Cooperative Education Report

Pet-Services Recommendation based on User's Current Location

Mr. Jiramate Leingprom

School of International & Interdisciplinary Engineering

Major of Computer Innovation Engineering

Faculty of Engineering

King Mongkut's Institute of Technology Ladkrabang

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Student Name: Mr.Jiramate Leingprom

Student ID: 59011598

Major: Computer Innovation Engineering

Department: School of International & Interdisciplinary Engineering

Advisor: Asst. Prof. Dr. Sutheera Puntheeranurak

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Company: Advanced Info Services Co., Ltd.

ABSTRACT

This research introduces the web application exploring and learning the problems of those who have no idea to take their pets to which pet services that has a good quality or is nearby. Based on these problems, the "PawTy" web application platform for the pet owner, veterinarian and pet service providers is implemented. This web application composes of 3 main features which are Pet ID and Medical Records Management System, Lost and Found Pets System and Pet-Services Recommendation based on User's Current Location. This research will focus on "Pet-Services Recommendation based on User's Current Location". The system is the service that recommends pet services to the users who have no idea where to take their pets to. This system can also suggest nearby places to the user by calculating distances between each pet service and user's current location. Moreover, the user can choose the types of pet services, categorize the places in terms of prices which can be from the lowest to the highest price and the most to the least popular and the user can give some suggestion or comments and rate each pet service as well. Lastly, registering and editing pet services can be used by pet services provider and developer.

Keyword: Pet Service, Recommendation, Startup Method, Web Application

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TABLE OF CONTENTS

Chapter Page

ABSTRACT I

ACKNOWLEDGEMENT II

LIST OF TABLES V

LIST OF FIGURES VI

LIST OF FIGURES VII

CHAPTER 1 INTRODUCTION 1

1.1 Background 1

1.2 Objectives 2

1.3 Scope of work 2

1.4 Methods 2

1.5 Expected Outcomes 3

1.6 Table of Operation 3

CHAPTER 2 LITERATURE REVIEW 5

2.1 Theoretical Background 5

2.1.1 Theories of motivation 5

2.1.2 Theories about Decision 6

2.2 Related Technology 8

2.2.1 Microservice 8

2.2.2 Vue.js 9

2.2.3 JavaScript 13

2.2.4 HTML Language 13

2.2.5 RESTful API 15

2.2.6 MySQL 16

2.2.7 JSON 17

2.3 Related Work 19

CHAPTER 3 METHODOLOGY 21

3.1.1 Researching for Current Trends 21

3.1.2 Pain Points and Customer Insight 23

3.1.3 Customer Duties 27

3.1.4 Business Model Canvas 31

3.2 Developing and Building Systems 32

3.2.2 Use Case Diagram 32

3.2.3 Sequence Diagram of Website 33

3.2.4 Building Architecture 36

3.2.4 API Gateway 39

3.2.5 Designing Database 40

CHAPTER 4 RESULT 44

4.1 Webpage with Lists of Pet Service 44

4.1.1 Details page 45

4.1.2 Comments 46

4.2 Pet services type 47

4.2.1 Sort By 47

4.3 Register and Edit Pet Services 48

CHAPTER 5 SUMMARY 52

REFERENCES 53

BIOGRAPHY 57

LIST OF TABLES

Tables **Page**

1.1 Demonstrate Operation Time..... 3

3.1 Pet Services Recommendation APIs..... 39

3.2 Database of Pet Services..... 41

3.3 Database of Comments Data..... 42

LIST OF FIGURES

Figures Page

2.1 Step of Decision-Making Process..... 7
2.2 Example of Microservices..... 8
2.3 Example of Monolithic Architecture..... 9
2.4 System Architecture of Core Data-Binding System in Vue.JS..... 10
2.5 Model View Controller Flow..... 11
2.6 Example of Set up Vue Cli Project..... 11
2.7 Example of Vue Component..... 12
2.8 Life Cycle Hook Diagram..... 14
2.9 Anatomy of an HTML Element..... 14
2.10 RESTful Web Services Architecture..... 15
2.11 A Simple JSON Document..... 17
2.12 Tree Label of JSON Structure..... 19
3.1 Chart of Value of the Pet Market in Thailand from K SME..... 21
3.2 Survey "Pet Owner 's Problem" on Google Form and Example of Questions..... 25
3.3 Question Asking about Age of Participants..... 25
3.4 Question about Where do You Take Your Pet to the Pet Services..... 26
3.5 Question about How do You Know Pet Services Above..... 26
3.6 Value Proposition Canvas..... 27
3.7 Business Model Canvas of "Pawty" App..... 31
3.8 Use case diagram of Webpage..... 32
3.9 Sequence diagram for User view nearby Pet Services..... 34
3.10 Sequence diagram for View each Pet Service Details..... 34
3.11 Sequence diagram for View Pet Services by Type..... 35
3.12 Sequence diagram for Comment and Give Rating..... 35
3.13 Sequence diagram for Pet Service Provider Register New Pet Services..... 36
3.14 Sequence diagram for Pet Service Provider Edit Details of Pet Services..... 37
3.15 Sequence diagram for login page..... 37
3.16 Architecture of Pet-Services Recommendations Webpage..... 38
3.17 Architecture of Register and Edit Places..... 38

LIST OF FIGURES

Figures **Page**

3.18 Architecture of Commenting Section..... 38
3.19 ER Diagram of The System..... 43
4.1 Main Pages of "Pawty" Web Application..... 44
4.2 Navigating to Details Page of Pet Service..... 45
4.3 Details of each Pet Service..... 45
4.4 Section for Writing Comments..... 46
4.5 Section for Viewing Comments and Ratings..... 46
4.6 Button with Type of Pet Services in Main Page..... 47
4.7 Pet Services with Clicked Type..... 47
4.8 Before Click Button Sort by Price..... 47
4.9 After Clicking Sort by Price Button..... 48
4.10 Bottom Bar for Registering Pet Services..... 48
4.11 Login Page before Registering and Edit Places..... 48
4.12 Register Pages..... 49
4.13 Edit Button in Pet Services Details Page..... 50
4.14 Editing Page with Details of Places..... 50
4.15 Edit Page with Updated Information..... 51
4.16 Places Details Page with Updated Information..... 51

CHAPTER 1

INTRODUCTION

1.1 Background

Pets are more like best friends to human. Nowadays, pet owner looks after their pets like one of their family members. Under these circumstances, pet owners take good care of their pets, provide good food, and even bring their pets to have vaccination, for the best health and hygiene. The relationship between people and pets has a long history. Pets are the closest to humans and the best friend of mankind or we can say that pets are a part of family. (Warangkana Kaprasit and Theerawat Jantuek, 2017)

The economic and social conditions have changed into capitalism impacting the family structure to be a single family that might have less family time. Family members are working to pay the bills, and they may overlook the relationship and time-spent with other family members. (Warangkana Kaprasit and Theerawat Jantuek, 2017)

Pet owners take care of their pets in many ways; buying goods for pets, taking pets to the clinic, getting grooming service, dropping off at pet hotel when the pet owner is not home for a long time or outside for several days. Pet owners want their pets to be served in a place nearby and can trust the quality of the pet service they will choose.

The pet owner wants their pets to be served from the most qualified pet staff, so the owner of the pet can be assured that the provider can provide efficient and accurate service to their needs. It is one of the key factors to decide when the animal owner chooses to use the pet services.

Moreover, sometimes for the pet owners who have their first pet may not know where the pet service is, or whether the store they should bring their beloved pet to match the pet owner's needs.

The project was presented to solve the problems associated with the pet-services recommendation, if the owner does not know which service they want to go or pet services near their house is reliable or not.

1.2 Objectives

1) To develop pet-services recommendation by using user's current location and sorting category by customer needs.
2) To study about designing pet-service recommendation that matches the customer needs.
3) To be a concept for gathering data and to have good services and systems.

1.3 Scope of work

1) The population in this research contains pet lovers, pet service owners which are pet hospitals, pet clinics and employees in pet services in Bangkok.
2) Web application is the part that communicate with users.
3) Background tasks using to manage the system which are in terms of Microservices containing the main tasks and data storing that store all places.
4) Sorting pet services by the user's location part is using GPS and Geolocation techniques from the web application to get the latitude and longitude and converting into distances in kilometers to find the nearest pet services to users.

1.4 Methods

1) Designing business model which contains value proposition and Business Model Canvas by using startup technique.
2) Designing architecture and database storing all pet services and comments of each place.
3) Designing the frontend part to communicate with users.
4) Collecting each pet service to use in experiment.
5) Build and test measuring distances between user's current location and each pet service.

6) Building and testing comments, reviews and ratings calculation functions in each pet service.
7) Developing webpage to be more secure.
8) Connecting and syncing all components to each other to test overall or some features that may malfunction and cause error.

1.5 Expected Outcomes

1) Users can go or find places that they want by using pet-services recommendation web application.
2) More reliable and reputation to pet services provider with real comments and reviews from real users for each place.

1.6 Table of Operation

Operating time is demonstrated in Table 1.1.

Table 1.1 Operating time

Topic	Month			
	August	September	October	November
1. Designing business model which contains value proposition and Business Model Canvas by using startup technique.				
2. Designing architecture and database storing all pet services and comments of each place.				
3. Designing the frontend part to communicate with users.				
4. Collecting each pet service to use in experiment.				

Topic	Month			
	August	September	October	November
5. Building and testing measuring distances between user's current location and each pet service.				
6. Building and testing comments, reviews and ratings calculation functions in each pet service.				
7. Developing webpage to be more secure.				
8. Connecting and syncing all components to each other to test overall or some features that may malfunction and cause error.				

CHAPTER 2

LITERATURE REVIEW

2.1 Theoretical Background

2.1.1 Theories of motivation

Motivation can define the acting forces of a person to initiate behavior. It is the things that get a person going for what they want. It is what makes your potential truly enjoy your job. (Benjamin Ball, 2012)

Motivation control human behavior as a result of demand pressures or the desire to struggle to achieve results. This could be caused naturally or by learning. Theories of motivation can be divided into 4 big theories which are:

1) Behavioral View of Motivation is about the importance in past experience that most affect people motivation; therefore, every behavior of human is most motivated by past experiences with good things and it turns to positive motivation that affect human needs. This theory focus on extrinsic motivation.
2) Social Learning View of Motivation believed that motivation by learning from social behavior especially on identification and imitation from the people one admires or from well-known people in the society. [1]
3) Cognitive View of Motivation believed that motivation by human behavior depending on how they perceive things with intelligence. In pressured situations, human will face disequilibrium state. Then, human must rely on assimilation and accommodation processes on the difference between new experience and the old ones. By doing this, human needs to rely on their intelligence. This theory focuses on intrinsic motivation. Also this theory emphasizes on the objective, plan and goal as well as level of aspiration when people tend to have high hope when they can finish their work. On the other hand, they will expect less when they fail.
4) Humanistic View of Motivation belongs to Maslow (Anekkul Krisang, 2546) describing the levels of human needs. The needs stimulate human to act.

Types of Motivation

Psychologists divided motivation into major groups as follows:

The First Group

- Aroused Motive is a motivation that push human to do some action immediately.
- Motivational Disposition or Latent Motive is a motive that exists but does not immediately appears.

The Second Group

- Intrinsic Motive is a motive that affected by own internal stimuli.
- Extrinsic Motive is a motive that affected by external stimuli.

The Third Group

- Primary motive is a motive that comes from the basic needs of their body such as hunger and thirst.
- The secondary motive is a consequence of the primary motive.
- Intrinsic and Extrinsic Motivation: many psychologists may not agree with behavioral theories that describe the behavior with psychology and mental motivation by using drive reduction theory because they believe that some human behaviors are intrinsic motivation. For Intrinsic Motivation is the motivation that comes from inside and it drives them to do some behaviors that did not expect external reinforcements. Extrinsic Motivation is a motivation from outside from a prize or admiration. [2]

2.1.2 Theories about Decision

Many scholars have provided the meaning of the concept and theory of decision making, as the researchers have studied the following meanings: Decision Making is a thought-based process for choosing one of the many options available to get the best choice and meet your needs as much as possible. (Ladapha Poolkasem, 2550)

The purchase decision-making process refers to the process of selecting products between 2-10 choices, in which consumers' property will be considered. Participate in psychological decision-making and physical behavior purchase of

psychological and physical activities in a certain period of time. These activities lead to buying and other people's buying behavior. (Schiff man & Kanuk, 1994.)

- Decision-making process

The purchase decision-making process (Adul Jatorongkakul, 2543) consists of five steps as shown below in Fig. 2.1.

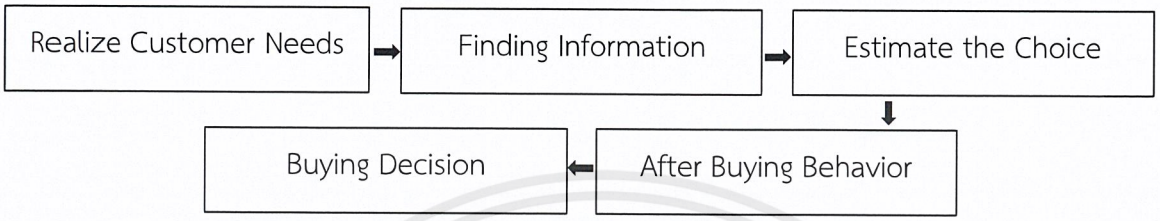

Figure 2.1 Steps of decision-making process.[3]

The differences of each process can be described in followings:

1) Need/Problem Recognition: a person is aware of internal needs which might be stimulated by external and internal stimulus.
2) Information Search: a person may find information from many sources after being stimulated by stimuli then respond to it immediately. However, if the stimuli is not yet responded, the motivation will be accumulated and lead to respond to the needs later, then a person will try to search for information.
3) Alternative Evaluation: it is the decision to choose whether or not to select a consumer product or whether it is a final decision, so the marketer needs to consider about the factors that influence a decision to appeal to the consumers decisions.
4) Purchase Decision: consumers prioritize preferences or satisfaction of each individual brand or product based. Then they will decide on a product or products from their preferences. The majority of consumers will continue to choose the product or products they love or used before the other if there are hard decision to make. Consumers will lower their preferences of the goods or services, like a replacement.
5) Post-purchase Behavior: marketers are not only responsible for making consumers buy products or services, if marketers need to know about the behavior after the consumer's purchase whether they are satisfied or not, then marketers should consider the relationship between the consumer's expectation and the product's quality. Both factors must be balanced. If the

product satisfaction of the consumer is lower than the expectation, consumer will not buy again because it is less than expected, consumers will be disappointed in the product or service immediately. On the other hand, the consumer is willing to buy again if the quality of goods or services meet or go beyond their expectations. Although if the quality of the product or service is exaggerated advertising, it will directly give negative effect on the goods or services. Therefore, the integrity of the product or service is an important issue for the seller to consider.

