



An Undergraduate Internship Report on Animals Den at Techdojo

By

Fairuz Humaira

Student ID: 1731126

Summer, 2021

Supervisor:

Md. Abu Syed

Supervisor's Designation

Department of Computer Science & Engineering

Independent University, Bangladesh

September 11, 2021

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

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

This is to certify that I, Fairuz Humaira have completed the report titled "Animals Den" and submitted it in partial fulfilment of the requirement for the Degree of Computer Science and Engineering from Independent University, Bangladesh (IUB). It has been completed under the guidance of my university supervisor Md. Abu Syed and company supervisor Ms. Shama Hoque. I also attest that the partially completed project demo that I showcased is original and based on my research and experience that I gained from my internship. This work has not been submitted as a project to this university previously, neither has it been submitted to any other institution. All the sources of information used in this Project Report has been duly acknowledged in it.

Signature

Date

Fairuz Humaira

Name

Acknowledgement

First and foremost, I would like to express my deepest sense of gratitude to Almighty Allah, it is because of His mercy and blessing that gave me the motivation and strength to work hard during my internship.

I would also like express my sincerest gratitude to my internal supervisor Md. Abu Sayed, Lecturer, Department of Computer Science and Engineering, Independent University, Bangladesh (IUB), who gave me all support by taking his time out to guide and keep motivating me to complete the project.

I then want to show my deepest gratitude to Ms. Shama Hoque, my external supervisor. She gave me the opportunity to work for Techdojo as an Intern. She also gave me guidance, advices and motivation to work hard; for which I will be forever grateful. My internship at Techdojo gave me the opportunity to work with other developers. My co-workers and seniors from Techdojo also gave me encouragement and support in the arena of developing softwares. This has given me the confidence to stay in this work of line for the future. Among my co-workers and seniors, I have mostly worked with Anan Sarah Nikita and Munjerin Hossain Muna. I would like to thank them for all their time, effort and expert skills that has helped me learn so much during the development of the project.

Last but not the least, I would like to thank my parents, other family members and friends for their constant support and encouragement.

Fairuz Humaira
September 2021
Dhaka, Bangladesh

Letter of Transmittal

September 10, 2021

Md. Abu Sayed

Lecturer

School of Computer Science and Engineering

Independent University Bangladesh

Subject: Submission of Internship Report

Dear Sir,

It is with a great pleasure that I am presenting the internship report on the project "Animals Den". Animals Den, a full stack MERN application is a project that I got to be part of and worked for under the software firm, Techdojo Limited. This task was given to me for the completion of my Bachelors Computer Science and Engineering Degree.

I am happy to inform you that I have successfully completed my internship for 12 weeks at Techdojo under the supervision of Ms. Shama Hoque, Managing Director. This project has given me opportunity to test my theoretical knowledge that I gained from my university courses as well as gain experience on what it would be like to work for a software company. I am deeply grateful for the guidance and advices you gave me during the course of these 12 weeks. It would be grateful if you could kindly go through the report and provide your valuable judgement.

I am hoping that this report will be interesting, unique and informative. I also hope that this meets your expectations. I have tried my best to avoid my mistakes and deficiencies and hope that this report will satisfy you. I would like to end by thanking you again for helping me and giving me the chance to submit this report to you.

Sincerely,

Fairuz Humaira

ID- 1731126

Evaluation Committee

.....
Signature

.....
Name

.....
Supervisor

.....
Signature

.....
Name

.....
Internal Examiner

.....
Signature

.....
Name

.....
External Examiner

.....
Signature

.....
Name

.....
Convener

Abstract

It is always a big decision to take responsibility of adopting a pet or putting a pet for adoption. All animals are unique and each type have its own special needs to survive in big world with content.

In context of Bangladesh, domestic animals have always been around us in one way or other. These domestic animals can either be someone's loved pet or a stray animal that solely survives on the people of the neighbourhood they reside on.

Animal lovers who are actively looking to adopt pets or trying to find homes for their beloved pets to be adopted struggle to find the suitable candidate for their pets.

With the technological advancement that's happening in Bangladesh, people are relying more on technologies and shifting from the traditional methods.

With that concept in mind, Animals Den, a web based MERN application have been introduced for the first time in Bangladesh. This application will be a one stop application for users who are willing to find pets to adopt or put their pets up for adoption.

The aim of this application is to create a community where animal lovers can find the best homes for their beloved pets and create a safer and better environment for animals and humans.

Keywords— animals, pet, adoption, MERN

Contents

Attestation	i
Acknowledgement	ii
Letter of Transmittal	iv
Evaluation Committee	v
Abstract	vi
1 Introduction	1
1.1 Overview/Background of the Work	1
1.2 Objectives	2
1.3 Scopes	2
2 Literature Review	4
2.1 Relationship with Undergraduate Studies	4
2.2 Related works	5
3 Project Management & Financing	8
3.1 Work Breakdown Structure	8
3.2 Process/Activity wise Time Distribution	9
3.3 Gantt Chart	10
3.4 Process/Activity wise Resource Allocation	10
3.5 Estimated Costing	11
4 Methodology	12
5 Body of the Project	21
5.1 Work Description	21
5.2 System Analysis	22
5.2.1 Six Element Analysis	22
5.2.2 Feasibility Analysis	25
5.2.3 Problem Solution Analysis	26
5.2.4 Effect and Constraints Analysis	27

5.3	System Design	28
5.3.1	Rich Picture	28
5.3.2	UML Diagrams	28
5.3.3	Functional and Non-Functional Requirements	34
5.4	Product Features	36
5.4.1	Input	36
5.4.2	Output	38
5.4.3	Architecture	39
6	Results & Analysis	41
7	Project as Engineering Problem Analysis	46
7.1	Sustainability of the Project/Work	46
7.2	Social and Environmental Effects and Analysis	47
7.3	Addressing Ethics and Ethical Issues	47
8	Lesson Learned	49
8.1	Problems Faced During this Period	49
8.2	Solution of those Problems	50
9	Future Work & Conclusion	52
9.1	Future Works	52
9.2	Conclusion	52
	Bibliography	54

List of Figures

2.1 Screenshot of Shelter Pet Project	6
2.2 Screenshot of Pet Finder	7
3.1 Work Breakdown Structure	8
3.2 Process/Activity wise Time Distribution of Animals Den	9
3.3 Gantt Chart of Animals Den	10
3.4 Process/Activity wise Resources Distribution of Animals Den	10
3.5 Process/Estimated Cost of Animals Den	11
4.1 Life Cycle of SDLC	13
4.2 Extreme Programming Methodology	15
4.3 React.js	16
4.4 Node.js and Express.js	17
4.5 MongoDB Logo	18
4.6 GitHub Logo	18
4.7 Postman Logo	19
4.8 Discord Logo	19
5.1 Figure of Six Element Analysis	22
5.2 Figure of Six Element Analysis	23
5.3 Figure of Six Element Analysis	23
5.4 Figure of Six Element Analysis	24
5.5 Figure of Six Element Analysis	24
5.6 Figure of Six Element Analysis	25
5.7 Figure of Six Element Analysis	25
5.8 Figure of Rich Picture	28
5.9 Figure of Entity Relationship Diagram	29
5.10 Figure of Use Case Diagram	30
5.11 Figure of Activity Diagram of Register and Login	31
5.12 Figure of Activity Diagram of Post	32
5.13 Figure of Activity Diagram of Editing Post	33
5.14 Figure of Activity Diagram of Editing Account	34
5.15 Screenshot of Homepage of Animals Den before Login	36

5.16 Screenshot of Registration page of Animals Den	37
5.17 Screenshot of Login page of Animals Den	37
5.18 Screenshot of Post Creation page of Animals Den	37
5.19 Screenshot of Single Post while updating page of Animals Den	38
5.20 Screenshot of Home page of Animals Den after Login	38
5.21 Screenshot of User Setting Page to Update Data	39
5.22 Screenshot of Updated Pet information in Single page of Animals Den	39
5.23 Screenshot of MVC Architectural Pattern	40
6.1 Screenshot of Homepage of Animals Den	42
6.2 Screenshot of the Post Page in Animals Den	42
6.3 Screenshot of the User Setting Page in Animals Den	43
6.4 Screenshot of the Post Update Page in Animals Den	43
6.5 Column chart of Id against the title given in posts	44
6.6 Column Chart of user id and username in Animals Den	44
6.7 Grid Chart of posted photo and user id in Animals Den	45

Chapter 1

Introduction

1.1 Overview/Background of the Work

The popularity of having pets in Bangladesh is increasing in a very fast pace[1]. Having an animal to play with and take care of is not only a way to show love for pets but can also help people to find peace, happiness and help us manage depression and loneliness[2]. With the start of pandemic, most people have been stuck at home which can get frustrating as well as lonely, having pets can definitely solve that problem and can make a person's life more lively and playful.

The only famous platform that allows interested adopters to browse though pets is 'Facebook'. It has now become a trend where different groups are available for people to look for a pet that they are interested in. And various types of pets cannot be found in a single group as well. Hence, people would need to be in different groups for this quest. And with that, sometimes people also ask for money with they contact the person who posted the Aniamal's adoption post.

So, to make it easier for future pet owners to post and find pets in one single platform, a team of developers in Techdojo including myself, have decided to work on this web application. This platform will allow users to browse through animals by various categories like type, age, gender and location etc.

This application will allow users to create their own account by registering, after which they will be able to browse through the animals' list that were given. The user will also be able to post adoption posts by submitting forms with the required information. Then, the animals that are being liked would be saved on the users liked animals' area. The animals would be seen from the most recent posts. And if the timeline of the adoption post is about to end then users would get notified. And the users can also saved the liked animals in their liked page so that it is easier to access they animals they are interested in. The users can search the animals by their breed, kind, age, type and location. And lastly, the users would be able to rate the other users so that other users can know their reliability.

1.2 Objectives

- **Get Pets adopted-** This platform unlike any other platform will be first of a kind in Bangladesh which would solely be dedicated to help people find animals their ‘Forever Home’ and help people post for animals that they would want to put for adoption so that those animals can live their best lives.
- **Create a community where animal lovers can connect-** This platform allows users to connect with each other when they would want to adopt the animal/s. This helps a person meet new people and can stay in touch as friends who both share the love of animals.
- **Keep track of the animal posts that were liked by users-** A person might like more than one animal that they might want to look back at without going through all the animal posts to search them again, by liking the specific posts, users would be able to view those posts in a different page.
- **Notify users when the adoption timeline is almost at its end-** A person might not be sure if they would want to adopt a specific pet, so when a specific timeline set by the user who posted the adoption post, then the person who liked that specific pet would get a notification of that time running out, for which they would have to decide if they want to adopt a pet or not.
- **Update adopted posts-** The animals that were adopted can no longer be viewed in the homepage but can be viewed in a new page where only adopted pets can be seen. This not only clears out the confusion of whether a pet is adopted or not but also acts as a booster for people who loves animals and are happy to see them finally have a family of their own.
- **Rating users-** There might be posts where people are not showing actual pictures of an animal and hence not being truthful to other users, so to avoid this type of situation from occurring, users can rate other users which will help other users know that if they are reliable or not.

1.3 Scopes

Features that can be seen after this web application has been developed are given below:

- Home page with animal posts.
- Sign-up Page.
- Login Page.
- Home page can be browsed with various search options.
- Posts can be liked by users.

- Adoption posts can be created.
- Users would be able to contact the pet owners who put up the adoption post using the contact information given in the adoption posts.
- Users can rate other users upon their interaction with them.

Chapter 2

Literature Review

2.1 Relationship with Undergraduate Studies

With the help of the knowledge and skills that I gained and learned in various courses here at Independent University, Bangladesh (IUB), helped me participate and work on this project at Techdojo. While, with these courses I had to learn a few more things to align my knowledge at the company. Some of the courses that helped me are given below:

- **CSE203 Data Structure-** This course has taught me the concepts of complex arrays, objects, classes, array of objects, objects of array, nested arrays, nested objects, etc. I have also learned how to handle and manipulate these complex data structures. ‘Animals Den’ also has many complex data structures and the knowledge from this course made it easier to handle it.
- **CSE213 Object-Oriented Programming-** This course was the first course that introduced Java programming language. In this course, I have learned about classes and its objects of programming. It taught me how to write modular programs which helped me organize my coding skills and taught me how to reuse the code when required. ‘Animals Den’ is a big application, so the lesson from this course helped me save time and effort by reusing some old modules by adding new functions whenever required, instead of writing new modules from scratch.
- **CSE303 Database Management-** This course has taught me the concepts of database management system. This course has thoroughly taught me rich picture, life cycle of a systems development project, ERD diagrams, database model designing, normalizations, relation mapping and advanced SQL as well, which had to be implemented in a project for this specific course. These techniques helped me in the development of ‘Animals Den’ and is also helping me to write this report for my internship course.
- **CSE307 System Analysis and Design-** This course has taught me about the tools for determining system requirements; data flow diagrams; decision table and decision trees; Systems analysis: systems development life cycle models. Object oriented analysis:

use-case modeling, Unified Modeling Language. Feasibility analysis, Structured analysis; systems prototyping; system design and implementation application architecture, user interface design. Many of these learnt things are helping me in the development of ‘Animals Den’ and is also helping me to write this report for my internship course.

- **CSE309 Web Applications and Internet-** This course has taught me important technologies that are extremely helpful for my personal growth as well as the technology industry. In this course, I have learned HTML, CSS, JavaScript, jQuery, JavaScript Handlebars and embedded JavaScript, Noe.js, Express.js, MongoDB and deployment with Heroku. Most of these technical skills have been helped to me to implement my participation in the project, ‘Animals Den’ as this is a web application. ‘Animals Den’ uses React which is a JavaScript Library.

2.2 Related works

Before starting the project, research papers, journals and articles have been looked into to find the problems faced by people using a website that caters to the adoption of the pets. I also looked into how the development of such projects and how it effects the people.

The first paper that I looked into is a paper called An Evaluation of the Role the Internet Site Petfinder Plays in Cat Adoptions[3], by Miranda K. Workman and Christy L. Hoffman which was published in the year 2015. This paper looked particularly into the factors that contributed to the adoption of cats on the website called Petfinder. They explored factors associated with a cat’s popularity on Petfinder and the percentage of adopters who visited Petfinder. They also looked into the factor that if before making adoption decisions, the number of clicks increased or not and if the potential adopter visited the profiles of the cats. They also looked into how the age and coat color of the cats affected their adoption post and looked into how many people visited those profiles.

By considering such factors and by analyzing the data they received they came to the conclusion that cats who were mostly viewed on the website, had a shorter length of availability for adoption. They also found that cats of younger age and coat colors had impacts on their adoption availability as well. This is because those cats were viewed the most which increased their chances of getting adopted. They also found that animals playing with toys which portrayed their vibrant and playful character also increased the chances of adoption.

From this paper, I came to the conclusion that as these adoption posts are being viewed online, then people would want to know the details such as age, character of the animals and pictures as well.

Another paper that I looked into is a paper called PetFinder Challenge: Predicting Pet Adoption Speed by Kaylee Zhang and Sherine Zhang which was published in the year 2019[4]. In this paper, the researchers tried to develop an algorithm to predict the speed of pet adoptions. For this task they used both traditional machine learning techniques and neural networks to predict the adoption rate. This was done in the hope that their developed method would be tested which would help to develop strategies to increase the adoption rate of animals. After

using the data and analyzing them using techniques like logical regression, naïve bayes and support vector machines, decision trees, and neural networks. They have found in their results that visual information such as photos and videos of the pet seems to have the most influence on the adoption decision.

