Department of Electrical and Computer Engineering

North South University

Senior Design Project

PetDekho: Pet-Care Application and Website

Zubair Mahmood Sowrab **2011657042**

Tanjim Imtial **2014215642**

Md. Zakaria Khan **2013412042**

Faculty Advisor:

Dr. Shazzad Hosain

Professor

ECE Department

Spring, 2024

APPROVAL

Zubair Mahmood Sowrab (2011657042), Tanjim Imtial (2014215642) and Md. Zakaria Khan (2013412042) from Electrical and Computer Engineering Department of North South University, have worked on the Senior Design Project titled "PetDekho: Pet-Care Application and Website" under the supervision of Dr. Shazzad Hosain partial fulfillment of the requirement for the degree of Bachelors of Science in Engineering and has been accepted as satisfactory.

Supervisor's Signature

…….

Dr. Shazzad Hosain

Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

Chairman's Signature

…….

Dr. Rajesh Palit

Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

DECLARATION

This is to declare that the project done is our original work and has not been submitted anywhere else for receiving a degree, a diploma or any other award of such sort. The information related to the project will not be disclosed and will remain confidential unless allowed by the course instructor. The previous works done in this field have been referenced and cited. The plagiarism policy, as stated by the project supervisor, has been maintained.

Students' names & Signatures

1. Zubair Mahmood Sowrab

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. Tanjim Imtial

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Md. Zakaria Khan

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

ACKNOWLEDGEMENTS

The authors would like to express their heartfelt gratitude towards their project and research supervisor, Dr. Shazzad Hosain, Professor, Department of Electrical and Computer Engineering, North South University, Bangladesh, for his invaluable support, precise guidance and advice pertaining to the experiments, research and theoretical studies carried out during the course of the current project and also in the preparation of the current report.

Furthermore, the authors would like to thank the Department of Electrical and Computer Engineering, North South University, Bangladesh for facilitating the research. The authors would also like to thank their loved ones for their countless sacrifices and continual support.

ABSTRACT

PetDekho: Pet-Care Application and Website

The pet care industry in Bangladeshis a huge industry but is often over-looked as a business sphere. But recently, the Pet-care industry has become a more than 200 million dollar industry in Bangladesh. Crores of Taka is being invested in bringing pet products and pet animals from different countries to Bangladesh.

People are looking to spend more and more on their pets every month. An average cat owner spends around 2000 taka to take care of their cats every month. Keeping all the mentioned factors in mind, the idea of PetDekho has been created to cater to all the stakeholders involved in the pet care industry. It is an idea that looks to explore and utilise a seemingly unexplored yet a huge industry with unlimited potential in Bangladesh.

PetDekho is a startup based project that is a one stop solution for pets. The pet industry in Bangladesh is a market which is yet to be fully explored and PetDekho aims to do just that. The project solves problems for pet business owners, veterinarians, pet specialists and pet owners. PetDekho aims to provide services such as a marketplace, vet services, pet specialist services and also pet transportation services. The project is a website which provides the services mentioned above. The project also has a mobile application which is used to transport animals.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1 Introduction

1.1 Background and Motivation

The pet-care industry on Bangladesh is an over 200-million US dollar industry. As the economy of the country is growing and the financial situation of people gets better, they are investing more and more in pet products and services.

But unfortunately, the pet care industry is a huge industry but it is one that is yet unexplored. This brings an exciting opportunity to work in this field and introduce an exciting, convenient and efficient way to conduct business for stakeholders in the pet care industry.

Keeping this in mind, we have come up with the idea of PetDekho. This project is a website and a mobile application which will have everything that pet owners, pet specialists and business owners could want and more!

The project brings new exciting features to the table such as transportation services, vet and specialist services all the while combining the existing features of pet care applications such as marketplaces and guidelines.

1.2 Purpose and Goal of the Project

The project aims to solve many problems faced by pet owners, businesses and specilaists in the pet care industry. The project can prove to be a game-changer for these stakeholders by solving problems such as:

I. Lack of guidance for pet owners.

II. Difficulty in consulting veterinarians.

III. Difficulty in consulting specialists.

IV. Platform for pet shop owners to grow their business.

V. A way to easily and safely transport pet animals.

VI. Unavailability of enough platforms to adopt or sell pets.

The project aims to create an interactive marketing and communication platform for all things pets! The project aims to help both pet and pet shop owners by providing an easy platform to buy and sell pets. The project aims to provide a way to transport pet animals securely at reasonable rates. Pet specialists are also considered while developing this project. The aim is to provide pet specialists with a way to generate customers and also make it easier for customers to find such specialists.

The project aims to combine state of the art features with a proper business model to contribute towards a booming pet care industry. We strive to provide the best services for pet care in Bangladesh and this project, PetDekho can surely prove to be a huge positive step going forward in the pet-care industry.

The objective of the proposed project is to create an interactive marketing and communication platform for all things pets! The proposed project aims to help both pet and pet shop owners by providing an easy platform to buy and sell pets.

The project aims to provide a communication platform among all pet owners. Pet specialists are also considered while developing this project.

The aim is to provide pet specialists with a way to generate customers and also make it easier for customers to find such specialists. The project aims to combine state of the art features with a proper business model to contribute towards a booming pet-care industry.

The market segment that is huge in the pet care industry is the pet accessories and food section. We aim to achieve profits through earning a percentage from the marginal profit made by the Petcare or pet shop owners. This ensures profits for us as well as petcare or pet shop owners due to their repeating customers.

The market segments that we mainly aim to reach through the proposed project are the pet medicine and health market. We want to reach out to veterinarians and pet clinics to collaborate with us and achieve profits both for them and make it easier for the customers.

Another market that is left unexplored in the pet care industry is the pet specialists market. Pet specialists such as babysitters and house builders do not get enough customers because of the unavailability of such a platform.

The proposed project, “PetDekho” aims to provide a platform to bring pet owners, veterinarians and specialists together under one roof. There are some systems which are similar to the project such as e-commerce websites, Medicare applications, utility services such as Urbanclap and social media platforms such as Facebook and Instagram.

While these applications may serve different purposes for pet owners, none of them are available all together. Through “PetDekho”, we are aiming to provide the best and most convenient facilities for pet care in Bangladesh.

Through our project, specialists will easily be able to find customers. Another place that the market can be explored in the pet care industry is the premium packages for pets. Pet enthusiasts are known to spend quite a sum for giving their pets the best care possible. Premium packages for pet care are a marketplace that we hope to explore in the future by collaborating with different pet care specialists.

The competitive advantages have already been mentioned above. The project offers many more features for pet owners all under one platform. The project offers vet consultations with chatting, pet specialist consultations with chatting, AI based features such as a Chat-bot and a recommendation system, guidelines for pet owners, community discussion platform and also a pet marketplace. Therefore, this project edges out existing projects in terms of features.

The project aims to create a trust with pet shop owners, veterinarians, pet specialists and pet owners. The project will provide more customers for the veterinarians, pet store owners and pet specialists. The projects aims to create a trust with customers by providing them with state of the art technology combining Artificial Intelligence with the aforementioned existing features and offering them services at the least prices possible.

The project aims to provide the best quality service for pets with our focus currently being providing organic pet food. We will work to make our transportation services as pet-friendly and environmentally-pleasant as possible. The pet industry is often neglected as a business sphere and we will explore just that.

PetDekho is a startup based project that will solve many problems for pet owners. The project aims to provide many services. We are, focusing however on one vertical at a time. We have started discussing our project with NSU Startups next as well. On discussion, we agreed that the project will currently focus on providing organic pet food which is a big market. The

project is exploring parts of the pet industry that hasn't been explored before. Our idea currently, is to work with vendors and provide organic pet food to consumers and retailers through our website.

1.3 Organization of the Report

This report is the final report for the CSE 499B Senior Year Capstone Project. The report is divided into eight chapters. Chapter 1 introduces the report and the project. Chapter 2 presents the research literature review by focusing on existing projects. Chapter 3 contains the methodology.

Chapter 4 consists of the investigation, result, analysis and discussion, chapter 5 contains the project's impacts. Chapter 6 shows the project planning and budget using tables and figures. Chapter 7 focuses on the complex engineering activities and problems involved in this project. Finally, the report concludes with Chapter 8. The report contains all the content explained with the help of tables and figures.

Chapter 2 Research Literature Review

2.1 Existing Research and Limitations

The pet-care industry is growing rapidly and some major players have come up in this industry. Some of the existing projects include:

I. Pet zone

II. Daraz

III. MewMewShop BD

IV. Lovely puppies for you

V. PetSmartBD

VI. Pet careBD

While the above projects have been developed for pet care, they serve only limited purposes such as selling or buying pets and pet products. Our project, “PetDekho” aims to combine the aforementioned marketplace for pets and pet products along with vet consultations, pet specialists consultations, discussion community and guidelines for pet owners.

PetDekho also provides a mobile application for transporting pets which is a problem we found on talking to vendors. The present Pet-care systems and applications in the country do not offer any such services.

The transportation services for pets are something new which we hope can solve the problem of safely and securely transporting pets. This will solve problems for both pet owners and pet business owners.

Currently, there is not any service in Bangladesh, which provides transportation services specifically for transporting animals. This application will be the first application to provide such a service of transporting pet animals from one place to another.

The competition for such an application is not properly available in the country at the moment. But, since the application works like a ride sharing or a delivery application the competition can be considered to be ride sharing or delivery companies.

I. Uber: Uber is the biggest ride sharing application is the world. It is also the biggest in Bangladesh. We are aiming to provide services similar to Uber but with added features for transporting pet animals.

II. Pathao: Pathao is currently one of the biggest companies in Bangladesh. It is a ride sharing application that also delivers packages all over the country. There is also a future possibility of collaborating with such companies for transporting and delivering pet goods and services.

III. InDrive: InDrive is another international ride sharing application that offers rides at affordable rates. We compete with these companies to ensure the best prices and satisfaction for the customers.

IV. Obhai: Obhai is another Bangladeshi company that offers rides with only digital payment. Obhai is another example of how to operate a transportation service.

V. Jatri: Jatri is a Bangladeshi startup. This startup is a way to transport groups of people in large vehicles. Jatri has also collaborated with local bus companies to provide ticketing services. Jatri is an excellent inspiration for us on how to build transportation based startup and also collaborate with local vendors to achieve big things.

On further research, we have found some limitations from existing projects. There have not been many projects that have been developed for pet-care. Even the websites or applications that have been developed are mostly e-commerce websites.

Many of the pet products are sold on other platforms which are e-commerce websites not meant for selling pet care products exclusively. Many people shop for pets or pet products from social media websites such as Facebook and Instagram.

The current trends in the pet care industry include purchasing pet products and pets mostly through local pet shops. Pet owners do not have a proper platform to take care of and shop for their pets. Veterinarians face crises at times due to lack of patients. Even pet owners sometimes face difficulties in finding the right veterinarian for their pet.

There is no way to transport pets in emergencies and PetDekho aims to become the first brand to provide the same. Hence, the pet market is a potentially huge industry that is still unfortunately unexplored. Overall, through “PetDekho”, we are aiming to provide the best and most convenient facilities for pet care in Bangladesh.