In conclusion, decision-making process is important for both service providers or suppliers and consumers. Since consumers are the stage of the decision from the result of demands from vendors or service providers as well as during-service care or after-purchase service care of goods or services. Therefore, it is necessary to strike a balance between the goods or services from a vendor or service provider and the demand by the motivation of the consumer, then the decision process will go well.

2.2 Related Technology

2.2.1 Microservice

Microservice is a service architecture that categorizes application into collection in loosely coupled form or loosely connected to each other. Figure 2.2 shows an example of microservices architecture.

Microservice has more advantages than monolithic architecture which developing all components in single environment.

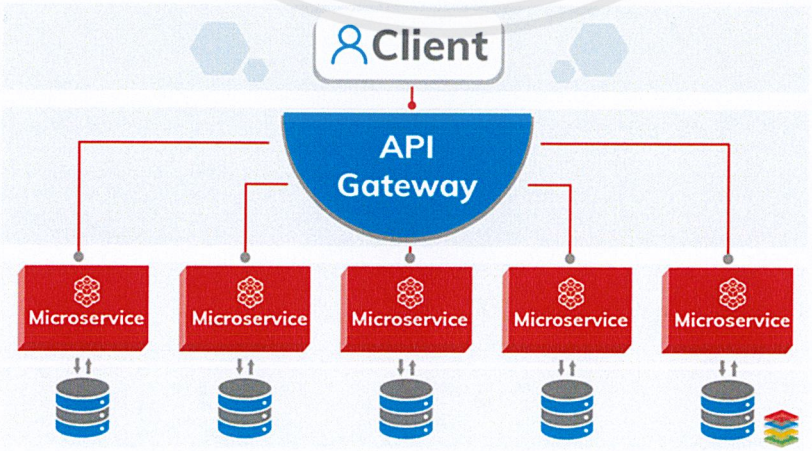

Figure 2.2 Example of microservices architecture. [6]

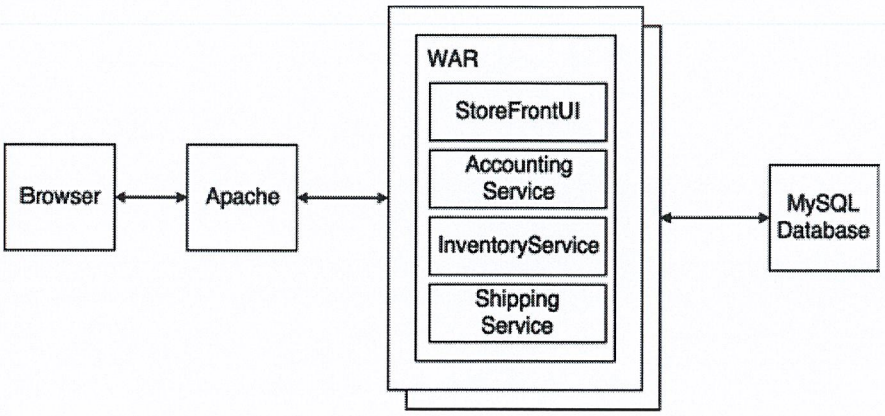

Figure 2.3 Example of Monolithic architecture. [7]

Figure 2.3 clearly shows the difference of microservices and monolithic. The disadvantages of monolithic is when the developer wants to fix one specific part, it will affect the entire software system as tightly coupled or harder to use when new technology is imported into the service. Scaling is also another problem of this architecture because it cannot make the scale into partitioning form, only can make the scale in round-robin from which will be allowed to this architecture.

The advantages of microservice comparing with monolithic are as follows:

- Reduce complexity of application.
- Developer is free to choose a technology.
- Add or import new services easily.
- Faster deploy, no need to wait for another service.
- Free to design architecture and scaling.
- Easy to change to a new technology.

2.2.2 Vue.js

Vue.js is a web framework library for building interactive web interfaces and managing view in MVC (Model View Controller) for developing user interface by combining with Angular and React to make reactive component that can update by itself.

A data-binding system in the core of Vue.js is shown in Fig. 2.4 is the data binding with the background of JavaScript code to the view that rendered. When the data changed, the view will change the data behind JavaScript code. Likewise, when the

data changes, the JavaScript code behind it is constantly changing data of the view as well. This makes writing code and any changes easier.

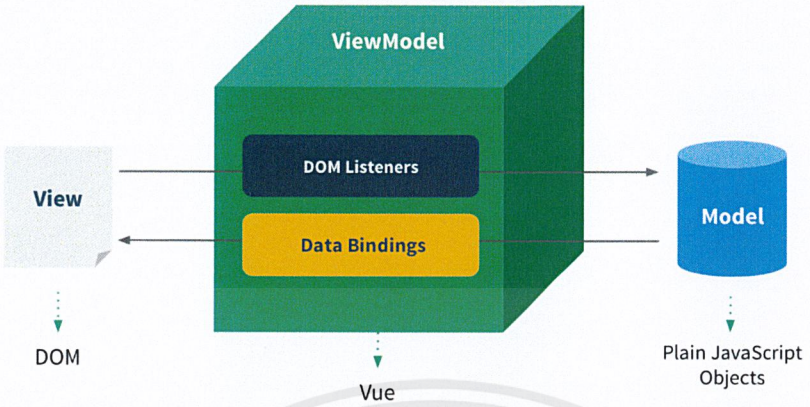

Figure 2.4 System Architecture of core data-binding system in Vue.JS [12]

Model View Controller (MVC) can be divided into 3 parts which are Model, View and Controller.

Model is the part which works with any raw data and communicates with the object and database and is less complicated than SQL commands. It works when controller needs data from model. The model will send a bunch of data to controller to manage. It is the task of examining the relationship of the data.

View is a frontend part that communicates with user or can be called by User Interface. It is the part that shows in a web browser and works together between controller and view. It also can support Ajax and reuse component by itself.

The Controller is the main component of the program which can manage, compute and receive data and it is the part that keeps all logic content inside. It is the first part of the work when a program is called from a web browser and communicates with user and program. All three parts can be explained as shown in Fig. 2.5 below.

The processes of MVC.

1. Client make request to web browser then it will send to controller to validate data.
2. Controller request model to manage requests.
3. Model will compute and contact with the database to manage the request and send the result to controller.
4. When controller get the result from model, it will use this result to view.

5. View will make page to show the result from process 4 and send back to controller.
6. Controller send the page in terms of response to client.

Vue provides functionality that is reactive to the point where the template should render or do nothing. This process does not required component update or immutable like React.

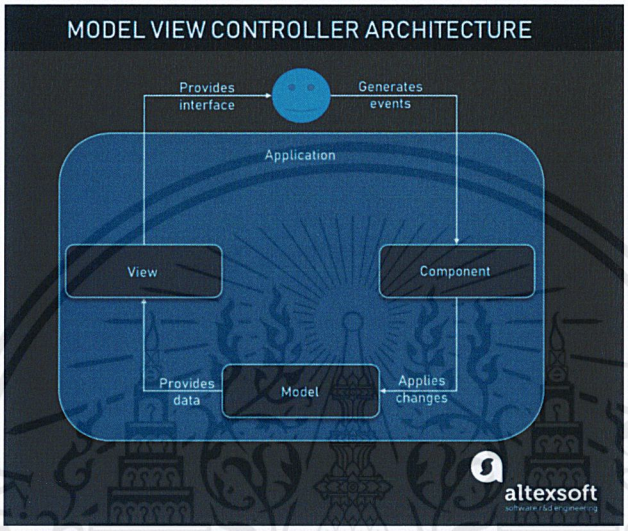

Figure 2.5 Model view controller flow. [15]

2.2.2.1 Vue Cli

Vue Cli is a set of instructions that will allow us to take a project with the Vue.js and bundle of all the necessary tools are in the libraries, which do not need to search for any extensions, only download and install and it will show as in Fig. 2.6.

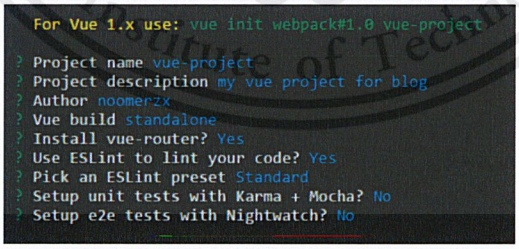

Figure 2.6 Example of set up Vue Cli project. [16]

2.2.2.2 Vue project structure

The structure of Vue project consists of:

1. Assets of a folder to keep things like photos and etc.
2. Components to keep all components which ".vue" is a file type.

3. Router is a directory to keep route that also can add and delete in this folder.
4. App.vue is a main component that covers all application.
5. Main.js is a main JavaScript code for setting up Vue and initiate Vue instance.

2.2.2.3 Vue Component

Vue.js divides the webpage into each part by calling each part as component like a green block in Fig. 2.7.

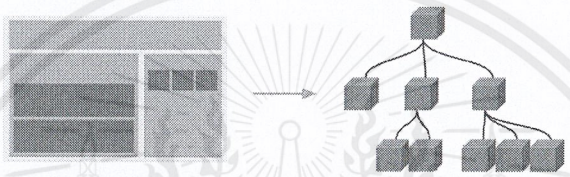

Figure 2.7 Example vue.js component. [17]

The component consists of two things which are:

1. Life Cycle Hook

   As shown in Fig. 2.8 Life Cycle Hook is a cycle of Vue Instance from building instance to be destroyed by each step that has a hook function that can write any functions.

2. Options

   Options help to manage the operation of a component by having important options consists of the followings:

- Data in a component state or parameters that kept by component.
- Methods that is a JavaScript function.
- Components that is required to register in these options if the component wants to use other components.
- Props that is the value obtained from the superior component to send information between components.

2.2.3 JavaScript

JavaScript is an object-oriented scripting language for programming on the Internet which was highly popular for developing the website to make the site look more animated and more satisfying to the users. By working in interpret mode or called by object-oriented programming that help to design and develop programs on the Internet for people who write in HTML language, it can work across platforms by combining with HTML and Java from client-side and server-side.

JavaScript can be used to write a program in an easier way without another language. It has a set of commands that responds to the users like when thee users click on checkbox; the JavaScript can send the command to open a new page making it more interaction with the users.

JavaScript can be written or changed into HTML Element. It means that it can change the display webpage format, or the content page can be hidden easily or can display the content.

JavaScript can be used to validate the data by noticing that when we fill out some websites such as Email or filling the wrong information, it has a pop-up window with warning message.

JavaScript can authorize which browser that the user use and build cookies to keep user's information into their devices.

2.2.4 HTML Language

HTML is the main language that is used to structure a webpage by using tag to display content. HTML stands for Hypertext Markup Language by hypertext is the message that connected with link (Hyperlink) Markup Language represents a language that uses tags to define the things that display on a webpage. Therefore, HTML is a language that uses tag to define the things that display on a webpage that can connect to each other by Hyperlink.

HTML can be made by using various text editor programs such as Notepad, Editplus or programs as a tool for creating webpages such as Microsoft FrontPage, Dream Weaver, which facilitate the creation of HTML pages.

Figure 2.9 shows an anatomy of an HTML element by having an opening and closing tag with content inside.

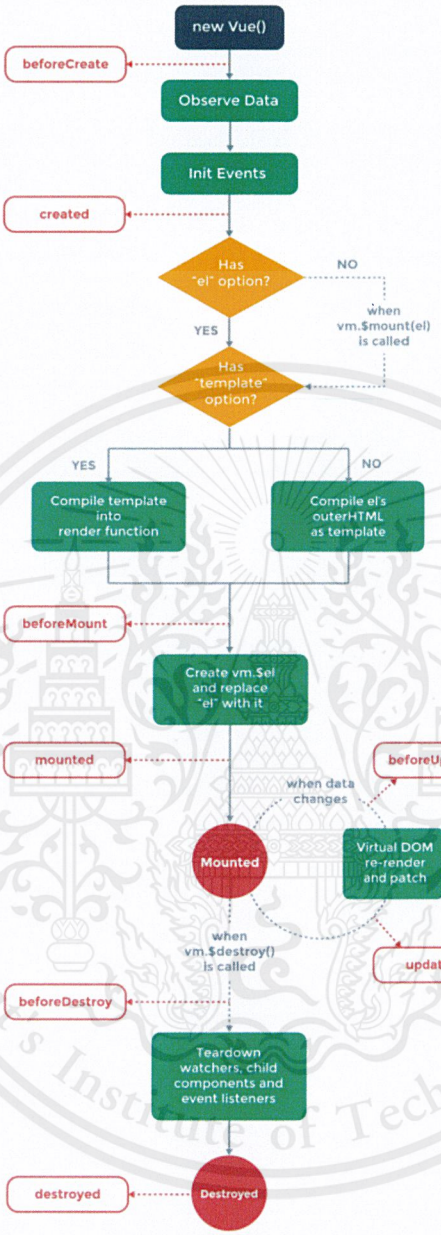

Figure 2.8 Life cycle hook diagram. [18]

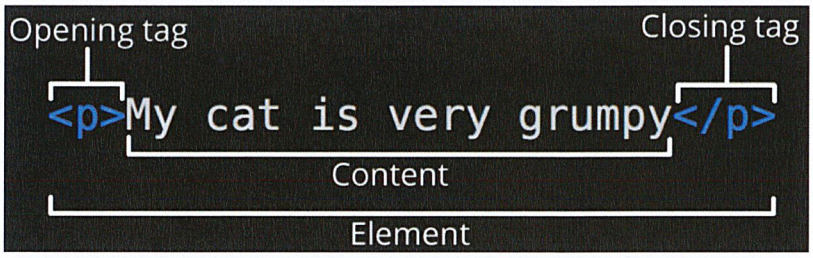

Figure 2.9 Anatomy of an HTML element. [23]

2.2.5 RESTful API

REST is created to check how good a Web application is. REST stands for Representational State Transfer. It is an architecture of software where the user works through an application by clicking links and it will respond in the next page by representing that this is the next state of the application and it will render and transfer to the user.