So, for this particular result, we have decided that adoption posts must have a picture of the pet along with this description.

Below I have attached two screenshots of two websites that would be similar to the work that I will be doing in the project, Animals Den.

<https://theshelterpetproject.org/>

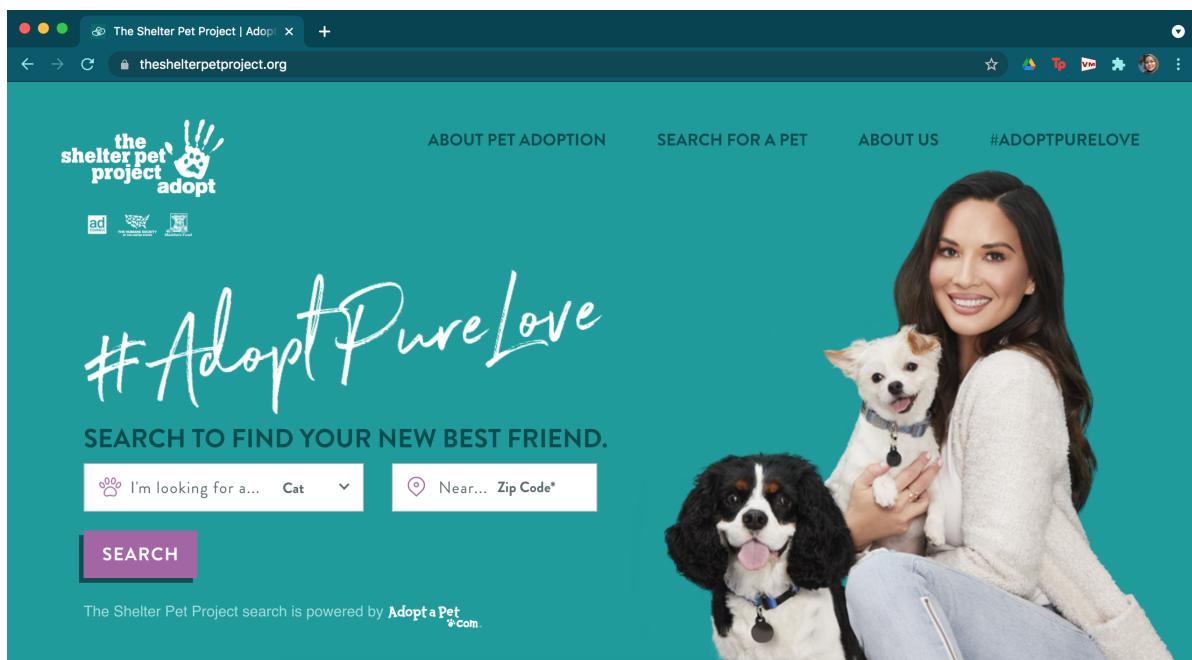


Figure 2.1: Screenshot of Shelter Pet Project

This is a web application which helps people find different types of pet based on their location. This application and ‘Animals Den’, both share this same concept of finding various kinds of animals.

2. <https://www.petfinder.com/>

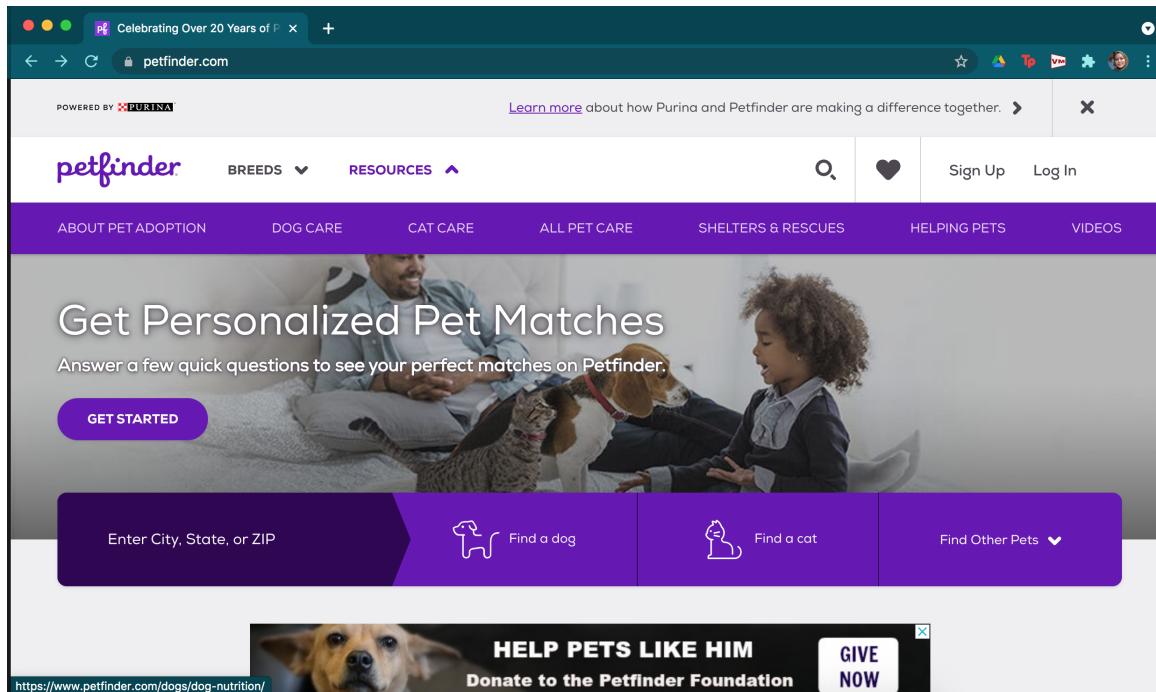


Figure 2.2: Screenshot of Pet Finder

PetFinder is also an online platform where animals of different breeds can be searched and later contacted for further adoption processes. This application also lets us search the animal by their location and also has provided other methods by which animals can be helped and rescued. Like PetFinder, ‘Animals Den’ also has the feature of searching animals by their breed and location.

Chapter 3

Project Management & Financing

3.1 Work Breakdown Structure

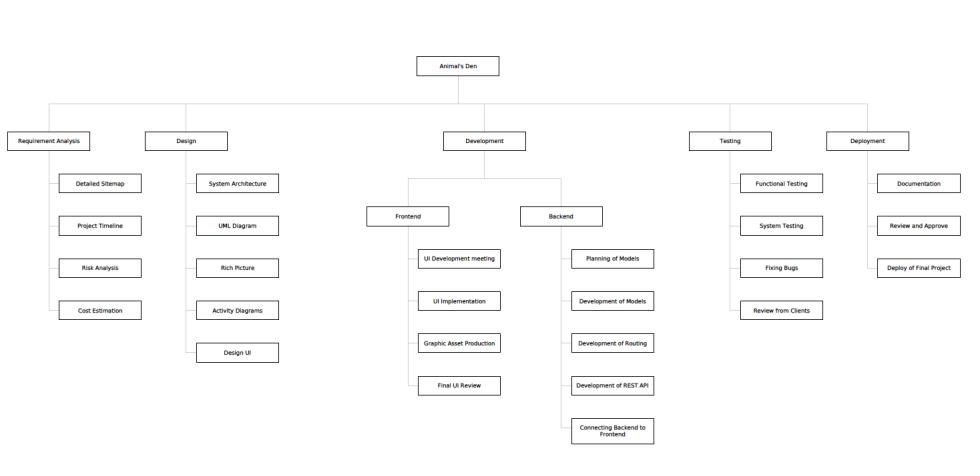


Figure 3.1: Work Breakdown Structure

Work Breakdown Structure (WBS) [5] is the tool that breaks work into smaller tasks to increase productivity and is used to make the work more manageable and approachable. This technique is one of the most important project management documents.

The above diagram shows us the work breakdown structure (WBS) of 'Animals Den'. Here, we can see five main project phases which are required to complete the project.

Those five phases are:

1. Requirement Analysis which has sub-tasks like detailed Sitemap, project Timeline, Risk Analysis and Cost Estimation.
2. Design has five sub-tasks which are needed to complete this section of the project. Those sub-tasks are System Architect, UML Diagram, Rich Picture, Activity Diagram and Design UI.

3. Development is the third phase of the project which is then divided into two parts-frontend and backend. Frontend has sub-tasks like UI Development Meeting, UI Implementation, Graphic Asset Production and Final UI Review. Then, for backend, tasks called Planning of Models, Development of Models, Development of Routing, Development of REST API and connecting Backend to Frontend.
4. The fourth phase is called Testing which has tasks like Functional Testing, System Testing, Fixing Bugs and Review from Clients.
5. The last phase is Deployment and has sub-tasks which are called Documentation, Review and Approve and Deploy of Final Project.

The WBS has given us a clear roadmap on how to approach these tasks one at a time. This made the project look more approachable and less complicated whereas, without the structure the work might have been complicated and all over the place.

3.2 Process/Activity wise Time Distribution

Task	Days
Requirement Analysis	8
Design	10
Development	22
Testing	8
Deployment	8
Total	56

Figure 3.2: Process/Activity wise Time Distribution of Animals Den

The Process/Activity wise Time Distribution shows us a table with the set of tasks that are required to be completed with the amount of time needed to complete each task. From the table we can see that Requirement Analysis would take around 8 days to be completed, Design would take around 10 days, Development has the largest amount of time allocated to it which is 22 days, then for testing it would take around 8 days and lastly for deployment it would also take around 8 days. In total, the project is estimated to be completed by around 56 days which can be said that it would require almost 2 months for its completion.

3.3 Gantt Chart

Gantt Chart of Animals Den

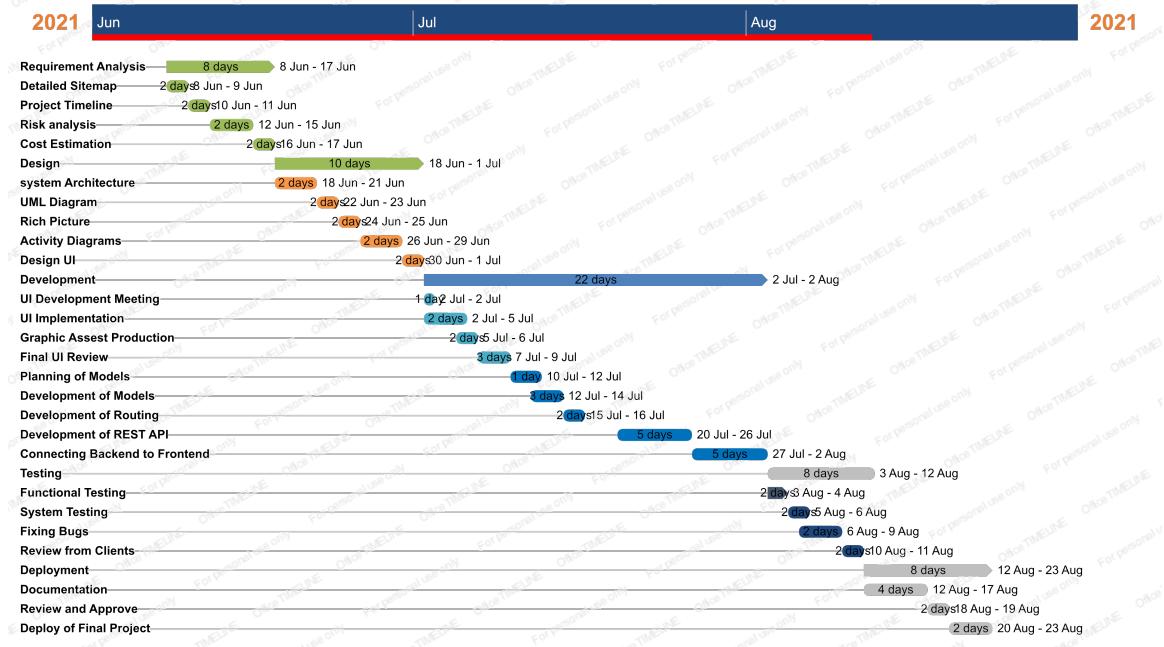


Figure 3.3: Gantt Chart of Animals Den

The above diagram shows us the Gantt Chart of Animals Den. A Gantt Chart is a graphical explanation of a project. From the above chart, we can see how each task along with its sub-tasks took a certain amount of time and how according to that allocated time those tasks were distributed to be completed in that specific time frame.

3.4 Process/Activity wise Resource Allocation

Task	Work Percentage
Requirement Analysis	8%
Design	22%
Development	50%
Testing	12%
Deployment	8%
Total	100%

Figure 3.4: Process/Activity wise Resources Distribution of Animals Den

The Process/Activity wise Resource Distribution shows us a table with the set of tasks that are required to be completed with the amount of work needed to complete each task. The main 5 tasks are:

- Requirement Analysis:** This task has 4 more sub-tasks which are Detailed Sitemap, Project Timeline, Risk Analysis and Cost Estimation. This task basically defines the

processes, the target users, the problems that can be faced, an estimated timeline and cost. This task discussed all the nitty-gritty of the project that was needed to be discussed. This task is considered to take about 8 percent of the entire project.

2. **Design:** This task has sub-tasks like System Architect, UML Diagram, Rich Picture, Activity Diagram and Design UI. This part of the project lets us get into the analytical part of the project. All the sub-tasks helped us understand what was required of the project, Animals Den and how it would function along with its flow. This task is considered to take about 22 percent of the entire project.
3. **Development:** This task is divided into two parts frontend which has tasks like UI Development Meeting, UI Implementation, Graphic Asset Production and Final UI Review. This part of the project basically helps us develop and build the outlook of the website and how it would appear to the final users. Then comes backend which has tasks like Planning of Models, Development of Models, Development of Routing, Development of REST API and connecting Backend to Frontend. This part of the task is the backbone of the project which makes the project alive. This important task takes about 50 percent of the entire project.
4. **Testing:** This task has sub-tasks like Functional Testing, System Testing, Fixing Bugs and Review from Clients. These are all the steps required to make sure the quality of the project is maintained, and no problem can be seen. This task is considered to take about 12 percent of the entire project.
5. **Deployment:** This final task has 3 sub-tasks like Documentation, Review and Approve and Deploy of Final Project. This task is needed before handing out the completed project and is considered to be about 8 percent of the project.

3.5 Estimated Costing

Stage	Time	Price(Tk)
Requirement Analysis	15h-80h	30,000
Development(Frontend)	100h-250h	40,000
Development(Backend)	100h-250h	60,000
Testing	60h-120h	20,000
Total	275h-700h	1,50,000

Figure 3.5: Process/Estimated Cost of Animals Den

The above table shows us the stages, time taken and lastly of money taken from the client for those stages. The estimation is calculated on the task that was needed to be completed and the time spent on each of these stages. The table breaks down the entire amount of 1,50,000 BDT in 4 stages and how each stage took that approximate time to be completed and the amount of money taken for it. In the end, we can see it took about 275h-500h to complete the entire project.

