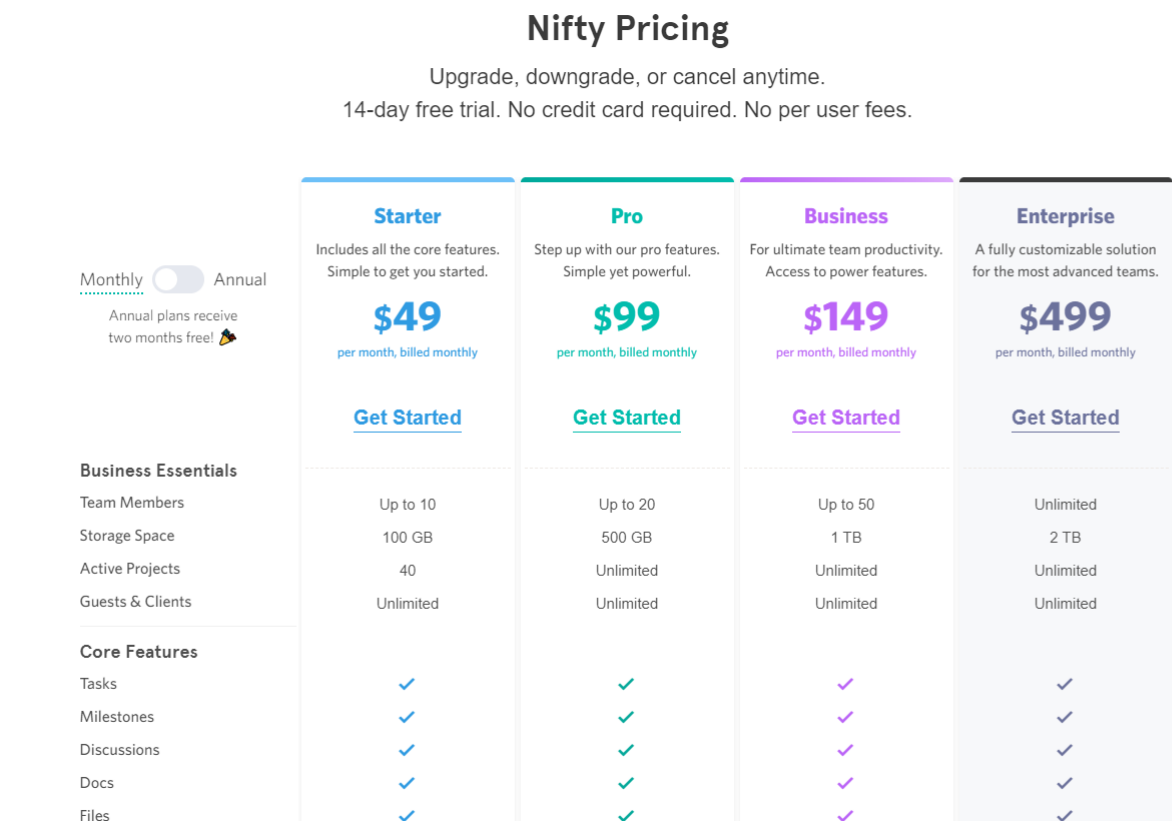|	**Starter**	**Pro**	**Business**	**Enterprise**
	Includes all the core features. Simple to get you started.	Step up with our pro features. Simple yet powerful.	For ultimate team productivity. Access to power features.	A fully customizable solution for the most advanced teams.
Monthly ◯ Annual	**$49**	**$99**	**$149**	**$499**
Annual plans receive two months free! 🎉	per month, billed monthly	per month, billed monthly	per month, billed monthly	per month, billed monthly
	Get Started	**Get Started**	**Get Started**	**Get Started**
Business Essentials				
Team Members	Up to 10	Up to 20	Up to 50	Unlimited
Storage Space	100 GB	500 GB	1 TB	2 TB
Active Projects	40	Unlimited	Unlimited	Unlimited
Guests & Clients	Unlimited	Unlimited	Unlimited	Unlimited
Core Features				
Tasks	✓	✓	✓	✓
Milestones	✓	✓	✓	✓
Discussions	✓	✓	✓	✓
Docs	✓	✓	✓	✓
Files	✓	✓	✓	✓

Figure 6.1: Nifty Pricing

6.1.1.2   JIRA

With scrum boards, Kanban boards, Roadmaps and Agile reporting, JIRA project management is one of the most versatile and widely-used app on the market. Almost all Agile software development teams prefer JIRA, as stated by Erin Gilliam Haije in mopinion [10]. Pricing of JIRA is as follows:

Figure 6.2: Jira Pricing

6.1.1.3   Clickup

Known for its user-friendliness, interactivity, and beautiful UX design, clickup is the perfect merge of functionality and aesthetics. Claiming to provide any feature imaginable, and offering some unique features like Mind Maps, Task Dependencies and custom statuses, Clickup takes the Project management software market to a whole new level. Pricing of Clickup is as follows:
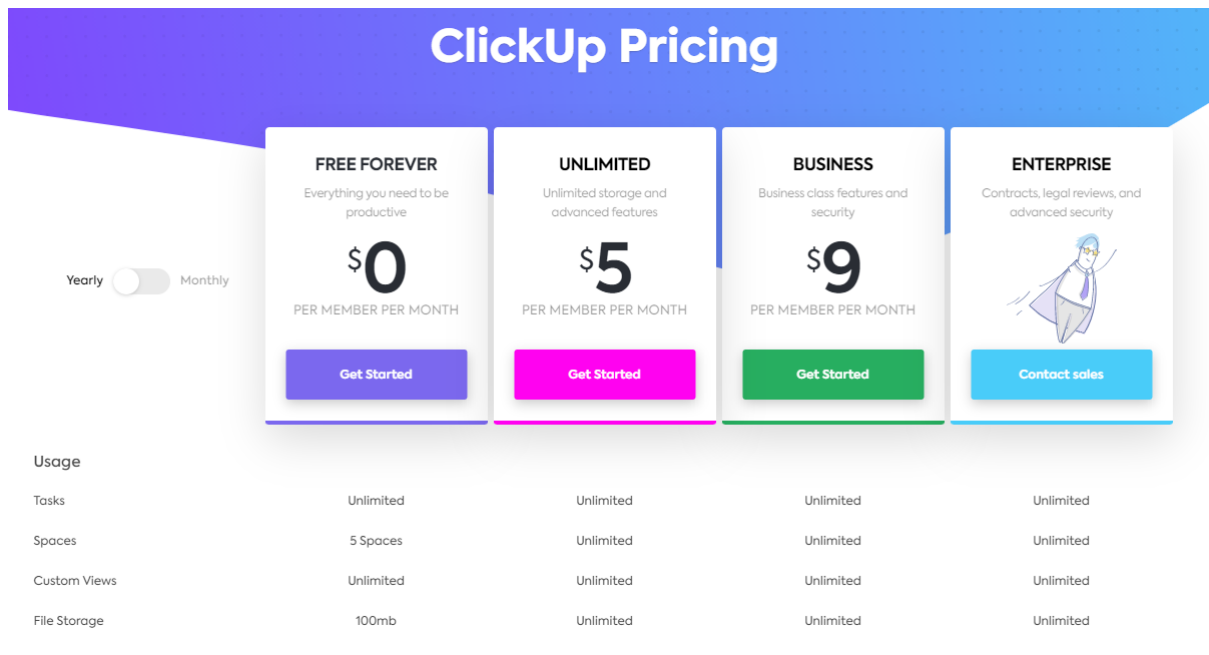
Figure 6.3: Clickup Pricing

In Summary:

While Jira does offer data center facilities, we will compare the cloud-based services pricing, which is mostly monthly subscription. as UCB is a large bank, the premium/business option is the ideal one to choose for this company, which on average, costs about 140USD, or nearly 12,000TK monthly, and 1,44,000TK annually. UCB also does not require most of the features offered by these apps, aiming for the most basic functionalities. While Protracker is not as premium or offers many services, it does satisfy the requirements of UCB. So, by employing me to develop ProTracker, UCB is saving nearly of 1.5Lakh tk annually.

6.1.2 Application Requirements

By the end of this internship, I had the intention to complete this app with the following functionalities:

- A dashboard viewing all tasks, projects, sorted in order of priority, specific to the user logged in.

- Create individual tasks, ranging from day-to-day activities, to long-term events.

- Create larger projects, which may have numerous smaller tasks.

- Prioritise projects and tasks, based on deadline, time remaining, manpower assigned, etc.

- Record individual performance, through daily task completion, overall involvement, and work quality.

- Link documents to projects. Record history of updates, progression, and testing.

6.1.3 Work Plan

Since I was the only Intern at the time, and was tasked with developing Protracker solo, using the System Prototyping for the SDLC fits my agenda, and aims to produce the best results in this case. The company plans to use this app long-term, while having the option to upgrade it with new features over time. Instead of beginning with well known specifications, as the possibilities are numerous, we enforce a series of software requirements, validate and analyze the result, rinse and repeat. One benefit over other SDLC methodologies: this model gives an early working version in development and makes it less costly to introduce changes.