REST is used to build one of the web services that can communicate on the internet in stateless form which has no session depending on request URL to search and process and response back to XML, HTML or JSON forms. It is a set of rules that followed by developers when they develop their own API. The developers are able to get the data or resource when user clicks or it is linked to a specific URL. Each URL is called request and the data that sent back to user is called response.

API or Application Programming Interface is the code that allow the programs to communicate with each other.

Architectural Properties contains 7 requirements which are as follows:

- Performance of responding.
- Scalability to adjust and expand to support more components.
- Simplicity of the same interfaces.
- Modifiability - an ability to make any changes of components to respond the changes even when application is working.
- Visibility - a visible component to component by service agents.
- Portability easy to move the program or data.
- Reliability to resist system failure.

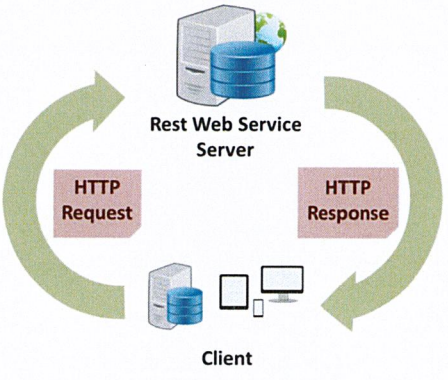

Figure 2.10 RESTful Web Services architecture [27]

Figure 2.10 shows how RESTful Web Services communicate with client by receiving request from client and response to the client.

By the request, method is a type of request that user sends to the server. The method consists of the followings.

1) GET to pull or read resource in server.
2) POST to create a new resource.
3) PUT to edit resource.
4) PATCH to edit resource as same as PUT method.
5) DELETE to delete a resource.

2.2.6 MySQL

MySQL is an open source program developed by MySQL Lab in Sweden. It is the database management system in SQL language. It is a tool for collecting information to be used in conjunction with other tools or applications. To accommodate the needs of the user. MySQL can work with various platforms such as Linux, UNIX or Windows but people mostly used MySQL with web-based to serve the script language that works on server-side such as PHP language or JSP.

Nowadays databases use 2 main types which are relational database and LDAP database.

1. Relational database or Relational Database Management System (RDBMS) is a system that stores data as a table. The table is divided into each table, then divided into each row, and each row is divided into columns, in which the links between the data in each table are linked by using references from the data in the designated column controlling by using RDBMS Tools.
2. LDAP database or Lightweight Directory Protocol that runs through Active Directory (AD) is an enterprise-grade service directory that is design based on the standard of Internet Technology, to support the searching for resources on a large network, and also helps administrator to conveniently manage complexed centralized network. AD is a collaboration between the DNS (Domain Naming System) and LDAP (Lightweight Directory Access Protocol) to enable Interoperability with

another directory service as well. Then develop a DCOM (Distributed Component Object Model) to effectively distribute apps function better. AD is structured in two types which are physical and logical structures.

2.2.7 JSON

JSON or JavaScript Object Notation is a data type of set of array or string of the JavaScript language that keeps in an easy-to-read form. JSON is one type of an array that transfers data by sending all data into one piece of data then AJAX returns to the server and it needs to slice the data that it wants. However, for JSON it can transfer from both client side and server side and each side can encode and decode JSON to read the data inside in type of array. Moreover, JSON can be applied to any transferring data.

JSON consists of pairs of keys and values, where the values can be a JSON as the example of a JSON in Fig. 2.11. JSON also supports array and several types such as integers and strings. JSON can contain the type of arrays and dictionaries to make JSON format to a full composition.

```
{
    "property1": "value1",
    "property2": "value2",
    "property3": "value3"
}
```

Figure 2.11 A simple JSON document. [30]

2.2.7.1 JSON Structure

JSON is using JavaScript language form but it does not act like a programming language. JSON is a language used to transfer data from one to the others. Fig. 2.11 shows the writing in JSON format and JSON can store data into Master-Detail form which below is an example.

```
[
{“firstname”: “name”,
 “lastname”: “name”,
```

```
"address": [
        {
        "address1": "address",
        "address2": "address",
        "City": "Bangkok",
        "Province": "Bangkok",
        "Country": "Thailand",
        }
    ]
}
]
```

2.2.7.2 JSON Trees

Each object of JSON is a pair of key and value and by each value it can be JSON objects, by using a tree-shaped structure to describe the model of JSON objects. However, this structure needs to preserve the characteristic of JSON which is of each node is a JSON message. Each node must represent the objects with JSON object. Below is JSON example.

```
{
    "Name": {
        "first": "John",
        "last": "Doe"
        },
    "Age": 30
}
```

A JSON object which contains “Name” and “Age”, the value of key “Name” is another JSON object and the value of the key “Age” is 30. This contains 5 values of JSON. If we are to preserve the characteristic of JSON structure, by using the edge-labelled tree to explain in Fig. 2.12 below.

The root is the entire JSON message and two edges that has "name" and "age" message is two keys in JSON object can lead to other nodes that represent another value. In this case, the key “Age” is only an integer, while “Name” contains another JSON object that is represented as a subtree of this entire tree.

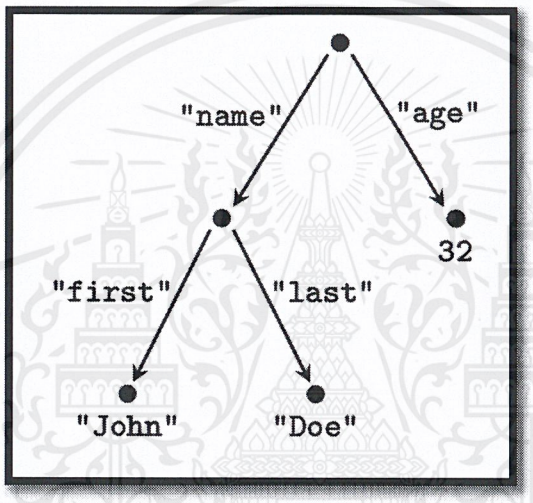

Figure 2.12 Tree label of JSON structure. [32]

2.3 Related Work

The researcher has reviewed the related researches about the pet-services recommendation based on the user’s current location and are as the followings.

From the research by Thirawat Chantuk and Warangkana Ka-Prasit (2017), it studied about Elderly’s Raising Pet Behavior in Ban-Chang, Rayong. The researched found that 12 people like to have pet, then we divide into 3 groups by the responses that have the same answers and the same ways. The first and second groups believe that having pet is the way to ease the loneliness they had but the final group believes that they do not want to have a pet because they do not have enough space. [33]

The research by Kamolpiyapat S. (2015) studied about The Decision Making to Use Service of Private Hospital in Bangkok. It found that the service quality and health

insurance influenced the decision making to use the service of private hospital in Bangkok at the statistically significant level of 0.05. [34]

The research by Waraporn Wilailurt and Ittikorn Khumdech (2014) studied about Factors Affecting Consumer Purchasing Decision of Health Insurance in Bangkok. The result shows the difference of personal opinion or factors that affected consumer purchasing decision of health insurance in Bangkok. Moreover, the factors are marketing mix, pricings, distribution channels, processing and brand reliability affected to purchasing decision for consumers in Bangkok. [35]

The research by Thananoppa Suwadit (2011) studied about The Impacts of Marketing Mix and Marketing Environment on The Selection of Private Hospitals in Chonburi province found that the marketing mix and marketing envelopment highly influenced the selection behavior. For marketing mix factor, the opinions for marketing mix affected customer's behavior in private hospitals in Chonburi have 5 highly influenced factors affected the selection which are services, pricings, distribution channels, personnel and the services processes. For the opinion in marketing mix that affected to customer's choice of private hospital in Chonburi is 2 highly influence are marketing encouragement and physical service. [36]

The research by Chantana Raknak (2011) studied about the Factors of Marketing that Affected Customer's Decision in Private Hospital in Bangkok found that the consumer's behavior that choose to get the services of private hospital in Bangkok. The high significant factors of marketing mix can affect the decisions to get services from private hospital in Bangkok are products, places of services, distribution channels, processing of delivering services and physical services. However, marketing mix factors in terms of pricing and marketing encouragement has an average level of significant. [37]

The research by Suntaree Tuan-Hom (2010) studied about The Satisfaction Of Out-patient Department Service In The Naresuan University Hospital found that out-patient mostly satisfied with the services, processes and steps of processes and also had an average satisfaction with staff's services, cooperation and facilities. [38]

CHAPTER 3

METHODOLOGY

3.1 Design Business Model

3.1.1 Researching for Current Trends

Current trends, K SME (KASIKORNBANK SME) has published information about "Pet Parent" that the pet market situation in Thailand is growing significantly. Since the lifestyle of modern people's lives changes from a large family to a small family which has only parents and child or some people choose to be single, and there are other reasons which are a part that drives the pet market to increase value. They did not raise just for love or want, but they nurture their pets as their child or a part of their family and can spend much money to give the best things and a better life for their pets. That results in the growing pet market at more than 3 billion baht by pet feed business, as shown in Figure 3.1 pie chart of the value of the pet market in Thailand which is the maximum value accounted for 45% at 1.46 billion baht; then pet health care such as pet hospital or pet clinic, accounted for 32% at 1.02 billion baht; and other business, for example, pet clothes or toys, which accounted for 23% at 7,370 million baht.

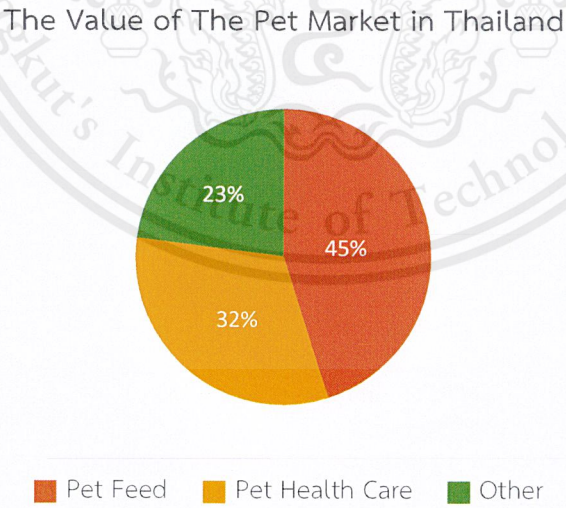

Figure 3.1 Chart of value of the pet market in Thailand from K SME. [40]

From K SME information there are five factors that drive the growth in the pet market in Thailand which are:

1. Aging Population

Single and older people are steadily increasing. Thailand is in the step of Aging Society where the population aged 60 and over accounted for 10% of the country's population. Moreover, for the next three years, Thailand would enter the Aged Society, which means that the elderly population aged 60 and over accounted for 20% of the country's population. Furthermore, loneliness is the reason why they want the pet in order to fulfill it. They are willing to pay in raising their pets like family members to keep them alive, like their child or their loved ones.

2. Dual Income, No Kids (D.I.N.K)

People who are married but have no children or have only one, and LGBT (Lesbian Gay Transgendered Bisexual) population are rising. People in Generation Y (who was born between 1980-2003) do not want to have many children. One woman in Generation Y gives birth to an average of only 1.6 children in the year 2010 which decreased from an average of 2 children in the year 1997. Those are the reasons that pets are more than just pets, but they become a part of their family to fulfill a sense of sharing with somebody.

3. Pet Humanization

Nowadays, pet owners feed their pets like their friends or their home members and give them proper care and prevention of disease. Some people love them like the pets are their real children and ready to pay to raise them properly and give more than the basic needs such as choosing a good quality hospital, taking them to spa, pool, training or hotel so they need the best products or services for their pets.

4. Pet Health Care Improved

Due to the increasing numbers of people who have pets lead to improve pet medical evolution. Pet owners dedicated to caring for their pets for the best quality of life. It is a contributing factor to the number of people who want to study veterinarian medicine and pet hospital are increasing and support the growing health care business for pets.

5. Friendly Pet Community

Due to the relationship between the pet owner and their pets are closer, numerous pet services are opened for this relation. Some restaurants, resorts, hotels, or public service places like parks, are pets allowed. Furthermore, there are increasing pet

services for place and pet hotels such as pet-sitting where they will take care of pets for pet owners who are away for a while or do not have time to look after them.

From researching current trends nowadays, pets are one part of the lifestyle of humans. Due to the society entering the society of the elderly, more people live longer, have fewer children, so they are making pets as friends, or as substitutes. Pet owners are ready to pay to take care and give the best to their pets causing the number of pets in Thailand to expand which is good for the pet-related business and is an excellent opportunity to start a pet-related business.

3.1.2 Pain Points and Customer Insight

After considering about trends, next is finding out what the problems are. In the first step, developers discussed and gathered ideas and listed problems as followings.

1. Missing Pet

The disappearance of pets is a painful for the pet owner. The hard thing is to find them because there are many channels of the search for lost pets like Facebook Page and Group, or Twitter which make the pet owners do not know where should they need to announce or how many announcements will get real quick result. Searching or finding in social media is rather hard to find their own pets. Maybe search bar does not match what they really want to find.