We are looking to add the rivers who earn money these above applications to our application, PetDekho. The drivers will be benifited hugely frok our application as our price point is on the higher but reasonable side. Also the amount that we will charge is much lower as compared to the rates of the above mentioned companies.

Our competition can also be considered as delivery companies. We are also working to deliver pet animals and pet products to different places all over Bangladesh. Again, this presents a chance to collaborate and work together to deliver the products.

Companies such as Redx, Steadfast and Pathao are some of the biggest delivery companies in the country. The project is also exciting because it presents an opportunity to work with such companies and generate even more revenue and bring more eyes to the pet industry.

We have a plan of providing cages and other necessary items to these companies to deliver animals even to different districts and cities all over Bangladesh. The import business for the pet market is very big in Bangladesh but the trading within the country is not nearly as big.

A large part of this cause is due to the unavailability of proper infrastructure and transport for the pet business within the country. Through our application, we are aiming to solve this problem.

The cost per unit depends on many factors. On every ride many factors must be considered, such as the distance, the fuel cost, the size of vehicle, the cost on the development side and other maintenance cost.

The cost will increase as the size of vehicles, the distance, etc are increased. As mentioned, we will be offering cages and other items such as sheets, food, etc to ensure the optimal ride for pets and pet owners. Therefore, the cost will be considered here as well.