Phase 1: Implement Project and Employee Management

Initial requirements analysis indicates that the primary focus is to be able to create, update, and be informed about the various projects that run simultaneously. Each project normally runs under one authorized "Project Lead" with a team of multi-talented staff. It is thus important to be able to track both projects, and the people involved in them. Thus, the first phase of Protracker involves creating tables for projects and employees. Design: the frontend is being developed with bootstrap and javascript, to make the webpages interactive, responsive, and user-friendly.
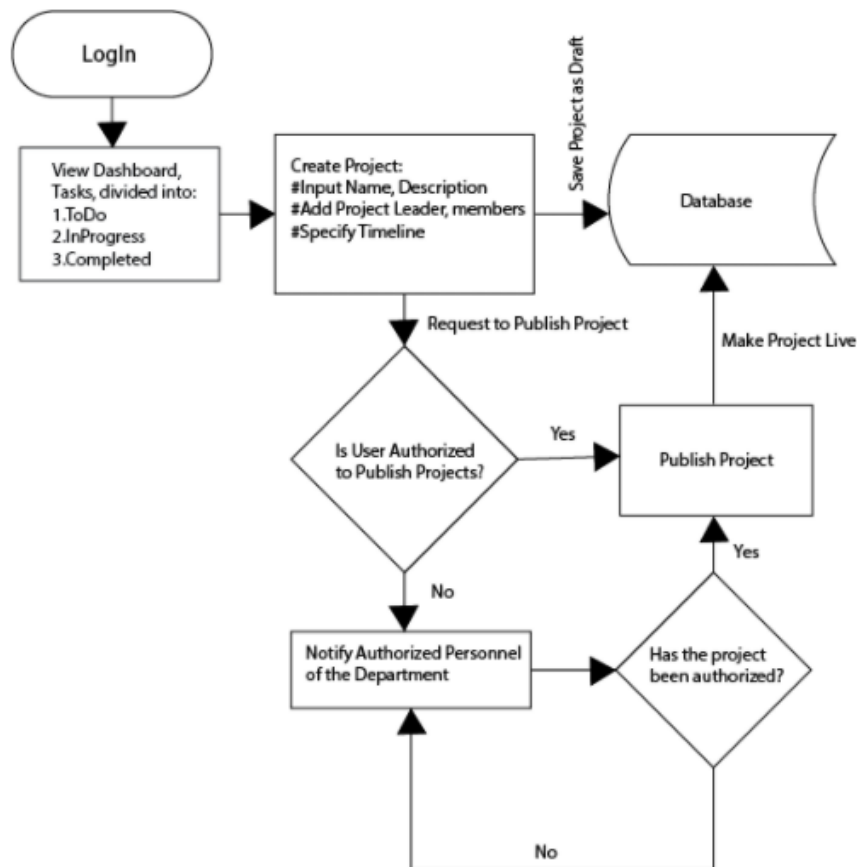A cursory analysis came up with the following flowchart for Project Creation:

Figure 6.4: Project Creation Flowchart

Phase 2: Implement Task Management

For most employees, the scrum board popping up right after login is the most important feature of any project management system. Starting the day off with clear knowledge of the day's tasks is vital for a productive environment. Each employee will have their dashboard tailored to tasks directly involving them, sorted by a built-in priority calculator. Users will also be able to update and create tasks, and add more users to a particular project. Users can also view their performance, generated by the app dynamically based on tasks completed and time taken to complete a task. Managers can receive reports on Team Performance.

6.2 Stages of Development

6.2.1 Planning Stage

The planning stage is fundamental is recognizing why an application should be built and how the development team will proceed to built it. The planning stage can roughly be divided into two steps: project initiation & project management.

6.2.1.1 Project Initiation

The first question that needs to be answered is this, "will this system increase business value?" Provided the answer is yes, business analysts quickly draft a system request, better known as BRD in UCB, that briefs the business needs, and how the proposed solution will serve these needs. After the BRD is approved, the next step is to do a feasibility analysis.

6.2.1.2 Feasibility Analysis

Feasibility analysis creates a more detailed guideline and guides the company in deciding whether to proceed with the development of the proposed system. It also identifies 'risks' in the development phase, as well as in post-development. This analysis study also involves risk management should the project be approved.[2]

Technical Feasibility The first assessment in this analysis is technical feasibility, which refers to the capability of the IT team to successfully design, develop and implement the proposed system. A number of risks pop up in this study that can endanger the successful completion and utilization of the software. Some of the defining factors are:

> **Familiarity with the application:** How familiar business analysts and users are to this system. New systems tend to have more risks since analysts would fail to recognize all user requirements and areas of improvement. Also, if users are new to the system, they may fail to efficiently utilize the new system, and might even be inclined to switch back to former methods.

> **Familiarity with the technology:** By technology, we refer to the tools, programming languages, frameworks, and methods used to develop the app. If a system is developed using new technology, it will cause delays and bugs as it is needed to learn the new technology before using it.

Project Size: The magnitude of the project, number of features to be implemented is directly proportional to the amount of risk involved. Larger projects are more complicated, difficult to manage, and is more likely to miss important system requirements. How the system is integrated with other systems is also a factor as complexity increases when multiple system have to work together.

Before Protracker, a project management system existed in UCB, named Orangejuice. Users and analysts thus are quite familiar with the new proposed system, which is essentially an improvement to the existing application. Also, Protracker has been developed using technologies that are already in use within the company. So, Users, developers and analysts find themselves on very familiar grounds with this new system.

Economic Feasibility Also Known as cost-benefit analysis, this study determines the financial benefits in developing the new system. In other words, this study answers another important question, "Should we build this system?". A number of techniques and mathematical formulae are used in this analysis to determine variables like 'return on investment', 'break-even point', 'discounted cash flow technique', and 'net present value'. It is also important to compare the financial benefits of developing protracker to off-the-shelf products. From the studies conducted, it is clear that developing Protracker is far more economic and financially beneficial than any other options.

Organizational Feasibility The final technique used for feasibility analysis is to assess the organizational feasibility of the system: how well the system ultimately will be accepted by its users and incorporated into the ongoing operations of the organization. A common manner of determining risks is calculating how well the features of the system align with business objectives. The better they align, the less risk there is. The next thing to assess is the stakeholder analysis. A stakeholder is a person/group of people/organization that can affect, or be affected by Protracker. Usually there are three categories of stakeholders to consider, the Project Head, Organizational management, and system users. Since Protracker is a small sized project, mostly system user feedback, and directions from the project Head, Afzal bhai and Navid bhai, make up the bulk of the organizational feasibility study.

6.2.1.3 Project Methodology

The software development lifecycle of Protracker closely resembles system prototyping model. System prototyping performs the design, analysis and implementation concurrently and quickly in order to deliver a simplified working prototype to users for evaluation and feedback. Over the course of a number of reiterations, molding in features in alignment of project head, management and user feedback, the finished product is attained when all the stakeholders are pleased with the prototype. Over the course of this internship, Protracker has been revised by Navid bhai and Afzal bhai, whose feedback and guidelines were incorporated over iterations.

6.2.2 Analysis Stage

The analysis stage can be broken down into 3 major steps:

1. Analyse and understand the existing solution.

2. Identify improvements.

3. Define requirements in the new system.

After a thorough study of Orangejuice, it is found that the two main features of the existing solution is recording details of projects and which employees are working on any particular project, and recording states, or phases, of a project lifecycle. Orangejuice was also developed a long time ago, using technologies that are now obsolete. The UI of Orangejuice is also clunky and not user-friendly. After this first step of analysis, the following requirements have been identified:

- Record and edit project details

- Record the employees tasked to each project

- Use modern tools and technology

- Create a user-friendly UI

In-house business analyst Faisal bhai further assisted in the second step and with his help, we identified a few key improvements that can be made:

- Introduce Individual Task tracking

- Generate Employee performance reports

- Add and store documents connected to each project

- Assign tasks to employees working under each project

6.2.2.1 Functional and non-functional requirements

For this project, it was not required to prepare questionnaires, conduct interviews or surveys since the scale of the project is quite small, with a niche target user in the initial stage, and requirements were already pre-defined. The target user pool of Protracker in this pilot version is mostly the High-level executives, analysts, development, and testing teams of the IT department. The final step is defining the functional and non-functional requirements of the proposed solution. The functional requirements are:

- Record project details

- Record employees working in each project

- Create project updates

- Store Documents to each individual projects

- Record tasks

- Create tasks that may be under a project, or unrelated to any project

- Assign employees to tasks

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The non-functional requirements are:

- Generate employee performance report based on task completion

- Use latest tools and technology

- Create a user-friendly front-end design

The following UseCase diagram briefly illustrates some of the features and their target users:
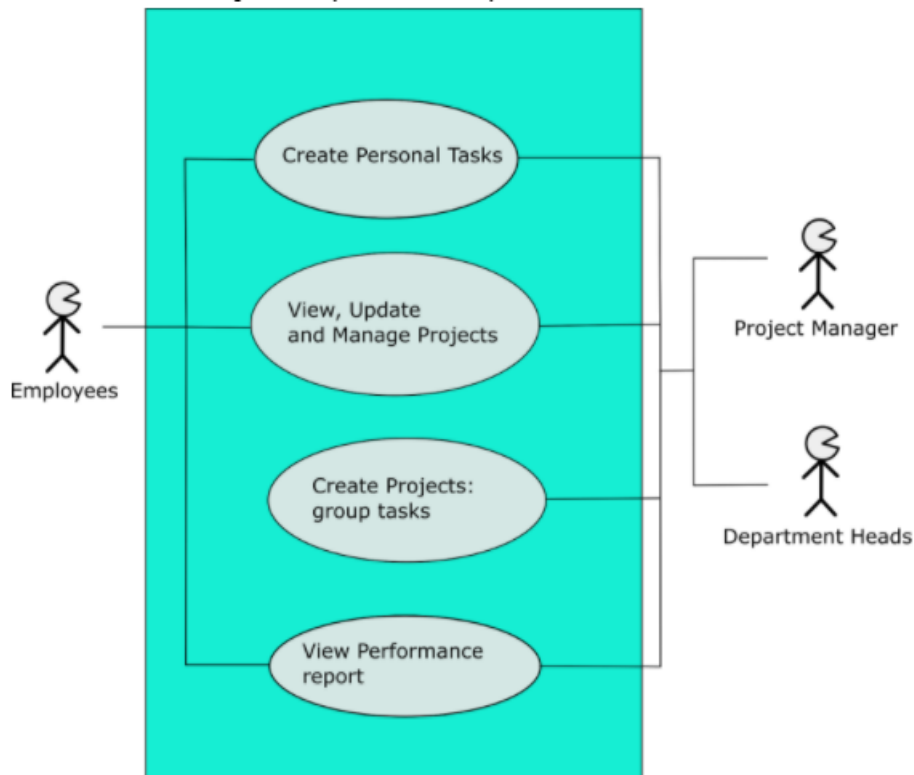

Figure 6.5: Usecase Diagram

6.2.2.2 Normalization of the Database

Normalization is the process by which analysts improve the quality of the data model, by removing data redundancies and breaking down complex relationships. The result of the normalization process is that the data attributes are arranged to form stable yet flexible relations for the data model. There are mainly three levels of normalization, however, in the modern day, up to 8 levels of normalization exist. For this analysis, it is ample to normalize up to 3 levels.
Initially we start with the data model at zero normal form:

Figure 6.6: Zero Normal Form

The first normal form(1NF) focuses on the instances of entities that have more than one value. In our table, tasks, project updates, and involved employees have to be broken off into separate entities in order to achieve the first normal form.
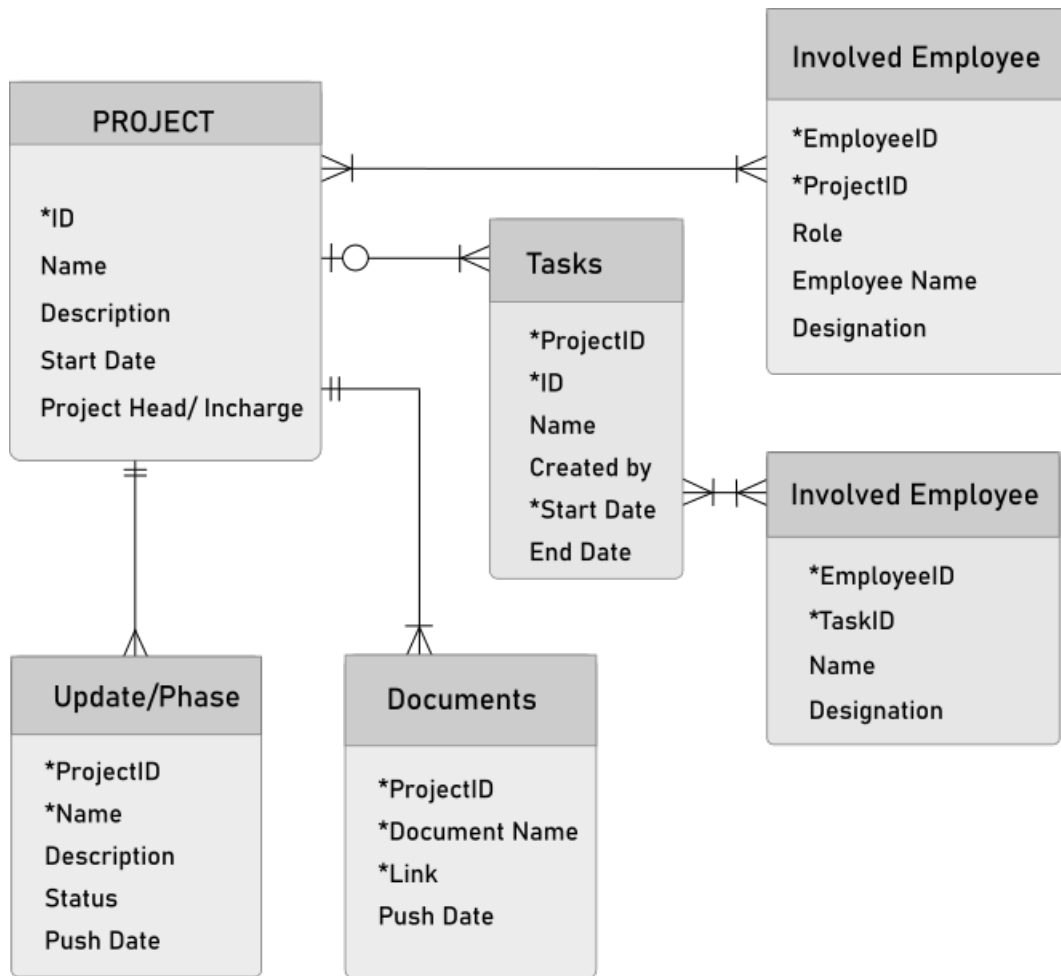
Figure 6.7: First Normal Form

The second normal form deals with partial dependencies. In case of relationships that have composite keys, like the involved employees table, it has data of employee details that is only dependent on the employee ID. These occurrences are broken off into separate entities to achieve second normal form.
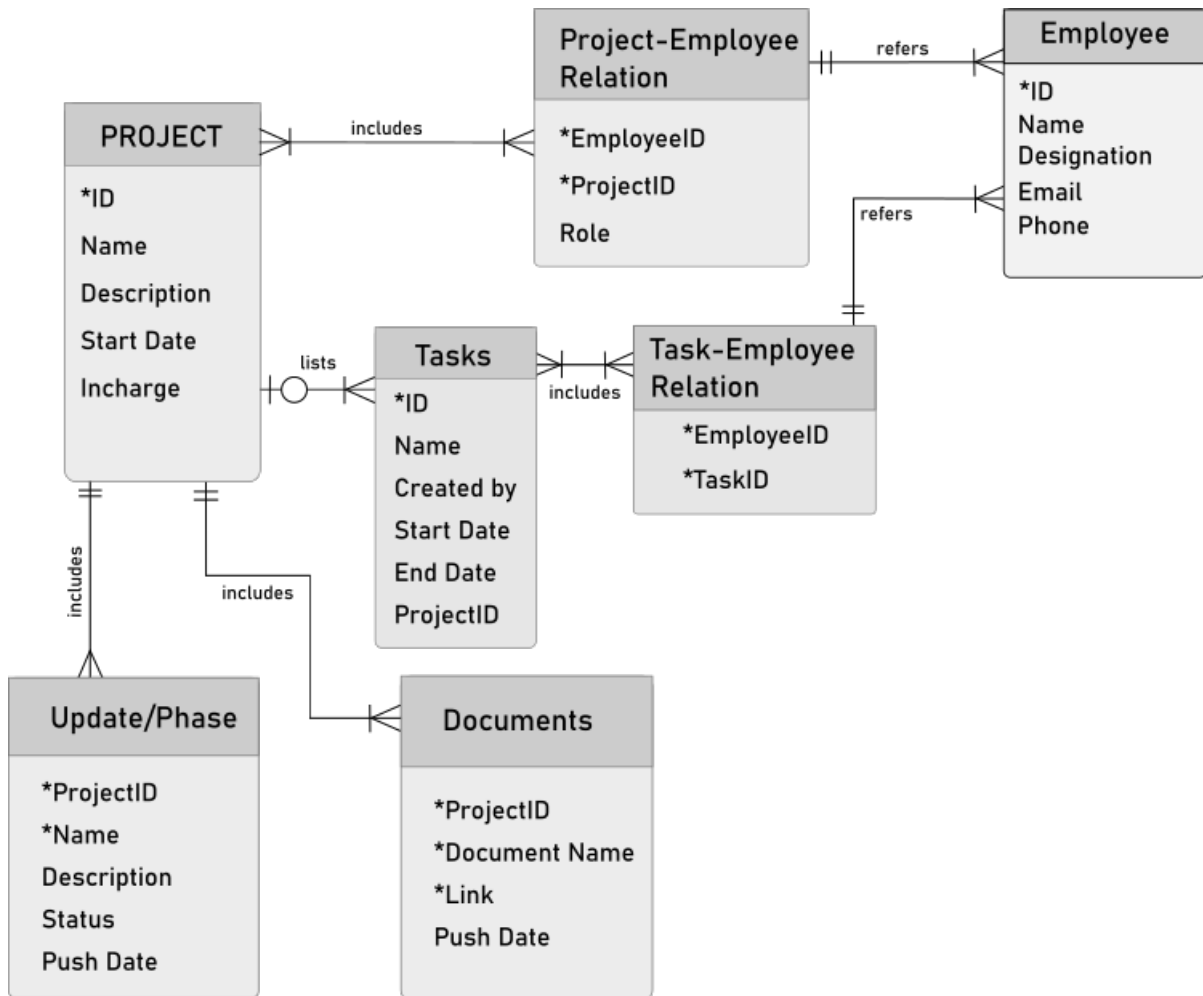
Figure 6.8: Second and Third Normal Form

The third normal form focuses on transitive dependencies. Transitive dependencies are columns that are dependent on non-key entities. In our data model, no transitive dependencies exist. So, the 2NF also passes 3NF requirements.