Chapter 4

Methodology

SDLC which stands for System Development Life Cycle is a software development process in software engineering[6]. This is a process that divides software development work into different phases to improve design, product management and project management. This can also be described as a framework that helps to understand the activities that are performed at each stage of a System Development Project. SDLC has some stages that it follows during the development phase. Those phases are:

- Planning
- Analysis
- Software design such as architectural design
- Software development
- Testing
- Development



Figure 4.1: Life Cycle of SDLC

SDLC or the Software Development Life Cycle [7] is a process that produces software with the highest quality and the lowest cost in the shortest possible time. SDLC provides a well-structured flow of phases that help an organization to quickly produce high-quality software which is well-tested and ready for the production use. The methodology may include the pre-definition of specific deliverables and artifacts that are created and completed by the project team to develop or maintain an application. Basically, software or system development methodology is a framework that is used to structure, plan, and control the process of developing an information system.

There are many software development methodologies or models that are used in development: among them we have used the Agile method to develop my project. Agile software development refers to a group of software development methodologies based on iterative development, where requirements and solutions evolve through collaboration between self-organizing cross-functional teams. The Agile Methodology is based on iterative and incremental development instead of a linear approach. It does not build an entire system at once, but rather develops incrementally. Agile is a flexible software development methodology, involving a large number of various iterations. The most widely used Agile methodologies are:

1. Agile scrum methodology
2. Lean Software Development
3. Extreme Programming (XP)
4. Crystal
5. Dynamic Systems Development Method (DSDM)
6. Feature Driven Development (FDD)

7. Prototyping

Other models that were used in developments are:

1. Waterfall model
2. Prototyping
3. Spiral Model

Extreme Programming (XP) Methodology

At Techdojo, the developers follow the latest methods of system development methodologies. They use the Agile method in which they follow the Extreme Programming(XP) method. Extreme Programming also known as XP[8], is an agile software development framework that aims to produce higher quality software, and higher quality of life for the development team. The goal of XP is to write high-qualitative software quickly and be able to adapt to customers' changing requirements. In XP, the customer works closely with the development team to define and prioritize user stories. The development team estimates, plans, and delivers the highest priority user stories in the form of working, tested software on an iteration-by-iteration basis. In order to maximize productivity, the practices provide a supportive, lightweight framework to guide a team and ensure high-quality enterprise software. XP has simple rules that are based on 5 values. The five values of XP are Communication, Simplicity, Feedback, Courage and Respect.

They are described in more detail below:

- **Communication:** XP tells us to the right type of communication is important between the team which can happen during team meetings and discussions.
- **Simplicity:** It is also said that the designs of the system should be clear, neat and thorough which means that the absolute necessary must be done and it should be clean and simple so that it is easier to maintain, support and revise.
- **Feedback:** Feedbacks about the efforts and tasks that are completed helps the team identify areas that can be improved, and it also supports the simplistic designs.
- **Courage:** Courage is needed to raise organizational issues that reduce a team's effectiveness. It is needed to stop doing something that does not work and try something else also to accept and act on feedback, even when it is difficult to accept.
- **Respect:** Members of the team need to respect each other in order to communicate with each other, provide and accept feedback, and to work together to identify simple designs and solutions.

XP Workflow

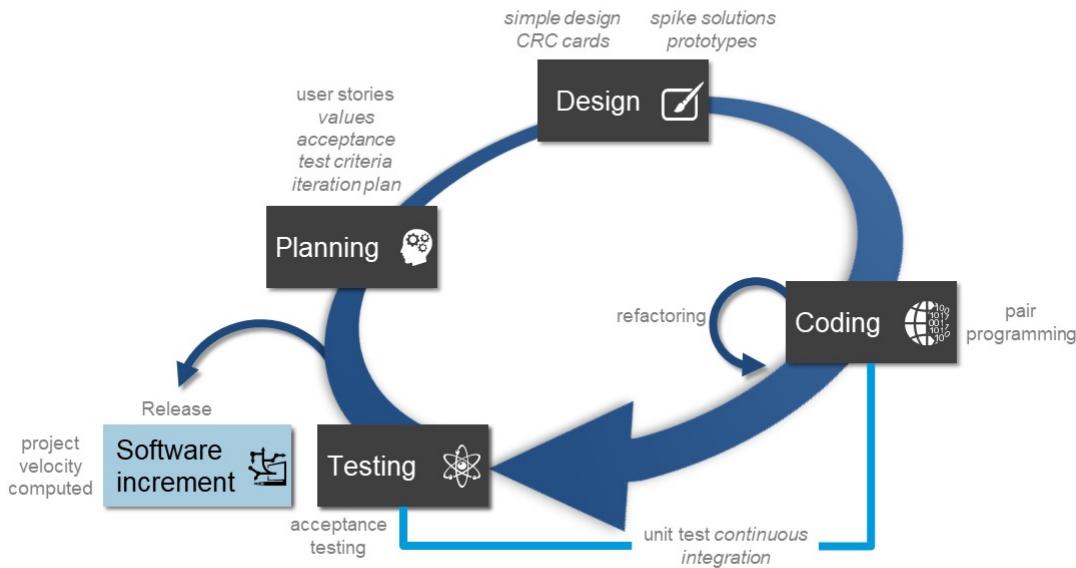


Figure 4.2: Extreme Programming Methodology

Advantages of Extreme Programming: There are several advantages of choosing Extreme Programming[9]. Those advantages that helped me during the development of Animals Den are given below:

- The process of XP helped me communicate with the developers as they helped me grasp the concepts of the project and what was required of me during the given tasks. This made the entire process easier as the planning was clear so the work could be done without confusion.
- After planning, discussing and finishing the assigned tasks that were given by senior developers, my codes and designs were checked by my senior developers to make sure everything was okay for the next step. This made the process easier as unnecessary programming work was avoided by this process.
- By the step of checking tasks after the completion of it, we were confident enough that the project was stable and bugs were caught very easily and were fixed with each step, making sure that the website was error free.
- As meetings were held often, the project requirements were always discussed so everyone was upto-date with the requirements of the projects.
- The backend and frontend part of the project was worked on separately so if any changes was required then it could be done easily as all the steps are compartmentalized.

- All our codes have been pushed to GitHub, so the code can be viewed by the developers easily and the changes can be seen too.
- With this methodology, the developers and I have used the given framework that the company used which helped us with our project.

Development Tools Used: To build the web application, ‘Animals Den’, I have used several development tools. Those are:

- React:

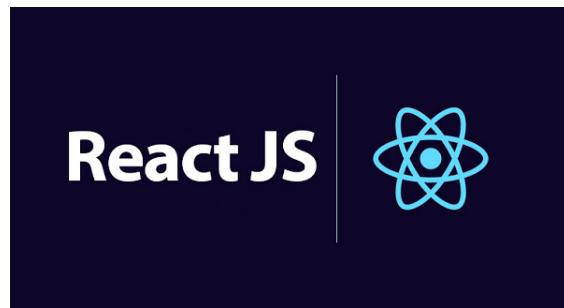


Figure 4.3: React.js

React (also known as React.js or ReactJS) is a free and open-source front-end JavaScript library for building user interfaces or UI components[10]. It is maintained by Facebook and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications. However, React is only concerned with state management and rendering that state to the DOM, so creating React applications usually requires the use of additional libraries for routing, as well as certain client-side functionality.

This library is mostly used alongside React Native at Techdojo, this was a new thing that I had to learn in Techdojo but my JavaScript knowledge from my university course helped me adapt to it well.

- Node.js and Express.js:



Figure 4.4: Node.js and Express.js

Node.js (Node) is an open-source development platform for executing JavaScript code server-side[11]. Node is useful for developing applications that require a persistent connection from the browser to the server and is often used for real-time applications such as chat, news feeds and web push notifications.

Node.js is intended to run on a dedicated HTTP server and to employ a single thread with one process at a time. Node.js applications are event-based and run asynchronously. Code built on the Node platform does not follow the traditional model of receive, process, send, wait, receive. Instead, Node processes incoming requests in a constant event stack and sends small requests one after the other without waiting for responses.

This is a shift away from mainstream models that run larger, more complex processes and run several threads concurrently, with each thread waiting for its appropriate response before moving on.

Express.js (Express) is a web framework that lets us structure a web application to handle multiple different http requests at a specific URL[12]. Express is a minimal, open source and flexible Node.js web app framework designed to make developing websites; web applications, API's much easier. Express helps to respond to requests with route support so that responses can be written to specific URLs.

I have been familiar with this platform as I have used this in my university courses so it was easy for me to work with Node.js and Express.js

- MongoDB:



Figure 4.5: MongoDB Logo

MongoDB is a source-available cross-platform document-oriented database program[13]. Classified as a NoSQL database program, MongoDB uses JSON-like documents with optional schemas. MongoDB is the Cloud-Native Document Database and provides this as a service. Here, I have used MongoDB as my backend server to store the data from the web application, ‘Animals Den’.

- GitHub:



Figure 4.6: GitHub Logo

GitHub provides hosting for software development and version control. It offers the distributed version control and source code management (SCM) functionality of Git, plus its own features[14]. It provides access control and several collaboration features. In GitHub, we reviewed and merged our code easily. GitHub also facilitates the version control issue tracking aspects of software development.

At Techdojo, the developers and I have been able to code at the comfort of our own homes and worked without any problem as the work was always reviewed through GitHub. We could push our code as well as pull the code that were given by other developers. We also merged the code whenever it was needed.

- Postman:



Figure 4.7: Postman Logo

Postman was used at the beginning of the development of the backend structure of Animals Den. This was used for making requests with APIs, testing the APIs and managing them.

Non-Development Tools Used

The Non-Development tool that I have used to develop ‘Animals Den’ is given below:

- Discord:



Figure 4.8: Discord Logo

Discord is a VoIP, instant messaging and digital distribution platform designed for creating communities[15]. Users communicate with voice calls, video calls, text messaging, media and files in private chats or as part of communities called "servers".

Through the help of discord, I have been able to attend meetings and calls with other developers. These meetings helped us clear out confusions and helped us come up with solutions when required.

Chapter 5

Body of the Project

5.1 Work Description

Animals Den is a web based MERN application. This application aims to create a platform for people who are looking to adopt pets. This platform helps them browse through various options and lets them choose according to their likings. This gives the animals a better chance of being adopted as it gives them a better exposure to people which would help their case of being adopted.

This web application is designed for any type of users. This means that people who are willing to use this application can browse through as people who are looking to adopt pets and for people who are posts the adoption posts.

The users would be able to view the home page which has the posts available to view but they can only act upon it by registering first with username, email and password. After this, they would be taken to the login page where they would need to insert their given username and password to enter their account.

This will allow them to view the home page where they will be able to view the posts of other users, their own account setting page where they can set up their own profile picture if they want to, edit their username, email and password as well. They can even delete their account if they want too. The users will be able to create posts with a picture and would be able to give a title and description of the animal with location.

The users will be able to edit and delete their own posts but would only be able to like the others of other users which will be saved for them in another page which will allow them to view those posts later on instead of browsing and searching for those specific posts. This will help them come up with a better decision if they would want to adopt a pet or not.

The users will be able to browse through the animals by category of animals and would be able to search for them through location, type, age etc. This makes their quest for finding their

perfect pet easier. The users will also be able to select a particular user and view the posts created by that particular user. For better user experience in the application, there will be an option to review other users after any type of communication regarding the adoption posts. This will give them reliability and other users would be able to trust those users and would be willing to adopt more pets if the options are available.

The liked posts of the pets might not always mean that the animals would be available for them only. The users would get notification via email if their liked pets' posts are being removed or if they have been adopted by other users or if their posts have been updated. This will give the user who liked the posts a clear idea if the animal is available or not and if they would actually want to adopt the animal.

The entire system is based on how it would be easier for the users to search for pets and how this will display the animals so that they get a better chance of finding a home that would love and take care of them.

5.2 System Analysis

5.2.1 Six Element Analysis

Processes	System Roles					
	Human	Non-Comp Hardware	Computing Hardware	Software	Database	Comm. & Network
Register	<p>1. Users To use the application to the fullest, users would have to register in system by providing their usernames, email and password.</p> <p>2. Internal IT expert If the users face any sort of problem while registering, some IT experts (e.g., Developers) can look into the matter to fix the bug.</p> <p>3. External IT expert The internet service providers provide internet connection to connect to the web application to register.</p>	<p>a. Paper and Stationery The users might be needed by the users to note down their username and password for their account in Animals Den.</p> <p>b. Papers and other stationery were required by developers during the initial design phase of the register page.</p>	<p>1. PC/Laptop/Mobile Phones/Other Computing Device The web-application can be accessed through a PC, laptop, mobile phone or any other computing device to register.</p> <p>2. Router/Internet Cables by ISP Providers/Switch From networking side, internet cables by the ISP providers or router or switch used by the users so that they can have access to the internet to use the application to register.</p>	<p>1. Operating System Any Operating system like Mac, Windows, Linux, Android or iOS will allow to use the application to register.</p> <p>2. Application Software Applications like Visual Studio Code, Postman, TextEdit were used by developers to develop the application.</p> <p>3. Web-based Application Software Web based applications like Google, Discord and GitHub were used for the development of the application and communication between developers.</p>	<p>1. MongoDB As the database, MongoDB is being used to store the new user.</p>	<p>1. Internet Connection Internet Connection is needed to access the web application to register. Internet Connection is also needed by developers to communicate between each other.</p> <p>2. Mail Email is required by users to register.</p> <p>3. Telecommunication Phone calls or texts may have happened between developers during the process of creating the register module for the application.</p>

Figure 5.1: Figure of Six Element Analysis

Login	<p>1. Users To use the application to the fullest, users would have to login after registering in system by providing their usernames and password</p> <p>2. Internal IT expert If the users face any sort of problem while trying to login, some IT experts (e.g., Developers) can look into the matter to fix the bug.</p> <p>3. External IT expert The internet service providers provide internet connection to connect to the web application to login.</p>	<p>1. Paper and Stationery Papers and other stationery were required by developers during the initial design phase of the login page.</p>	<p>1. PC/Laptop/Mobile-Phones/Other Computing Device The web-application can be accessed through a PC, laptop, mobile phone or any other computing device to login.</p> <p>2. Router/Internet Cables by ISP Providers/Switch From networking side, internet cables by the ISP providers or router or switch used by the users so that they can have access to the internet to use the application to login.</p>	<p>1. Operating System Any Operating system like Mac, Windows, Linux, Android or iOS will allow to use the application to login.</p> <p>2. Application Software Applications like Visual Studio Code, Postman, TextEdit were used by developers to develop the application.</p> <p>3. Web-based Application Software Web based applications like Google, Discord and GitHub were used for the development of the application and communication between developers.</p>	<p>1. MongoDB As the database, MongoDB is being used to get the username and password to login to the registered account.</p>	<p>1. Internet Connection Internet Connection is needed to access the web application to login. Internet Connection is also needed by developers to communicate between each other.</p> <p>2. Telecommunication Phone calls or texts may have happened between developers during the process of creating the login module for the application.</p>
--------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure 5.2: Figure of Six Element Analysis