Chapter 3 Methodology

3.1 System Design

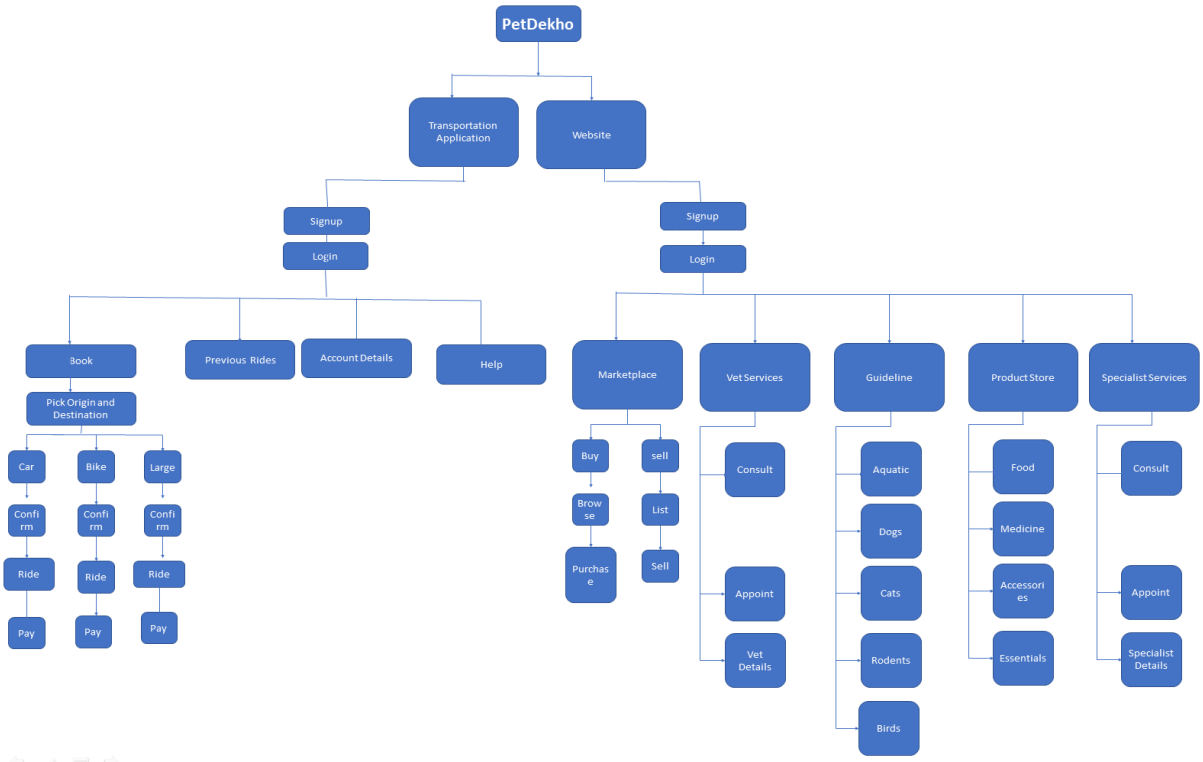

Figure 1. Flowchart of the Project

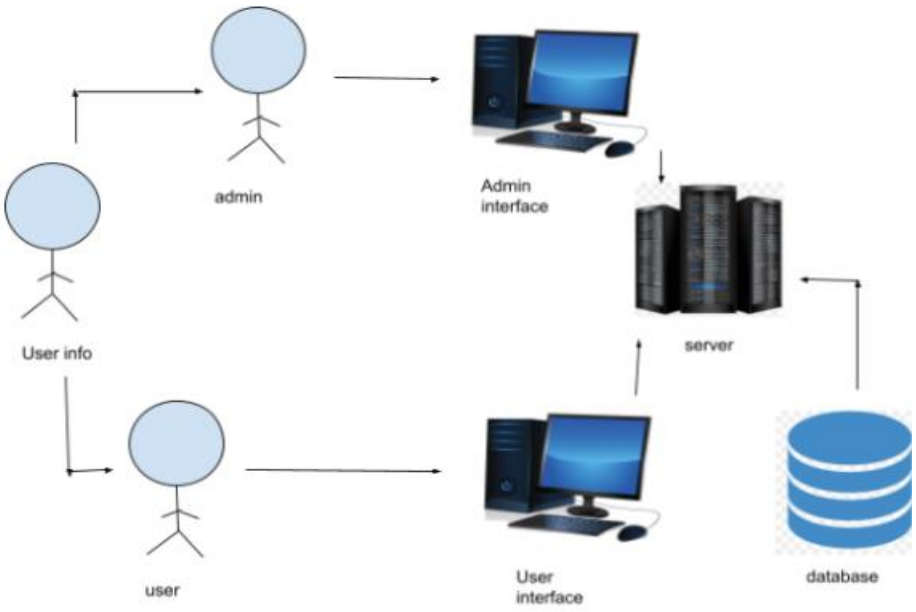

Figure 2. System Architectural Design

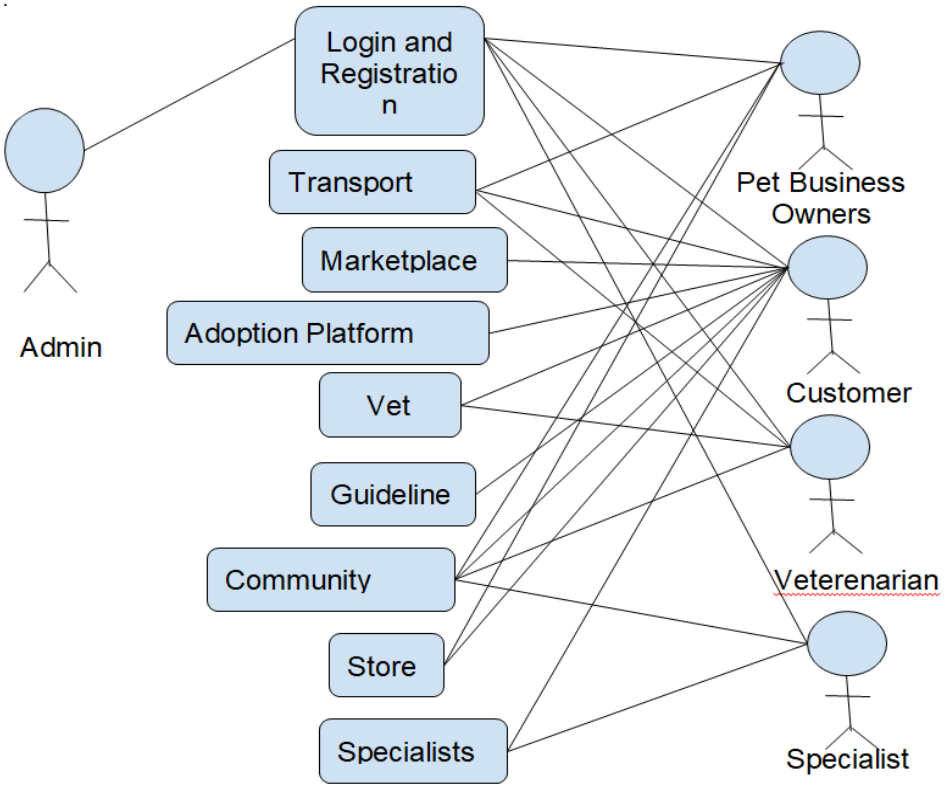

Figure 3. Use Case Diagram

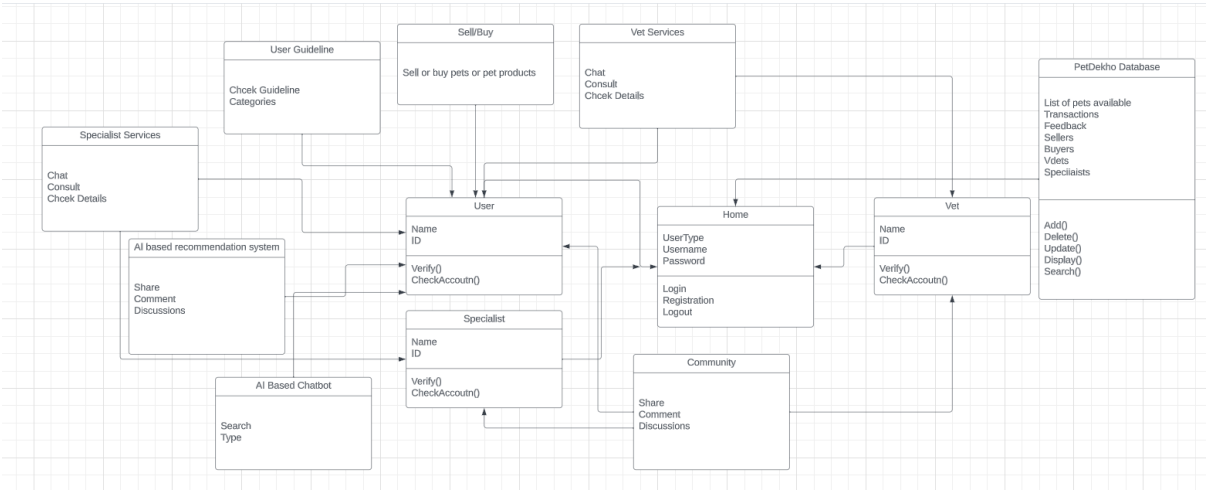

Figure 4. Class Diagram

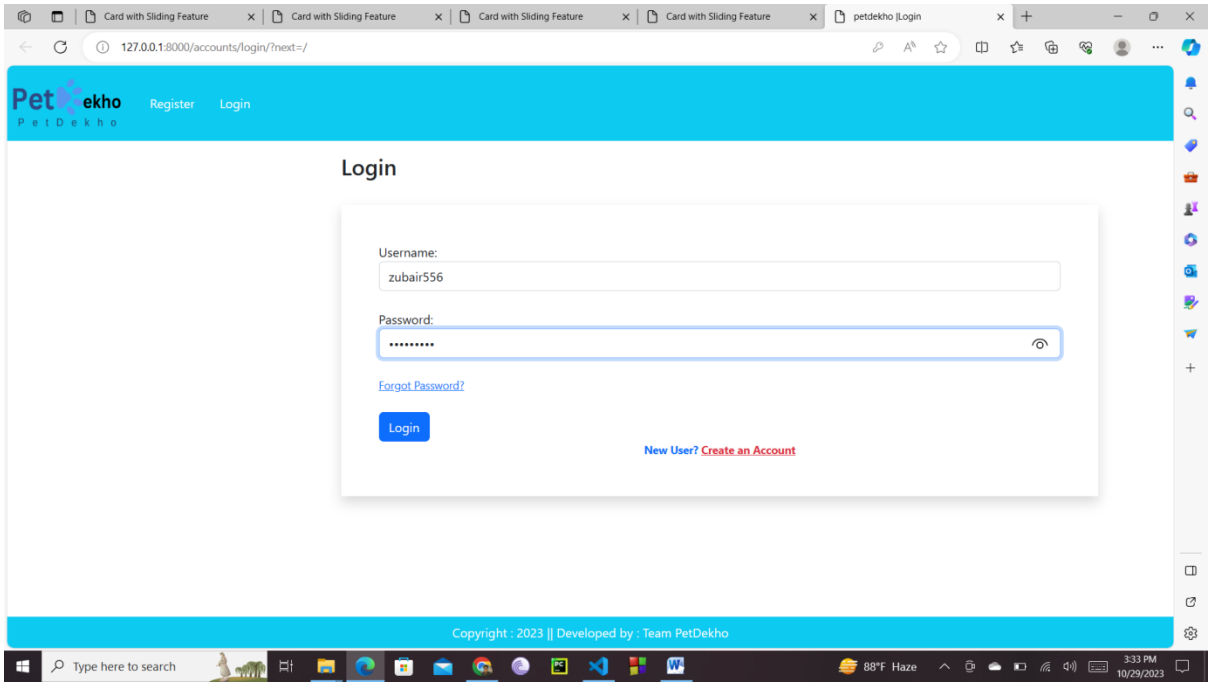

Figure 5. Login Page (Website)

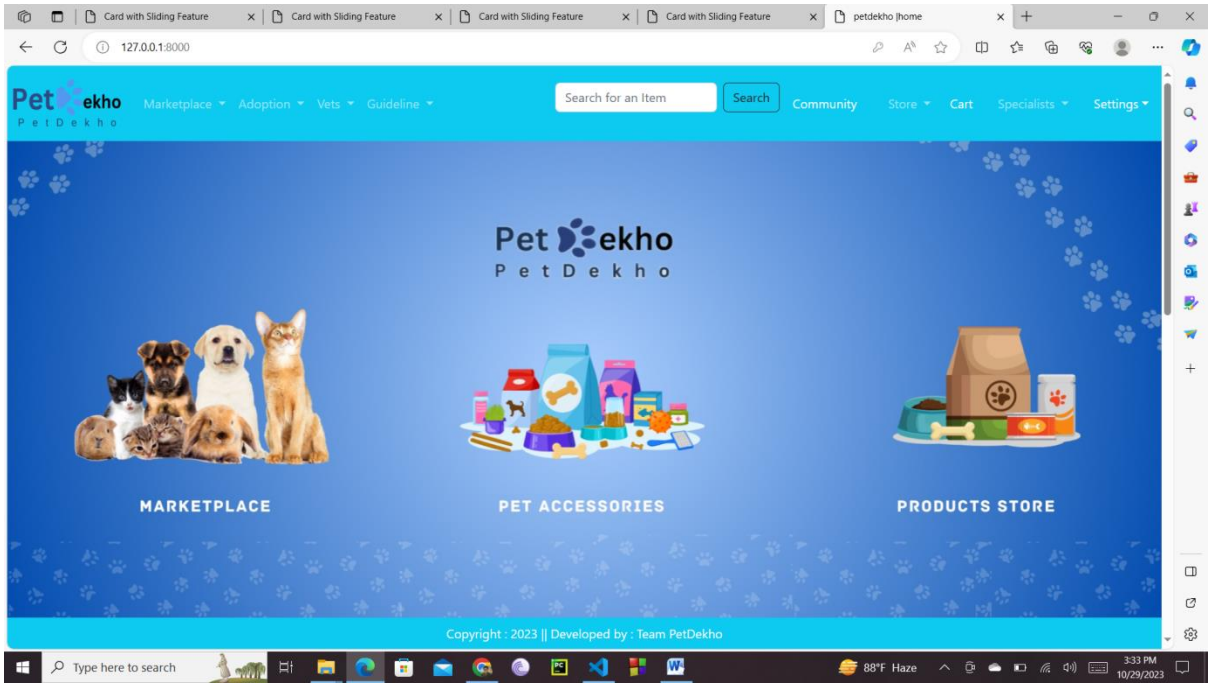

Figure 6. Home Page (Website)

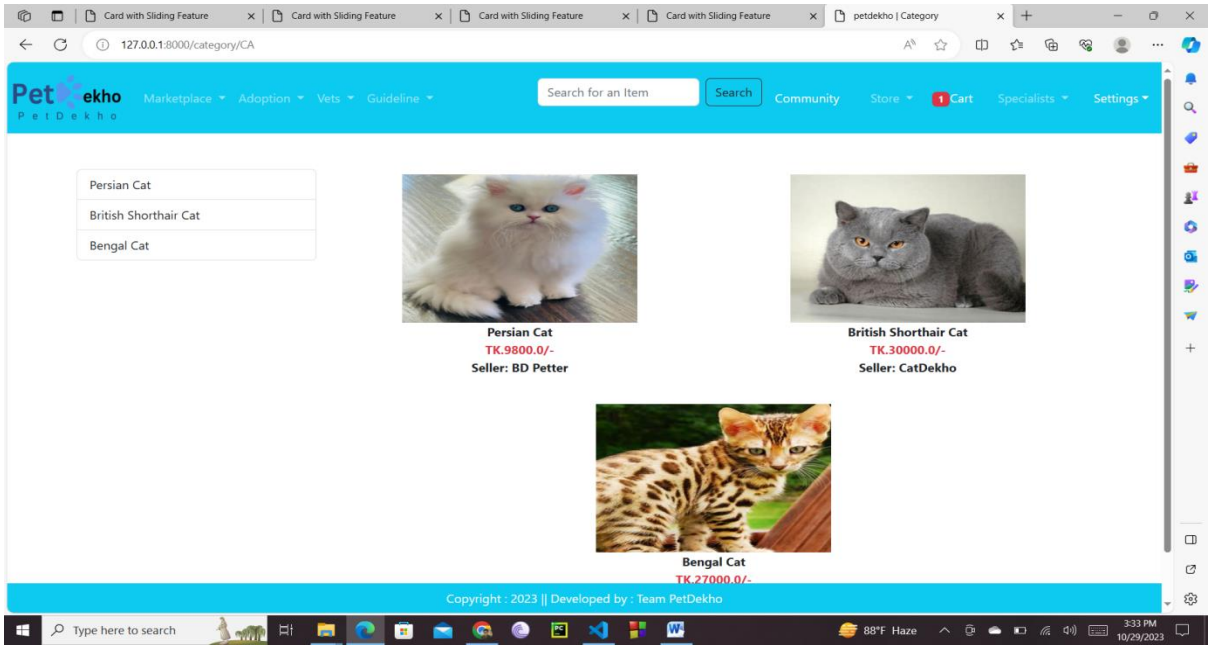

Figure 7. Marketplace Page (Website)

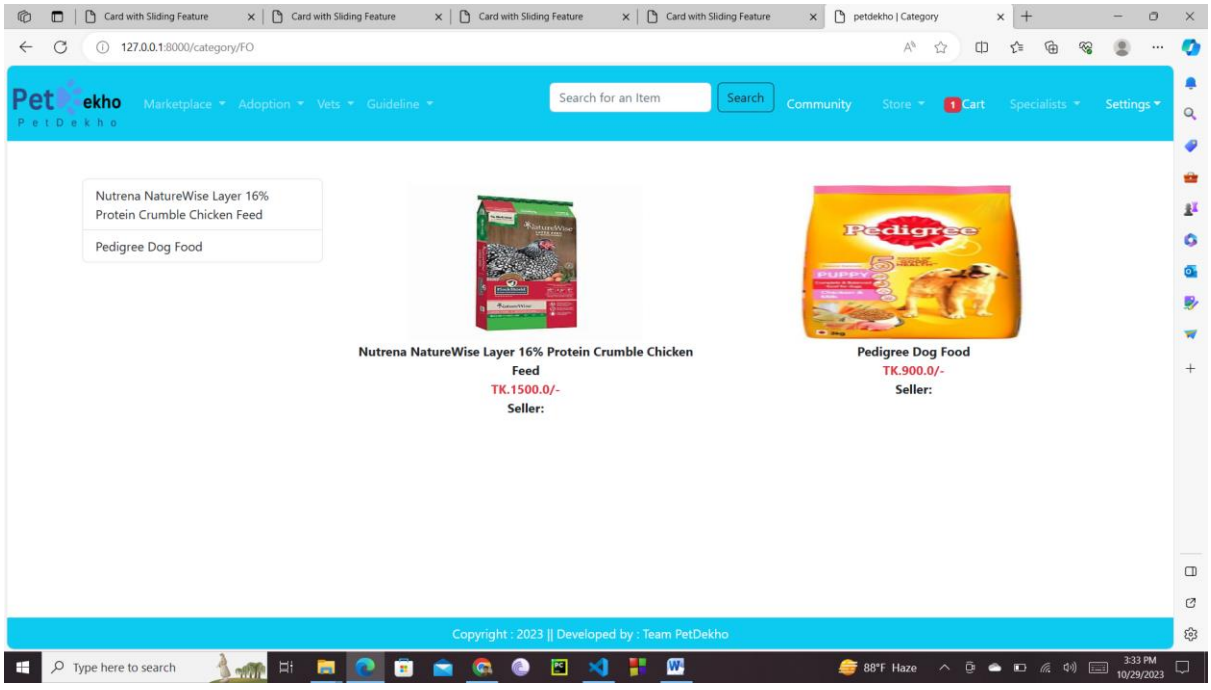

Figure 8. Store Page (Website)

