



إيواء | EWAA

IT 497: Graduation Project Report
Product Release-2

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Table of Contents:

1	INTRODUCTION	8
1.1	THE PROBLEM	8
1.2	THE SOLUTION.....	9
1.2.1	<i>Scope</i>	10
1.3	PRODUCT VISION	10
1.4	SOFTWARE PROCESS METHODOLOGY.....	11
1.5	MAIN CONTRIBUTION	11
1.6	SUMMARY	12
2	BACKGROUND	14
2.1	RECOMMENDER SYSTEM.....	14
2.1.1	<i>Collaborative Filtering Recommender Systems</i>	14
2.1.2	<i>Content-Based Recommender Systems</i>	15
2.2	KNOWLEDGE-BASED RECOMMENDER SYSTEMS.....	15
2.3	UTILITY-BASED RECOMMENDER SYSTEMS	16
2.4	DEMOGRAPHIC RECOMMENDER SYSTEMS.....	16
2.5	HYBRID RECOMMENDER SYSTEMS	16
3	LITERATURE REVIEW	19
3.1	COMPETITIVE PRODUCT ANALYSIS	19
3.1.1	<i>Tbny Application</i>	19
3.1.2	<i>Pet Adoption Application</i>	21
3.1.3	<i>PetMatch Application</i>	23
3.1.4	<i>PetFinder Application</i>	25
3.1.5	<i>Pet Adopter Application</i>	27
3.2	COMPARISON TABLE OF COMPETITORS FEATURES	29
4	SYSTEM DESIGN AND DEVELOPMENT.....	31
4.1	METHODOLOGY	31
4.2	SYSTEM REQUIREMENTS	33
4.2.1	<i>System Users</i>	33
4.2.2	<i>Requirements Elicitation and Analysis</i>	33
4.2.3	<i>Interviews Results</i>	33
4.2.4	<i>Questionnaires Results</i>	34
4.2.5	<i>User Interactions</i>	35
4.2.6	<i>Roadmap and Product Backlog</i>	36
•	Roadmap	36
•	Product Backlog.....	37
4.3	SYSTEM DESIGN	52
4.3.1	<i>Architectural Diagram</i>	52
4.3.2	<i>Class Diagram /DFD</i>	53
4.3.3	<i>Component Level Design</i>	55
•	Add Pet	55
•	Send Request	56
•	Like Pet	57
•	Recommendation and Recommender Systems.....	58
•	Content-Based Recommender System.....	59
•	Collaborative-Filtering Recommender System	61
4.4	DATA DESIGN	63
4.4.1	<i>Data Models</i>	63
4.4.2	<i>Data Collection and Preparation</i>	65
4.5	INTERFACE DESIGN	67
4.5.1	<i>Navigation Diagram</i>	67



4.5.2 UX Guidelines	68
4.6 IMPLEMENTATION	70
4.6.1 Add Pet..	71
4.6.2 View Pet	72
4.6.3 Request	73
4.6.4 Like Pet..	74
4.6.5 Filter Search	75
4.6.6 Recommender System Tables	76
• Content Filtering based	76
• Collaborative Filtering based.....	78
4.6.7 Packages	80
• Get contact information	80
• Share.....	81
4.6.8 Challenges.....	82
5 SYSTEM EVALUATION	84
5.1 USER ACCEPTANCE TESTING	84
5.1.1 Demographics of Participants.....	85
5.1.2 Questionnaire/Interview Results.....	86
5.2 QUALITY ATTRIBUTES (NFR TESTING)	102
5.3 DISCUSSION	106
6 CONCLUSIONS AND FUTURE WORK.....	109
7 ACKNOWLEDGEMENTS	111
8 REFERENCES	113
9 APPENDICES	117
9.1 APPENDIX A: REQUIREMENTS ELICITATION INTERVIEWS	117
9.2 APPENDIX B: REQUIREMENTS ELICITATION QUESTIONNAIRE	122
9.3 APPENDIX C: EWAA PET DESCRIPTION	128
9.4 APPENDIX D: PETS DATA COLLECTION QUESTIONNAIRE	136
9.5 APPENDIX E: USER STORY ACCEPTANCE TESTING.....	141
9.6 APPENDIX F: INTEGRATION TESTING.....	159
9.7 APPENDIX G: USER ACCEPTANCE TESTING QUESTIONNAIRE.....	169



List of Figures:

FIGURE 1. COLLABORATIVE FILTERING EXAMPLE	14
FIGURE 2. CONTENT-BASED EXAMPLE	15
FIGURE 3. HYBRID MODEL EXAMPLE	16
FIGURE 4. TBNY APPLICATION	20
FIGURE 5. PET ADOPTION APPLICATION	22
FIGURE 6. PETMATCH APPLICATION	24
FIGURE 7. PETFINDER APPLICATION	26
FIGURE 8. PET ADOPTER APPLICATION	28
FIGURE 9. USE CASE DIAGRAM	35
FIGURE 10. ROAD MAP	36
FIGURE 11. ARCHITECTURAL DIAGRAM	52
FIGURE 12. CLASS DIAGRAM	53
FIGURE 13. ADD PET FLOWCHART	55
FIGURE 14. SEND REQUEST FLOWCHART	56
FIGURE 15. LIKE PET FLOWCHART	57
FIGURE 16. PSEUDOCODE OF RECOMMENDER SYSTEMS CASES	58
FIGURE 17. CONTENT-BASED RECOMMENDER SYSTEM PSEUDOCODE	60
FIGURE 18. COLLABORATIVE FILTERING RECOMMENDER PSEUDOCODE	62
FIGURE 19. ER DIAGRAM	63
FIGURE 20. NON-RELATIONAL DATA MODEL	64
FIGURE 21. NAVIGATION DIAGRAM	67
FIGURE 22. ADD PET CODE	71
FIGURE 23. ADD PET CODE	72
FIGURE 24. REQUEST CODE	73
FIGURE 25. PARTICIPANTS AGE DEMOGRAPHIC	85
FIGURE 26. PARTICIPANTS EDUCATIONAL LEVEL DEMOGRAPHIC	85
FIGURE 27. PARTICIPANTS GENDER DEMOGRAPHIC	86
FIGURE 28. UAT QUESTIONNAIRE RESULT CHART 1	86
FIGURE 29. UAT QUESTIONNAIRE RESULT CHART 2	87
FIGURE 30. UAT INTERVIEWS RESULT CHART 1	88
FIGURE 31. UAT INTERVIEWS RESULT CHART 2	88
FIGURE 32. ADOPTION HISTORY AFTER MODIFICATION	107
FIGURE 33. INTEGRATION HIERARCHY	159



List of Tables:

TABLE 1. COMPARISON TABLE OF COMPETITORS FEATURES	29
TABLE 2. PRODUCT BACKLOG.....	51
TABLE 3. ADD PET COMPONENT	55
TABLE 4. SEND REQUEST COMPONENT	56
TABLE 5. LIKE PET COMPONENT	57
TABLE 6. CONTENT-BASED RECOMMENDER SYSTEM COMPONENT	59
TABLE 7. COLLABORATIVE FILTERING RECOMMENDER SYSTEM COMPONENT	61
TABLE 8. ADD PET IMP.....	71
TABLE 9. VIEW PET IMP.	72
TABLE 10. REQUEST IMP.....	73
TABLE 11. LIKE IMP.....	74
TABLE 12. FILTER SEARCH IMP.	75
TABLE 13. CONTENT-BASED RECSYS IMP.	77
TABLE 14. COLLABORATIVE-FILTERING RECSYS IMP.	79
TABLE 15. GET CONTACT INFORMATION IMP.....	80
TABLE 16. SHARE IMP.....	81
TABLE 17. TEST INTERVIEW OUTLINE	89
TABLE 18. TEST INTERVIEW 1	91
TABLE 19. TEST INTERVIEW 2	93
TABLE 20. TEST INTERVIEW 3.....	95
TABLE 21. TEST INTERVIEW 4.....	97
TABLE 22. TEST INTERVIEW 5.....	99
TABLE 23. TEST INTERVIEW 6.....	101
TABLE 24. NFR TEST SCENARIO.....	102
TABLE 25. NFR TESTING	105
TABLE 26. INTERVIEWS OUTLINE.....	117
TABLE 27. INTERVIEW 1 TRANSCRIPTIONS	119
TABLE 28. INTERVIEW 2 TRANSCRIPTIONS	120
TABLE 29. INTERVIEW 3 TRANSCRIPTIONS	122
TABLE 30. USER STORY ACCEPTANCE TESTING	159
TABLE 31. INTEGRATION TESTING	169



إيواء | EWA

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Abstract (English):

People in Saudi Arabia in Riyadh who wish to adopt pets do not have an easy way to reach them. They must follow time-consuming and demanding methods, such as visiting animal shelters physically. Alternatively, they may have to rely on social media platforms to find pets, which may expose them to manipulation and deceit. This is because social media platforms are not reliable platforms for pet adoption. In order to solve these problems, an Android application was developed to spread awareness about pet adoption in Saudi Arabia by helping pet owners to find suitable homes for their pet, and by providing a recommender system that helps pet adopters to find and adopt the ideal pet easily. We implemented this project by using an Agile methodology. A recommendation-based Android application was developed to help users offer and adopt pets. Finally, we observed that users are satisfied with the provided solution since it helped them in saving time and provided them with a reliable platform for adoption that offers many useful features such as and not limited to suggesting pets based on the user's preferences.