2. Pet Identity

Nowadays, the identification of pets is only a pet identification book where the pet owner will receive when going to the pet hospital. The book contains pet information, pet owner information, vaccine history that pets have received. The problem encountered is that some pet owners do not put their information into the book. No information has confirmed the existence of pet owners. Some owners pretended to go to pet service and said that they would come to take their pets later, but finally abandoned the pets there and that cause burdens for pet service.

3. Taking Care

Caring for one's life is not only love. Each day, pet owners have to care and have many responsibilities to do for their pets include feeding, cleaning, or even taking them to see a veterinarian for checking their health or getting treatments. The pet owner's lifestyle may not be able to do easily. Some pet owners have to work from

morning to evening, and some have to go to other provinces or be away from home for many days. Sometimes they would forget to feed their pet or too tired to play with a pet or give as much attention as a pet needs.

4. Safety

Accidents are unpredictable, and if it happens to our lovely pets, it is excruciating for the pet owners. Not only that they have to pay to cure their pets physically, but they also have to heal their pets mentally. Moreover, if their pets caused the disaster by attacking other people or other pets, it may have severe consequences for the pet owner. In addition to accidents that require security, there are also pet kidnapping that owners have to be careful of.

5. Medical Records

Each pet owner has an identification book for their pets. Sometimes they forget to bring the book when they go to see a veterinarian and cannot tell the pet symptoms or drugs that their pet has received or previous treatment which may cause the veterinarian to unintentionally make mistakes when providing medical care.

6. Stray Animals

Stray animals used to have a home and owner before but may have unexpected happenings that change their life. They might be lost, or mean owners abandoned them and that cause more propagation. Furthermore, they also create burdens and chaos for society in terms of cleanliness, safety, and uneasiness to the people in the community.

The next step is to create the questionnaire to define the problems from pet owners by using Google Form to create the survey "Pet Owner 's Problem." and announced it on social media; for instance, Facebook, Twitter and Line. The questions will be multiple choices to answer for the ease of the respondents.

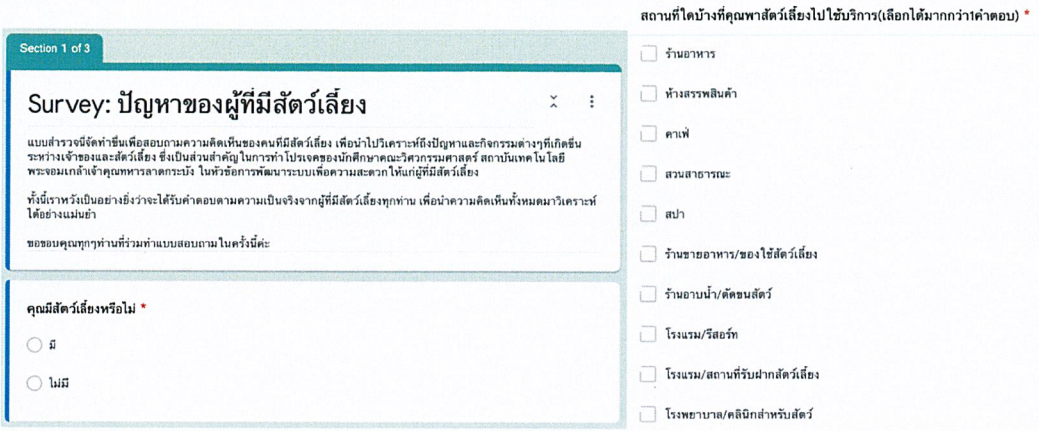

Figure 3.2 Survey "Pet Owner 's Problem" on Google Form and example of questions.

Figure 3.2 shows survey of pet owner's problem with 227 participants, 157 are the numbers who have pets and the rest do not. The range of age that mostly join the survey is about 18-25 years old represent the total amount of 85 people or 54.1%. Secondly, over 26 years old which are 68 people or 43.4%. The least is age range under 18 years old with the total amount of 4 people as shown in Fig. 3.3.

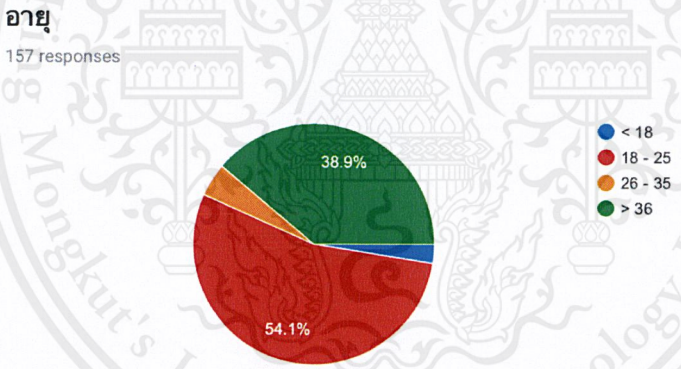

Figure 3.3 Question asking about age of participants.

This survey also ask about "Where did you take your pets to the pet services?" and "How do you know these pet services?" to understand and define whether participants who do the survey know where the pet services located at or most kind of service that pet owner bring their pets to.

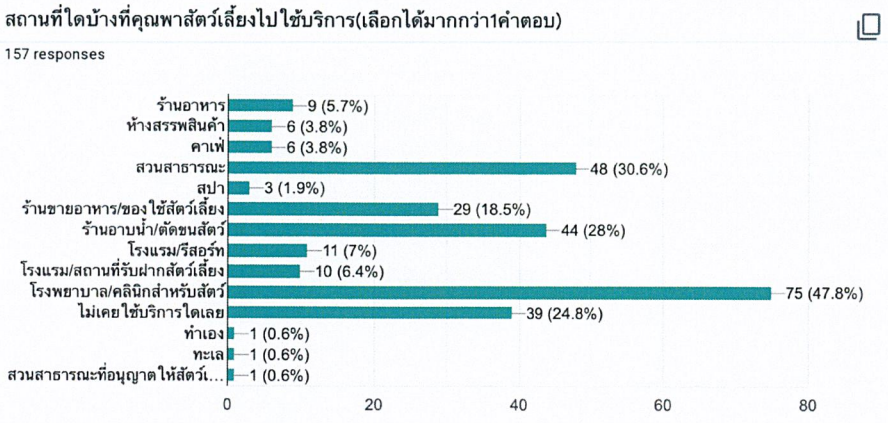

Figure 3.4 Question about where they take the pet to the pet services.

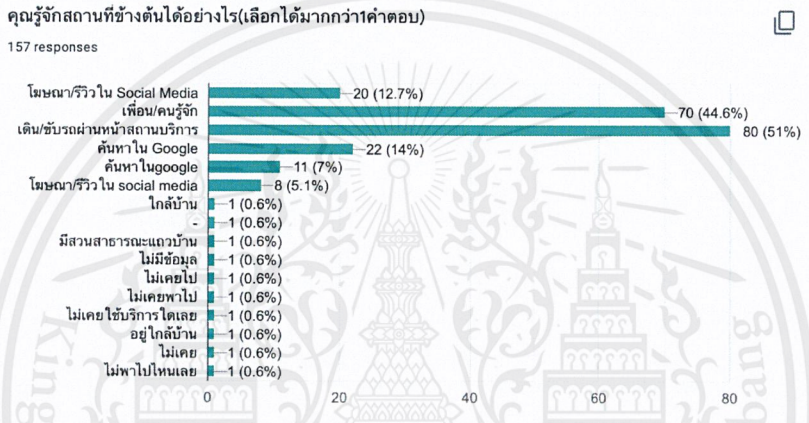

Figure 3.5 Question about how they know the pet services above.

From the survey, Fig. 3.4 shows that most people are likely to visit or have service with Pet Clinic or Hospital are 75 people or 47.8%. Secondly is similarly between Park and Pet Grooming at 48 and 44 and calculating into 30.6% and 28%, respectively.

Figure 3.5 shows how they know the places that shown above. From most answers show that people know where the places located by walking or driving past that place and recommended by friends or acquaintances.

The next step is about gathering and summarizing the Value Proposition of the product. From survey, by dividing the customers into two groups which are pet owners and pet services providers. Since the problems that pet owners encounter related to pet services, such as hospitals, so this is an excellent opportunity to reach these two groups of customers. By bringing all issues to brainstorm what the gains and pains of the pet owners are and how to build the gain creators and pain relievers to respond to the customer desires.

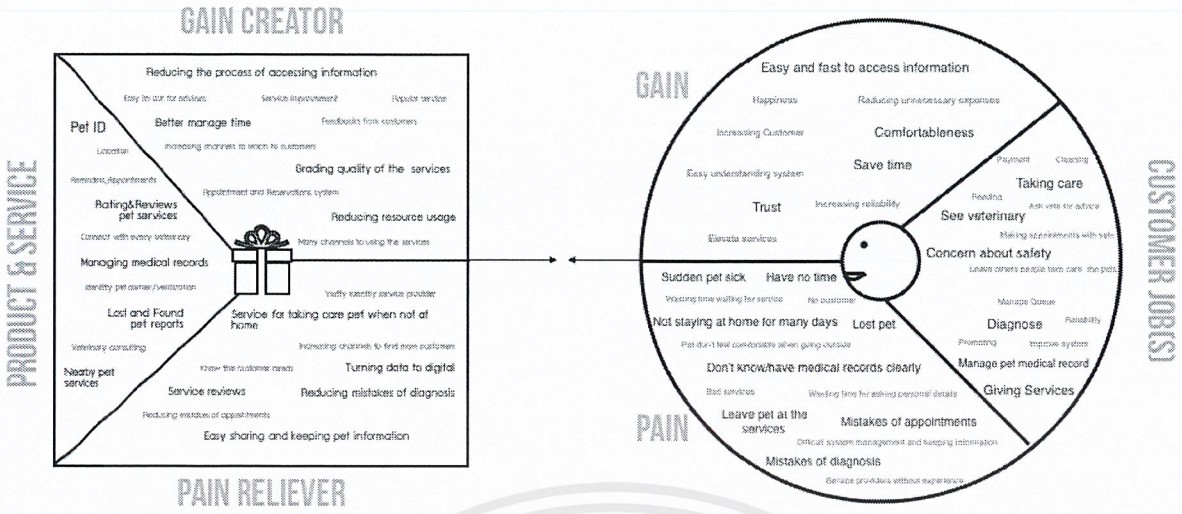

Figure 3.6 Value proposition canvas.

Figure 3.6 shows the value proposition tool. On the left side is the customer desires include customer jobs, pains, and gains. On the right side is what will answer the customer desires, which are gain creators, pain relievers, and products and services. From brainstorming, they are separated into two types of customers which are the pet owner and pet service as follows:

3.1.3 Customer Duties

Customer Duties describes what customers are responsible for.

Pet owner

- Taking care of pets
- Seeing veterinarian
- Concerning about safety
- Spending
- Cleaning
- Feeding
- Asking for advice
- Making appointments with the veterinarian
- Leaving other people to take care of the pets

Pet service

- Diagnosing
- Managing pet medical record

- Giving Services
- Managing Queue
- Building reliability
- Promoting the business
- Improving the System

Gains

What makes customers happy and exceed their expectations.

Pet owner

- Easy and fast access to information
- Comfort
- Timesaving
- Trust
- Happiness

Pet service

- Easy and fast access to information
- Unnecessary expenses reduction
- Timesaving
- Customer increasing
- Easy understanding system
- Reliability increasing
- Services improvement

Pains

What annoy or trouble customers and to prevent them from getting what they need to do.

Pet owner

- Sick pet
- Lack of time
- Not staying at home for many days
- Lost pet
- Do not know medical records
- Time wasting while waiting for service
- Pet does not feel comfortable when going outside
- Mistakes of appointments

- Difficult system management and keeping Information
- Bad services
- Service providers without experiences

Pet service

- Mistakes of diagnosis
- Do not have medical records
- Difficult system management and keeping Information
- Leave pet at the services
- Time wasting when asking for personal details
- No customer
- Mistakes of appointments

Gain creators

What can help the customer to fulfill their gain.

Pet owner

- Easy to ask for advices
- Better time management
- Grading quality of the services
- Many channels to use the services
- Appointment and Reservations system
- Reducing the process of accessing information

Pet service

- Service improvement
- Popular service
- Increasing channels to reach the customers
- Reducing the process of accessing information
- Better time management
- Feedbacks from customers
- Reducing resource usage

Pain relievers

What can help the customer to relieve their pain.

Pet owner

- Service for taking care of pet
- Verify identity service provider

- Turning data to digital
- Service reviews
- Easy sharing and keeping pet information
- Real time consultation
- Reducing mistakes of appointments

Pet service

- Knowing customer needs
- Reducing mistakes of diagnosis
- Easy access to pet information
- Verifying identity of pet owner
- Reducing mistakes of appointments
- Increasing channels to find more customers

Products and services

- Pet ID
- Managing medical records
- Rating and reviews pet services
- Lost and Found pet reports

After brainstorming, below are the summary by ranking from the most pains of the pet owners in descending orders.

1. Sick pet.
2. Difficult system management and keeping Information.
3. Do not know medical records.
4. Bad services.
5. Service providers without experience.
6. Pet does not feel comfortable when going outside.
7. Mistakes of appointments.
8. Lost Pet.
9. Not staying at home for many days.

Most pains of the pet services in descending orders are as follows.

1. Mistakes of diagnosis.
2. No customer.
3. Do not have medical records.
4. Abandoned pets at the pet services.

5. Difficult system management and keeping Information.
6. Time wasting when asking personal details.
7. Mistakes of appointments.

With these problems came up with the solution for those pains with the pet lover platform named "Pawty," which is a medium between the pet owner and the pet service. This platform contains "Pet ID and Medical Records Management" to solve the problematic system management and keep information including pet owner verification and pet medical records accession. "Pet Service Recommendation" to answer the lack of time of pet owners by recommending the pet service to take care of their pets and to increase channel to reach to the customer for the pet services, and "Lost and Found Pet Report" to help the pet owners in finding their lost pet.