With the completion of these steps, we can conclude Analysis and move on to the Design stage.

6.2.3   Design Stage

The purpose of the Design stage is to determine how the new system will operate, and how we will build it. In this stage, one of the initial tasks is to generate a 'system requirement' document, or "software requirement specification" (SRS) as it is called in UCB. While the business document lists the logical features and business requirements of the app, the SRS file details on the technical specifications: what architecture to use, whether to outsource or buy certain features, breaking down the system into smaller achievable programming tasks, data models and physical models, hardware and software selection, etc.

The first question to answer is whether to develop the system in-house, buy and then customize a product from a vendor, or outsource the project to a software firm. Each of these options has its strengths and weaknesses, as discussed previ-

ously. Protracker has been approved to be developed in-house, as this option is the cheapest and best option, given the scale of the project and requirements.

The next step is to determine the software and hardware architecture. The software architecture can be broken down into four functions.[3] The first is data storage. For our system, we have selected to use SQL servers to store data. The second is data access logic. Data is communicated through the EntityFramework. The third is application logic. Application logic refers to the logical methodology and functionalities of the system. These are theorized initially with the help of use cases, functional requirements and DFDs. The fourth and final step is presentation logic. How will the new system interact with users? The system can be a windows application, browser application, or even a mobile app. How a user requests information, what permissions to implement, and how data is sent back and forth from the user interface are all determined in the presentation logic.

The three components of hardware architecture are servers, client computers, and the network that connects them. The most common hardware architecture is the client-server architecture. This architecture balances the processing between the client computers and the server. Presentation logic is computed in client-side while data storage and data access is managed in server-side. Application logic may be computed on either side, or split between client and server. There are a number of important benefits of this architecture. Firstly, it is scalable. We can add as many clients as we need, even after the new system is implemented. Secondly, this architecture can support various types of clients and their operating systems and hardware specifications. Client-server architecture is mostly web-based, and often run with a browser, so OS and hardware specifications are not important to consider. Finally, this architecture is very manageable. Bugs, hardware failure, and other risks can be troubleshooted easily because the connections are separate, and faulty items can be swapped out individually. For these reasons, this architecture has been selected for Protracker.

Afterwards, a number of technical requirements are determined. For example, performance requirements include speed, capacity, availability and reliability factors. Security requirements including encryption, authentication, system value, and access control requirements. Nowadays, most companies also have to perform a cultural and political requirement analysis. This includes what language to use, how customizable the app will be, unstated norms and legal requirements. Since the proposed system is of a small scale and only to be used inside UCB, most of these analyses have been skipped as they are not necessary.

The next step is to design the user interface. The goal is to make the UI aesthetically pleasing, while keeping it simple to use, and minimize the amount of effort a user needs to accomplish their goal. Another important thing to consider here is User Experience, how experienced are the users in using computers? Often, there is a diverse level of user experience in the pool, and a developer might need to design multiple UIs to address this diversity. Our user pool is the IT section of UCB, who are all very experienced and familiar with the existing solution. So, protracker UI is designed with the same flavour as the existing solution.

The Activity Diagram represents how a new project will be created and incorporated into the system. As security is a prime concern of banks, all new projects have to be authorized by Administrative Figures before ProTracker sets a new project as "live". Any employee can create a new project, fill in the details, but afterwards will need to forward authorization to respective figures. ProTracker does this in real-time by sending an email, while also notifying if concerned personnel are logged in.
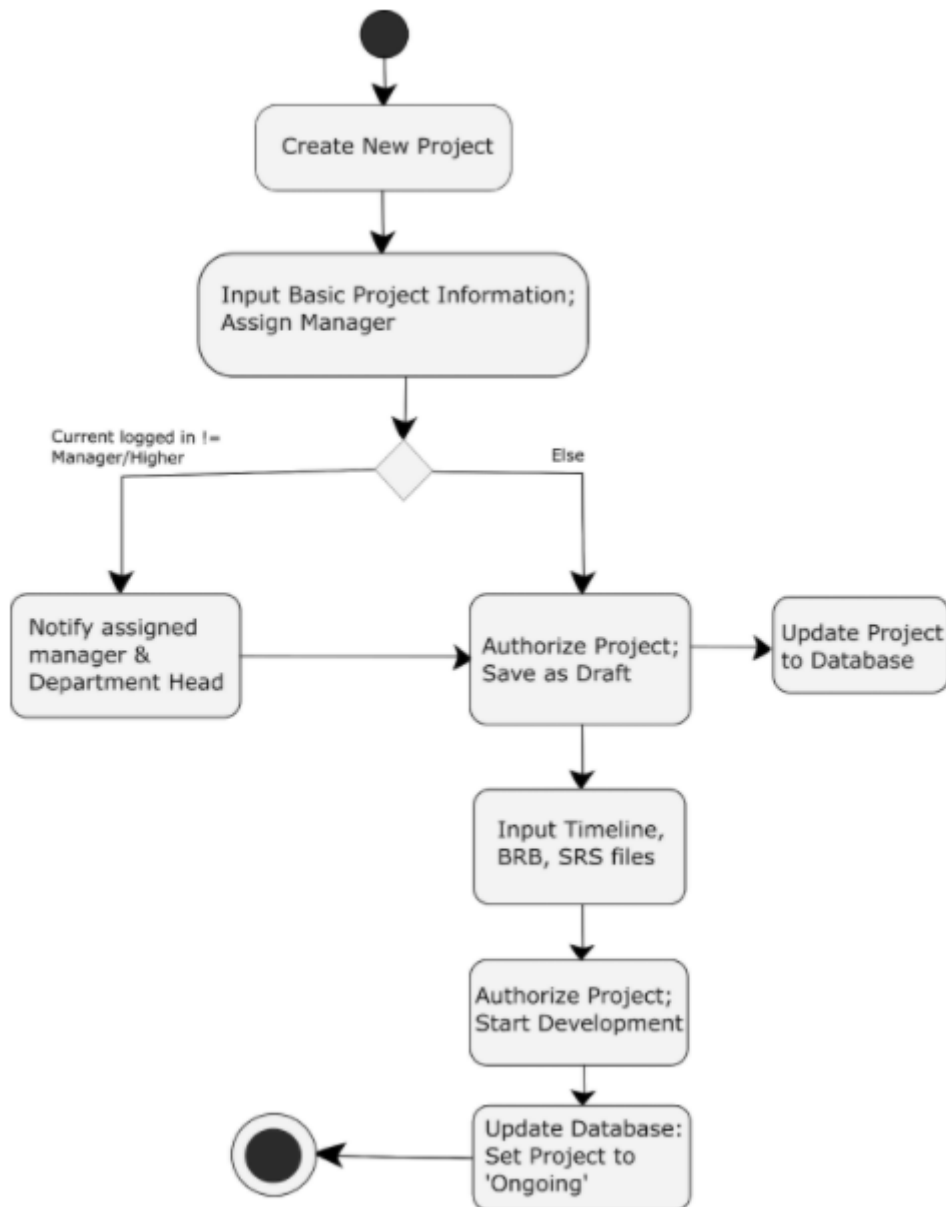