Abstract (Arabic):

الأشخاص في المملكة العربية السعودية في مدينة الرياض الذين يرغبون في تبني حيوانات أليفة ليس لديهم طريقة سهلة للوصول إليهم. يجب أن يتبعوا طرفة تستغرق وقتاً طويلاً، مثل زيارة ملاجي الحيوانات. أيضاً قد يضطرون إلى الاعتماد على منصات التواصل الاجتماعي للعثور على حيوانات أليفة، مما قد يعرضهم للتلاعب والخداع. وذلك لأن منصات التواصل الاجتماعي ليست منصات موثوقة لتبني الحيوانات الأليفة، لأجل حل هذه المشكلة، تم تطوير تطبيق اندرويد لنشروعي حول تبني الحيوانات الأليفة في المملكة العربية السعودية من خلال مساعدة أصحاب الحيوانات الأليفة في العثور على منازل مناسبة لحيواناتهم ومن خلال توفير نظام التوصية لمساعدة الراغبين في تبني حيوان أليف. فمنا بتطوير وتنفيذ هذا المشروع باستخدام منهجية آجайл. ولقد تم تطوير تطبيق أندرويد قائم على نظام التوصية لمساعدة المستخدمين على عرض وتبني الحيوانات الأليفة بسهولة. أخيراً، لاحظنا أن المستخدمين راضون عن الحل المقترن لأنه ساعدتهم في توفير الوقت والحصول على تطبيق تبني موثوق به يوفر العديد من الميزات على سبيل المثال لا الحصر اقتراح حيوان أليف بناءً على تفضيلات المستخدمين.

Keywords: Adoption; Pet; Breeds; Pet owners; Pet adopters; Recommender System.

Introduction





1 Introduction

Owning pet can bring many benefits to people, such as: increasing happiness, reducing stress, relieving loneliness and encouraging exercise [1]. In order to own a pet, you need to either buy it from specialized stores, which, depending on the pet kind, can be expensive. The other option is to adopt a pet from a pet owner or an animal shelter.

Pet adoption can help preserve animal welfare, which is supported by the government and is an essential part of the teaching of Prophet Mohammed (ﷺ) that encourages treating animals with kindness, consideration and mercy [2]. In addition, pets adoption helps in offering them good permeant homes and can reduce the number of over-burdened pet owners and shelters [3]. However, pet adoption has not been given enough attention. Up to our knowledge there are no applications that support pet adoption in the kingdom of Saudi Arabia.

The purpose of our proposed application is to provide a platform to increase awareness regarding pet adoption in Saudi Arabia and facilitate communication between pet owners and pet adopters to make the adoption process more efficient. The rest of this section is divided as follows: first, we present the problem then the proposed solution as well as the scope. After that we present our product vision, then the software process methodology, followed by the main contribution and finally a summary of this entire report.

1.1 The Problem

People who wish to adopt pets do not have an easy way to reach them. They need to follow time-consuming and demanding methods, such as physically visiting animal shelters and waiting in different queues to fill adoption forms. Or they need to resort to social media platforms to search for available pets for adoption which could subject them to manipulation and deceit. That is because social media platforms are not reliable platforms for pet adoption, but adopters depend on them due to the lack of other reliable solutions.

In addition, people with an interest in pet adoption face a lot of difficulties during the search process, such as and not limited to not being able to find the pet breed they want especially if they have no background or previous experience of pet owning, thus it can be really challenging and time-consuming to search for a pet that meets their wants and needs,



keeping in mind the next obstacle that they might come across which is not being able to find detailed pieces of information about pets including their photos, healthcare, behavior histories, or descriptions of pet's personalities without a specific platform to reach for.

On the other hand, people who want or need to offer their pets for adoption go through the same difficulties not being able to take their pets to shelters, because shelters do not accept pets from the owner since their main focus is on rescuing only pets in need or due to shelters being already at full capacity, so pet owners only chose is to keep asking people if they want to adopt their pets or also use social media to reach for an adopter.

1.2 The Solution

The proposed solution is a mobile application dedicated to digitalize and facilitate pet adoption process in Saudi Arabia, and to solve the problem of using time consuming and unreliable methods for pets adoption, the application benefit pet owners by helping them to find loving and suitable homes to their pets, as well as helping pet adopters with finding and adopting their ideal pets easily.