3.1.4 Business Model Canvas

After collecting all problems and the value proposition, the next step is to design the business model canvas (BMC) to plan the business strategies and map overall business to expand and generate revenue in the future. The target customers are the pet owners and pet service providers by reaching them on social media, web application, events, at the pet services and pet-allowed places. The pet owners can use this platform for free but for the pet services if they want to reach more customers, they can pay for posting an advertisement on this platform as shown in Fig. 3.7 below.

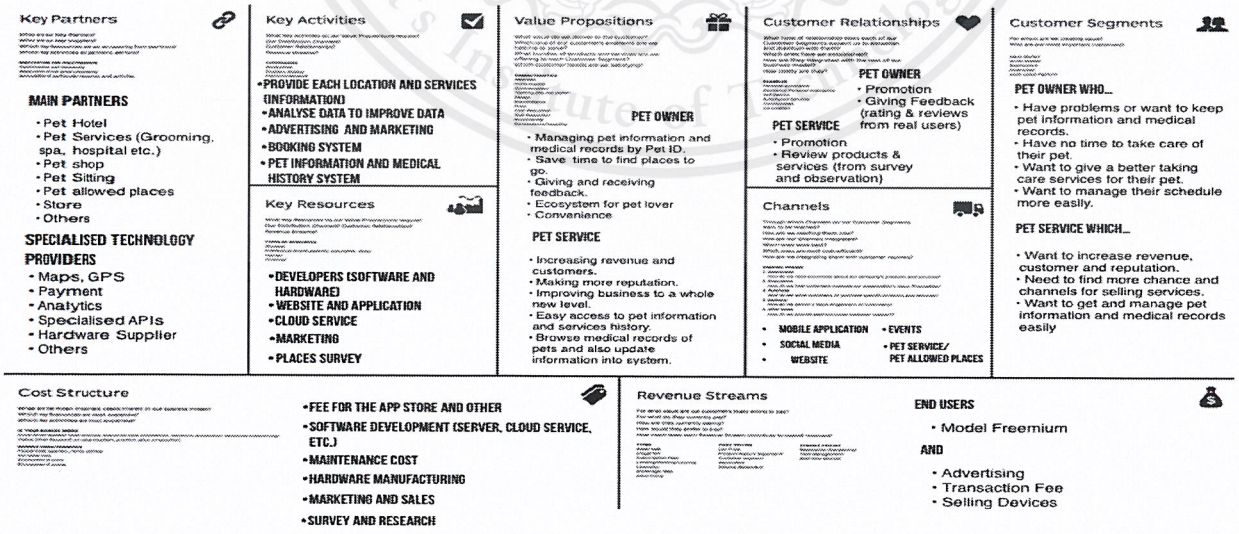

Figure 3.7 Business Model Canvas of "Pawty" app.

3.2 Developing and Building Systems

After the researchers gather information from 3.1., then one researcher design and develop web services application from these following details:

3.2.1 System Model

Pet-services recommendation based on user's current location is divided into 3 types of user which are developer, pet service provider and user. For the Administrator of this web application is a developer.

3.2.2 Use Case Diagram

The use case diagram is a technique to compare with the other diagram and it needs more details to describe user's behavior. It is necessary to create each case of the use case for easy reading and managing.

For the use case diagram of this pet-services recommendation can be divided as shown in Fig. 3.8 below.

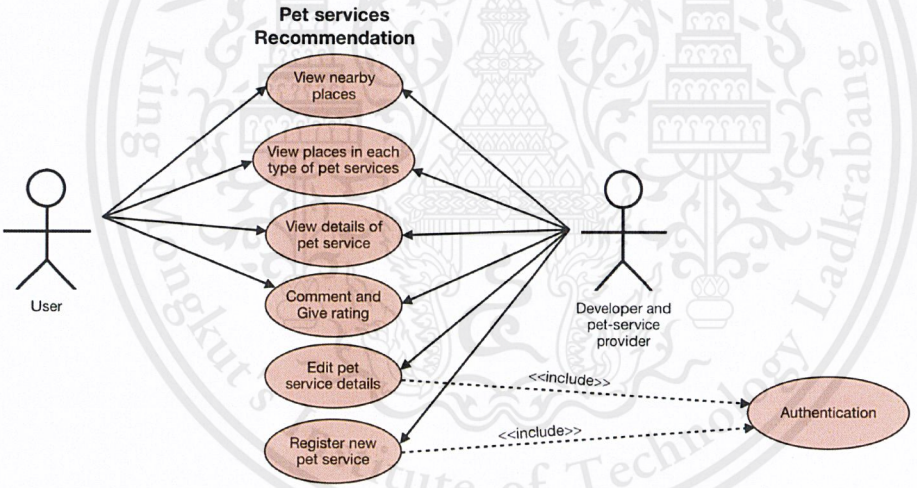

Figure 3.8 Use case diagram showing each ability that users and developer can do in the webpage.

The use case diagram demonstrated in Fig. 3.8 is for 2 types of users categorized according to the tasks: one is the users utilizing this application and another one is the developers and the pet-service providers. Both of them can view nearby places and details of place types. They can also give comments and add a rating to pet services. However, the user utilizing this application cannot edit and add a new pet service into the webpage. These tasks are needed to be done by the developer and pet-service providers only.

3.2.3 Sequence Diagram of Website

Sequence diagram showing how the system interacts with each other by arranging in time sequence. For the sequence diagram for pet-services recommendation dividing into 2 types of use case which are:

User or pet owner:

- View nearby pet services
- View each pet service details
- View pet services by type
- Comment and give rating

Pet service provider:

- View nearby pet services
- View each pet service details
- View pet services by type
- Comment and give rating
- Register pet service
- Edit pet service that exists

1) View nearby pet services

When users, pet-service providers or developers access into the webpage, it will request the user's current location for calculating between each pet service to measure how far between user's location and each pet service and shows the details of each pet service nearby user's location in descending order in kilometers as shown in Fig. 3.9.

2) View each pet service details

When users, pet-service providers or developers click at see more info of the pet service, the webpage will request places that match the ID of pet service and show pet services that the they want on the webpage as shown in Fig. 3.10.

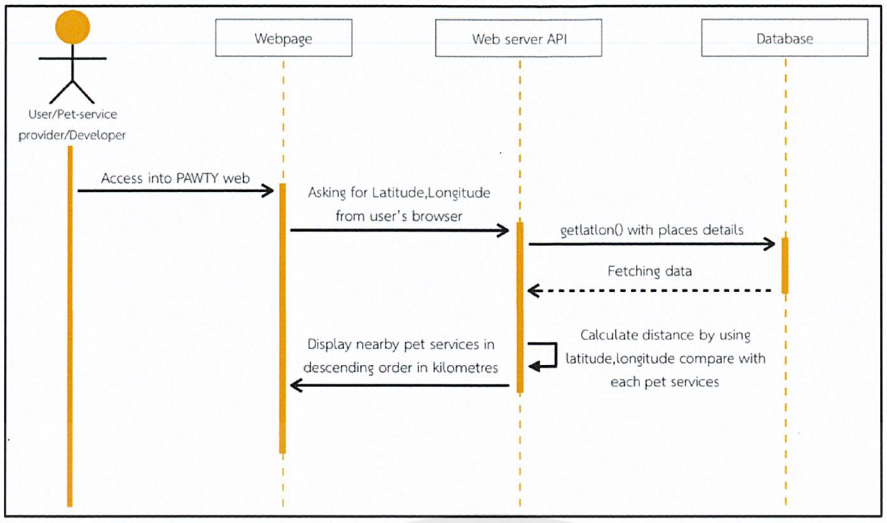

Figure 3.9 Use case diagram for user view nearby pet services.

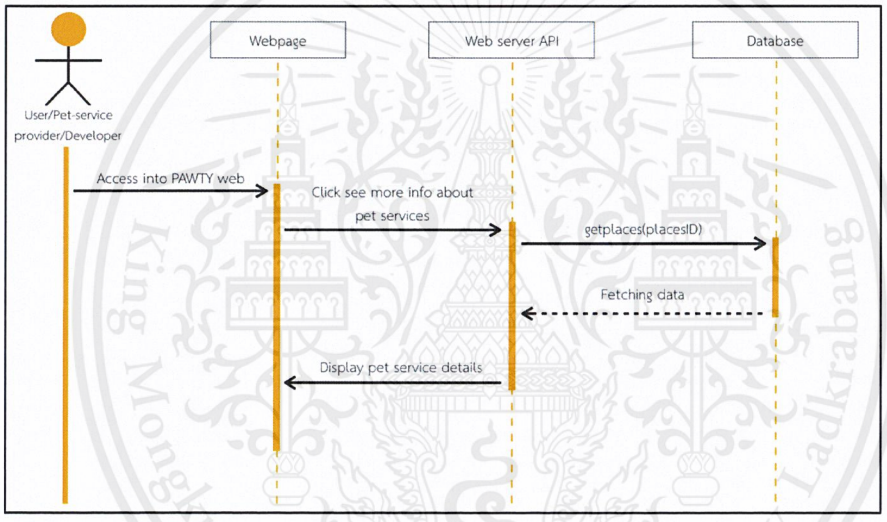

Figure 3.10 Use case diagram for user view of each pet service details.

3) View pet services by type

When users, pet-service providers or developers click at type button that the they want to focus on, the webpage will request places that match the type of pet service and show a list of pet services on the webpage.

4) Comments and give rating

When users, pet-service providers or developers type comments and give a rating to any places, the webpage will send a request to web server API for posting data which contains comment and rating to store in the database. Then, webpage will display comment and rating in the page as shown in Fig. 3.12.

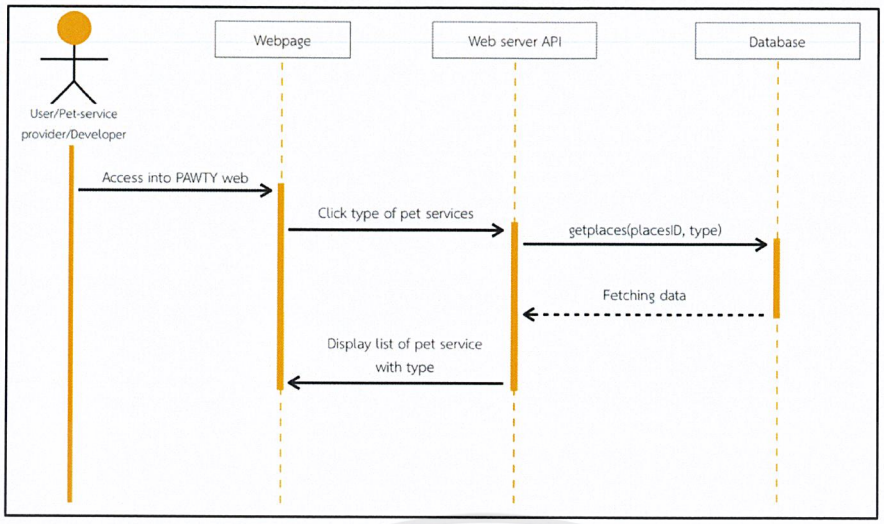

Figure 3.11 Use case diagram for user view pet services by type.

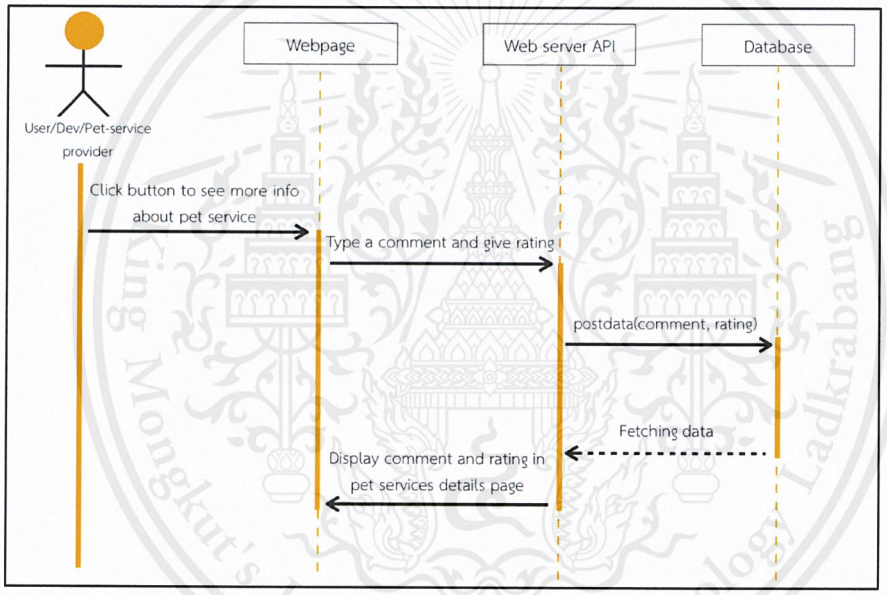

Figure 3.12 Use case diagram for comment and give rating.

5) Register pet service

Figure 3.13 shows sequence diagram for pet service provider register new pet services. If the pet service providers want to add their own pet services into the webpage, they need to click the register pet service button and fill out all information and click submit then system return message to the webpage with success or failed to register and show pet services that recently added into the webpage.