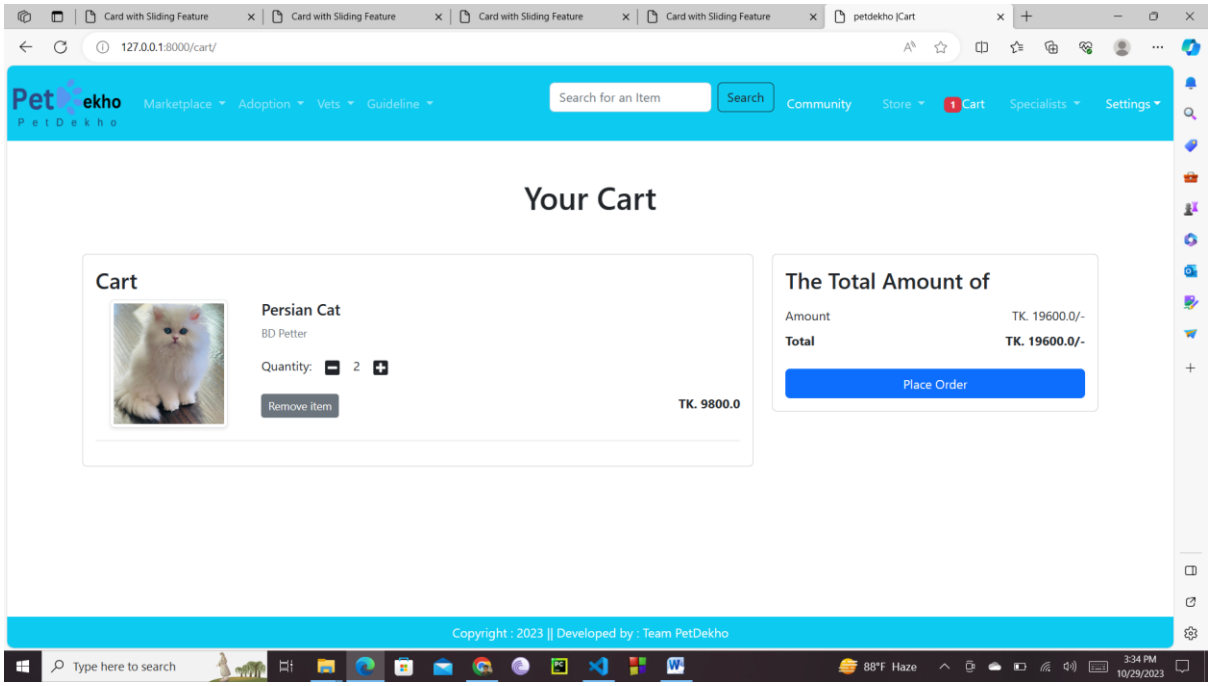

Figure 9. Cart Page (Website)

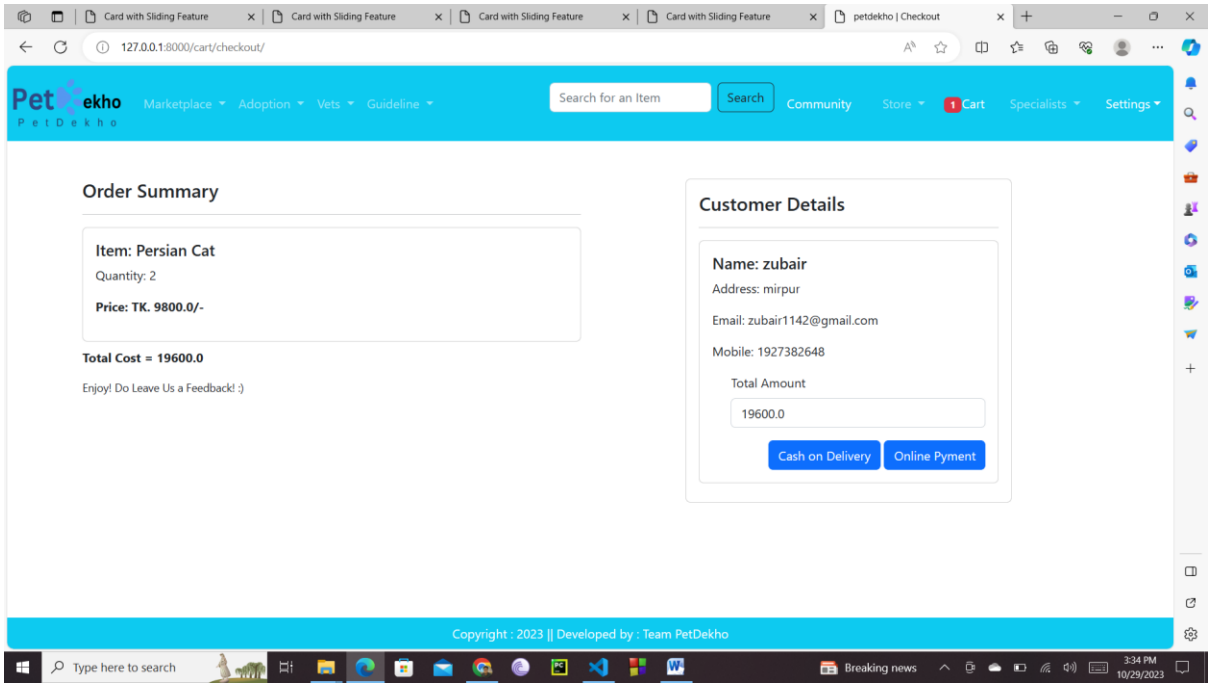

Figure 10. Order Summary Page (Website)

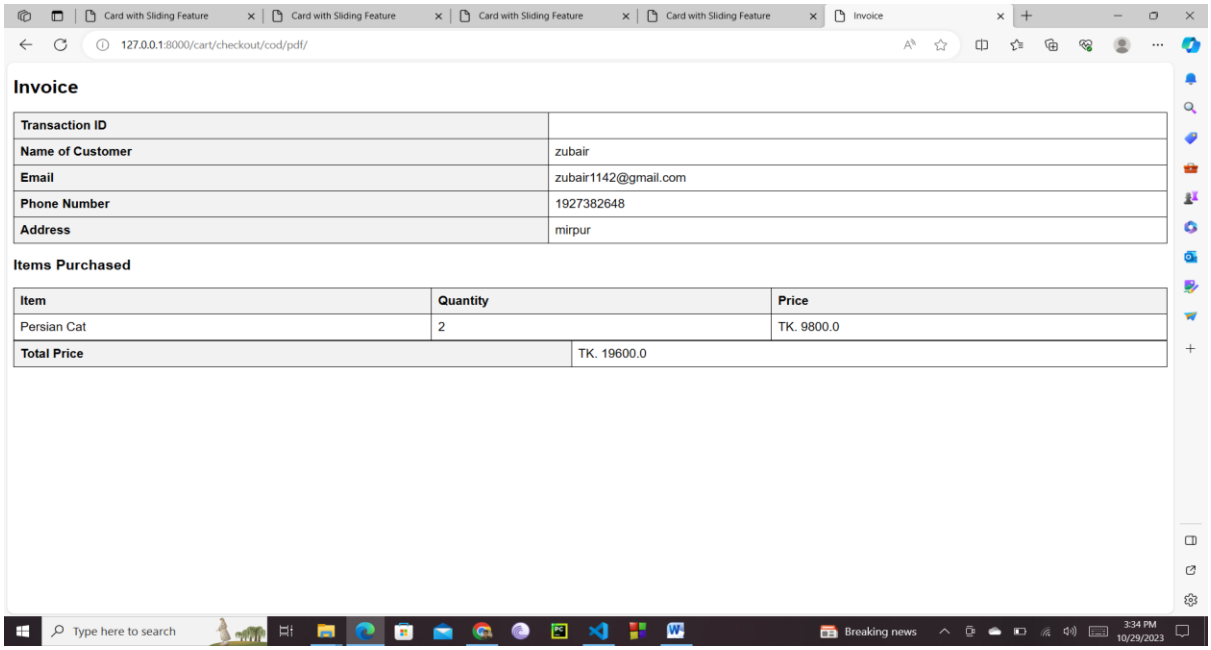

Figure 11. Receipt Page (Website)

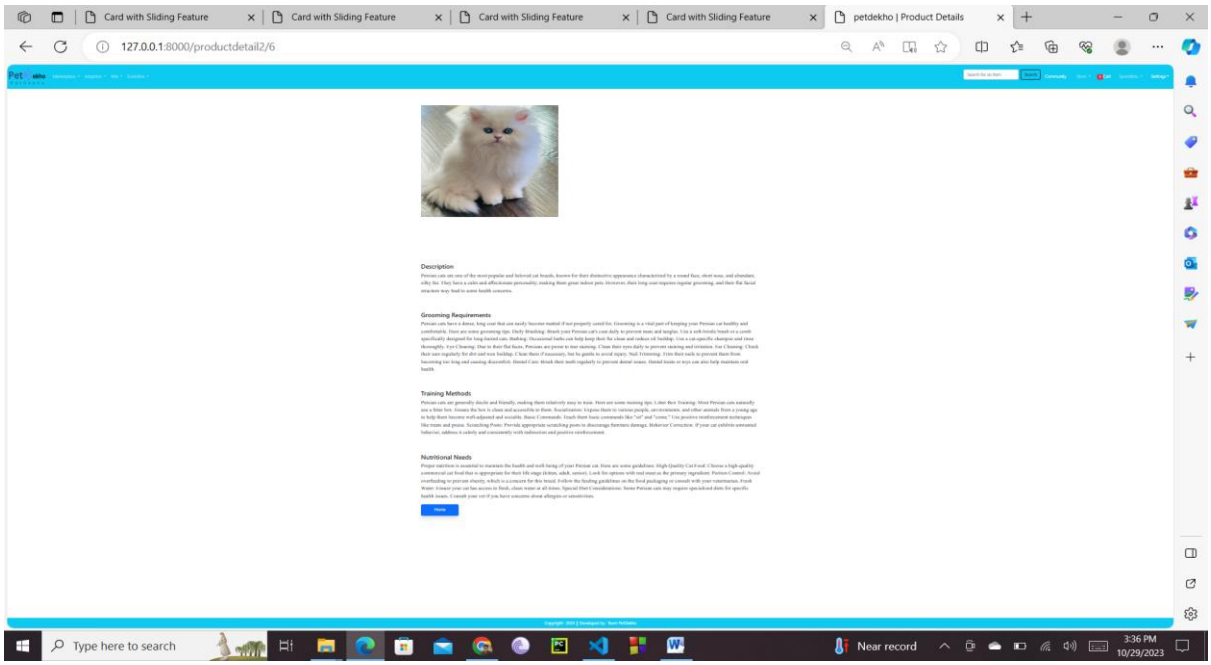

Figure 12. Guideline Page (Website)