Create, edit and delete adoption post	<p>1. Users Users would be able to create posts. After which they will be able to edit or delete their own posts.</p> <p>2. Internal IT expert If the users face any sort of problem while trying to create, edit or delete the post then some IT experts (e.g., Developers) can look into the matter to fix the bug.</p> <p>3. External IT expert The internet service providers provide internet connection to connect to the web application to create, edit and delete posts.</p>	<p>1. Paper and Stationery Papers and other stationery were required by developers during the initial design phase of the form page.</p>	<p>1. PC/Laptop/Mobile-Phones/Other Computing Device The web-application can be accessed through a PC, laptop, mobile phone or any other computing device to create, edit or delete posts.</p> <p>2. Router/Internet Cables by ISP Providers/Switch From networking side, internet cables by the ISP providers or router or switch used by the users so that they can have access to the internet to use the application to create, edit or delete posts.</p>	<p>1. Operating System Any Operating system like Mac, Windows, Linux, Android or iOS will allow to use the application to create, edit or delete posts.</p> <p>2. Application Software Applications like Visual Studio Code, Postman, TextEdit were used by developers to develop the application.</p> <p>3. Web-based Application Software Web based applications like Google, Discord and GitHub were used for the development of the application and communication between developers.</p>	<p>1. MongoDB The posts that are created are saved in the server, the updated version is saved as well and when a post is deleted then the post is removed from MongoDB server.</p>	<p>1. Internet Connection Internet Connection is needed to access the web application to create, edit or delete posts. Internet Connection is also needed by developers to communicate between each other.</p> <p>2. Telecommunication Phone calls or texts may have happened between developers during the process of creating the post form for the application.</p>
----------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure 5.3: Figure of Six Element Analysis

Edit and delete user Account	<p>1. Users Users would be able to edit and delete their accounts.</p> <p>2. Internal IT expert If the users face any sort of problem while trying to edit or delete the account then some IT experts (e.g., Developers) can look into the matter to fix the bug.</p> <p>3. External IT expert The internet service providers provide internet connection to connect to the web application to edit and delete account.</p>	<p>1. Paper and Stationery Papers and other stationery were required by developers during the initial design phase of the setting page.</p>	<p>1. PC/Laptop/Mobile-Phones/Other Computing Device The web-application can be accessed through a PC, laptop, mobile phone or any other computing device to edit or delete accounts.</p> <p>2. Router/Internet Cables by ISP Providers/Switch From networking side, internet cables by the ISP providers or router or switch used by the users so that they can have access to the internet to use the application to edit or delete accounts.</p>	<p>1. Operating System Any Operating system like Mac, Windows, Linux, Android or iOS will allow to use the application to edit or delete accounts.</p> <p>2. Application Software Applications like Visual Studio Code, Postman, TextEdit were used by developers to develop the application.</p> <p>3. Web-based Application Software Web based applications like Google, Discord and GitHub were used for the development of the application and communication between developers.</p>	<p>1. MongoDB The updated information would be saved in MongoDB if the account information is edited and if a user deletes an account then it would be removed from the server.</p>	<p>1. Internet Connection Internet Connection is needed to access the web application to edit or delete accounts. Internet Connection is also needed by developers to communicate between each other.</p> <p>2. Telecommunication Phone calls or texts may have happened between developers during the process of creating the user module for the application.</p>
-------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure 5.4: Figure of Six Element Analysis

Browse Category and Search	<p>1. Users Users would be able to browse by category as well as search by location, age, breed etc to make the finding easier.</p> <p>2. Internal IT expert If the users face any sort of problem while trying to browse by category or while searching then some IT experts (e.g., Developers) can look into the matter to fix the bug.</p> <p>3. External IT expert The internet service providers provide internet connection to connect to the web application to browse by category and search.</p>	<p>1. Paper and Stationery Papers and other stationery were required by developers during the initial design phase of the category and search module.</p>	<p>1. PC/Laptop/Mobile-Phones/Other Computing Device The web-application can be accessed through a PC, laptop, mobile phone or any other computing device to browse by category and search.</p> <p>2. Router/Internet Cables by ISP Providers/Switch From networking side, internet cables by the ISP providers or router or switch used by the users so that they can have access to the internet to use the application to browse by category and search.</p>	<p>1. Operating System Any Operating system like Mac, Windows, Linux, Android or iOS will allow to use the application to browse by category and search.</p> <p>2. Application Software Applications like Visual Studio Code, Postman, TextEdit were used by developers to develop the application.</p> <p>3. Web-based Application Software Web based applications like Google, Discord and GitHub were used for the development of the application and communication between developers.</p>	<p>1. MongoDB The categories of the posts are saved in the category module in the server.</p>	<p>1. Internet Connection Internet Connection is needed to access the web application to browse by category and to search. Internet Connection is also needed by developers to communicate between each other.</p> <p>2. Telecommunication Phone calls or texts may have happened between developers during the process of creating the category module for the application.</p>
-----------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure 5.5: Figure of Six Element Analysis

Review Users	<p>1. Users Users would be able to review users .</p> <p>2. Internal IT expert If the users face any sort of problem while trying to review users then some IT experts (e.g., Developers) can look into the matter to fix the bug.</p> <p>3. External IT expert The internet service providers provide internet connection to connect to the web application to review users .</p>	<p>1. Paper and Stationery Papers and other stationery were required by developers during the initial design phase of the review design.</p>	<p>1. PC/Laptop/Mobile-Phones/Other Computing Device The web-application can be accessed through a PC, laptop, mobile phone or any other computing device to review users.</p> <p>2. Router/Internet Cables by ISP Providers/Switch From networking side, internet cables by the ISP providers or router or switch used by the users so that they can have access to the internet to use the application to review users .</p>	<p>1. Operating System Any Operating system like Mac, Windows, Linux, Android or iOS will allow to use the application to review users .</p> <p>2. Application Software Applications like Visual Studio Code, Postman, TextEdit were used by developers to develop the application.</p> <p>3. Web-based Application Software Web based applications like Google, Discord and GitHub were used for the development of the application and communication between developers.</p>	<p>1. MongoDB The server saves the review of the particular user given by other users.</p>	<p>1. Internet Connection Internet Connection is needed to access the web application to review users upon interaction.</p> <p>2. Telecommunication Phone calls or texts may have happened between developers during the process of creating the review for the application.</p>
--------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure 5.6: Figure of Six Element Analysis

Notify users on Posts	<p>1. Users Users would be able to receive notifications via emails.</p> <p>2. Internal IT expert If the users face any sort of problem while trying to receive notifications then some IT experts (e.g., Developers) can look into the matter to fix the bug.</p> <p>3. External IT expert 1. The internet service providers provide internet connection to connect to the web application to receive notifications</p>	<p>1. Paper and Stationery Papers and other stationery were required by developers during the initial phase of the notification part.</p>	<p>1. PC/Laptop/Mobile-Phones/Other Computing Device The web-application can be accessed through a PC, laptop, mobile phone or any other computing device to receive notifications via emails .</p> <p>2. Router/Internet Cables by ISP Providers/Switch From networking side, internet cables by the ISP providers or router or switch used by the users so that they can have access to the internet to use the application to receive notifications via emails .</p>	<p>1. Operating System Any Operating system like Mac, Windows, Linux, Android or iOS will allow to use the application to receive notifications via emails .</p> <p>2. Application Software Applications like Visual Studio Code, Postman, TextEdit were used by developers to develop the application.</p> <p>3. Web-based Application Software Web based applications like Google, Discord and GitHub were used for the development of the application and communication between developers.</p>	<p>1. MongoDB The server will save that a notification has been sent to the user via email.</p>	<p>1. Internet Connection Internet Connection is needed to access the web application receive notifications.</p> <p>2. Telecommunication a. Phone calls or texts may have happened between developers during the process of creating the notification API for the application.</p> <p>b. Phone calls can be made to users if they want to adopt a particular pet.</p> <p>3. Mail Emails were sent to users so that they can be notified on their liked posts.</p>
-----------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Figure 5.7: Figure of Six Element Analysis

5.2.2 Feasibility Analysis

Feasibility Study[16] is the study that helps us to understand certain factors of the project or system and how those factors would help in the development of the project and how that would make the project a successful project.

By analyzing the factors of feasibility, it would be easier to determine the problems and hurdles that can be faced in the system . From the results of the feasibility analysis, high-level architectural design decisions are made which makes the project organized and reduces the chance of project failure. The feasibility factors that we analyzed for Animals' Den are given below:

- Operational Feasibility:** In Operational Feasibility sector, the project would be considered successful only if the requirements are met for the project and if the operation of the

project is successful and is maintained after the deployment. The project Animals Den meet the operational feasibility. This system has its complex logic and technology but the entire system for the client users can be easily understood. Each functionality of the application can be figured out without much explanation as they are self-explanatory.

- **Technical Feasibility:** For the technical Feasibility, the resources available, both hardware and software with the other required technology are analyzed to understand the development of the project. This is done by keeping the technical feasibility in limelight. With this, the capability of handling these technical hardwares and softwares are analyzed to see if it would be efficient and successful in the process of making the application. For Animals Den, React.js, Node.js, Express.js and MongoDB have been used. These technologies are being used in the industry and are considered to be the trendier technologies than others. The team at Tech dojo who were involved in the process of developing this application has used at least one of these technologies for the application. Other technologies like GitHub and Discord were used to mostly communicate and share the project update with the coworkers. So, it can be said that this project is Technically feasible.
- **Economic Feasibility:** In this analysis, the cost and benefit of the project is analyzed. This sector oversees the cost that was needed in the development, operation, requirement analysis, design etc. The analyzed data sees if the project is going to be successful in term of economic sector. Animals Den was developed by using technologies that were open-sourced. So, the project can be said that it is economically feasible.
- **Scheduling Feasibility:** In this analysis, the timeline of the project was analyzed to make sure that the project would be completed on time. This would make the project successful if the given timeline is followed.

5.2.3 Problem Solution Analysis

In this section, I will be discussing the problems that were identified, analyzed and finally a solution was figured to solve that particular problem. This section helped the application be more user friendly and reachable to many users.

The problems that have been identified are given below:

- Eye Strain- Spending too much time on computing devices like PCs, laptops, phone etc can be harmful. All of these devices emit blue light which can overtime cause retinal damage and can make the brain think that it's always daytime which can lead to sleepless nights or insomnia.
- Weight gain- At this time of pandemic, most of us are spending time at home and are sitting around for most of the day. This can lead to laziness and can lead to weight gain which can be harmful for health.

- Fraud users- It is very possible that all the users might not be honest in the posts they create in the application we made. It might happen that they gave fake pictures or misinformed the people who were interested in the posts they made.
- Liking a pet without knowing its location- A user might like a pet but does not know the location of the pet and it can happen that the pet is in a very far location which would take a very long commute. Hence, the user might get disheartened and would have wasted his time.
- Pet availability- Sometimes, a user might like a pet but due to taking some time and not contacting the user who gave the adoption post might mean that the pet has been adopted and it was too late to adopt their liked pet.

The solutions to the problems that have been identified are given below:

- Solution to Eye Strain- The solution to the eye strain that this app will bring is its essence. The concept of this project is that animals will find their forever homes while at the same time, humans, who are animal enthusiast will find pets that they can take care of. Spending time with their significant pets will reduce their screen time which will help to reduce the strain on the eyes.
- Solution to Weight gain- The solution to weight gain is that having pets in a household would always keep the people on moving. As pets need to drain out their energy by playing, so by playing with them within the walls of our own home will give us the motivation to break through the laziness and start exercising or by playing with our pets.
- Solution to Fraud users- To solve this critical problem, a review option of the users have been introduced in the system. The users who have interacted with other users regarding pet adoptions can leave their opinion in the review section, this will allow other users know their reliability.
- Solution to Liking a pet without knowing its location- To solve the problem of liking a pet without knowing its location would be introducing location in the search option. This can help users find pets that are close to their location.
- Solution to Pet availability- To solve the pet availability problem, a notification system has been introduced. This means that the user would get notified about the posts that they have liked.

5.2.4 Effect and Constraints Analysis

This application will let users browse through the pets that they would want to adopt. They would be able to do that by various types of search as well as by posting adoption posts. But, this application does have some limitations that are yet to be overcome and solved.

Animals Den being a one stop application will have many positive effects in terms of society and environment. Animals and humankind will both be benefited from this application. Users

would be able to look for animals as well as post them up for adoption so that they have a safe space to live forever. This large platform will have users who will actively looking for animals to adopt and this increases the chance of them getting adopted.

This is still a new concept in Bangladesh that people would browse through an application to reach out for pets. It does have some drawbacks to it. In this application, it would be hard to determine which users are giving misinformation. Thus, for this the application lets the users communicate and get in touch through the app and recommends to meet in person before taking up a pet in their homes.

This is one of a kind initiative in Bangladesh and would make the quest to find the perfect pet more easier.

5.3 System Design

5.3.1 Rich Picture

Rich Picture is a type of diagram that is done during the initial stages of a project. This helps us visualize what would happen in the system. This lets the team come up with an agreed plan on how to built the system. The rich picture of animal is given below:

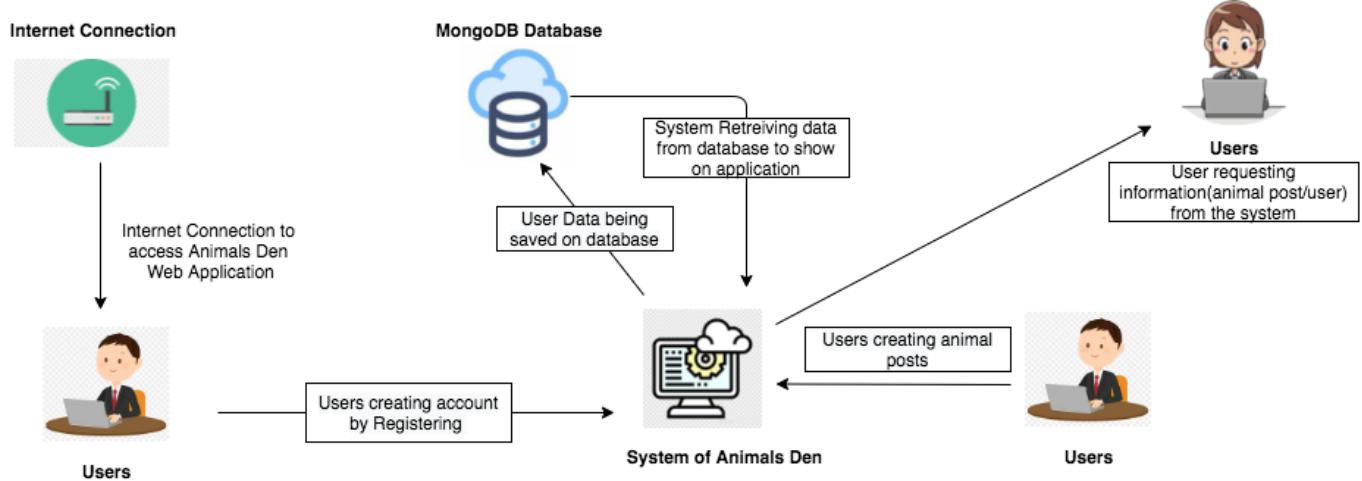


Figure 5.8: Figure of Rich Picture

5.3.2 UML Diagrams

UML(Unified Modeling Language) diagrams show us models that help us understand software solutions, application structures, system behaviour[17]. It shows the flow of activity that happens one after another. From the many kinds of UML diagrams, I have used these specific diagrams to visualise the flow of activity for my project. The diagrams are given below.