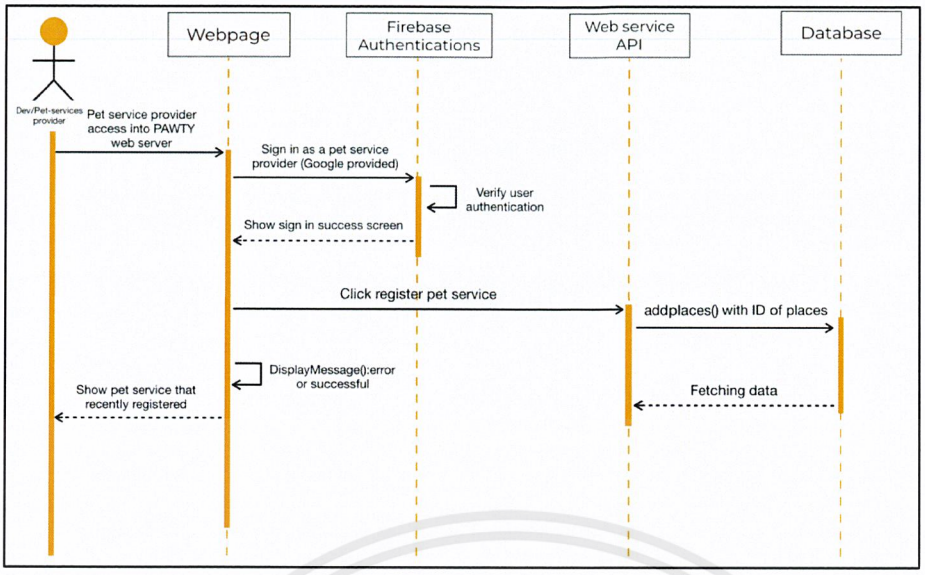

Figure 3.13 Use case diagram for pet service provider to register new pet services.

6) Edit pet service that exists

Figure 3.14 shows the sequence diagram for pet-service provider to edit details of pet services. Before doing the register and edit, the pet-service providers need to be authorized by login into webpage. After that, they need to click "SEE MORE DEATILS" button of the pet service that they want to edit. Then they need to click the "EDIT" button for editing the information that they want to change and finally click the submit button. The system then returns the message to the webpage with the words of success or failed to edit and return to pet services that they recently edited to check whether webpage is updated or not.

7) Login

Figure 3.15 shows the sequence diagram of login page before pet-service provider and developer do the register and edit details of each pet service.

3.2.4 Building Architecture

Figure 3.16 shows the system architecture of webpage that shows a list of pet services containing Web Application and Microservices including system APIs and databases by using Google Cloud Platform.

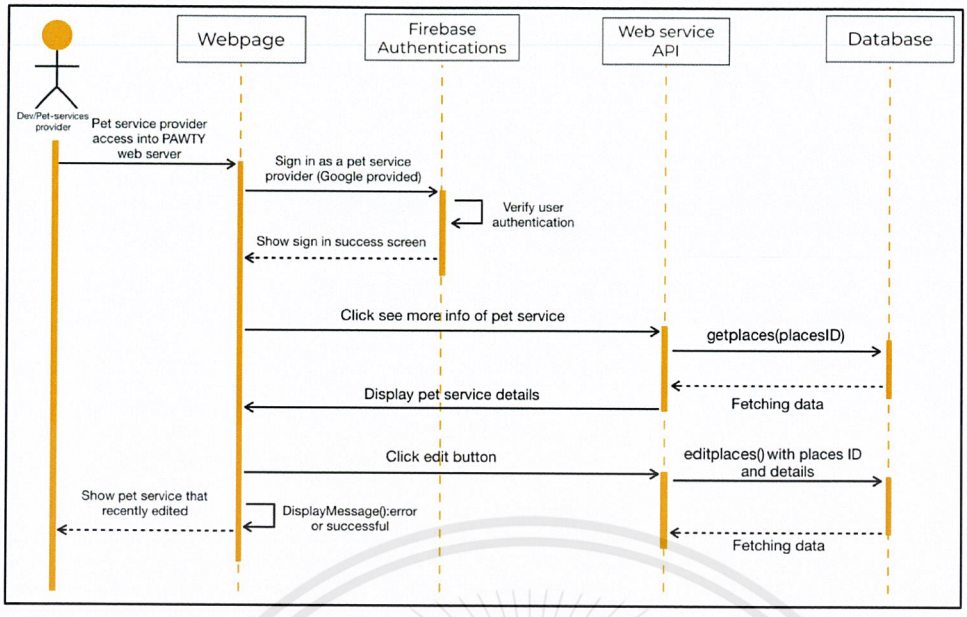

Figure 3.14 Sequence diagram for pet service provider edit details of pet services.

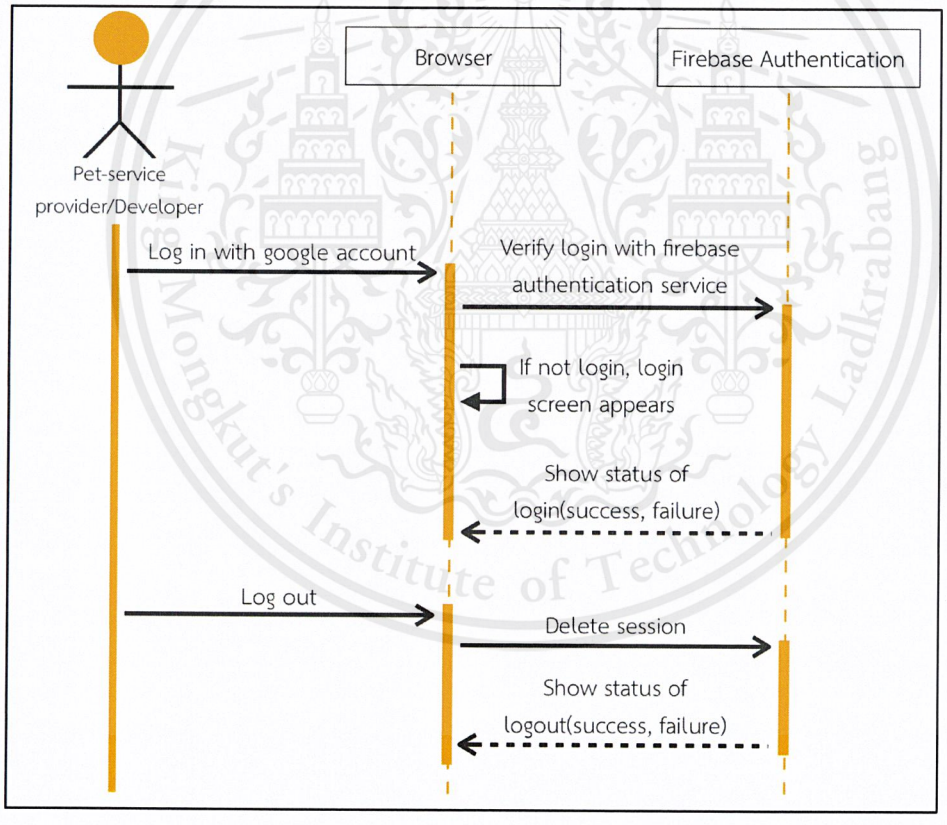

Figure 3.15 Sequence diagram for login page.

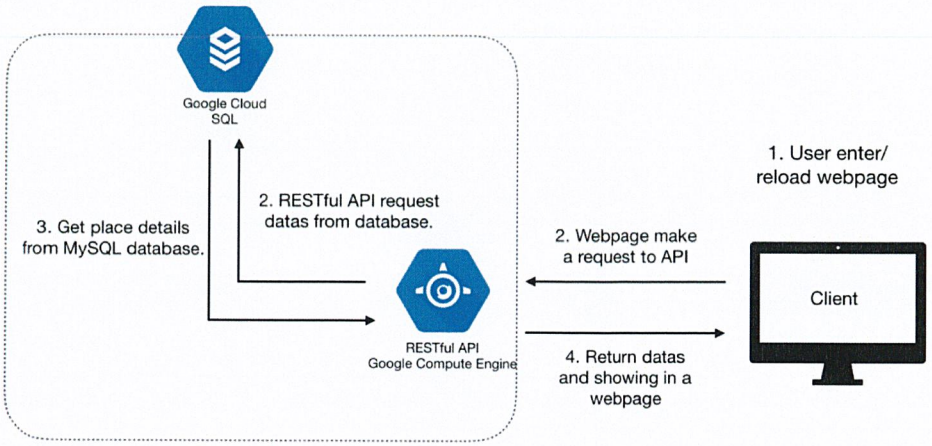

Figure 3.16 Architecture of pet services recommendations webpage.

Figure 3.17 shows the system architecture of webpage used to register and edit places.

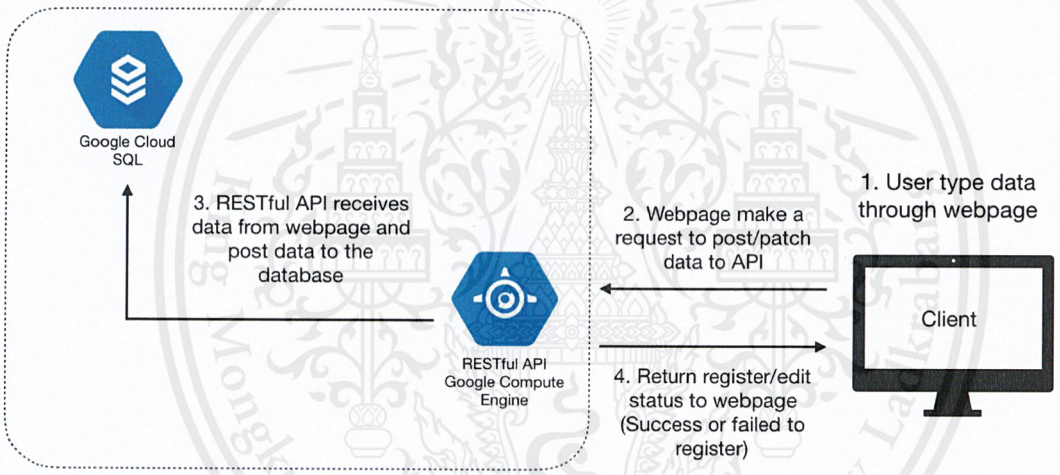

Figure 3.17 Architecture of register and edit places.

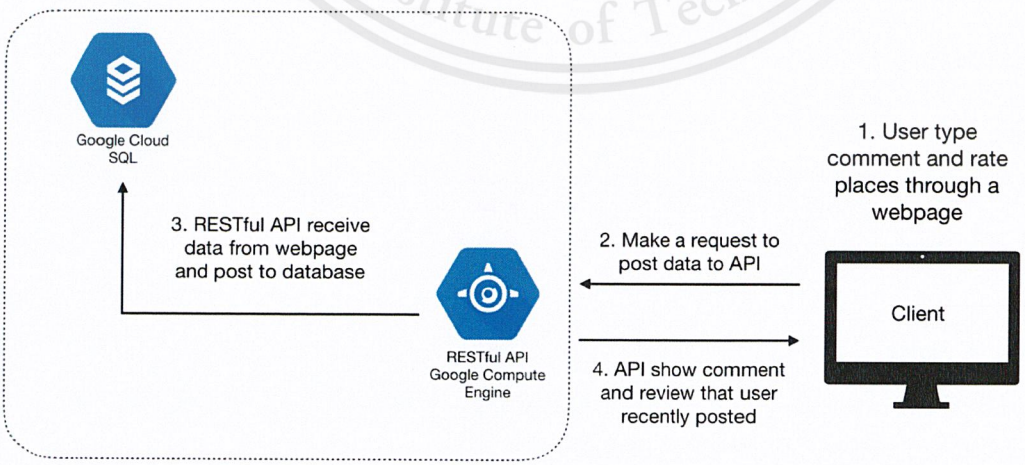

Figure 3.18 Architecture of commenting section.

Figure 3.18 shows the system architecture of webpage showing a list of pet services which contains Web Application and Microservices including system APIs and databases by using Google Cloud Platform.

3.2.4 API Gateway

API Gateway can handle requests in the service and used to create a single-entry point to expose the endpoint of different APIs by revealing only one parameter and allowing the requests to come into the service pass context path. Pet-services recommendation APIs is shown in Table 3.1.

Table 3.1 Pet-services recommendation APIs.

APIs	Description	Input	Output
api//registerplaces/	Using to register pet services into database.	Details about pet services.	Status: Register Success or Failed.
api/editplaces/<ID>	Using to edit each detail about places.	Edited data of places.	Status: Edit Success or Failed.
api/comments/<ID>	Showing comments by mapping ID of places to match with each place by <ID>.	Number or ID of pet services.	All comments of the users in each pet service.
api/commentsPost/	Using to post comments into database.	Author name, comments, rating of places and ID or number of places.	Status: Commented or Failed to post comment.
api/placesdist/	Using to show nearby places by calculating between latitude and longitude of places and user's location.	Latitude and longitude of user's location	List of places with distances in kilometers sorting in descending order.

APIs	Description	Input	Output
api/placestype/	Using to show nearby places with type of places by calculating between latitude and longitude of places and user's location and type of places that users want.	Latitude and longitude of user's location and types of pet services.	List of places in each type with the distances in kilometers sorting in descending order.

3.2.5 Designing Database

This project worked with microservices from MySQL by Google Cloud Services to manage databases. Database is separated into 2 following main items:

1) Pet services places storing containing the data of each pet service including:

- Place's name is a name of pet service
- Address is the address of pet service
- Latitude is a coordinated geographic type that specifies the position of north and south point on the Earth's surface onto that pet service.
- Longitude is a coordinated geographic type that specifies the position of east and west point on the Earth's surface onto that pet service.
- URL image is the image of pet service that keeps in an address form.
- Open Time is the time that the pet service is opened.
- Close Time is the time that the pet service is closed.
- Phone number is the phone number of the pet service.
- Pricing is the range of prices or services cost.
- Type is the type of pet services.
- Place Rating is rating of places. (0 is a default of this experiment.)

The table of pet services comments is shown in Table 3.2.

Table 3.2 The database of pet services

Field Name	Data Type	Description	Example of data
placesID	Integer	ID of places with auto increment	1
placesName	Varchar	Name of pet services	Pet Shop
Latitude	Float	Latitude of pet services	12.34567
Longitude	Float	Longitude of pet services	100.123456
Address	Varchar	Address of pet services	KMITL, Chalong Krung 1 Alley, Lat Krabang, Bangkok 10520
placesRating	Integer	Rating of pet services	0 (Default)
Telephone	Varchar	Phone number of pet services	02-000-0000
Opentime	Float	Opening time of per services	09.00
Closetime	Float	Closed time of pet services	18.00
Pricing	Integer	Approximate price range of pet services	0 - 1000 THB
Type	Varchar	Type of pet services	Pet Shop, Pet Grooming etc.
URLimage	Varchar	Lost/Found pet size	https://ww.google.com/

2) Pet services comments are all comments from the users whether it be reviews or comments or any suggestion will be stored in this database including:

- Comment Name is the name or author who comments in each place.
- Comments is the details that author write in the comments whether it be suggestions, comments or reviews.
- Rating is the rating or score that author of comments will give to each place.