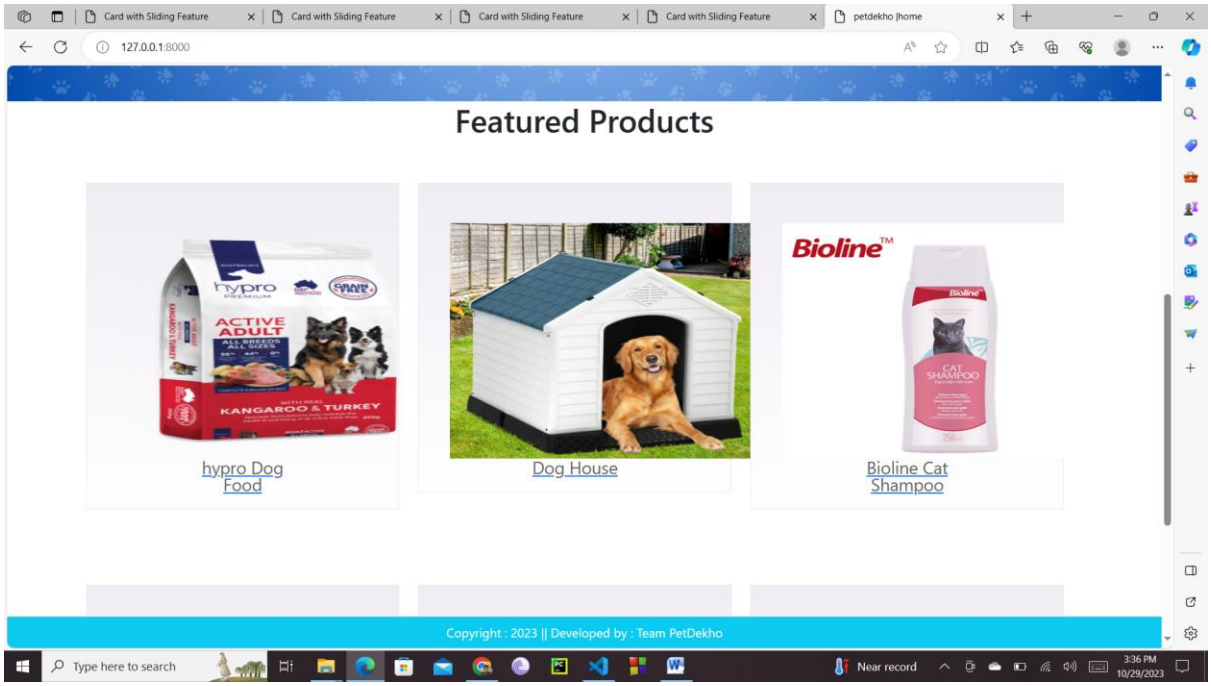

Figure 13. Featured Products Page (Website)

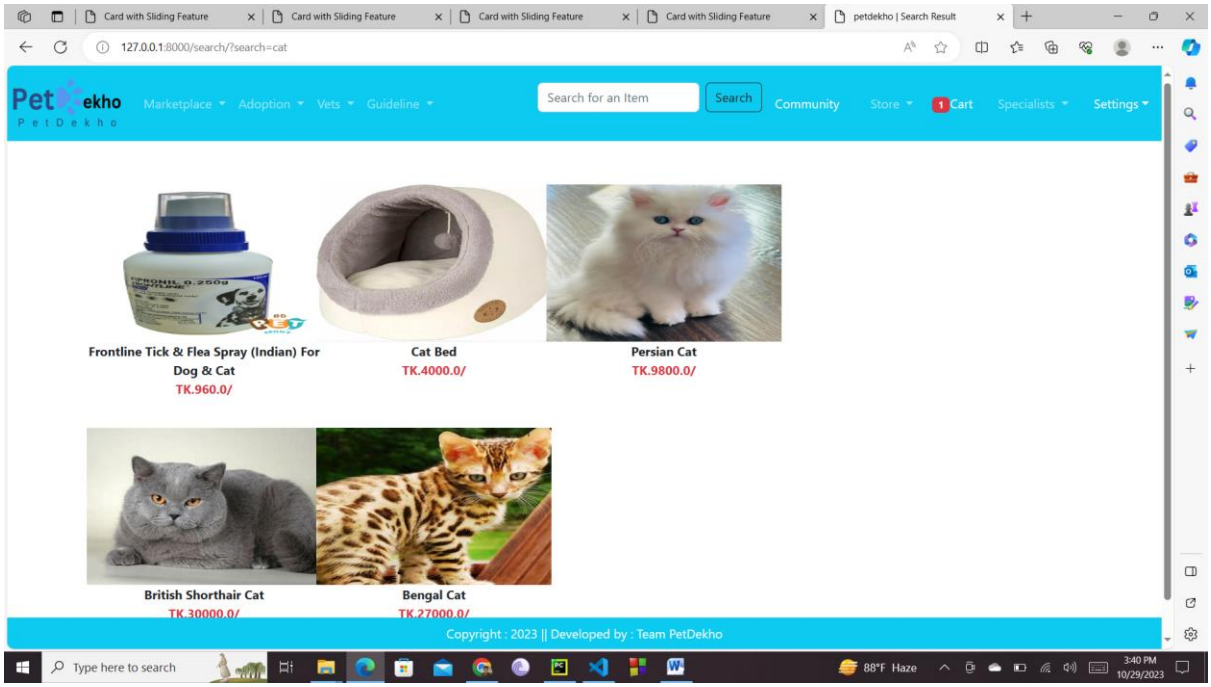

Figure 14. Search Page (Website)

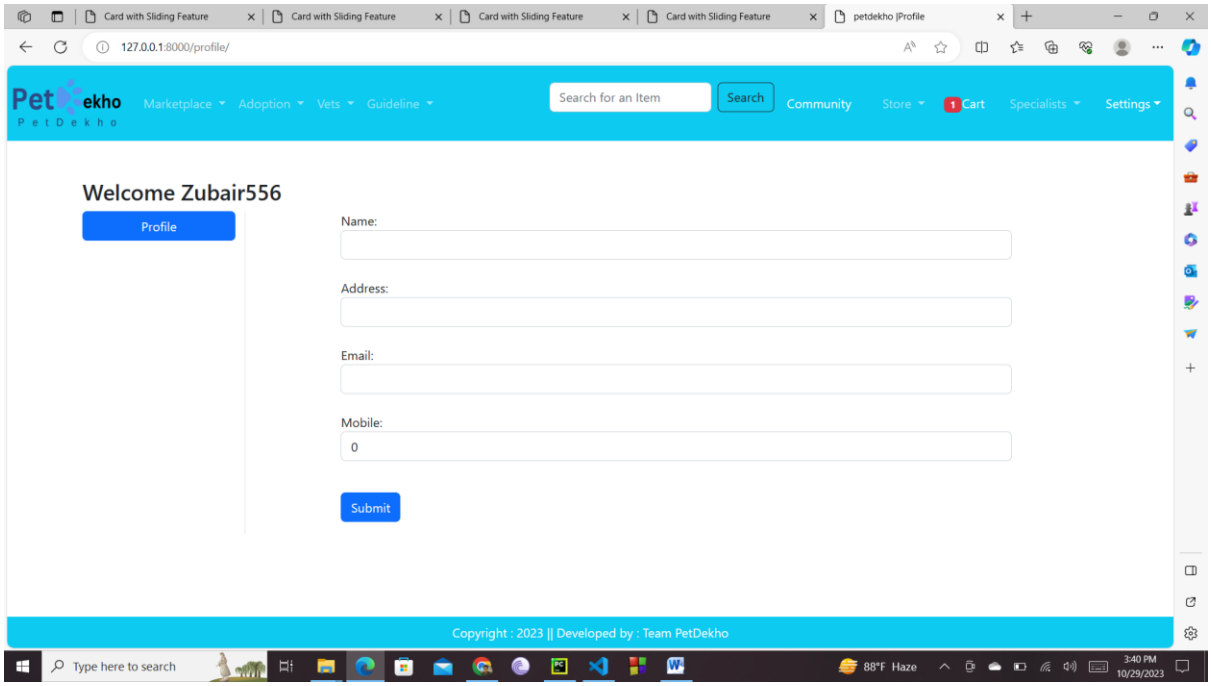

Figure 15. Profile Page (Website)

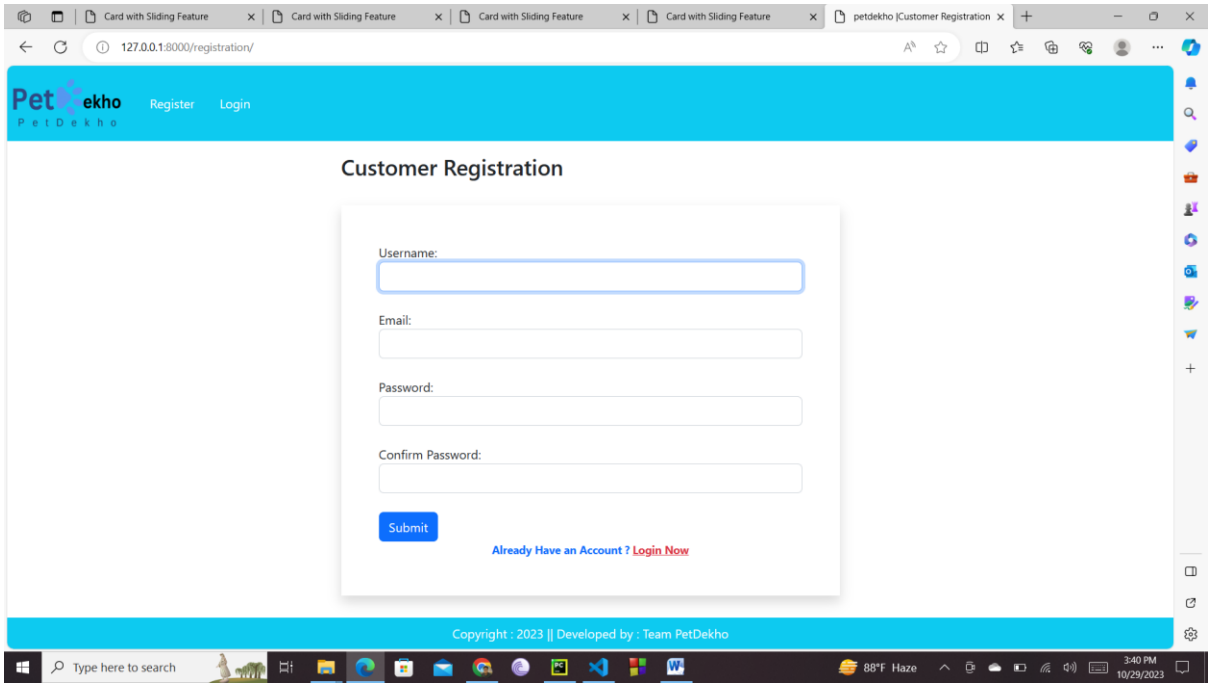

Figure 16. Registration Page (Website)

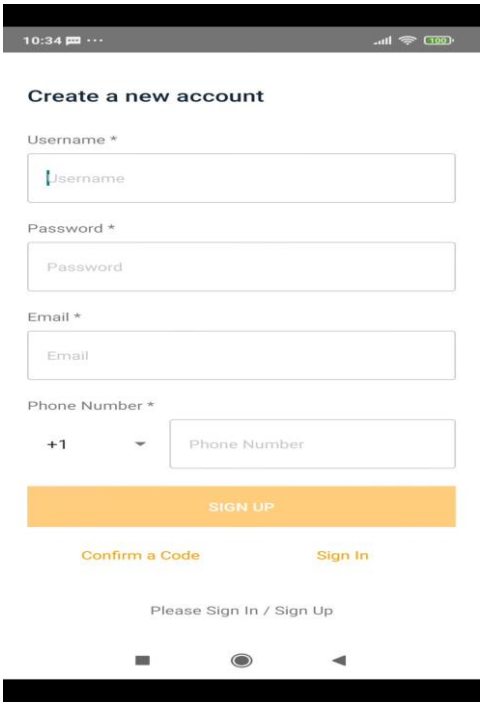

Figure 17. Registration Page (Application)