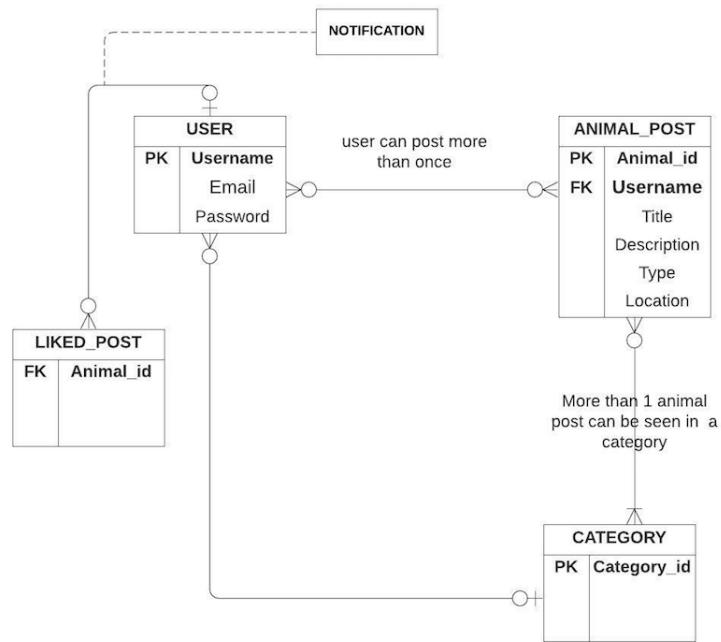
Entity Relationship Diagram(ERD)

Figure 5.9: Figure of Entity Relationship Diagram

Use Case Diagram

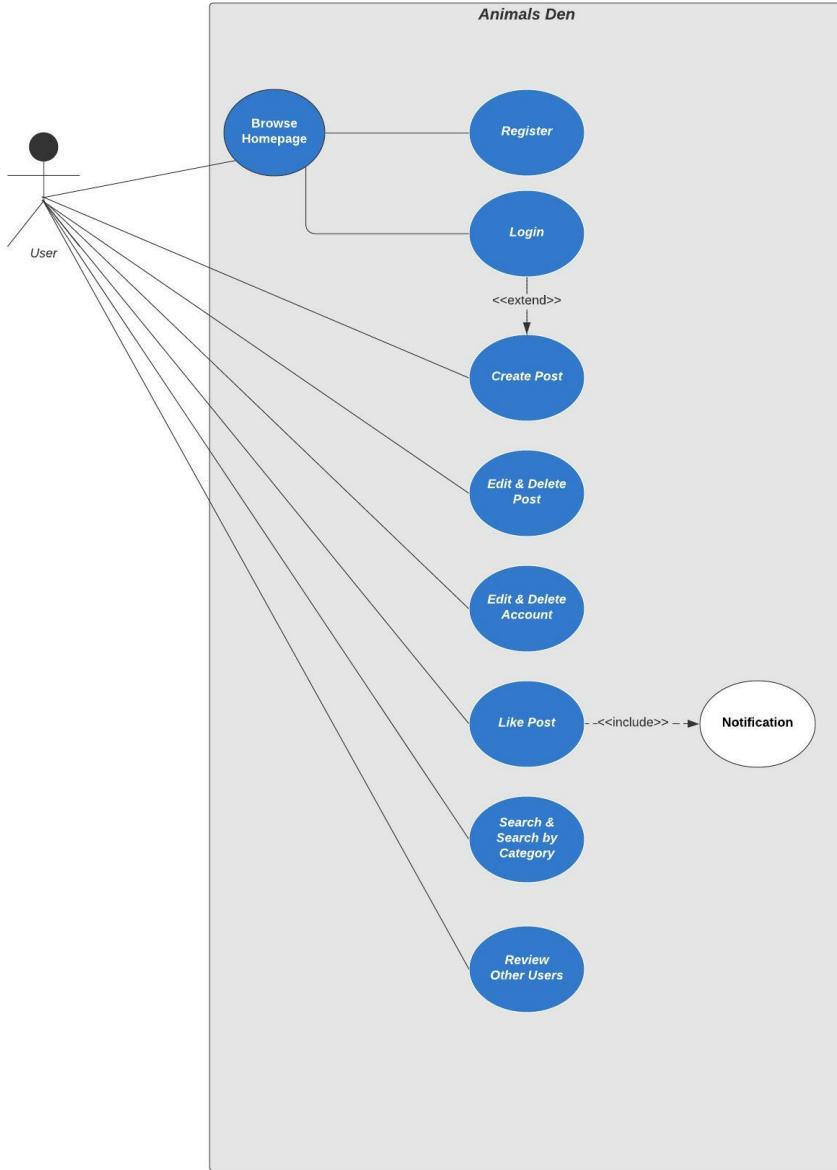


Figure 5.10: Figure of Use Case Diagram

In the above Use Case diagram we can see that the user can browse through the homepage amid registering and logging in the page. After registering and logging in, the user can create posts to put animals up for adoption. Users can then edit and delete the post if they feel like it. Users would also be able to edit and delete their own account. If a user likes a particular post then they would receive any updated notification for that post via e-mail. The liked post would be saved and users would be able to search by category and by other various search like age, breed, type, location etc. Lastly, the users would also be able to review other users based on their interaction.