Figure 6.9: Activity Diagram

Protracker is being developed using the code-first approach. However, The following ER diagram had been drafted to aid database creation early on in the design stage.
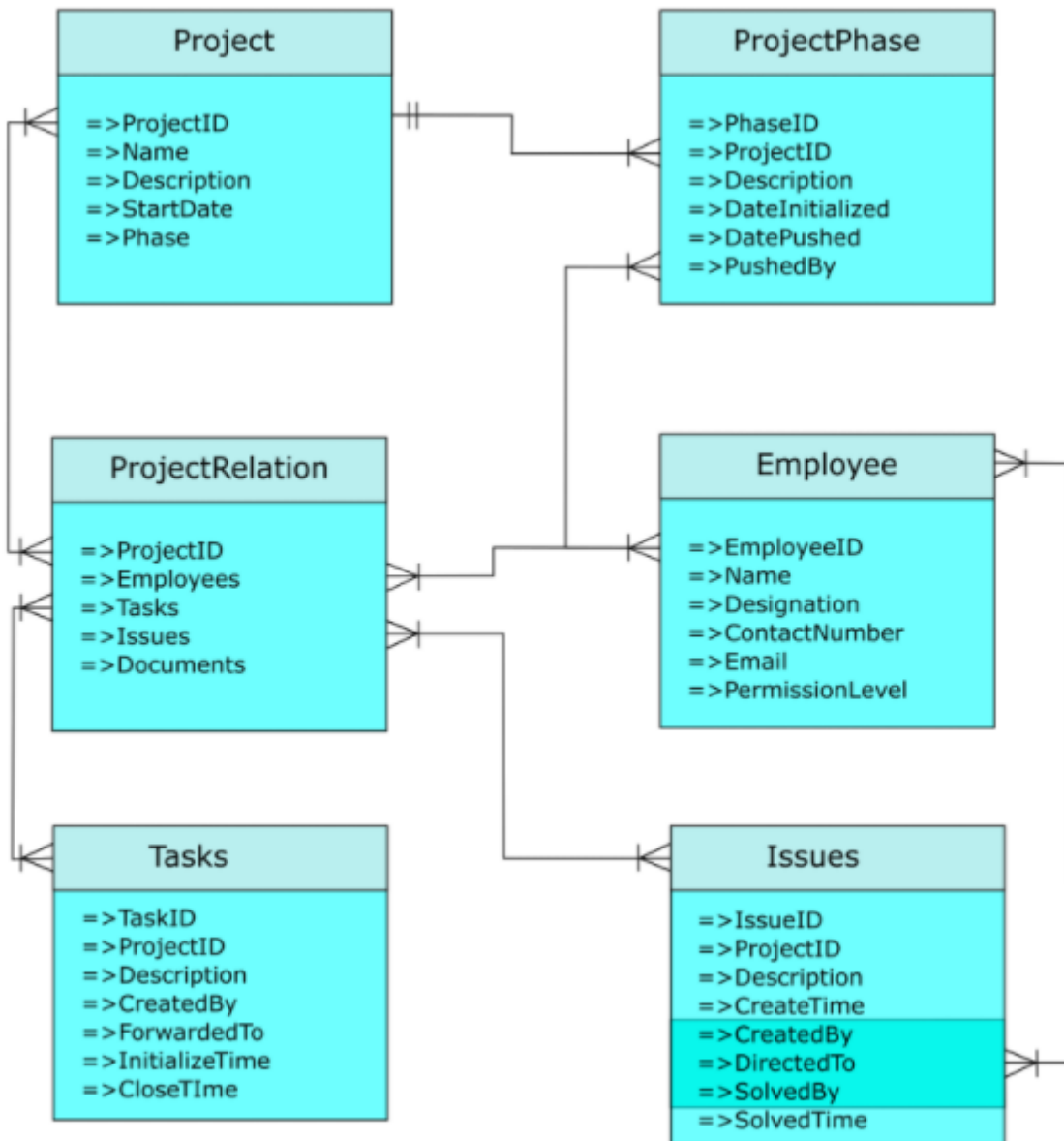
Figure 6.10: ER Diagram

The Class Diagram below shows the primary properties and methods to be implemented, as well as the relationships between the classes. Protracker primarily centers around projects, keeping track of the staff assigned to each project, as well as daily/weekly tasks to a project. The function of the task class is to break down a project into smaller day-to-day objectives. However, a task may also not be related to any project. Such tasks, termed personal Tasks, track a staff's daily activities that are not part of any project development. UpdateHistory class is a child class of Project. Its function is to record the phases of a project, from inception to Live.
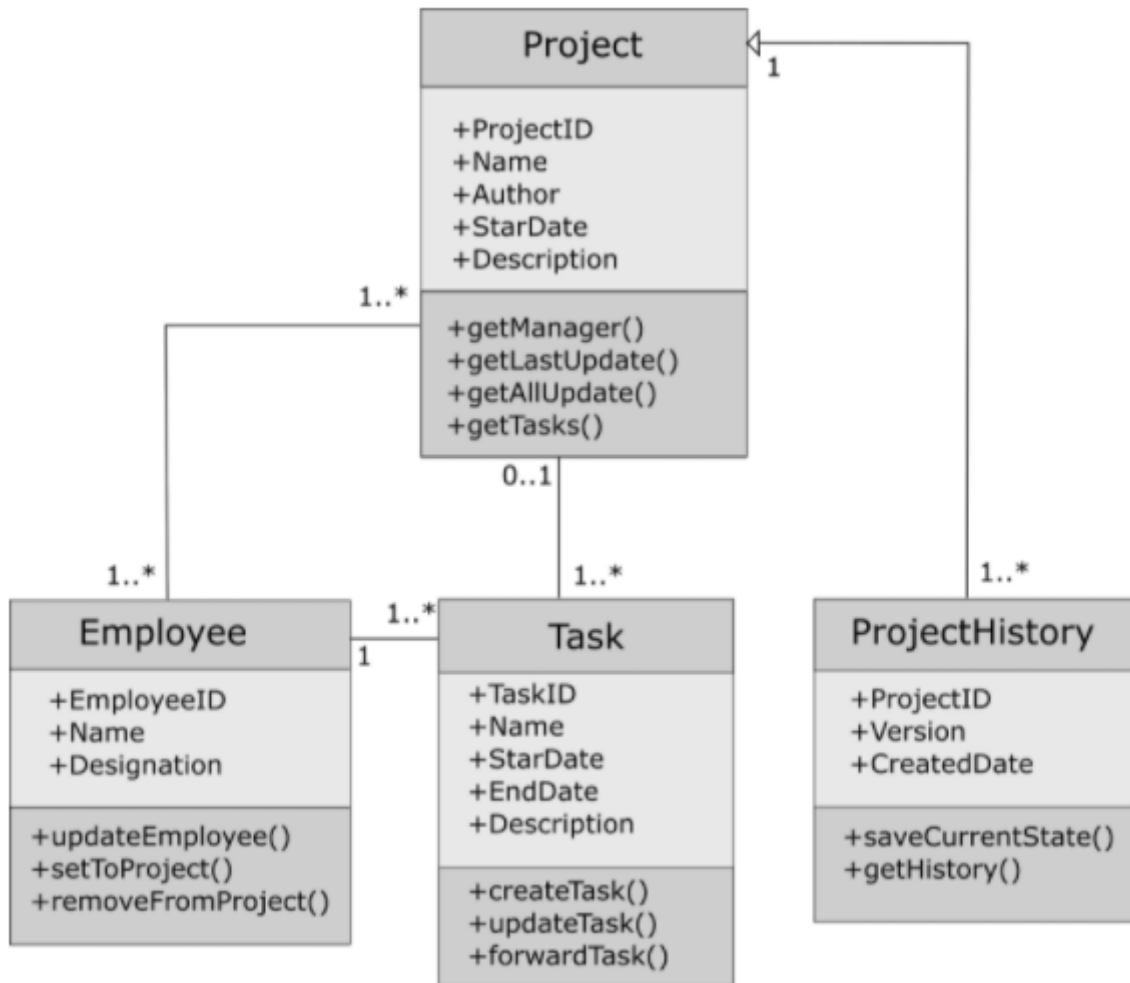
Figure 6.11: Class Diagram

6.2.4 Development Stage

The development stage of Protracker has taken roughly 8 months. As of now, the app has been approved for evaluation and testing. Let's take a closer look at some of the features of Protracker and how they have been implemented:

6.2.4.1 Login/User Management

Microsoft has implemented a framework for User management, known as "ASP.NET core Identity". Upon configuring this framework and after updating Database, the framework creates a number of tables in the database. Let's elaborate on 3 of them:

- AspNetUsers

- AspNetRoles

- AspNetClaims

Figure 6.12: Database Table Generated for AspIdentity

AspNetUsers   AspNetUsers table store the login information of a user. It stores the UserName, PasswordHash, Email, Phone Number and a few other Security and Concurrency fields. When a new user registers, thei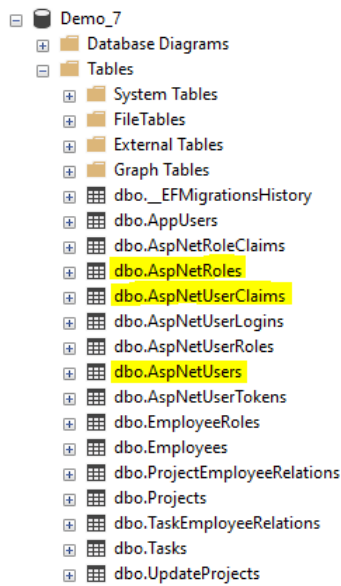r information is stored in this table. When a user logs in, their username and password is crosschecked against this table as well.

AspNetClaims   Different applications will need to store different types of data for its Users. An ecommerce site will need Delivery Address information of saved customers, while a project management system will need to store what projects an employee is involved in. Due to this diverse level of requirements of diverse webapps, Microsoft created a standard Users table that stores just a few imperative information, while adding a way to connect a user to a custom user table. This way is known as Claims. In the Claims table, 4 fields are stored.