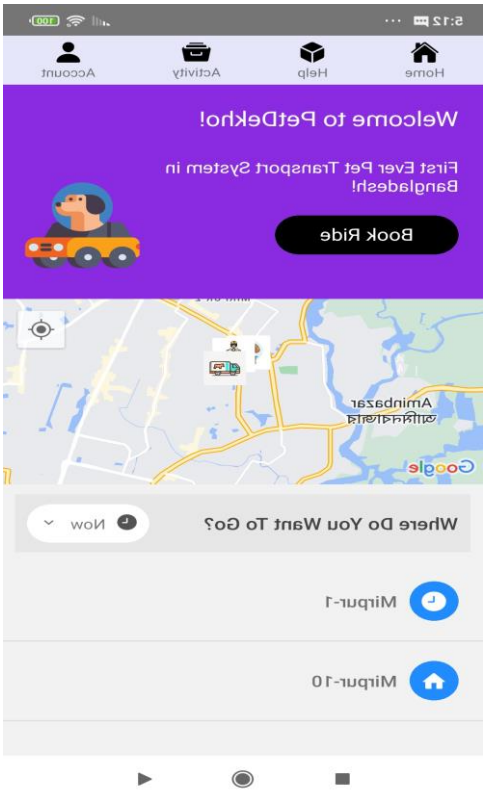

Figure 18. Home Page (Application)

Figure 19. Destination Search Page (Application)

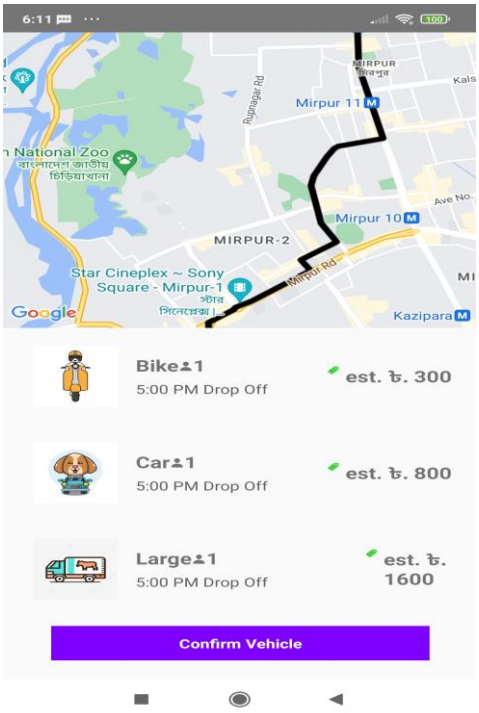

Figure 20. Search Results Page (Application)

3.2 Hardware and/or Software Components

We used various tools for designing the website and the application. For the website, we used Python, Django, MySQL, HTML, CSS and JavaScript. For the mobile application, we used React-native, JavaScript, AWS amplify and Google cloud console. We used AdobeXD and Figma to design our website and application. We used Trello and Github to collaborate and store the files.

TABLE I. A SAMPLE SOFTWARE/HARDWARE TOOLS TABLE

Tool	**Functions**	**Other similar Tools (if any)**	**Why selected this tool**
Python	Used as language to write the code for the website	Programming languages such as C++ and Java.	Efficient for its readability and writability, organized and easily interoperable.
Django	Used as framework for the website.	Flask, CherryPy, Bottle	Django is one of the most versatile frameworks available. It is secure and reliable. Django has high scalability and is very fast in terms of processing.
MySQL	Used as database for website.	MongoDB, Firebase and other such databses.	It can hold large amounts of data and is easy to manage.
HTML/CSS	Used to create and style the webpage.	JavaScript, Adobe AIR,	Easy to learn and use. Lots of designing

		Bootstrap and other such tools.	options.
JavaScript	Used to code and design the application and website respectively.	HTML, CSS, Adobe AIR and other such tools.	Very fast, simplified and interoperable.
React-Native	Used for creating the mobile application.	Flutter, AngularJS, Vue.js, Next.js	Good performance, easy to implement, interoperable
AWS Amplify	Used for backend for application.	Firebase, MongoDB, MySQL	Interoperable, easy to operate, easy and secure authentication, efficient API usage.
AdobeXD	Used for designing the website.	Figma, FluidUI, UXPin	Large asset libraries, easy to design prototypes
Figma	Used for designing the website and application.	AdobeXD, FluidUI, UXPin	Code generation is easy, easy to design, functional designs.
Trello	Used for managing the project.	Jira, Github	Easy to use, attractive understandable UI which helps to easily divide work.
Github	Used for storing project codes.	SourceForge, GitLab	Easy to use, interoperable, secure, collaboration is easy.
Google Cloud	Used for generating keys and SDKs for the mobile application (maps).	MaoBox, Apple Maps, HERE Maps	Easy to implement in code, organized and documentation is readily available. Tracks real

			time location very fast.
PyCharm	Used as IDE for writing Python Code.	Jupiter, VS code	Many plugins, easy installation, fast and easy to understand code.
Visual Studio Code	Used as IDE for writing Python and react native Code.	PyCharm, Android Studio	Interoperable, vast extension library, very fast
Android Studio	Used to write code using java SDKs, used as simulator for mobile application	VS Code, eclipse, flutter	Emulator is very fast, coding is faster, testing is easier, easy working with android.

3.3 Hardware and/or Software Implementation

499A was the opportunity for us to work on our website. We used python as the language due to its way readability and writability. Also python has lots of built in libraries which makes it easier to use. The framework chosen for the website was Django.

Django is one of the most versatile frameworks available. It has a built in panel, is secure and reliable. Django has high scalability and is very fast in terms of processing. For the database, we used MySql which is one of the most popular relational database management systems available today. It can hold large amounts of data and is easy to manage. So, this is what we used for the backend.

The next process was deciding on what to use for the front- end. For the front-end, we used HTML for designing the page and CSS for styling the designed pages. We used JavaScript as well to design our pages.

Bootstrap was also used to further design the front-end. We divided the portion of work among group mates. Two of the group mates worked on the backend while one group mate worked on the front end design.

For the mobile application, we used React native to develop the project. We used JavaScript for the front end and also as the main language to develop the application. We used Amazon Web Services Amplify for our backend. We also implemented Google maps by using Google maps API and enabling different libraries such as:

I. Distance Matrix API

II. Geocoding API

III. Geolocation API

IV. Maps SDK for Android

V. Google Places API

To work on both the website and the application we used Visual Studio Code as a code editor to type and run the applications. The code editor is very versatile, fast and easy to use. To collaborate and work efficiently, we used tools such as GitHub, which is a secure and safe way to store the code and pull it whenever it is needed.

We also used trello as a way to communicate and keep track of our work. We also built class diagrams, system diagrams, flowcharts and use case diagrams to make sure we were implementing the project properly.

Figma and AdobeXD were used as tools to design the interface of both the website and the mobile application. We used the lambda function from aws amplify to get access to a variety of functionalities such as email verification. We used aws amplify's default authenticator function to create our signup and login page. We used a graphql schema to store the backend code of our application.

We followed regular testing for our application after every step. We used the codes pushed into the GitHub repository, integrated them in the application and performed regular checks. We did this by following component testing. We checked each component again and again after integration into the application.

We used unit testing to check each and every unit after coding. We also took regular feedbacks from potential users to understand if we are properly implementing the app according to their needs.

For react native specifically, we used a tool called Jest. It is a test tool to ensure approachable, feature-rich and familiar API integration. We used NodeJS, react native and Android Studio to help create the mobile application. The android studio served as a way to use the simulator for our application.

For writing the codes, we used PyCharm to write the codes for our website which was created using Python and Django. We used Visual Studio Code to write the codes for both our website and particularly our mobile application.

We have also designed surveys and questionnaires for potential customers to help boost the development of our application. The front end was done by one member and the backend was done by the other two group members.

To collaborate and work efficiently, we used tools such as GitHub, which is a secure and safe way to store the code and pull it whenever it is needed. We also used trello and WhatsApp as a way to communicate and keep track of our work. We also used Jira in the beginning to help us get started with our project. We created cycles and worked on initial stages of the project on Jira.

We also built class diagrams, system diagrams, flowcharts and use case diagrams to make sure we were implementing the project properly. We used the lambda function from aws amplify to get access to a variety of functionalities such as email verification.

We used aws amplify's default authenticator function to create our signup and login page. We used a graphql schema to store the backend code of our application. The graphQL schema was integral in developing the backend of our application as it is used to link with nodeJs and write all the data into the backend.

The application can be produced in a cost effective way. The application is mainly a mobile application for android. The application is made using open source free software. The development process is completely cost effective. There is however, a cost of acquiring maps. We are using Google maps API for our application.

But the main cost lies in the maintenance cost. For a large scale project, we need a big database and will cost a decent amount to maintain it. We need employees to look after both the business and the development side of the project.

PetDekho will receive a certain percentage from each ride while the drivers get to keep the rest. As this project uses transport for transporting pets which is a kind of specialized transport the cost per unit distance will normally be a little higher than normal applications.

We are also looking to provide cages and other items necessary for transporting pets. Therefore, we will also generate revenue from ads and brand partnerships. The prices also vary depending on the size of vehicles. Larger vehicles will cost more than the use of smaller vehicles.

Therefore, the project aims to gain a competitive advantage over its competitors in the marketing and business field as well. Overall, the methodological choices that we made turned out to have a positive impact on our project and we have been able to complete a large portion of our project.

Chapter 4 Investigation/Experiment, Result, Analysis and Discussion

To find out the interest of people in PetDekho, we conducted surveys and found out the following:

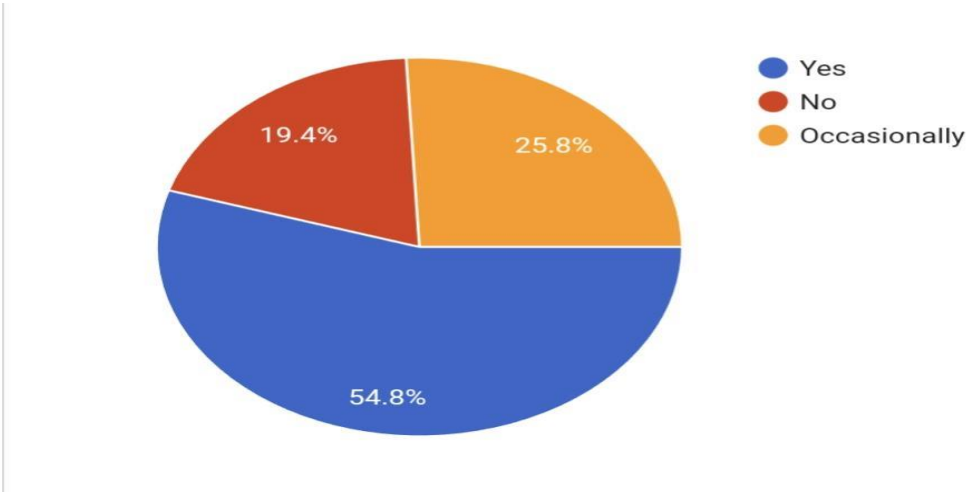

Figure 21. Survey Chart 1

Over half of the responders responded by saying that they face a difficulty while finding veterinarians. PetDekho aims to easily provide pet owners with the best vet services nearby. Veterinarians can also benefit by getting more patients.