Activity Diagram

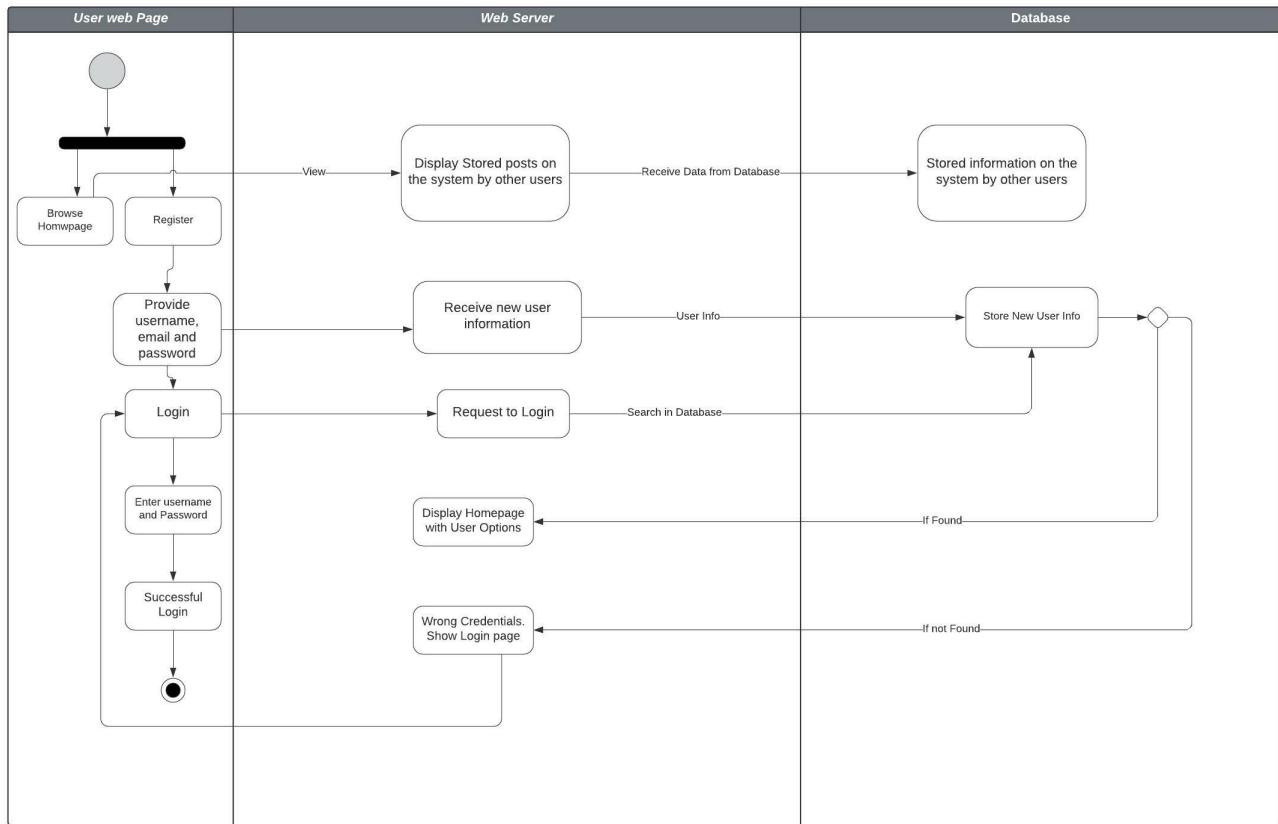


Figure 5.11: Figure of Activity Diagram of Register and Login

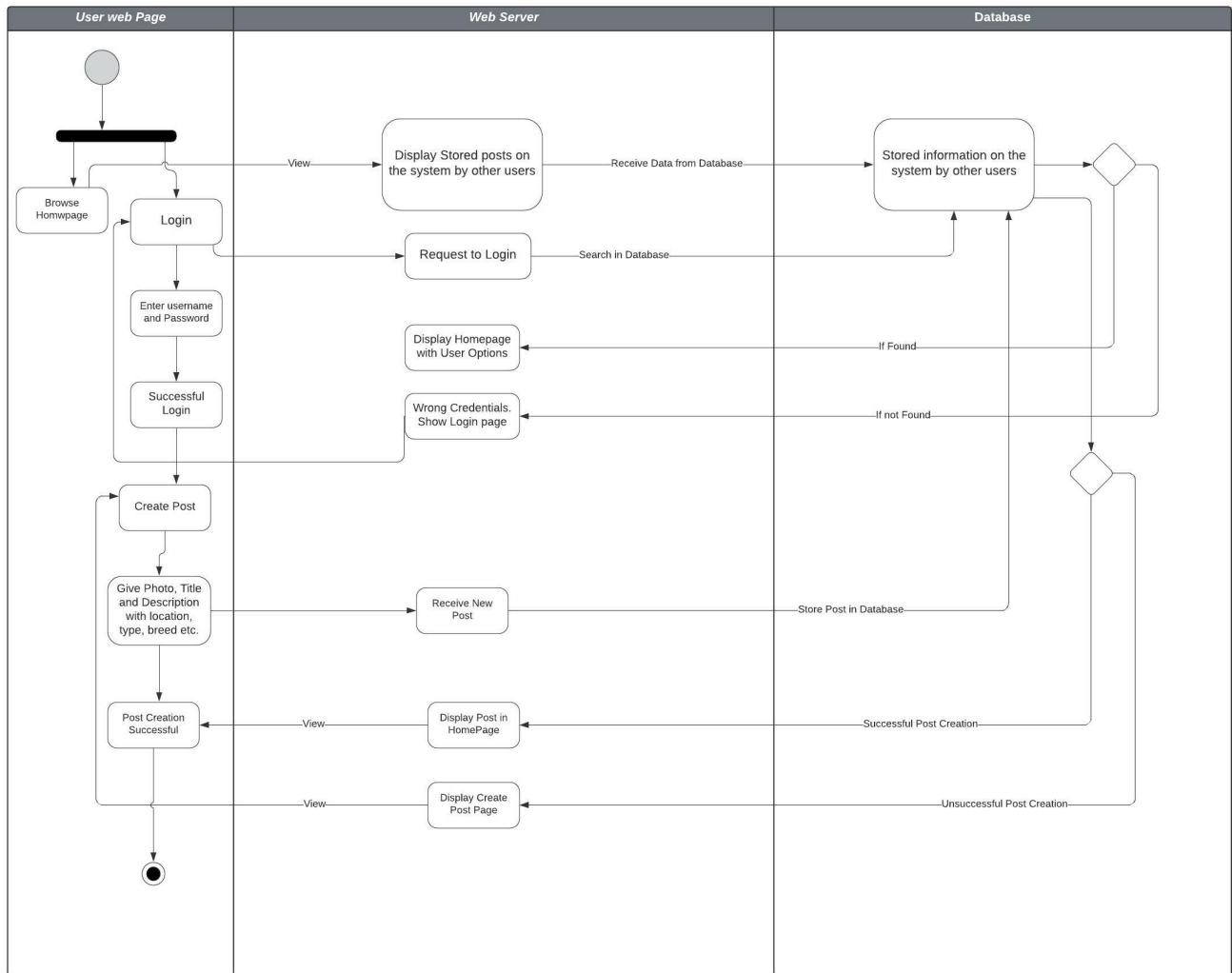


Figure 5.12: Figure of Activity Diagram of Post

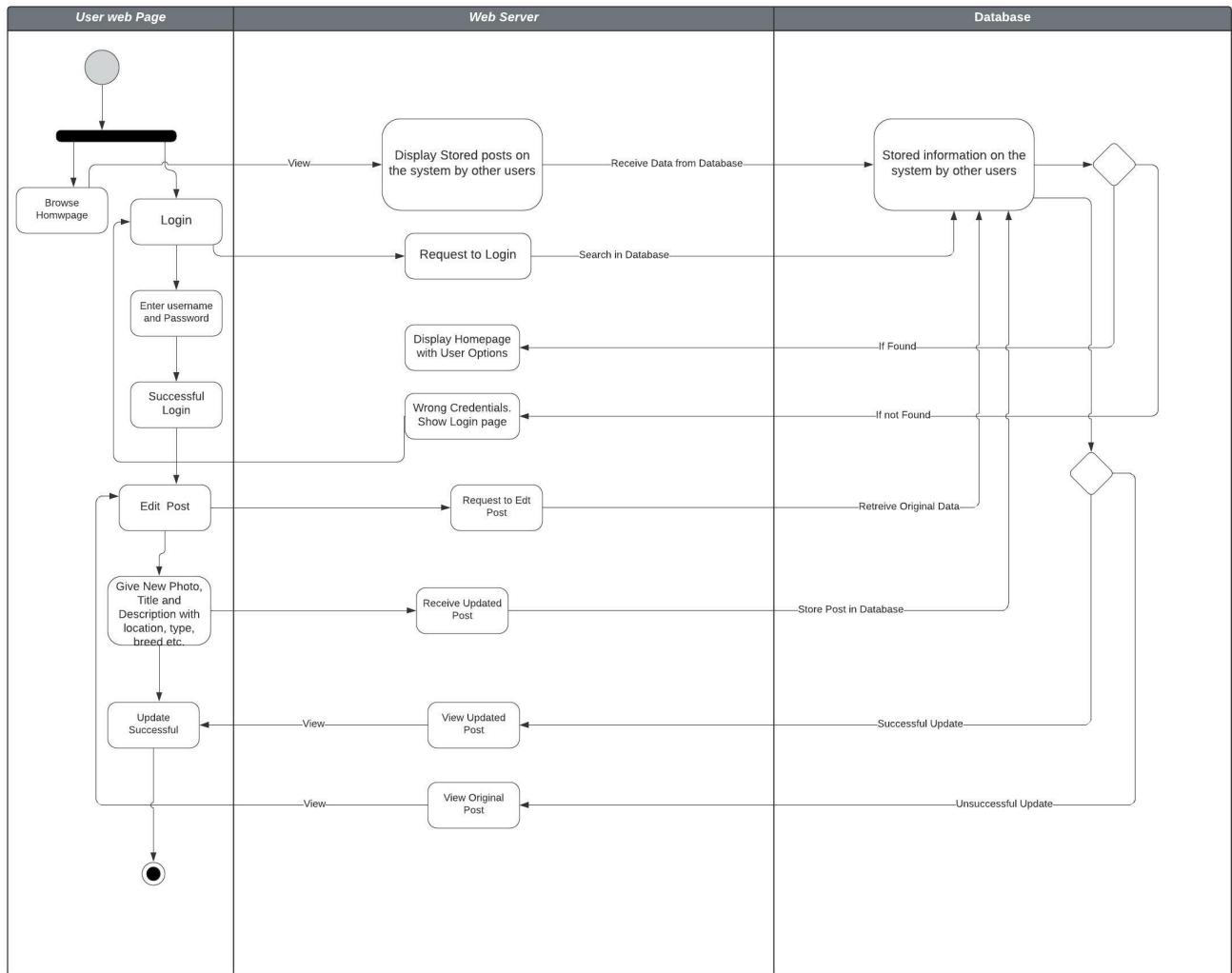


Figure 5.13: Figure of Activity Diagram of Editing Post

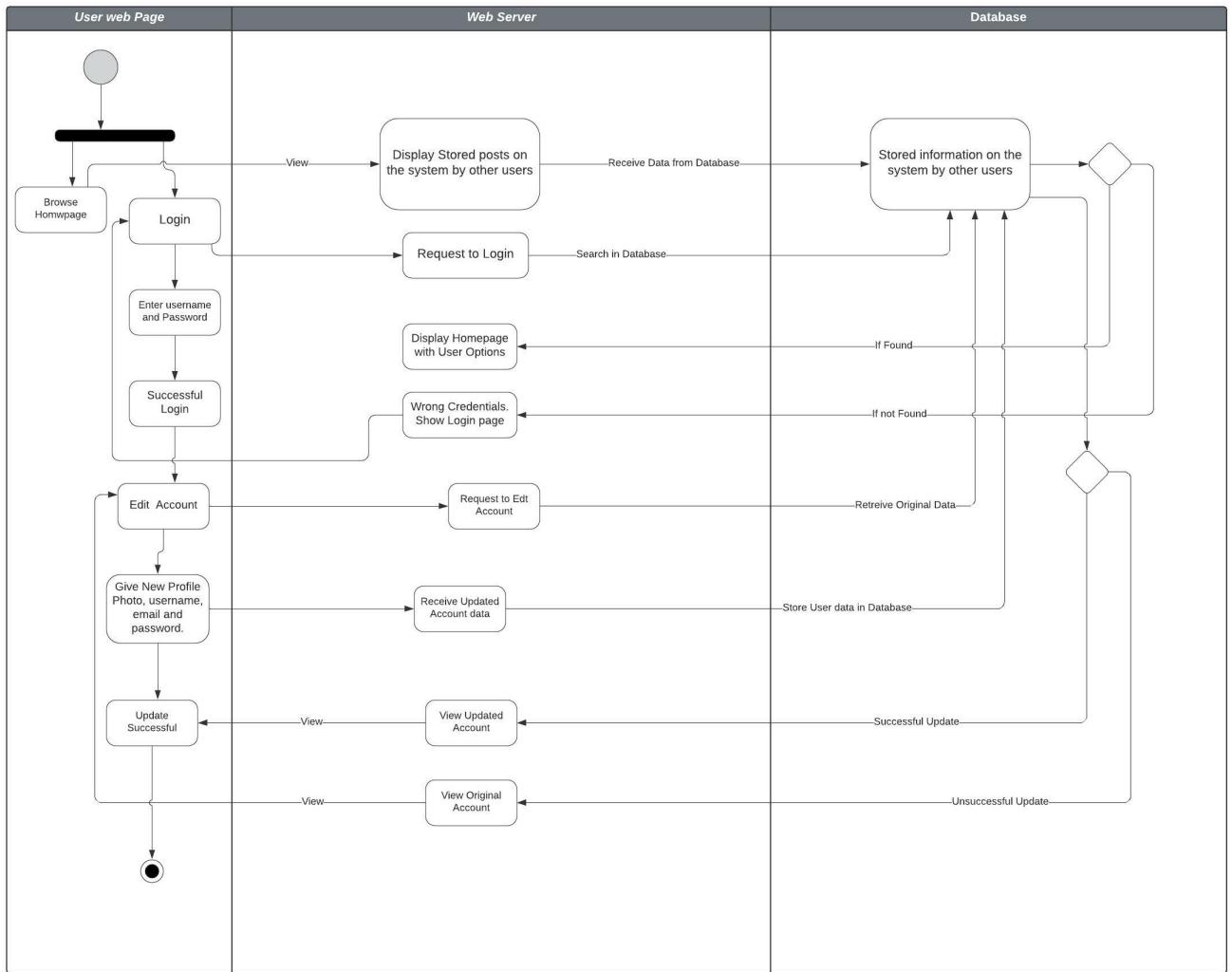


Figure 5.14: Figure of Activity Diagram of Editing Account

5.3.3 Functional and Non-Functional Requirements

Functional Requirement means the functionality that the system must have to be viable. Functional Requirements are beneficial in the process of developing a system. It lets us know about the functionality that we should expect the system to have, errors can be caught at this stage which is cheaper to fix, helps us identify if any functionality is missing or not etc[18].

The Functional Requirement of Animals Den are given below:

- Compatible to any type of smart device- This web based application should be able to run and work in any time of Android, iOS, Mac, Windows and Linux computing device. This will give a chance to all the users who are keen on using this application.
- Smooth Registration- The users who are registering should have a smooth and secure registration. The password should be hashed so that no one would be able to access it to

take over to the account.

- Post Functionality- Users should definitely be able to post picture of pets they are willing to put up for adoption so that they can see them and help them get a chance of finding their forever home. The post should have picture, title and as many details as possible.
- Single Posts- Users should have a smooth and clean interaction in the UI so that they don't feel like their system would lag behind. After viewing a single post, the user should be able to like the post and save the post.
- Notification on Posts- Users who have liked a particular post would get notification and be updated on the animal posts they have liked.
- Edit/Delete Account- Users who have account can update their profile picture, email, username and password. Their new updated data is then saved in the database.
- Edit/Delete posts- Users should be able to edit the data in their posts and can also delete the post if they feel like it.
- Review users- Other users would be able to review users based on their interaction. This makes their post more verified and validated.
- Category based Search- Users should be able to search by selecting categories to see the posts of that specific group. This saves time and makes the search process much easier.
- Search- Users should be able to search by various options of breed, type, age, location etc. This again makes it easier and saves time of the user who is looking to find a pet.

A non-functional requirement is a specification that describes the system's operation capabilities and constraints that enhance its functionality[19]. The non-functional requirements that I will be discussing for Animals Den are given below:

- Performance- The performance of the system while running should be smooth and should not lag. This means that while carrying out the functionalities, the system should be fast and smooth with its work.
- Information- The information given in the user setting page should be protected as new username, password and email are given.
- Security and Control- A particular account can only be accessed if they have the correct username and password. Anything otherwise would not allow the users to login to their account.
- Efficiency- The application should be fast while saving the data. The posts should be saved and notification should be received after the update has been done.

- Service- Users should be able to access the application throughout the day and night. They should also be able to access the app at any place of the world at any time.
- Maintainability Requirement- The system should be maintained regularly so that if any problem do arise then it can be solved instantly.

5.4 Product Features

5.4.1 Input

In this section, we will be able to see some of the pages from the project, Animals Den. Over here, we would have to give the correct information to register and login and give correct information of the animals to have the highest possibility of getting them adopted.

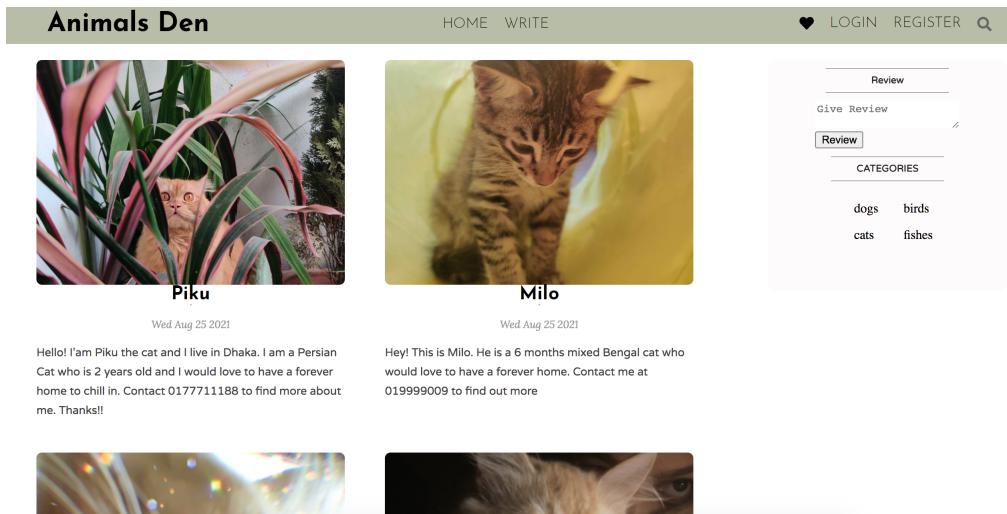


Figure 5.15: Screenshot of Homepage of Animals Den before Login

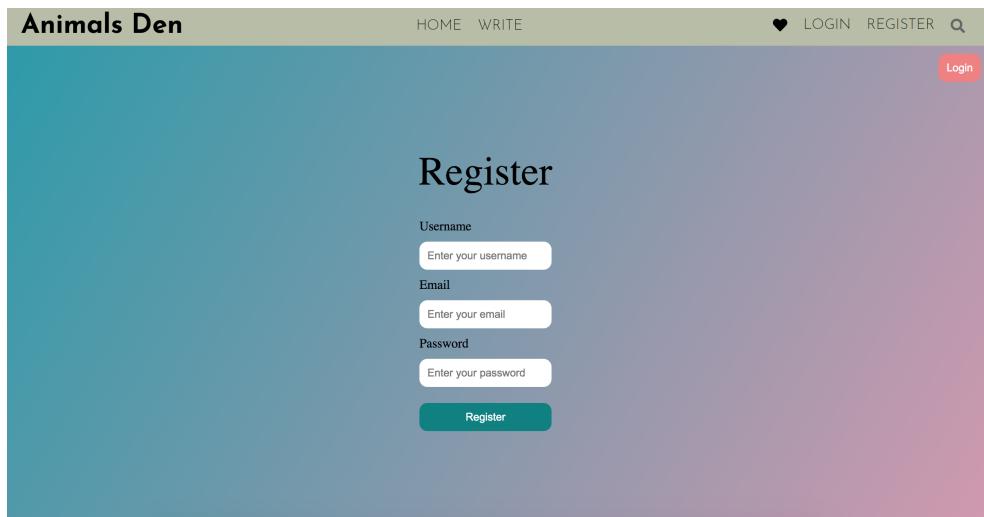


Figure 5.16: Screenshot of Registration page of Animals Den

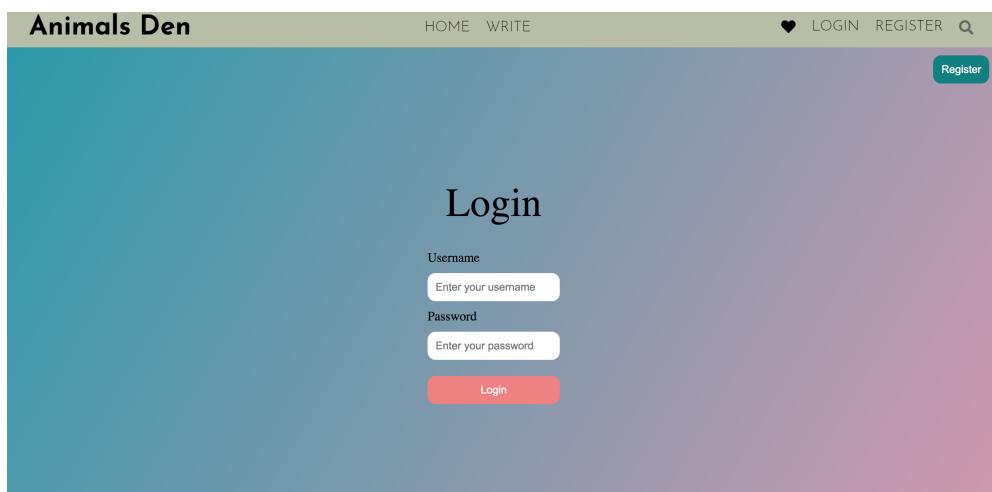


Figure 5.17: Screenshot of Login page of Animals Den



Figure 5.18: Screenshot of Post Creation page of Animals Den

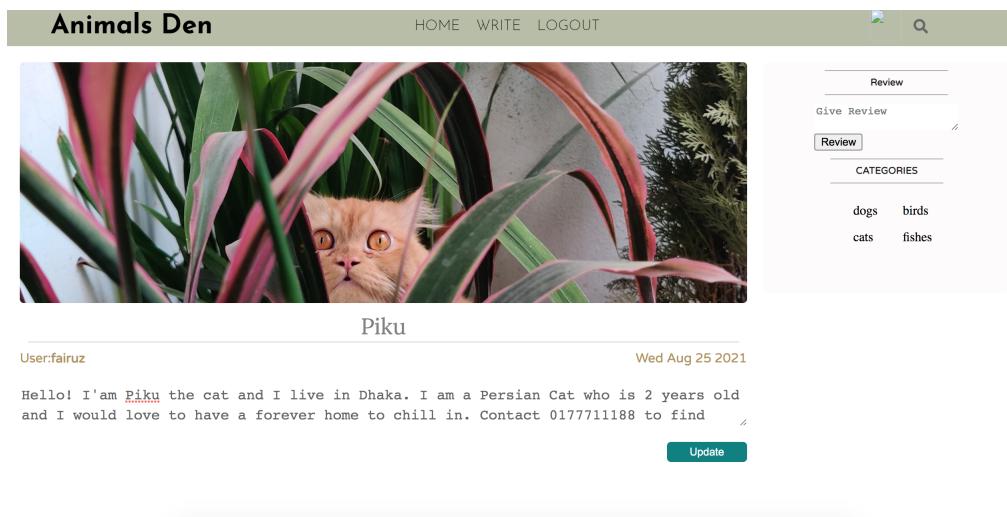


Figure 5.19: Screenshot of Single Post while updating page of Animals Den

5.4.2 Output

In this section, I will be showing the pages I see after login phase as well as some of the editing phases after logging in the user account in Animals Den.