	Id	UserId	ClaimType	ClaimValue
▶	1	2f272a72-8cc9-...	EmployeeId	2
	1005	b50f1f63-d033-...	EmployeeId	2006
	1006	afed1ff7-2071-4...	EmployeeId	2007
	1007	6ab48406-08bb...	EmployeeId	2008
	1008	9ad3dbaa-05f7-...	EmployeeId	1
*	NULL	NULL	NULL	NULL

Figure 6.13: AspNetUserClaims table

Id: auto-generated unique value

UserId: The AspNetUser Id, generated by the AspNetUser table on new entry.

ClaimTyle: Specifies the field the ClaimValue refers to.

ClaimValue: Specifies the value of the Claim.

Protracker has a class called 'Employee', in which there is a field called 'EmployeeId' which stores the unique id of an Employee. AspNetClaims connects an Employee to a User by storing the UserId and corresponding EmployeeId.

AspNetRoles   This table stores the roles that can be assigned to a User, which can be checked for authorization to any methods or features. For example, only a user with the roles Admin or Top can access the Admin Panel. The roles assigned are saved in the AspNetUserRoles table.

	Id	Name	NormalizedNa...	ConcurrencySt...
▶	ADMIN	ADMIN	ADMIN	6B2E5168-2A0A...
	MANAGER	MANAGER	MANAGER	F00D722C-5CD...
	TOP	TOP	TOP	aslfkasdjkl
*	NULL	NULL	NULL	NULL

(a) AspNetRole

	UserId	RoleId
▶	70d-822fd65c9be2	ADMIN
	9ad3dbaa-05f7-...	ADMIN
	afed1ff7-2071-4...	ADMIN
	6ab48406-08bb...	MANAGER
	9ad3dbaa-05f7-...	MANAGER
	2f272a72-8cc9-...	TOP
	9ad3dbaa-05f7-...	TOP
	afed1ff7-2071-4...	TOP
*	NULL	NULL

(b) AspNetUserRole

Figure 6.14: AspNetRole Tables

6.2.4.2   Models

In the MVC framework, also known as Model-View-Controller, Models are the representation of the objects in the program. EFcore uses the Models to generate tables in Database, and Data is manipulated in lieu of the Models. In other words, Models are the gateway between Database and Program.

Project Model   The Project class stores all information related to a project. ProjectHead is a property of Employee class that stores the person-in-charge of a project, and InvolvedEmployees is a list of employees that are working in the project. Tasks property stores the list of Tasks under the project. *See fig. 9.2 in Appendix A (page 59)*

Employee Model   Employee class contains information on Employees, as well as Lists of Projects and Tasks they are involved in. *See fig. 9.3 in Appendix A (page 60)*

Tasks Model   Tasks are smaller, specific objectives that may or may not be related to a project. Tasks can range from small ones that are meant to be finished in a day, to large ones that could take weeks, and any number of employees can be assigned to a task. *See fig. 9.4 in Appendix A (page 60)*

Many-to-Many Relationships   Projects to Employees, and Tasks to Employees are many-to-many relationships. In EntityFrameworkCore, many-to-many relationships are implemented using a separate table. These tables have a composite

Primary key. Meaning, there isn't a singular unique Id of these entries, rather 2 columns of non-unique Ids together create the primary key. In the case of the ProjectEmployeeRelation table, ProjectId and EmployeeId are the composite primary keys. *See fig. 9.5 and fig. 9.6 in Appendix A (page 61)*

6.2.4.3 Controllers

Controllers manage the flow of Data to and from the frontend to the server. All business logics, Methods, Security measures, etc are implemented in the Controllers. *See fig. 9.7 and fig. 9.8 in Appendix A (page 62)* Every Controller has three things in common:

- They all have the word 'Controller' at the end of the class name.

- They all inherit the builtin abstract class 'Controller'.

- They are all situated in the Controllers folder.

The AspNet MVC framework has a special interface called "IActionResult". Methods Implementing this are called action methods. Action methods always return a view. So for each action method, there is always a view rendered that is returned to the browser. Usually an action method will have a corresponding view to it. However, an action method can also redirect to the view of another action method, or call another action method in its return statement. *See fig. 9.9 and fig. 9.10 in Appendix A (page 62)*

6.2.4.4 Views

Views are situated in the Views Folder, sub-foldered by name of Controllers. *See fig. 9.11 in Appendix A (page 63)* There is an important distinction between normal HTML files and razor files, which can be identified by the extension '.cshtml'. AspNet by defaults uses razor pages when creating a view. The benefit of razor pages is that C# code can be written inside HTML file, which the browser compiles and interprets when the page is loaded. C# code snippets are marked by @ sign, or can be written in snippets, that are marked by @{ }. *See fig. 9.12 in Appendix A (page 64)*

Chapter 7

Professional Growth

> Your profession is only as noble as
> your attitude and intent towards it.
>
> *Jonas Caino*

7.1 Challenges

The journey of my internship has been a bittersweet experience, filled with frustration, apprehension and complications. Learning programming is like learning a new language. you know what you want to do, but the challenge is to make a machine understand what you want to do. Over the course of this year, I have learned many keywords, builtin methods and what they do. I do not consider what I have learned so far to even scratch the surface, but it's a start. A year ago I had no clue how to do anything in webapp development. I have felt hopeless and in despair multiple times, but with my persistence, and a bit of help, I am where I am today. Today, I know I have a strong foundation of the mechanics of one framework of web-app development. I know I can develop a functional website, may it be an ecommerce site, or a news page.

> "Success is how high you bounce when you hit bottom."
>
> *-General George Patton*

7.1.1 Facing the Office Environment

As a person who spent 20 years of his life in a classroom environment, the office environment is overwhelming at first. It was especially difficult for me as I was the only intern, there were no peers for the company, and employees had to prioritize their work before spending time on an intern. In the beginning, I remember feeling unwanted, an alien to this office. It took a week or so to get comfortable, and be able to communicate with the team, ask for help and guidance. While it wasn't my biggest challenge, it was still a significant challenge to overcome, and I am happy that I have overcame it.

7.1.2 A Start to Coding

Initially, I was overwhelmed by programming. Every line seemed like an alien language, and I practically got stuck on every keyword, method chaining, and whatnot. It is only through persistence was I able to overcome my frustrations and biggest challenge. As I reach the end of my internship, I realize I am not scared of programming anymore. I have learned to debug and learned many builtin methods and keywords. Looking back, I see I have gained tremendous skill and have climbed a significant portion of the scary mountain, one step at a time.

7.2 Technical Skills

An Internship is the first real taste of the corporate structure, where it is time to learn and simultaneously apply our knowledge and skills. We spend more than 20 years of our life learning theories, and internship is where we finally learn to apply those theories in real-world applications. This internship has provided me with a wonderful opportunity to learn technical aspects, application and find the confidence to pursue a career in programming. In this section I have mentioned a selective list of the technologies that I have learned about.

7.2.1 C# and ASP.NET

C# is a multi-paradigm, general-purpose programming language. Static typing, strong typing, lexically scoped, imperative, declarative, functional, generic, object-oriented (class-based), and component-oriented programming are all covered by the C# programming language. C# is a Microsoft object-oriented programming language that tries to combine C++'s computing capability with Visual Basic's programming ease. C# is based on C++ and has features that are similar to Java.[13] .NET is an essential component of many Windows-based applications, providing common functionality for them to execute. ASP.NET is a server-side Web application framework that allows you to create dynamic Web pages. Programmers can use it to create dynamic web sites, web applications, and web services. The Common Language Runtime (CLR) underpins ASP.NET, allowing programmers to build ASP.NET code in any supported .NET language.

7.2.2 SQL Server and SQL Server Management System(SSMS)

Microsoft SQL Server is a relational database management system that Microsoft has created. As a database, it is a software product whose principal job is to store and retrieve data as required by other software applications. Its operations can be conducted on the same computer or on a networked computer.

7.2.3 Visual Studio 2019

Microsoft Visual Studio is the company's integrated development environment (IDE). It's used to create web pages, web apps, and web services by writing computer programs. Visual Studio is a collection of tools and services that can be used to construct a wide range of programs for the Microsoft platform as well as other

platforms. Millions of developers worldwide choose Visual Studio, whether you're creating mission-critical .NET apps, producing lightning-fast code with C++ AMP, or testing and debugging a cloud-87 linked HTML/JavaScript app that runs on several devices.

7.3 Communication Skills

Effective communication involves the ability to express one's ideas in a clear and concise manner. It also involves the ability to catch other people's ideas. Meaning, ideal communication goes both ways, both being able to intake eccentric ideas and also output them. As a student, my Internship provided me with the oppourtunity to do exactly that. I have learned to exchange ideas with the software development team on how to develop this project, what features to include, how to prioritize different features and incorporate them at a time.

7.3.1 Information Gathering

Gathering information is an important communication skill, especially for someone aspiring to be a successful software developer. The amount of information we can get from routine communication has a big impact on the quality of our requirement engineering. As I worked on the webapp, I had to strengthen my knowledge gathering skills since if I didn't fully get the requirements, my efforts could be in vain.

7.3.2 Listening

Listening can be tedious at times, but there is no other way to grasp a product but to become a good listener. I am able to improve my listening skills as a result of my internship.