- Places ID this will relate to the ID of the places to identify which comments belong to which places.

The table of pet services comments is shown in Table 3.3.

Table 3.3 The database of comments data.

Field Name	Data Type	Description	Example of data
custID	Integer	Customer ID of comments with auto increment	1
commentName	Varchar	Author who writes comment	Jiramate Leingprom
Comments	Varchar	Comments of places	Good Places one.
commentRating	Float	Rating of places given by customer who reviews	3.5
PlacesID	Integer	ID of each pet service that match with ID of pet services database	2

Figure 3.19 shows the ER Diagram (Entity Relationship Diagram) of the system which contains the "PetservicePlaces" table keeping the data of each pet service, and the "CommentData" table keeping comments and rating of each place.

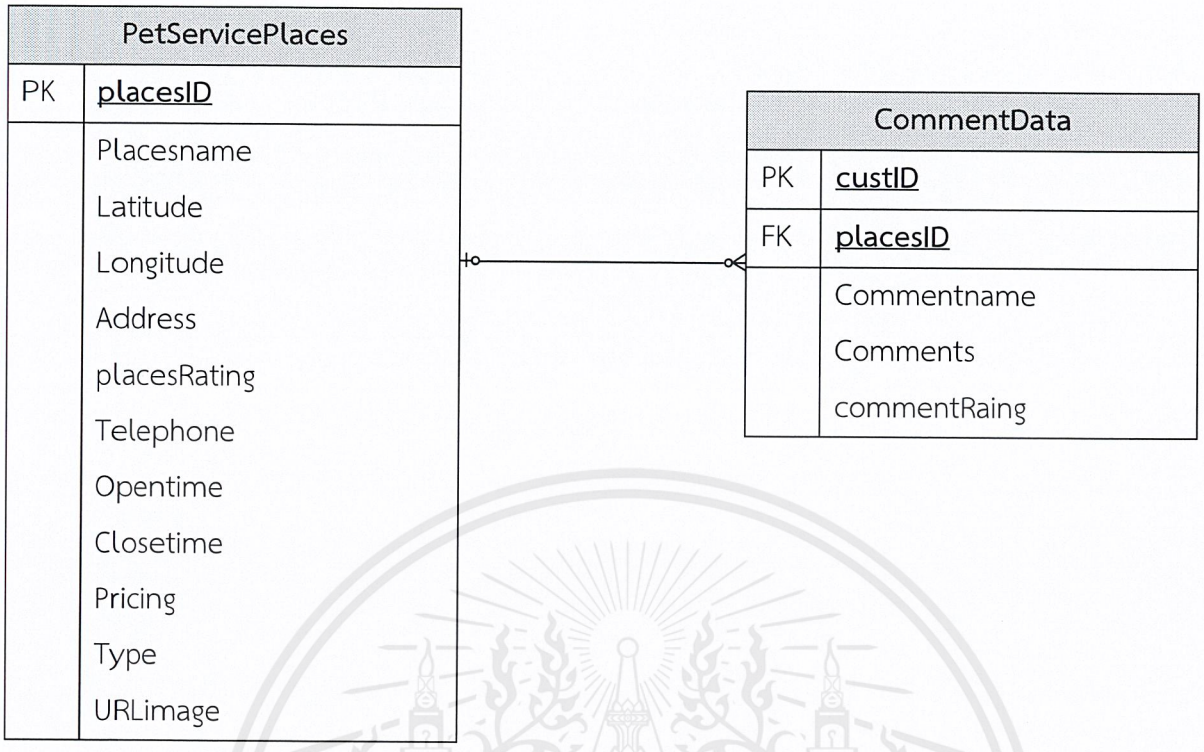

Figure 3.19 ER Diagram of the system.

CHAPTER 4

RESULT

In this chapter, researcher will mention each process that is a result from developing pet services recommendation based on user's location by dividing into 3 major parts which are Webpage with lists of nearby pet service, pet service with type of each place, and register and edit places.

4.1 Webpage with Lists of Pet Service

This webpage describes the details about pet services sorting by nearby user's current location. In this web application will have about 3 pages which are main page, page that matches the type of pet service and details of pet services. For each pet service, developer and pet services provider need to fill in the information of pet services so that they appear on the website.

Figure 4.1 shows main page of "Pawty" web application. The main page contains each pet service that are nearby user's current location gathering data from RESTful API containing name of pet service, the distances between pet services and user's location in kilometers, address and rating of each pet service. This page also has buttons that navigate to each type of pet services which are Pet Shop, Pet Hotel, Pet Café, Pet Grooming and Restaurants that allow pets in.

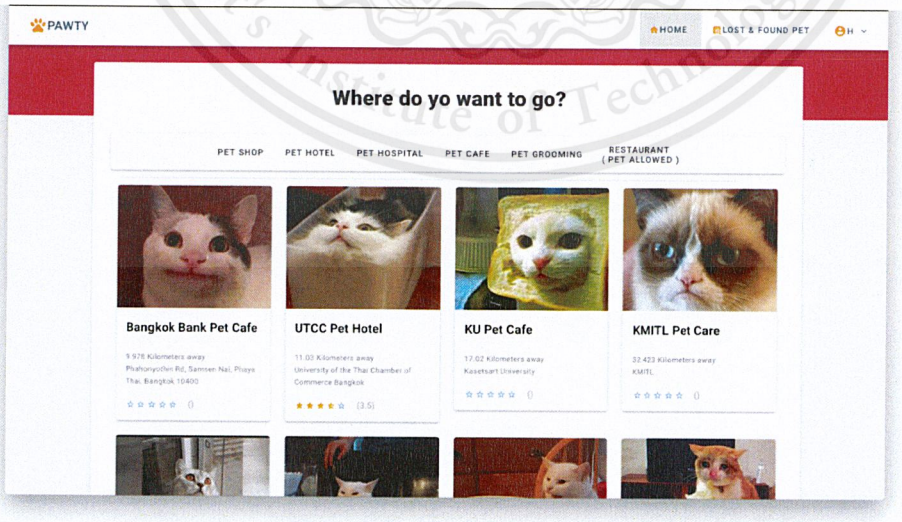

Figure 4.1 Main page of "Pawty" web application.

4.1.1 Details page

This page will show all details about pet services that users want by clicking "See More Info" on a card as shown in Fig. 4.2.

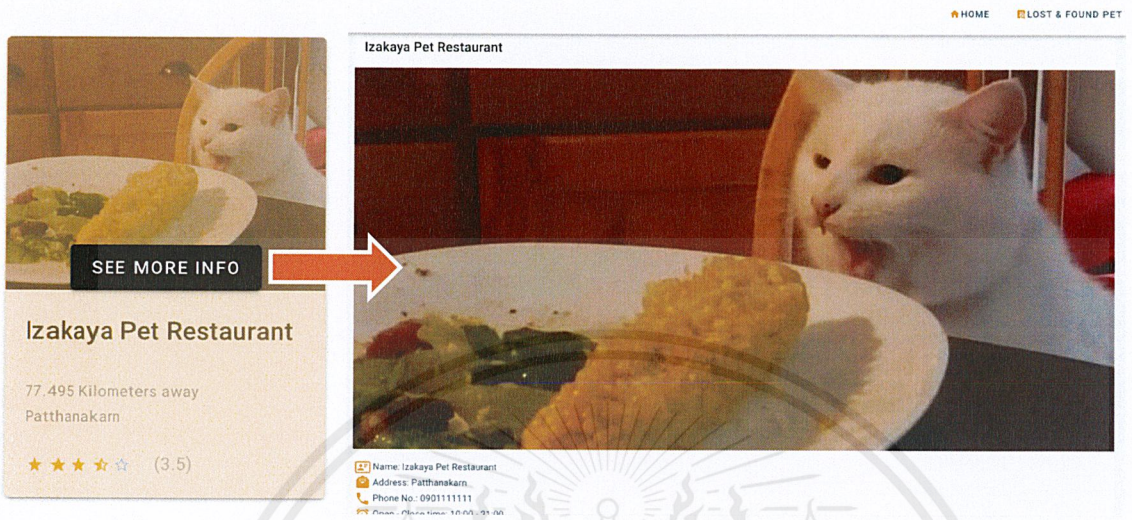

Figure 4.2 Navigating to details page of pet service.

In this page containing details of pet service which are name, address, phone number, open and close time, rating and average or range of price for each service as shown in Fig. 4.3.

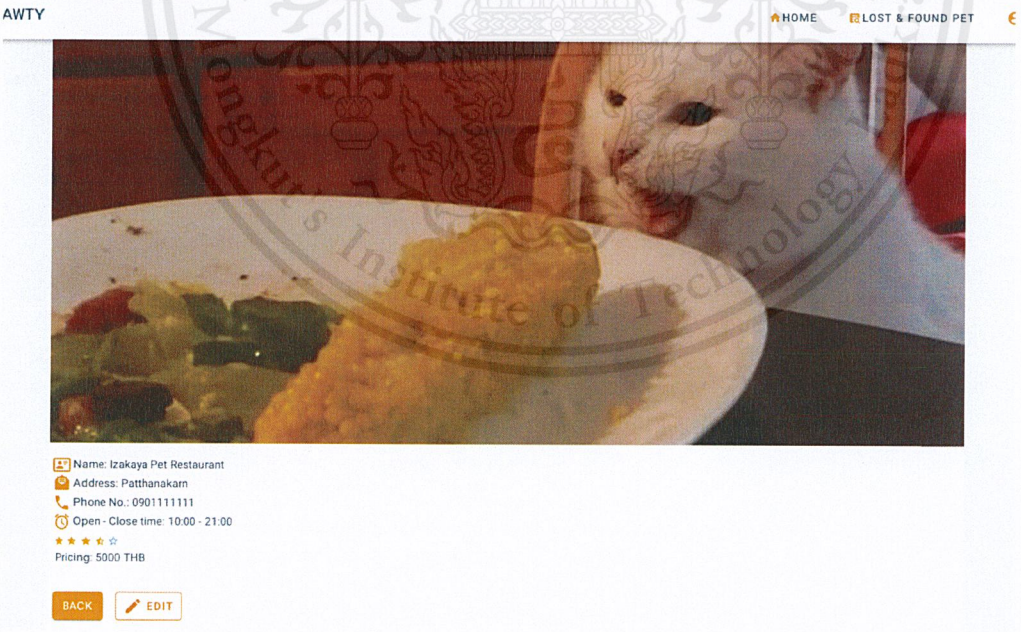

Figure 4.3 Details of each pet service.

4.1.2 Comments

In the details page, users can write a review or give a feedback for pet services by commenting at the bottom of the page as shown in Fig. 4.4.

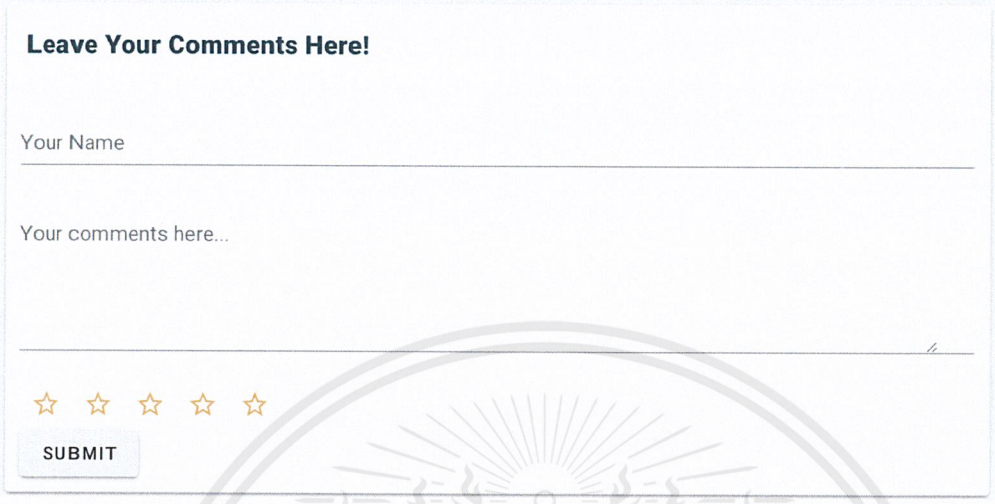

Figure 4.4 Section for writing comments.

Users also can view all reviews and ratings given by other users in this page as shown in Fig. 4.5.

Figure 4.5 Section for viewing comments and ratings.

4.2 Pet services type

Figure 4.6 shows types of pet services which contains pet shop, pet hotel, pet hospital, pet café, pet grooming and restaurants that allow pet. By selecting type of pet services at the main page and the webpage will navigate to the type that user wants.

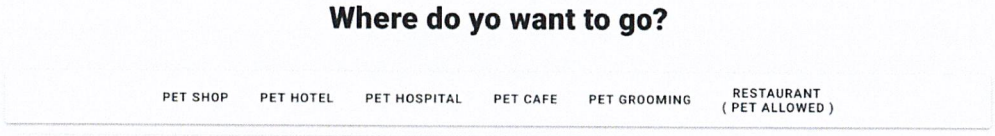

Figure 4.6 Button with type of pet services in main page.

If the user clicks one of the buttons above; for instance, Pet Hospital, the webpage will show only the type that user clicked as shown in Fig. 4.7.

Figure 4.7 Pet services with clicked type.

4.2.1 Sort By

From Fig. 4.8 this webpage has 'Sort by' function: sort by prices, by ratings and by names of pet service. This example shows sort by price and after sorting price as shown in Fig. 4.9.