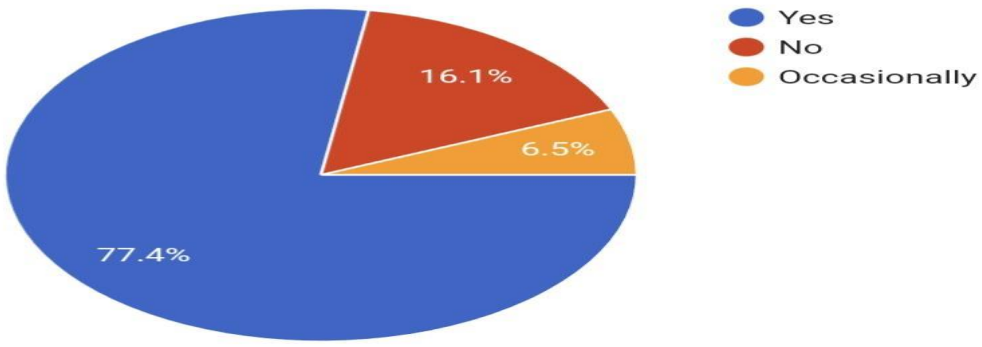

Figure 22. Survey Chart 2

Almost 80% of responders also face difficulties in finding pet specialists. Through PetDekho we will help pet owners find the needed pet specialist for their pets.

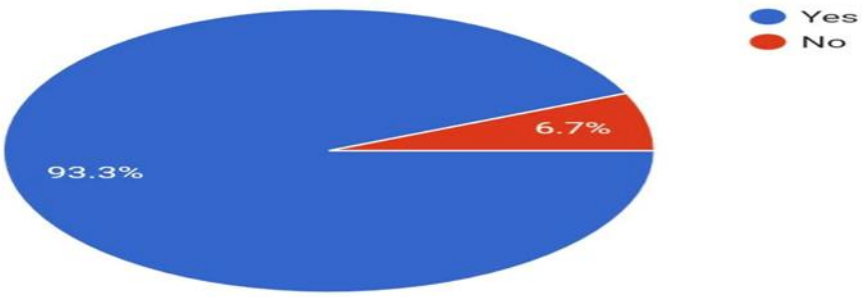

Figure 23. Survey Chart 3

We also asked whether people would be interested in an application for taking care of all their pets' needs and the answer was a resounding yes. PetDekho's business model consists of many verticals. The project contains a marketplace, a veterinarians section, a pet specialists section and also a separate application for transporting pets.

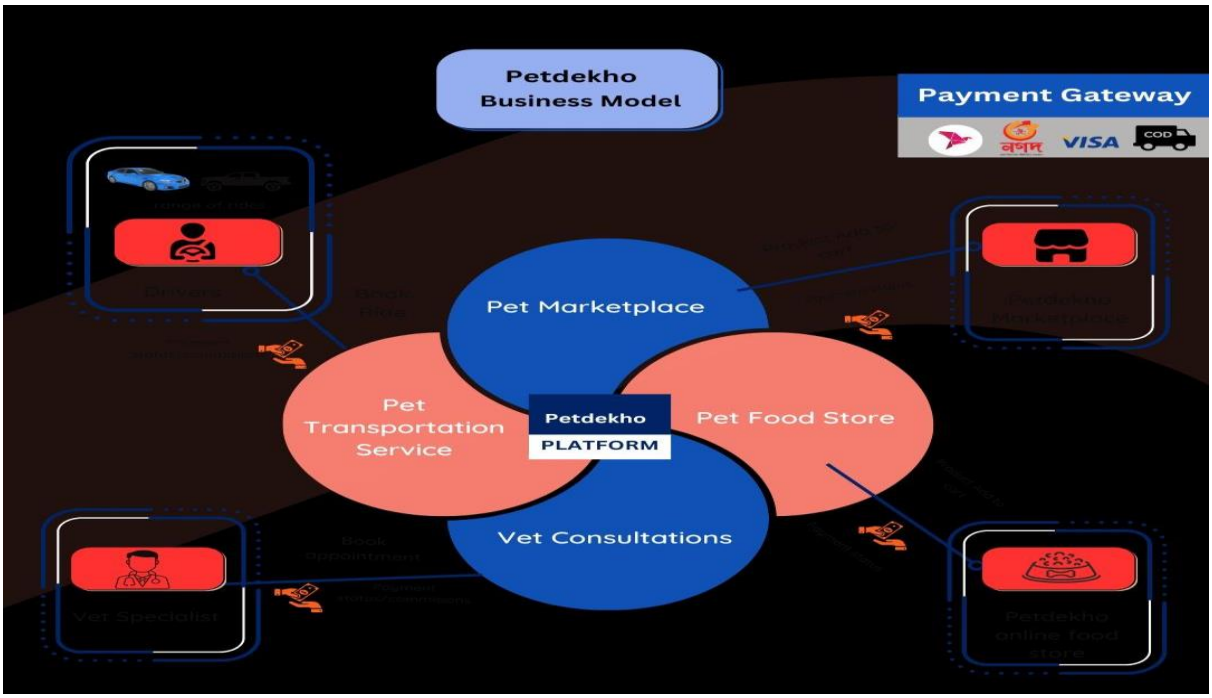

Figure 24. Business Model

The big step in our project was to scale the project and find a proper business outlook for the project. To do so, we had to find customers. The best way to do this we thought was by conducting surveys. We surveyed over a 100 people using online forms and also surveying

them on paper. We were able to generate over 95% positive responses and also could find out potential market competitors for our proposed project.

The next way was to get veterinarians and pet owners to give their opinions and generate potential customers from there as well. We focused on particular areas in Dhaka such as Mirpur, Bashundhara R/A and Kafrul.

We went to vet clinics and pet shops and got their approval by handing out pamphlets and discussing their potential interests in our project. We analysed the collected data using graphs and tables in the form of excel spreadsheets.

In 499B, we worked on visiting vendors, talking to them and surveying them. On doing so, we found that transporting pets was a major problem. Therefore, we worked on a mobile application to transport pets. We have planned to build the transportation system by providing cages, training drivers and providing other necessary equipment to transport pets. We have also started working with North South University Startups Next to further work on the project.

The project idea can be translated into a saleable product. We have spoken to and received thoughtful insights from all stakeholders involved who can make this project successful. This is a major problem that many pet owners and pet business owners face as they don’t have a proper way to transport these pets.

Also, we will try our utmost to ensure pet safety and customer satisfaction. The pet business industry is a market that has not been explored yet but it is something that we are willing to work on and build a saleable product.

There are some challenges that come with developing the product. The first challenge is the development process. We are collaborating among three group members to develop the product. Mobile application using react native is new to us and therefore, it is a challenge to learn and develop the product.

Additionally, there are many other third party applications such as Google maps and online payment applications that we have to integrate in the application to make it interoperable. This is also something that we are learning and developing. The next part of development that is challenging is the business part. This is a completely new application that hasn’t been

heard of in Bangladesh. Therefore, making customers understand and use our product is also going to be a challenge. Again, the same goes for all the stakeholders.

The pet market is also a very niche market that we have to be vet careful with while developing. Bringing investors into our application also will prove to be quite a challenge. Hiring drivers and training them to ensure optimal rides for pets and owners is another challenge.

Therefore, this application is a completely new idea that brings with it many challenges but at the same time, brings with it many possibilities to explore a hidden gold mine that is the pet industry.

Chapter 5 Impacts of the Project

5.1 Impact of this project on societal, health, safety, legal and cultural issues

The product is definitely going to change consumption patterns. Pet owners and pet business owners both have faced a problem of transporting animals because there isn't any option available to do the same. People will no longer have to be worried about taking their pets to veterinarians in case of emergency and pet business owners will have increased sales, especially the online based pet business owners.

Sustainability consideration and constraints includes economic, environmental, and social (equity) aspects that need to be evaluated and taken into account in project research and development. There is a strong relationship between these three pillars of sustainability.

In the future, such technology may even be used for transporting heavier animals over long distances in larger vehicles. The product is both modifying and existing task and is also introducing something new.

There is no product in Bangladesh which focuses on transporting animals. There may be a few manual jobs such as trucks for transporting farm animals but they are difficult to manage and find.

The product also creates new jobs and fields. This application will help in increasing business sales for pet businesses and also provide drivers with an extra source of income. The project will also create new jobs for developers as well. The animals truck drivers who struggle to find clients will now have an alternate option.

There are a few safety aspects and health concerns here. As already mentioned, there is a risk of causing harm to the environment as this business is entirely dependent on fuel-running vehicles as long there are no other cheaper and efficient alternatives available in Bangladesh. There is a safety issue of the animals which are to be transported. The vehicles have to maintained in such a way so as to ensure optimum safety of both the animals and the animals owners.

The first regulation that has to be considered is the law set by the government. The startup will do everything possible to uphold the laws of the country. The animal safety issue is another concern. As already mentioned this concern can be dealt with by giving proper training to drivers and employees.

Environmental concerns can also be dealt with by using eco-friendly vehicles, using smaller vehicles wherever necessary, taking shorter routes and modifying vehicles to handle pets. The project will ensure to uphold the ethical values when it comes to handling pets and satisfy pet owners and businesses.

5.2 Impact of this project on environment and sustainability

The project brings with it many environmental challenges. The project will use vehicles which will run on fuel. This brings a challenge to the air quality level of the city. The project also brings a challenge of keeping the pets healthy and transported safe and sound to the destination. For this the vehicles will have to be sanitizer and washed regularly.

The vehicles must also be modified to make them pet and animal friendly. For this the drivers must be trained to handle accordingly. In the future, we can implement eco-friendly vehicles to reduce the environmental impact. Shorter routes can be taken to reduce distance and fuel costs.

In compliance with the laws set by the country and keeping environmental ethics in mind, we will make sure to make the project as environmentally friendly as possible. Only the required amounts of fuel will be used, shorter routes will be taken and smaller vehicles will be used whenever possible.

Animal waste will be properly disposed of and the animals will be treated with utmost care. When it comes to managing the application, green computing will be an option that will be focused on and less amount of electricity and energy will be used whenever possible.

Our prototype is a mobile or smartphone application which is similar to a ride-sharing app. We are using react native to create the application. Amazon Web Services Amplify is being used as the database.

The application is being created for minimal cost. The only cost that comes with the application is the cost for a map API. We are looking to implement maps in the application for easier tracking and use by the customer.