7.4 Management Skills

One could argue that interning isn't the ideal approach to obtain management experience. That may be somewhat accurate, because an intern would be really fortunate if he or she had the opportunity to manage something throughout the internship. However, there is always the possibility of managing oneself to improve one's management qualities. The biggest management skill i have learned during my internship is planning.

Before beginning a task, I always thought about how I would approach it. Occasionally, other tasks will pop up, and I will need to plan which task to complete first. Even if those preparations were simply for myself, I can say that it has helped me get used to planning ahead.

7.5 Creativity

The biggest pleasure I found in developing Protracker is how it brought out my creativity. In programming, there is no one way to achieve the objective, and the freedom to be creative, to find creative solutions to problems has been an absolute delight for me.

Chapter 8

Self-Assessment

> I start early and I stay late, day
> after day, year after year, it took
> me 17 years and 114 days to
> become an overnight success.
>
> *Lionel Messi*

My internship program has changed my life in ways a thesis program never could have. For the first time in my life, I was placed in a realistic office environment, one in the middle of a pandemic. Throughout my university life, I'd actively avoid enrolling in morning classes. My routine involved waking up late, attending classes, spending time with friends, returning home and playing competitive CS:GO with my teammates, late into the night. For the first 2 months of my Internship period, I figured it would be best if I stayed home and watched YouTube tutorials to learn coding, since YouTube was blocked in UCB. I'd wake up late, watch a few YouTube tutorials on ASP.NET, understand nothing, get frustrated, do nothing productive for the rest of the day, sleep, rinse and repeat. Every day I would realize I got nowhere that day, I needed to try something different the next day, only to find out the next day turned out exactly the same. I soon realized I was wrong and how desperately I needed to break out of my old routine.

On the 25th of January, I took a few steps that changed the course of my Internship, and possibly my future. I made a few changes in my life. I decided to wake up every day at 7:30, have breakfast and a cup of coffee, arrive at the office by 10:30, and journalize what I learn daily.

> *"People do not decide to become extraordinary.*
> *They decide to accomplish extraordinary things."*
>
> *—Edmund Hillary*

I started each day with the intention to learn something, no matter how small. I reached out to Navid Bhai, and he would give me some time and materials to study every day. By day 36, I already started seeing progress. It dawned on me that the recipe for my success starts with continuous effort to wake up and go through a healthy morning routine, followed by arriving at the office, basking in the productive

work environment, recording what I do each day, going over previous things repeatedly every time I felt I am stuck, and doing this long enough that it becomes a habit.

I realize an internship should not have taken this long and developing an app does not take this long. But with the ongoing pandemic, repeated lock-downs, getting infected with COVID-19 twice and getting married all throughout the duration of my internship, I am proud of my progress. It has been a slow start, but it is a start nonetheless.

Prior to this internship I questioned my ability and desire to be a webapp developer. After a year of working, I finally feel confident enough to say that I am a webapp developer. I feel attracted to this field enough to pursue a career in web development. When I go to any website, I have started to visualize the codes working wonders behind the scenes. I think about the font used, what sort of authentication is in place, what a particular button does, and I can imagine how I would create this webpage.

Thanks to UCB and BRAC University, I finally feel ready to start my career. I am no longer vexed by webapp development, and I have had enough of an exposure that now, I know what I am doing. It is an incredibly gratifying feeling, and I am happy to have achieved my state of peace and comfort in the world of codes.

Chapter 9

Conclusion

9.1 Benefits of Internship Program

Between Thesis, Projects and Internship, only Internship can expose a student to the corporate world. This value alone, in my opinion, is large enough to consider an internship. In addition, there are many paid Internships, meaning one can start earning while learning the ropes, as well as completing a required University course. Three birds with one stone, as the proverb would go. Let's look at some statistics to further illustrate the benefits to an internship.

9.1.1 Internship to full-time Job

According to CompareCamp, 70% of companies offer interns a full-time job [9]. The reason for this high percentage is because companies tend to withhold personnel they have put effort in. In an internship, effort goes both ways. a student puts in the effort learning, while an employer puts in effort teaching. This also means, a significant number of interns do not have to go through the Hurdles of Job Hunting. For this reason, 80% of students accept said job offers. As a result, 56% of internships turn into a full-time job [5]. These numbers are much higher than a student who graduates by completing a thesis/project based course.
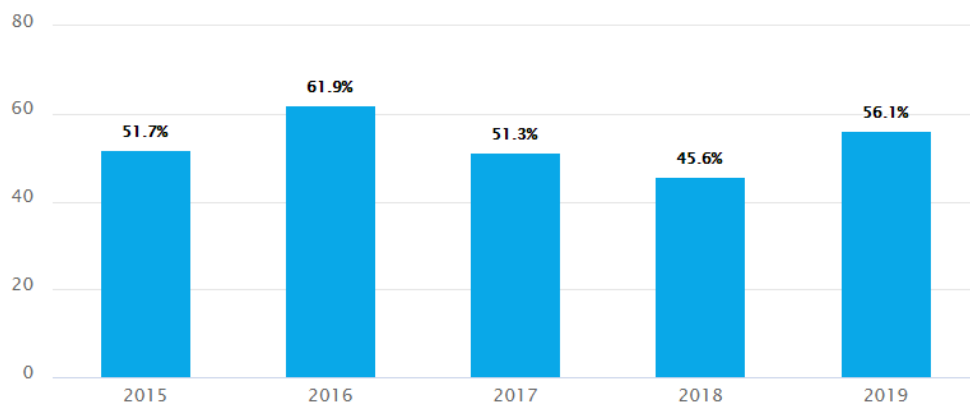

Figure 9.1: Intern Conversion Rates from 2015-2019

9.1.2 Unpaid Internships

While it is undeniable that it is nice to get paid for honest work, I am technically doing an unpaid Internship. I have been paid a minimal amount as conveyance bill, but other than that, no other financial support were offered. However, unpaid Internships have significant non-financial benefits. There is much more lenience in terms of work hour and responsibilities. and it provides a much smoother transition from student life to corporate life. However, statistically, the number of unpaid Internships have dropped significantly over the last decade, as companies are incorporating more ethical approaches to Internship programs.[11]

9.1.3 Networking

Internships open the doors to expanding our network outside of our friends and university. The connections that are developed through an internship are generally much more valuable as these contacts are usually hard-working individuals well-versed in their fields. Additionally, it is a rule of thumb that bigger and better connections lead to bigger and better opportunities.

9.2 Areas of Improvement

While there are social structures and systems, like Education, Health, and yes, Corporate, that do work, none of these systems are flawless, and there is always room for improvement. In my opinion, companies and universities offering internship programs could consider the improvements to their programs as mentioned in this section.

9.2.1 Enforce Paid Internships

While it should be an intern's primary focus to gain useful knowledge and experience rather than to earn money, getting paid promotes motivation and satisfaction in Interns in their pursuit of said knowledge and experience. If an internship is unpaid, it is normally governed by strict labor laws. Unpaid interns, for example, cannot benefit the company financially or be utilized to replace labor done by paid workers, according to US federal law. Many companies still do benefit from an Interns services without compensation. Thus, it is my belief that interns should be paid a modest amount during their internship.

9.2.2 Promote Team Internships

While some companies do take interns in batches, it isn't the standard routine. Office staff in most cases are very friendly and helpful, but there are some people, like me, who find it difficult to adjust, or start finding themselves irrelevant. Taking interns in batches of 3-4 helps alleviate this, it provides the benefits of peers, encourages teamwork and collaborative efforts, promotes productivity and inhibits loneliness.

In Conclusion...

It has been a year since I've started this internship program, and as I write these final words, I reflect upon how this year passed. A lot more has happened in my life other than this internship, and all the events I have gone through within this period made me realize that I have learned to juggle the numerous aspects of life simultaneously. I have gained a lot more confidence regarding the job market, and my strides towards landing my first job are firmer than ever. I would like to end this report with a quote from a favorite movie:

> *"Success ke peeche mat bhago, Excellence ka peecha karo. Success jhak maar ke tumhare peeche ayegi."*
>
> *-Rancho, 3 Idiots*

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Appendix A

9.3 Codes and Algorithm

Project Model


```
40 references
public class Project
{
    53 references
    public int Id { get; set; }
    25 references
    public string Name { get; set; }
    12 references
    public string Description { get; set; }
    [DataType(DataType.DateTime)]
    9 references
    public DateTime StartDate { get; set; }
    14 references
    public string Author { get; set; }
    13 references
    public string Status { get; set; }
    10 references
    public string Version { get; set; }
    [ForeignKey("Employee")]
    7 references
    public int EmployeeId { get; set; }
    15 references
    public Employee ProjectHead { get; set; }
    17 references
    public List<ProjectEmployeeRelation> InvolvedEmployees { get; set; }

    0 references
    public List<UpdateProject> Updates { get; set; }

    8 references
    public List<Tasks> Tasks { get; set; }
}
```

Figure 9.2: Project Model

Employee Model


```
61 references
public class Employee
{
    56 references
    public int Id { get; set; }
    [Required]
    42 references
    public string Name { get; set; }
    21 references
    public string Designation { get; set; }
    [Required]

    public string ContactNumber { get; set; }
    [DataType(DataType.EmailAddress)]

    public string Email { get; set; }

    public string Department { get; set; }


    public int PermissionLevel { get; set; }


    public List<ProjectEmployeeRelation> InvolvedProjects { get; set; }

    public List<TaskEmployeeRelation> InvolvedTasks { get; set; }
}
```