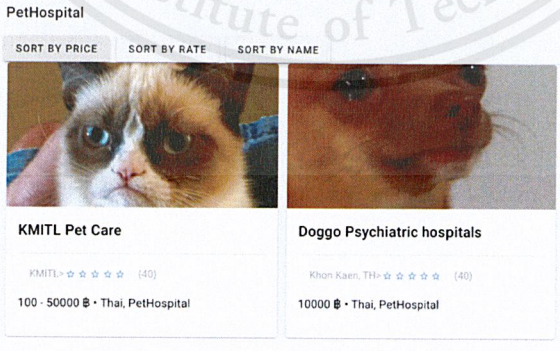

Figure 4.8 Before clicking sort by price button.

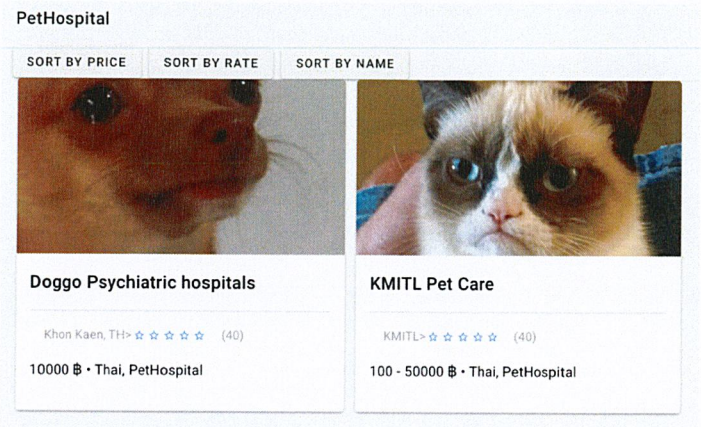

Figure 4.9 After clicking sort by price button.

4.3 Register and Edit Pet Services

The developer or the pet service provider who wants to add the places into the web can do that by scrolling website and clicking to register as shown in Fig. 4.10.

Figure 4.10 Bottom bar for registering pet services.

Before registering and editing, pet services provider and developer needs to login first to authorize their identity as shown in Fig. 4.11.

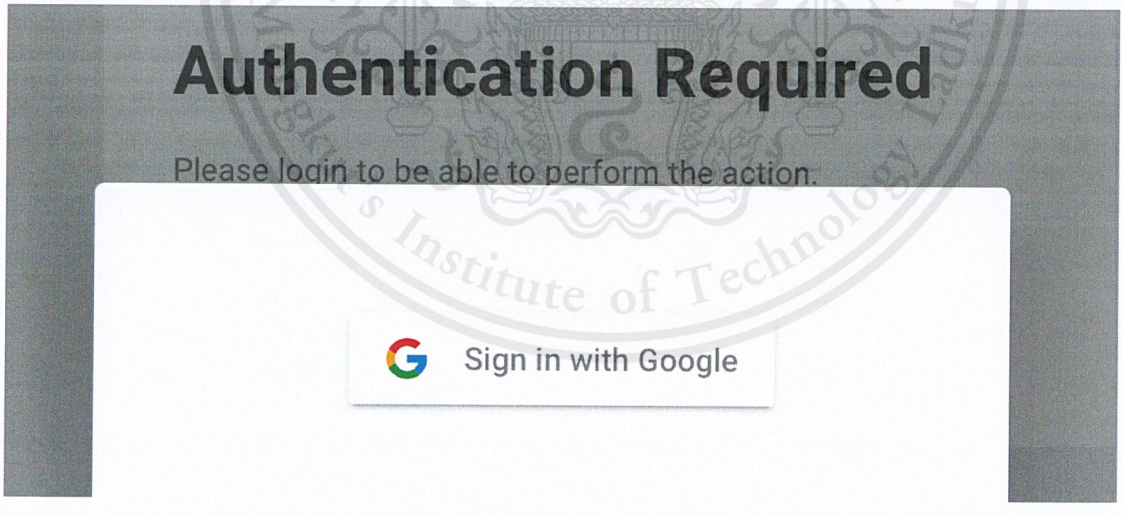

Figure 4.11 Login page before registering and editing places.

After login, the webpage will navigate to register page as shown in Fig. 4.12.

Figure 4.12 Register page.

After filling out all information about pet services, developer or pet service provider needs to mark the check box to agree to register the places and click "SUBMIT" button.

For editing places, developer or pet service provider need to click "EDIT" button in place details page that they want to. For instance, in Fig. 4.13, developer wants to edit details of "UTCC Pet Hotel".

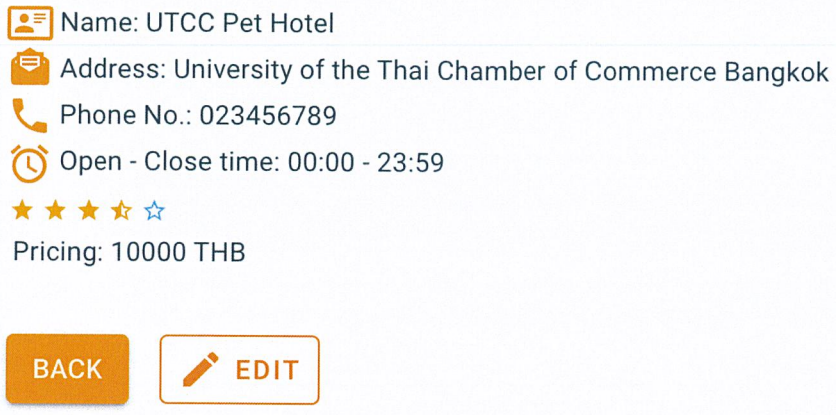

Figure 4.13 Edit button in pet services details page.

Then the page will navigate to edit places with the details of places in text field as shown in Fig. 4.14 and is ready to edit details as developer or pet service provider want.

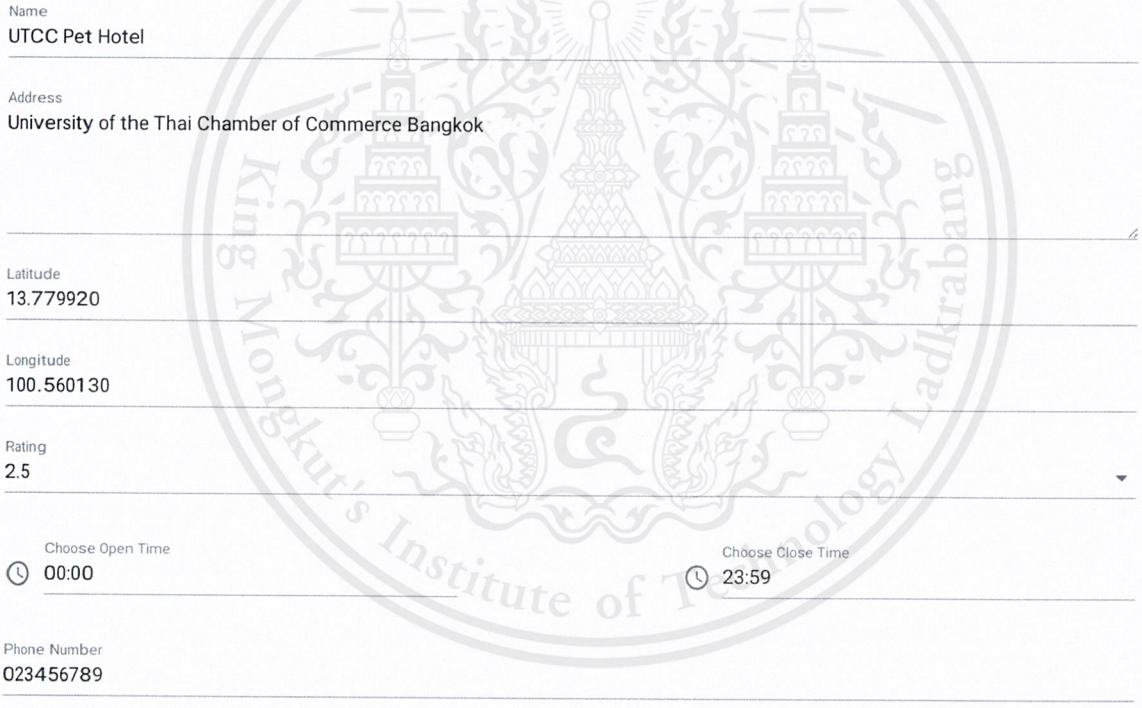

Figure 4.14 Edit page with details of places.

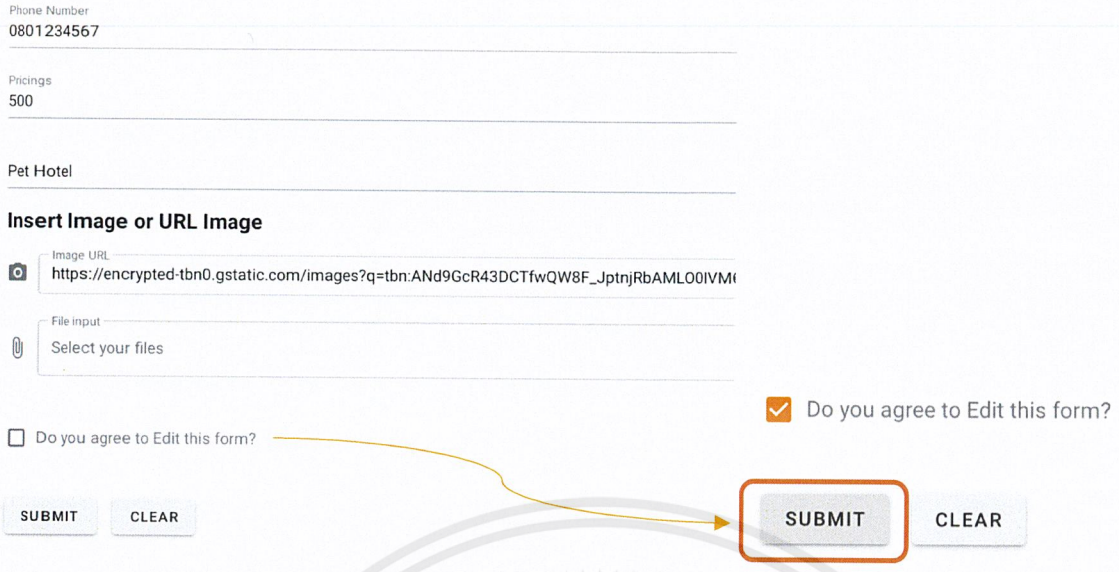

Figure 4.15 Edit page with updated information.

After typing new information instead of old one, then click "SUBMIT" button at the bottom of the webpage as shown in Fig. 4.15.

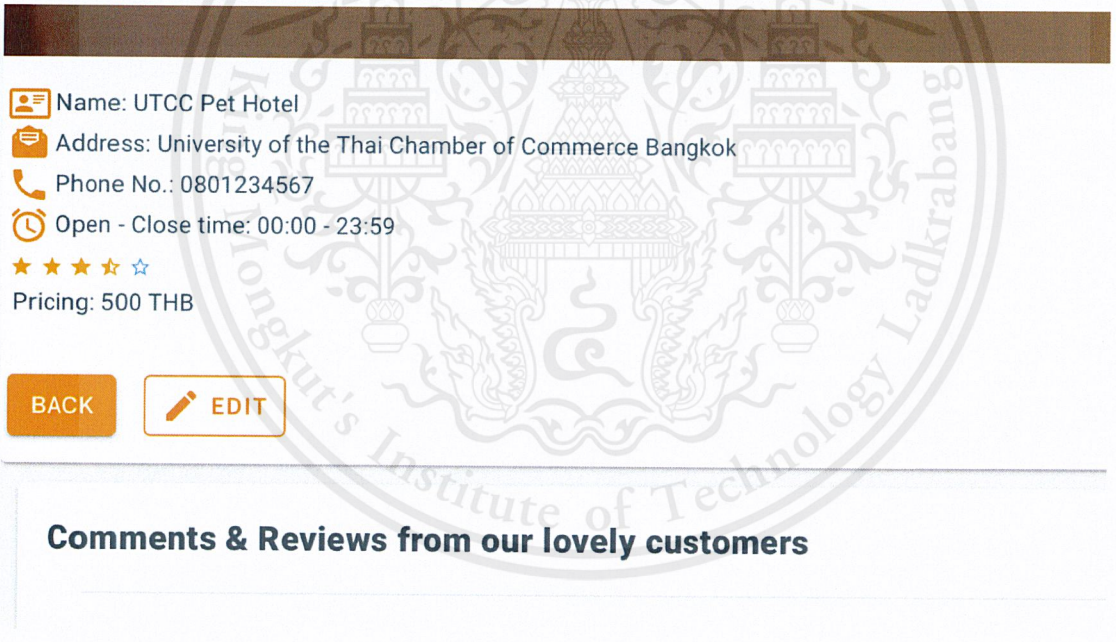

Figure 4.16 Place details page with updated information.

Then, webpage will bring to details page that contains updated information of pet service details as shown in Fig. 4.16.

CHAPTER 5

SUMMARY

The objective of this research is to help pet owners to have an idea of bringing their pets to high quality services. Moreover, it also helps pet-service provider to make their shops, stores or services more popular and get more opportunity to sell.

Pet-Services Recommendation is implemented for pet owners to easily find the pet services whether it is nearby, reasonable or popular. In addition, it can be accessed anywhere and anytime by a website on a smartphone.

Moreover, Pet-Services Recommendation not only benefits the pet owners, but also benefits the pet services providers, with convenient search for nearby pets and able to view ratings. Pet-service providers can increase the numbers of customers and improve their service quality for pets to encourage more customers to use their services.

Therefore, pet-service recommendation system can increase the quality of life for pets and the people in society, when it is widely supported and developed in the future.

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BIOGRAPHY

Cooperative Title: Pet-Services Recommendation Based on User's Current Location

Student Name: Mr. Jiramate Leingprom

Student ID: 59011598

Faculty: Engineering

Major: Computer Innovation Engineering

Department: School of International & Interdisciplinary Engineering