For this a good amount of cost has to spent. We can reduce the cost by using free and less efficient APIs or completely eliminating the map altogether. Instead of a map we could use a checkpoint system where the customer can track the vehicle through a regular update of the checkpoints.

The cost for developing the project on a large scale is quite high. The project is startup based and will require significant investment from third parties. The project model consists of cars, bikes and larger vehicles which will also need the production of cages to transport the animals.

Also, the development of the project on a large scale will need a lot of employees and developers. Another constraint is that this market is quite a niche market and has customers in select parts of the country. Market research will also require a significant amount of investment.

Cost can be saved in many places for this project. Through maps, the best routes can be chosen to decrease fuel usage and cost. Through social media marketing, more customers can be generated while generating more revenue.

Cost and energy can also be reduced by using smaller vehicles wherever necessary. As it is a sensitive market which offers sensitive services and products, proper training will be given to employees to handle the pets with care and drive with more caution.

The project will ensure energy efficiency by pertaining to concerts related to the environment in terms of both vehicles and electronic devices. Fuel usage, animal safety and health and green computing will be given top priority.

In accordance to the cyber security laws in the country, the details and information of all customers will be protected and encrypted with utmost strictness. The transactions will also be kept private. The details of the all drivers all

There is no particular technology that exists specifically for transporting pet animals in the country. Therefore, this is an entirely new project. The existing projects that this project can be compared to are ride-sharing applications or courier applications.

The limitations that these applications have are the environmental aspects and they do not have an option to transport animals. Employees will be collected and necessary details will be made available on request of rides.

There are many challenges that come with the application. As mentioned this a new application in this country. It will be a big challenge to make stakeholders understand the product and invest in it. The development part brings many challenges as developing and maintaining the application to ensure resourcefulness, interoperability, and other standards of software engineering through regular updates is going to require a decent amount of skilled employees.

The drivers must also be trained to handle their vehicles and transport animals in a safe and sound manner. Government regulations also will be followed in regards to animal safety and also business regulations. All records will be updated and documented. To ensure safety, all information will be collected about the drivers and employees within the company.

Maps will be used with tracking to ensure optimal safety and assurance. Another challenge that comes is the regular monitoring of vehicles. To ensure satisfaction of pet business owners and pet owners at the same time is also going to be a challenge.

The project will be funded through many ways. First of all, it will be funded by investors. We will look to present our application in front of many investors to help with the funding of our product. We will look to engage in brand partnerships and ad campaigns to bring in extra funds for our product.

A certain percentage will come to the company from each ride. The cost will be a little higher as already mentioned to meet the costs and budget of the company while ensuring worth for value for customers.

If the product does well, we will also think of crowd-funding as an option to raise funds as it allows customers become more involved in the product and also allows us to gain their trust. The recent digital Bangladesh initiative taken by the government is also a great way for

young aspirants such as us to gain funds. Many government initiatives have been taken to ensure funds and investments for small startups. This is a way that we will attempt to raise funds for our startup product.

Chapter 6 Project Planning and Budget

Time Frame	August 23	September 23	October 23	Noveember 23	December 23	January 24	February 24	March 24	April 24	May 24
Plan preparation										
Existing project Research										
Surveying potential customers										
Talking to vendors										
Designing the Website										
Coding										
Final Report for 1st semester										
Problem finding for application										
Talking to vendors and customers										
Finalizing topic for application										
Designing application										
Finalising tools for application										
Development										
Learning and integrating maps										
Final Testing and potential customer review										

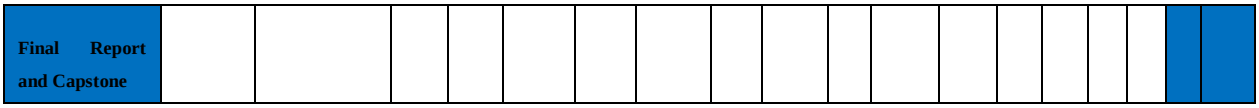

Figure 25. Gantt chart.

Since our project was a software based website and smartphone application, we used free and licensed software tools to create the project.

SL	Deliverable	Expense
1	Hosting	50$
2	UI and UX design	15$
3	Google Play Store	25$
4	Development Fee	100$
5	Market Research	30$
6	Promotion and Marketing	50$
	Total	270$

Figure 26. Cost analysis

Chapter 7 Complex Engineering Problems and Activities

7.1 Complex Engineering Problems (CEP)

TABLE II. A SAMPLE COMPLEX ENGINEERING PROBLEM ATTRIBUTES TABLE

Attributes		**Addressing the complex engineering problems (P) in the project**
P1	Depth of knowledge required (K5-K8)	Designing and Simulation (K5), Engineering & IT (Circuit Design/Smartphone Application) Tools (K6), Involve Environmental Effects (K7), Scientific Research Papers (WK8).
P2	Range of conflicting requirements	In the project, there is a conflict of whether a map is required or not.
P3	Depth of analysis required	No unique way to design. Depth of analysis needed to select a specific solution from many alternatives. (Website/Application)
P4	Familiarity of issues	Python, Django, React-native
P5	Extent of applicable codes	There is no existing code or standard for this project.
P6	Extent of stakeholder involvement	There are several stakeholders needs to be involved including pet owners, businesses, vets and specialists.
P7	Interdependence	Project involves a number of interdependent systems such as payment applications, maps SDKs.

7.2 Complex Engineering Activities (CEA)

TABLE III. A SAMPLE COMPLEX ENGINEERING PROBLEM ACTIVITIES TABLE

Attributes		**Addressing the complex engineering activities (A) in the project**
A1	Range of resources	This project involves human resource, money, modern tools (website, mobile application), software tools, etc.
A2	Level of interactions	Involves interactions between different stakeholders including pet owners, businesses, vets and specialists.
A3	Innovation	Is a new project that aims to explore new fields in the pet-care industry through technology.
A4	Consequences to society / Environment	Creates new earning methods, boosts businesses and keeps environmental problems and animal safety in mind.
A5	Familiarity	Needs to be familiar with maps and e-commerce sites. Is similar to ride sharing apps and e-commerce websites.

Chapter 8 Conclusions

8.1 Summary

PetDekho is a project that seeks to bring big changes to the pet-care industry. The project aims to solve all the problems related to pet-care in Bangladesh and delve into this potentially huge market.

There is no proper platform for people in the pet care spherein Bangladesh and PetDekho aims to solve this problem. PetDekho is a startup based project that garners everything to pets. It is a solution that we think can be a big game changer in the pet market. The pet industry is an industry that is growing at a faster rate than ever before.

The project is created to help business, pet owners, vets, drivers and pet specialists. There is a lot that needs to be explored in the pet industry in Bangladesh and PetDekho aims to become a great addition to the industry.

There are many verticals that are covered with the website and application of PetDekho and we hope to generate some much needed buzz for the pet industry by providing a platform unlike ever before. Although the pet industry is growing at a fast rate, the market is still unorganised.

With PetDekho, we hope to introduce a business model that will make the industry more professional and in turn, generate more revenue than ever before. The project is a way to bring all pet-care industry stakeholders under one roof.

The project has been been able to generate potential customers through their opinions and views in the form of surveys and physical interviews. The project has also become of interest to pet specialists, vets and pet-shop owners due to its ability to potentially generate good profits for them. The project can help achieve the following:

I. Maintaining a reputation (through reviews and ratings)

II. More patients which in turn increases revenue for vets and clinics.

III. Easier way to find, communicate and consult with veterinarians.

IV. PetDekho will serve as an online marketing platform.

V. An application for safely and securely transporting pets.

VI. Easy revenue sharing (a very small percentage of revenue goes to the website for every patient visit / a monthly system is also allowed which will take slightly more percentage)

VII. A huge marketplace where pet owners can shop for everything related to pets.

VIII. A guideline for new pet owners.

IX. Opportunity to earn more for pet owners and specialists.

The remaining tasks that we have for our project are tocomplete the vet and specialist services section and also to implement digital payment services. These are the remaining tasks for our website. Another plan that we have is to complete the mobile application for our project. We have already completed almost the entirety of the application and hope to build the driver application and work to grow the application as well.

Once, we have finished our entire website and application, we will begin working with other such entrepreneurs and hope to take our startup project to new heights. The unexplored Pet-care industry which PetDekho looks to explore and benefit from to the maximum extent. The current trends in the pet care industry show that the industry is on the rise and is generating thousands of customers in Bangladesh every year. This in turn, is generating hundreds of millions of dollars in revenue. Through PetDekho, we are looking to target every sector of the industry form where revenue can be generated and eyes can be attracted towards this potentially huge industry.

PetDekho aims to solve problems for stakeholders in the Pet-care industry. Through PetDekho, we are looking to take the pet care industry to technological heights that it has never seen before. We are looking to introduce many features that will definitely benefit all stakeholders in the industry.

PetDekho aims to bring about a new wave of Pet Care business organisations by providing a platform and new ways to market their products. Therefore, our project is a mission based start-up project and we hope to scale it on a large basis. Through PetDekho, we wish to offer the best services for pet-care facilities in Bangladesh and it can potentially prove to be a big

influence in the Bangladeshi pet care industry. Keeping all the above mentioned factors in mind, it is clearly evident why PetDekho can prove to be a game changer not just in the pet care industry, but also in the ever growing startup wave in Bangladesh as well.

8.2 Limitations

There are a few limitations of the project. Some of them are:

- No driver application yet for the transport service.
- Work left to be done in the vet section.
- Work left in the specialist section.
- Large project with many stakeholders that requires a large team and manpower to manage.
- Many verticals to be focused on,
- Training drivers to handle animals.
- Environmental and animal safety has to be considered.
- New application in the unlike any other application before.

8.3 Future Improvement

We have completed the marketplace section of the website. Parts of the vet and specialist services are yet to be completed. We are now working on completing the Vet and Specialist section of the website.

We hope to introduce Artificial Intelligence based features such as a chat-bot and recommendation system in the future as well. We have also kept ideas in mind such as introducing offers and discount tokens once our website takes off. We also have decided to keep paid features on our website and application such as paid chat and consultations online.

We have also begun getting in touch with these specialists. The transportation application is almost done with a driver application remaining to present real world data. We have started working with NSU Startups Next to further develop the project.

The project has been progressing smoothly with the outline we had planned at the beginning of CSE 499A. The project will definitely prove to be of great use to all stakeholders in the pet

care business as it is a smoother and much more efficient way of conducting business than ever before.

References

1. S. Halder and S. Rahman, “Market for pet food, accessories growing,” *The Daily Star*, Sep. 19, 2023. https://www.thedailystar.net/business/economy/news/market-pet-food-accessories-growing-3422306
2. “Pet Food - Bangladesh | Statista Market Forecast,” *Statista*. https://www.statista.com/outlook/cmo/food/pet-food/bangladesh
3. M. A. Ali, *Business Post*, Jan. 22, 2022. [1]“Pet culture grows, business too,” businesspostbd.com. https://businesspostbd.com/trade/pet-culture-grows-business-too-2022-01-22
4. S. B. Azad, “Emerging pet industry,” *The Financial Express*, May 22, 2024. https://today.thefinancialexpress.com.bd/print/emerging-pet-industry-1716305651