Figure 9.3: Employee Model

Task Model


```
52 references
public class Tasks
{
    38 references
    public int Id { get; set; }
    28 references
    public string Name { get; set; }
    30 references
    public string Description { get; set; }

    public string Status { get; set; }

    public int Priority { get; set; }
    [DataType(DataType.DateTime)]

    public DateTime CreateDate { get; set; }
    [DataType(DataType.DateTime)]

    public DateTime EndDate { get; set; }

    [ForeignKey("Project")]

    public int? ProjectId { get; set; }

    public Project Project { get; set; }

    public Employee CreatedBy { get; set; }

    public List<TaskEmployeeRelation> InvolvedEmployees { get; set; }
}
```

Figure 9.4: Task Model

60

Many-to-Many Relationship in EF core

```
9 references
public class ProjectEmployeeRelation
{
    9 references
    public int ProjectId { get; set; }
    6 references
    public Project Project { get; set; }
    9 references
    public int EmployeeId { get; set; }
    7 references
    public Employee Employee { get; set; }
    7 references
    public EmployeeRoles Role { get; set; }
}
```
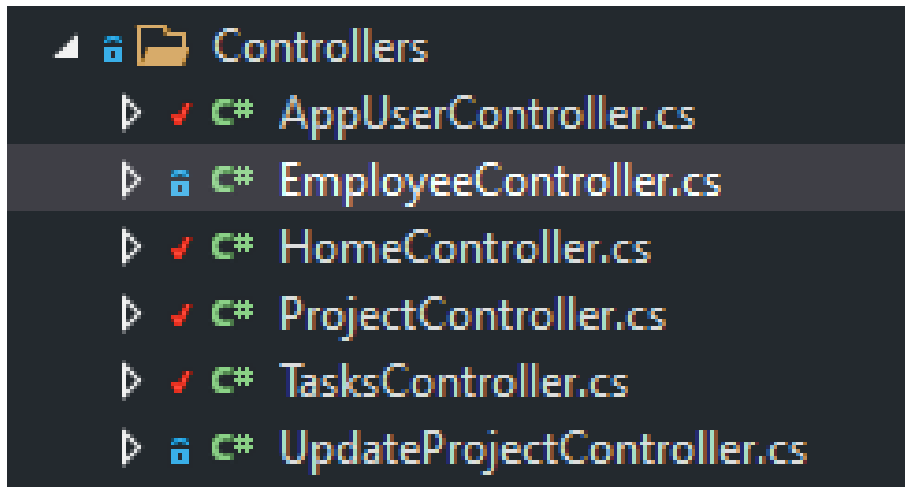
Figure 9.5: Project Employee Relation

```
9 references
public class TaskEmployeeRelation
{
    5 references
    public int TaskId { get; set; }
    2 references
    public Tasks Task { get; set; }
    12 references
    public int EmployeeId { get; set; }
    16 references
    public Employee Employee { get; set; }
    3 references
    public EmployeeRoles Role { get; set; }
}
```

Figure 9.6: Task Employee Relation

Controller

Figure 9.7: Controller in Solution Explorer
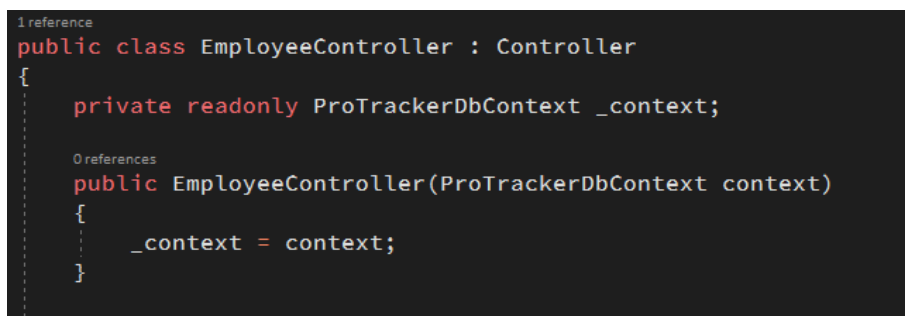
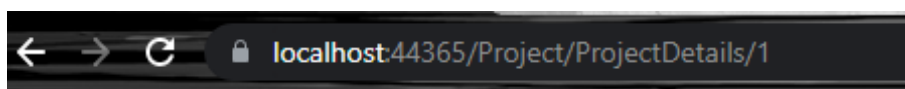Figure 9.8: Inheriting Controller Class

IActionResult

Figure 9.9: Controller and Action

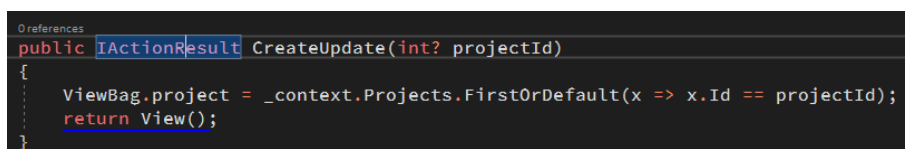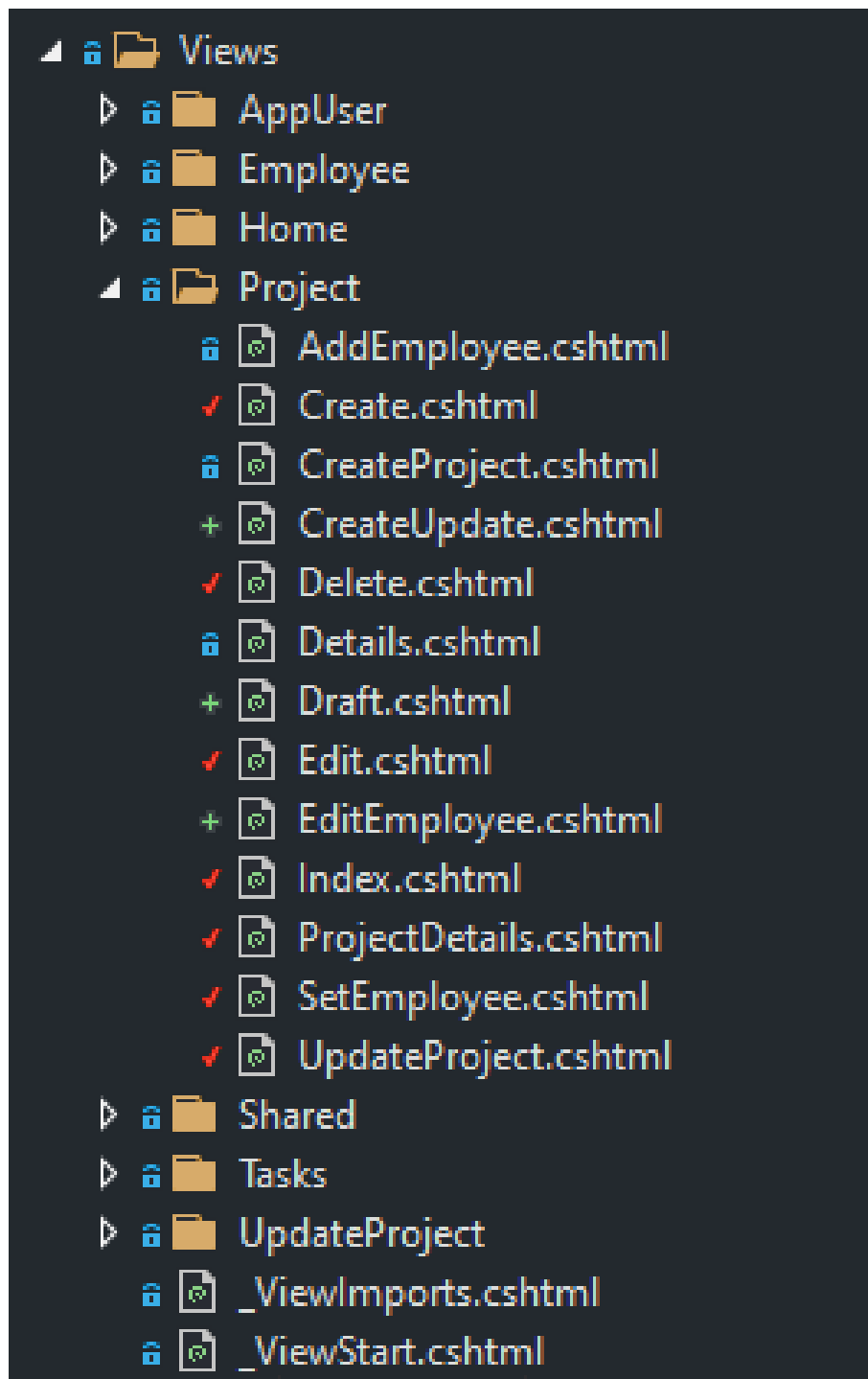Figure 9.10: IActionResult

View Explorer

Figure 9.11: View Explorer

Using Razor Pages

Figure 9.12: Razor Example