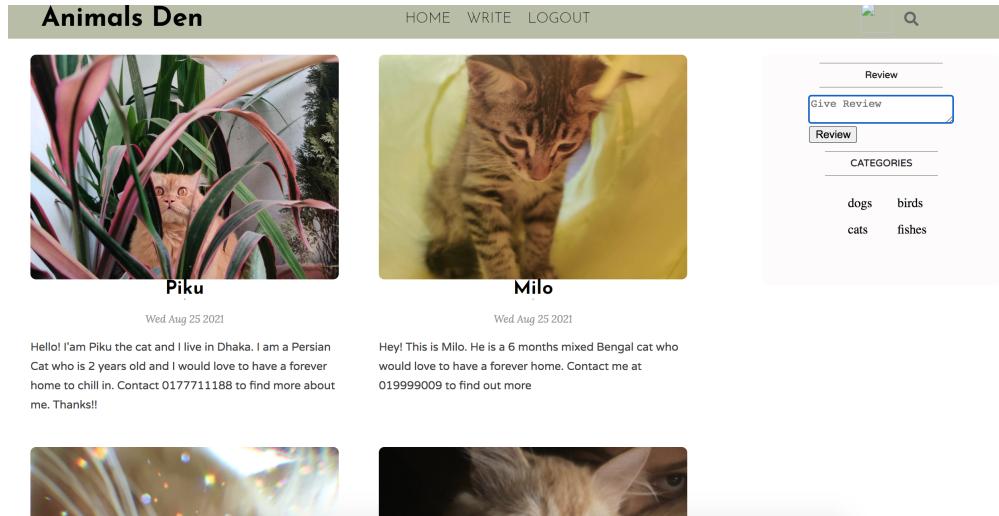


Figure 5.20: Screenshot of Home page of Animals Den after Login

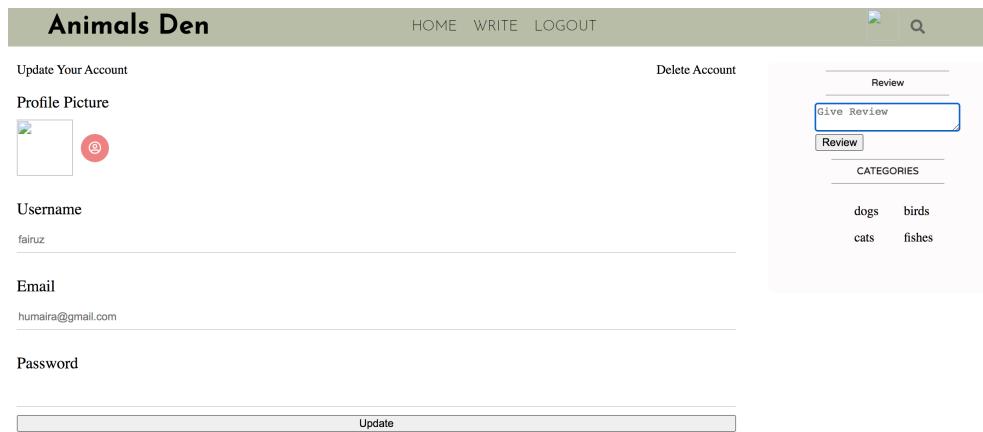


Figure 5.21: Screenshot of User Setting Page to Update Data

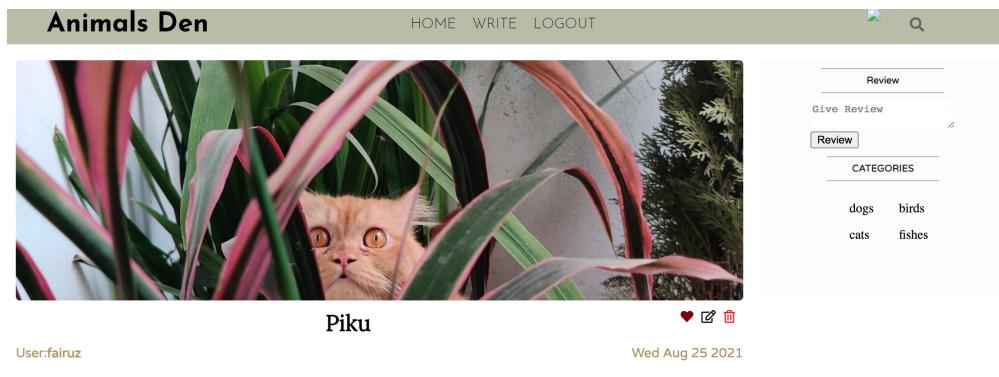


Figure 5.22: Screenshot of Updated Pet information in Single page of Animals Den

5.4.3 Architecture

MVC which stands for Model Viewer Controller has been used as the architectural pattern to develop this system. This design pattern has three major components as mentioned above. The model is connected to the database of the system, the user gets to use and see the view and upon requests the controller manipulates the model which then updates the data and can be viewed in the viewer component which is then seen by the user.

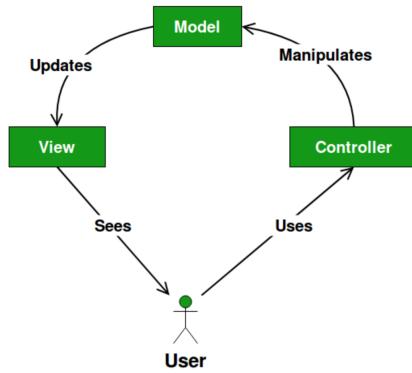


Figure 5.23: Screenshot of MVC Architectural Pattern

The model in this design does not have any logic describing how to present the data. It is just pure application data. Then comes the View. This phase presents the model's data to the user. The view does not understand what the data means in the model but can access the data. Then comes the Controller, which links the Model and the View. It has all the logical part of the application and listens to the event triggers and shows the appropriate view when the specific trigger happens[20].

By using the MVC pattern, I and the developers at Techdojo, have developed Animals Den. Animals Den also has models that contain pure data, the views as well as the logic of the controllers to fetch the specific data to carry out the functionality of the application.

For example, Animals Den has models of users which contain pure user data and does not have any logical functionality in it. When a registered user tries to login to his/her account then they would have to use their username and password which are data from the model. By clicking the login button, the controller manipulates the view. This causes the data to be manipulated and the page setting which is considered as the view changes.

The advantage of using this technique is the entire team could work simultaneously with the models, controller and views which made us work together. This helped us clear out confusions and mistakes when that was occurring.

Chapter 6

Results & Analysis

Animals Den, a fullstack MERN application is a web application. For the frontend and backend development, tools like React, Node.js, Express.js and MongoDB were used.

In this section, I will be explaining some parts of the application by providing its screenshots. These screenshots are taken from the working application.

Pages like homepage, registration, login, posting adoption post, searching for specific animals, viewing a single post, editing and deleting a post, editing user page and lastly logging out. All these working functionalities can be seen in the ongoing project. More features like liking a post which will cause the user to get notification on the specific post using firebase cloud notification, reviewing the users for validity and creating features for admin user can be seen in the future. The screenshots of the working pages will then further help me explain and analyse the graphical report that was generated with the models using the help of MongoDB.

From the chapter 'body of the project', we have already understood the workflow of this project. Some screenshots of the register, login and a few other input pages were given there.

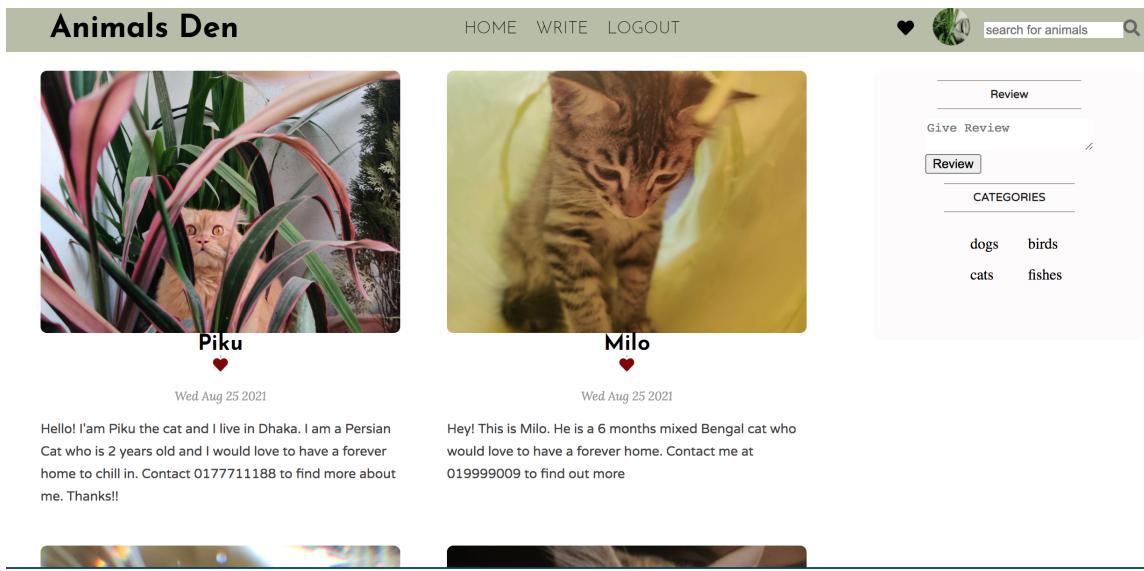


Figure 6.1: Screenshot of Homepage of Animals Den

Here, I have posted the screenshot of the page where users would be able to view the adoption posts given by other users. This page is accessible to users who still have not registered and logged in. But only after having an account will the user get an view where they would be able to access the write page, setting page as well as review other users. These user data are being stored in the database of the system.

Additionally, we can see that there is a search bar that helps us search for specific criteria that we want our pets to have. For example, the type of animal, location, etc.

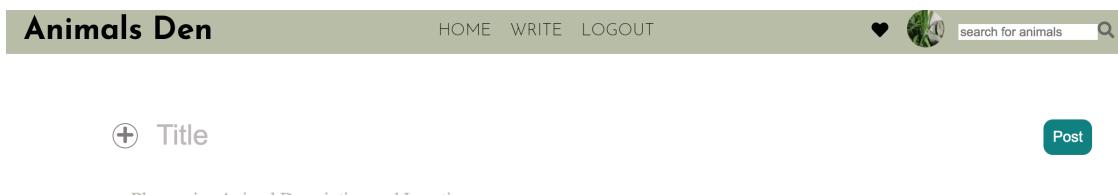


Figure 6.2: Screenshot of the Post Page in Animals Den

In this page, we are able to insert photo, title and description to post for the adoptions. After clicking the post button, these data will be saved in the database.

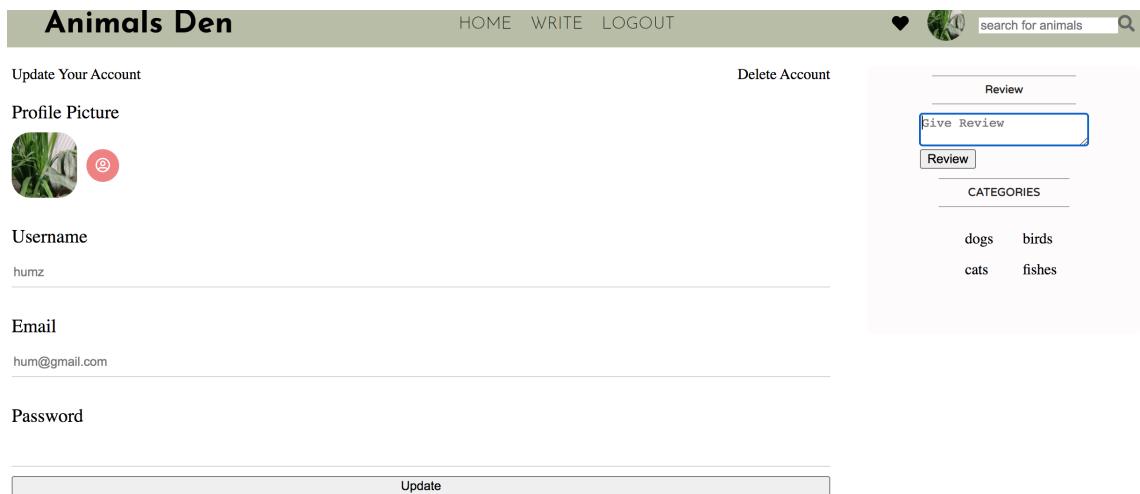


Figure 6.3: Screenshot of the User Setting Page in Animals Den

Here, we are able to upload a profile picture for the user, change the username, email and password. All these data will be replaced by the initial data provided by the user. The password like before will be encrypted for security.

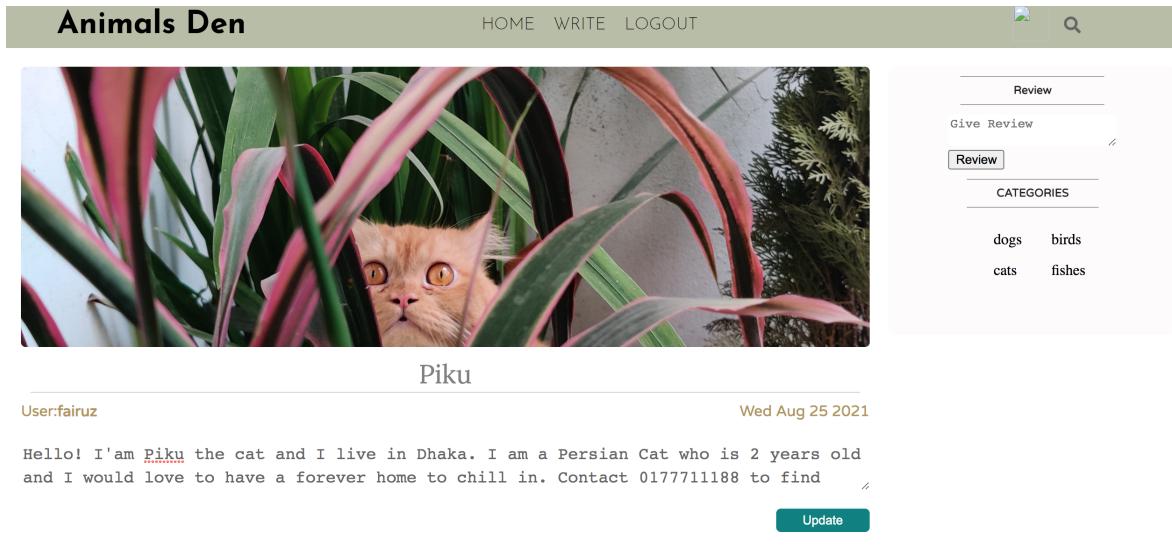


Figure 6.4: Screenshot of the Post Update Page in Animals Den

In this page, the user who has posted a particular post will only be edit/delete that post. Here, I am showing an example of how a post can be updated and then these updated data will be replaced in the place of the data that was initially given.

These screenshots will help us understand the comparison made in the data analysis that was provided by the users of the system. These data has helped us generate several kinds of graphical charts.

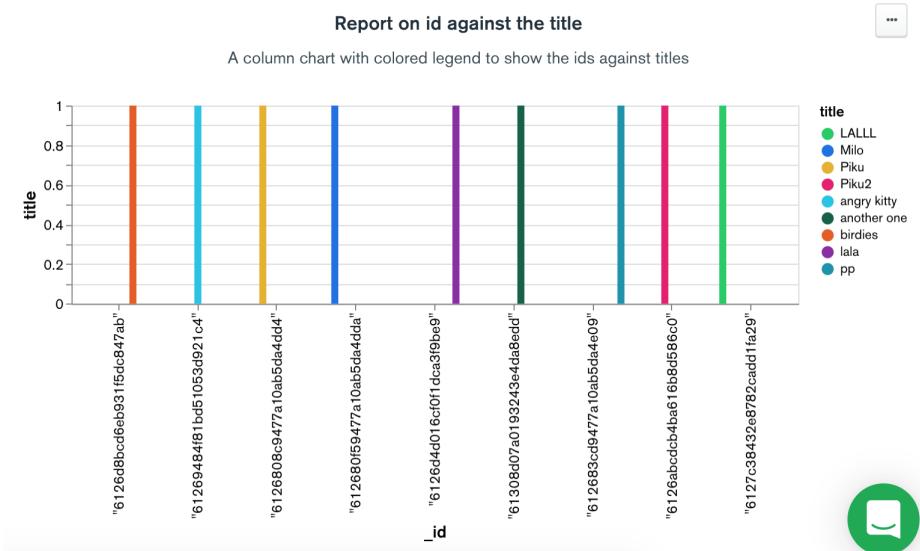


Figure 6.5: Column chart of Id against the title given in posts

This column chart is showing the number of users using their id in the x-axis and the titles are on the y-axis. the titles are also color coded to make it visually appealing and is easier to understand. From this chart, we can understand that all the users in this report have given a title for their posts. These information were given by different users while writing posts to put the animals up for adoption.

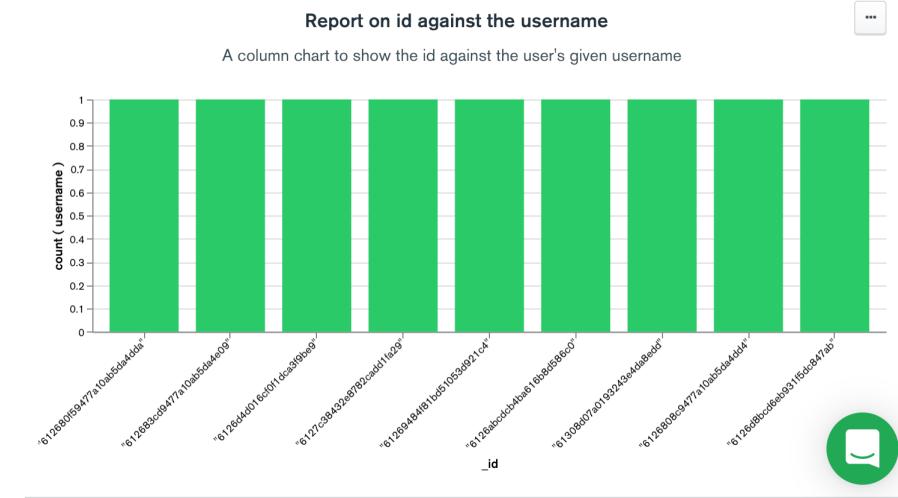


Figure 6.6: Column Chart of user id and username in Animals Den

This figure is also another representation of a column chart that shows the data of how all the presented users with user Id have a username. The x-axis has the user IDs while the y-axis shows the data of the username. The body of the chapter had register and login pages that required usernames from the users. Those data were initially saved in the database. The Screenshot of user setting page also shows that the username as well as the other data provided initially can be changed and updated in the database.

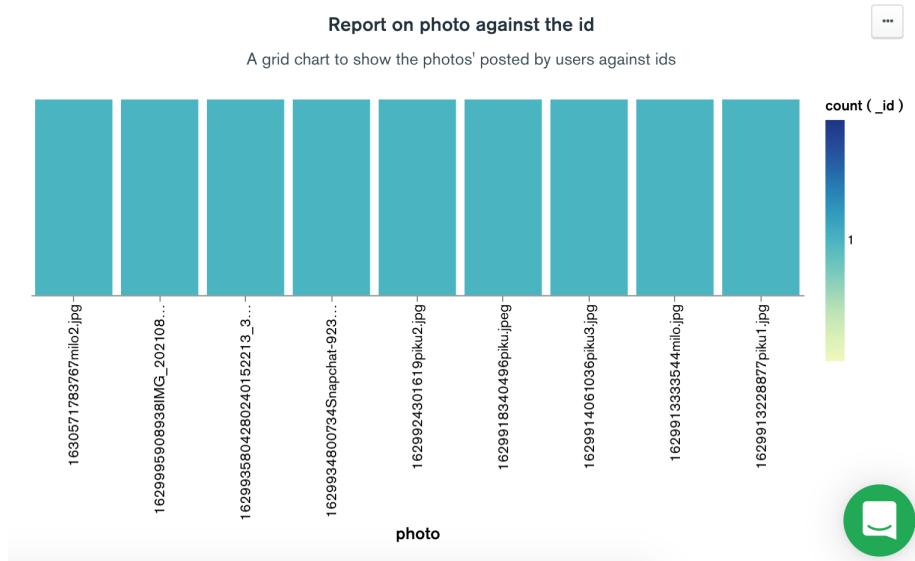


Figure 6.7: Grid Chart of posted photo and user id in Animals Den

Lastly, this grid chart of photo and user id gives us a clear visual that users post pictures for their adoption post to attract more users. The x-axis has the name of the photos used by the users and this data is shown based on the individual posts by different user ids. This tells us that a user can post a single photo at a time and that data is being saved individually in the database of the system.

Chapter 7

Project as Engineering Problem Analysis

7.1 Sustainability of the Project/Work

When it comes to the sustainability of the product/work, then various aspects come into the factor. Sustainability of the product[21] refers to the ability of the product being maintained and updated. It is vital to understand the concepts sustainability and to come up with an appropriate sustainability plan so that project failure can be avoided.

The sustainability of the product can be categorized into 3 parts[22]:

a. Community Sustainability: Community sustainability refers to how much the community, i.e., the people of the society who will be users of the application, will support the project to be sustainable. They can support can happen in many ways. People can browse through the application, people can spread the awareness of the application through other social media platforms, referring it to other people, using the application and giving the review, etc.

Animals Den, a one stop application to find pets to adopt is believed to have a strong user base. This is because this type of application will be one of a kind in Bangladesh. This will cause the user base grow which will cause the community to grow as well. For this reason, it can be said that Animals Den is sustainable when it comes to community sustainability.

b. Financial Sustainability: Financial sustainability tells us about the financial support that the project would require/need after the grant of the project has ended. The running cost of the application would include the cost of the server, database storage etc. When a complete and full-fledged release will be made of the application, Animals Den, then it will generate its revenue by running ads in the application. This application also serves for the better community between humankind and animals, it is also expected that the organization will get sponsorship and donations. Thus, it can be said that Animals Den will be financially sustainable.

c. Organizational Sustainability: Organizational Sustainability talks about how the organization will continue to function[22] after the completion of the project. The completed application would update the functionality and add new features to the application as well as fix the bugs. The organization can also expand the project by introducing new teams as well. The marketing team would also have to advertise the application to get more users in the application. This is why it can be said that the application, Animals Den would be sustainable organizationally.

7.2 Social and Environmental Effects and Analysis

Computing devices like smart phones, laptops, iPads, PCs etc. are needed in our lives in a daily basis. We either need them for educational, office or recreational purposes. Many organizations take advantage of this technology to spread awareness about their products or purposes. This helps the organization communicate more with its users or customers, creates a learning platform, exposes the product to a greater mass of audience which increases the chances of the project to be successful and lastly it helps the business grow. With this, Animals Den being a web application will also impact the society and environment in a few ways. From one of our research[3], it helped us to understand that providing pictures help the probability of adoption increase.

a. Social Effect: Using these technologies, users would be able to find their desired animals that they would like to adopt, or users would be able to put up animals for adoption. This will help people be happier and be more interactive with the outside world through pets. Animals Den help people find their pets which will reduce the screen time and help reduce the pressure on the eyes. Animals Den will help create a community where animal lovers can communicate to find better homes for these precious animals.

b. Environmental Effect: Animals Den would have a huge impact on the environment in several ways. Animals Den will help people find pets in one place at the palm of their hands, instead of visiting different groups and places just to find the perfect pet for themselves. This also helps animals immensely. This gives the animals a better chance to be adopted as they have more exposure to users who are actively looking for animals to adopt. This creates a better environment for humans and animals as well. This would help reduce the number of stray animals and would help them live a better livelihood.

7.3 Addressing Ethics and Ethical Issues

Users who are willing to use application put their trust on app developers as they provide their personal information like name, address, phone number, email etc. in the forms of the application. But with this advancing technology and huge data collection, hacking and cyber crime are taking place. To avoid these types of situation, the developers and I at Techdojo,

7.3. ADDRESSING ETHICS AND ISSUES IN SERVING PROBLEM ANALYSIS

have followed the rules and ethics that would not breach any code of conduct regarding ethical issues.

Some steps that were taken to maintain ethics are given below:

- 1. Collecting relevant data only:** The application Animals Den would require the user information while making their account as well as extensive information if they create a post. For this reason, we have only given the option of adding the address and phone number while creating the posts and not the user account.
- 2. Unique Email address-** To avoid identity theft on the internet, we have introduced the functionality where users would be able to create one account using one unique email address. This helps reduce the opportunity of identity theft.
- 3. No Discrimination Policy-** Animals Den does not discriminate against any race, religion, color, gender, sexuality, religious beliefs, political opinion, language, social origin, social status, nationality. The application also does not discriminate the animals of different types, origin, age, gender, color etc.
- 4. Password Protected-** The user password in this application would be encrypted which means that if any one tries to hack it, then they would not be able to view the password. This would reduce the chances of hacking the user account.
- 5. Clean Advertisement-** The advertisements that would be used in Animals Den will be clean and would not have any bad impact on the user of this application. Advertisements will be filtered and will avoid the ones that are related to violence, blood and gore, injury etc.

Chapter 8

Lesson Learned

8.1 Problems Faced During this Period

In this section, I will be discussing the problems I faced during my internship period. The technological arena is ever changing and only moves forward. This means that with the advancement of technology, newer systems and languages are being introduced every day and it is our job to keep up with it. As a fresh undergraduate student with no prior experience of how the actual office life works, I faced some complications which I have discussed below.

New environment, tools and technologies: During the initial phase of my internship, I only knew about the programming languages and libraries that were used during my classes. The internship at Techdojo was eye opening as it gave me an idea of how real work would be like. This was a bit intimidating at first which made me nervous to speak to my seniors at the company when it came to the discussion of some solutions of a few problems. The methodologies used in the project was only learnt by me in my university courses and to see them being implemented on a project was staggering.

Online internship: Another problem that I faced during this phase was maintaining the timing for my project work. Due to COVID, most of the university classes are being held online for which some of the classes ended very late. I had a hard time juggling between the courses and my internship work life.

Photo uploading functionality: During this phase, it was hard to select a few data to show the inputs, outputs of the projects. The ongoing development of the project had some problems. A few times the uploaded profile photos of the users would be uploaded in the database, but when it came to fetching the data to the frontend portion, it failed.

Data analysis Report: In the phase of result analysis, the problem that I faced was to portray the data that the users provided in the application. The gathered data needed to be shown in the form of reports or charts which the application itself does not do.

Password Encryption: During the last phase of my internship, I found that difficulty to make the upload of the pictures in the website faster. I also had to make sure that the emails were encrypted while registering in the application.

8.2 Solution of those Problems

I, with the help of my supervisors and seniors overcame the problems that were faced by me during the internship period. The techniques and methods that helped me overcome the problems are given below:

New environment, tools and technologies: The seniors and co-workers at Techdojo were extremely friendly and helpful which helped me open up and contribute more to the processes of the project. The seniors at the company helped me understand the concepts of the methodology more which in return helped me give more effort in the project. Their motivation encouraged me to ask questions and get out of my comfort zone to think out of the box in order to contribute to the project I did during my internship period.

Online internship: The solution of this problem was given by my seniors in the company, as due to the pandemic the office hours were remote, and this helped me to be a bit flexible during the daytime when it came to class hours. Their advices helped me fix my schedule better where I could give my best for both the internship project and university classes.

Photo uploading functionality: To solve the problem faced during this phase, I and the developers discussed the problems that I faced while developing this module and worked together using GitHub and Discord and solved the problems.

Data analysis Report: To overcome this problem, I have taken the help of MongoDB charts. Here, I have used some data provided by the users for some specific modules in the application and presented them using different types of graphs to show that the functionality works properly in these specific modules.

Password Encryption: To understand what went wrong in the functionality of a slow upload of images in the application, I analyzed the functionality using my console and tried decoding it using the help of other developers. This helped me analyze understand my mistake properly.

To make sure that the password in encrypted and cannot be seen by others, we have used a password hashing functionality to avoid this problem.

Chapter 9

Future Work & Conclusion

9.1 Future Works

Animals Den is a venture that is unique and one of a kind in Bangladesh. An application that specifically caters to the adoption of pets is a new concept in Bangladesh. This application is starting with its basic functionality that can help people find their desired pets. But as the application is still in its development phase, there are many features that can be seen in this application in the future.

Some features that can be added in the future are given below:

1. A chat functionality can be introduced so that users can communicate directly in the application.
2. This application currently has an option to upload only one picture, in the future multiple pictures can be uploaded.
3. Videos can be uploaded too in the future to increase the chances of the pet getting adopted.
4. Admin users can be created in the future so that they can delete the fraud user accounts based on reviews.
5. The functionality of giving reviews can be seen upon the future development of this application. This will help users understand the reliability of a post of a specific user.

9.2 Conclusion

My internship at Techdojo was very productive and effective to me. The timeline of the internship took place during the rough times the pandemic. Like many other employees and interns, I also had to gain the experience of working from home. This internship had given me the chance to get a glimpse of what an actual work life experience would be like. I was also taught the etiquettes of corporate life.

This internship had given me the chance to learn new technologies that are highly demanded in the current job market and also gave me the opportunity to implement the skills

that I learned in my university courses. I also have learned a lot from my mentors who have helped me navigate and understand what was required of me and understand how to make the work easier by giving me advices. This has given me the confidence to ask questions and work in companies related to the technological sector whereas, previously I would think before asking the questions due to lack of confidence. This also improved my coding skills and helped me use other technologies like GitHub for version control.

During my internship period, I learned JavaScript, Node.js, React.js, Express.js and MongoDB. Animals Den, being a MERN stack application has helped me gain extensive knowledge in these things which has given me the opportunity to understand the technologies better. My internship has also taught me how to write and format a report in Overleaf which would be very helpful for any future work related to reports.

I would say that it was a blessing for me to work under such great people who helped me during every part of my internship period. They have given me the confidence of working in new projects as interns usually do not get the chance to work on live projects. This gave me a great opportunity to understand my skill set and I am forever grateful for this chance that was given to me to prove myself.

Finally, I would like to thank my supervisors from university and Techdojo who showed me the path to strive for best outcome. Their advices helped me navigate through the internship and helped me be a part of this unique application and helped me complete my internship period. Their guidance and motivation have given me the confidence to work and strive for triumph when it comes to future project work.

Bibliography

- [1] F. Naznin, “Pets as home decor.”
- [2] K. M. Robinson, “How pets help manage depression.”
- [3] M. K. Workman and C. L. Hoffman, “An evaluation of the role the internet site petfinder plays in cat adoptions,” *Journal of Applied Animal Welfare Science*, vol. 18, no. 4, pp. 388–397, 2015.
- [4] K. Zhang and K. Zhang, “Petfinder challenge: Predicting pet adoption speed,” 2019.
- [5] “Work breakdown structure.”
- [6] “Sdlc-overview.”
- [7] A. ALTVATER, “What is sdlc? understand the software development life cycle.”
- [8] “Extreme programming (xp).”
- [9] “Extreme programming: Software development to the extreme.”
- [10] “React(*javascriptlibrary*).”
- [11] J. Denman, “What is node.js?.”
- [12] “Express/node introduction.”
- [13] “Mongodb.”
- [14] “Github information.”
- [15] “Discord(software).”
- [16] “7 types of feasibility analysis.”
- [17] Nishadha, “Uml diagram types.” Accessed-28.08.21.
- [18] M. Martin, “What is a functional requirement in software engineering?.” Accessed-28.08.21.
- [19] Editor, “Non-functional requirements: Examples, types, how to approach,” Feb 2020.
- [20] “Mvc-design-pattern.” Accessed-28.08.21.
- [21] “Fundamentals of project sustainability.”
- [22] “What is project sustainability?.”