The **EWAA** application provides the following features:

1. Registering and logging in/out from the application.
2. Adding / editing / deleting a pet for adoption.
3. Browsing available pets for adoption.
4. Categorizing pets by type, breed, and other features such as color, age and gender.
5. Adding likes for pets and sharing pets information through social media.
6. Initiating / receiving an adoption request.
7. Viewing sent / received adoption requests.
8. Cancel a sent adoption request.
9. Accepting / Rejecting an adopting request.
10. When the request is accepted, the phone number and email address of the pet owner and pet adopter are provided, where they can be contacted easily, so communication takes place outside the application.
11. Receiving notifications.



12. Viewing previous adoption history.
13. Providing pet recommendations and suggestions.

1.2.1 Scope

The main users of the application are pet owners and pet adopters located in Riyadh. The mobile application is developed for Android platform users only. It supports the Arabic language.

Currently the application focuses on two types of pets which are cats and dogs, because they are the most common choices of pets among pet lovers and owners according to the information we got from contacting pet shelters and owners. In the future other types of pets can be included in the application.

Listed below are some important clarifications regarding the application scope:

1. To protect the privacy of both pet owners and adopters, the application's primary function is to display information on available pets for adoption, rather than to display information on owners or adopters. The application only provides initial contact information like: phone number - email, once an adoption request is made and accepted.
2. The application does not handle agreements, regulations and laws handling pets.
3. The application does not handle the physical transfer of pets or sharing locations.

1.3 Product Vision

For pet owners and adopters who need to adopt pets or offer pets for adoption. The **EWAA** is a mobile application that facilitates and digitalize pet adoption or offers pets for adoption. Unlike other products in Saudi Arabia which just provide pets products and supplements, our product is the first application in Saudi Arabia to raise awareness towards pets adoption and digitalize the adoption process.



1.4 Software Process Methodology

The **EWAA** application is built using an **Agile** approach which is a software development methodology, where the project team cycles through several stages such as planning, designing, executing and evaluating to deliver small working parts of a software periodically and inspecting these delivered parts for any changes if needed. Following an **Agile** approach while building this application involved several iterations between different stages such:

1. Planning and discussing the requirements and objectives of the project.
2. Designing the software to identify software components and their relationships.
3. Developing the front end and back end of the software.
4. Testing and integrating the software to make sure it does what is expected from it.
5. Deploying the software.
6. Reviewing the software to ensure it meets the requirements.

1.5 Main Contribution

The **EWAA** application aims to facilitate and digitize the adoption process as stated before, because the main focus of our application is to raise awareness towards the pet adoption process in Saudi Arabia by providing a dedicated digital platform that allows pet owners to offer their pets for adoption easily, as well as to help pet adopters to find and adopt their ideal pet.

Compared to our competitors in Saudi Arabia of the pet domain, in general, all of their services are limited to displaying and providing pet supplies such as food, treats, etc. So, with **EWAA** being the first application dedicated to adopting pet in Saudi Arabia, we believe that the application will contribute to not only helping overcrowded pet shelters, but also supporting both of pet owners and adopters by providing an innovative and easy way to adopt pets online without resorting to unreliable and time-consuming methods.



1.6 Summary

This report introduces **EWAA** application, and it's organized through the following ordered sections: The introduction that set the scene of the project, the problem and solution. The background where we understood and analyzed the domain of the project. The literature review where we identified and analyzed our potential competitors. The system design and development where we specified the system methodology, requirements, system design, components design and implementation. The system evaluation where we tested the system with end users to make sure it meets its requirements. The conclusion and future work for the application. acknowledgments, references and finally appendices.

Background





2 Background

In this section we introduce some necessary information about recommender systems and pets.

2.1 Recommender System

A recommender system is a subclass of information filtering systems. Recommendation systems seek to make recommendations to predict a user's rating or preference for an item. Essentially, it suggests relevant items to users based on different algorithms [4]. Many websites and applications use recommender systems in fields such as healthcare, e-learning, nutrition, marketing, and many more.

Recommender systems can be broadly classified based on models. Models that use user-item interactions are collaborative filtering methods, while models that use attribute information about users and items are content-based recommender methods. Following we will present the most popular recommender models.

2.1.1 Collaborative Filtering Recommender Systems

The goal behind collaborative filtering is to take a user's opinion on various products or items and then recommend the best product or item to other users based on the user's past rankings and the opinions of other users of similar sorts. Collaborative filtering models do not necessitate many product attributes to function. Collaborative filtering is classified into two types: memory-based and model-based.

Advantages of using collaborative filtering models:

- It uses information collected from other users to recommend new items to the current user.
- Users can gain a larger exposure to a variety of products, which may lead to opportunities to persuade users to repeat purchases of products.

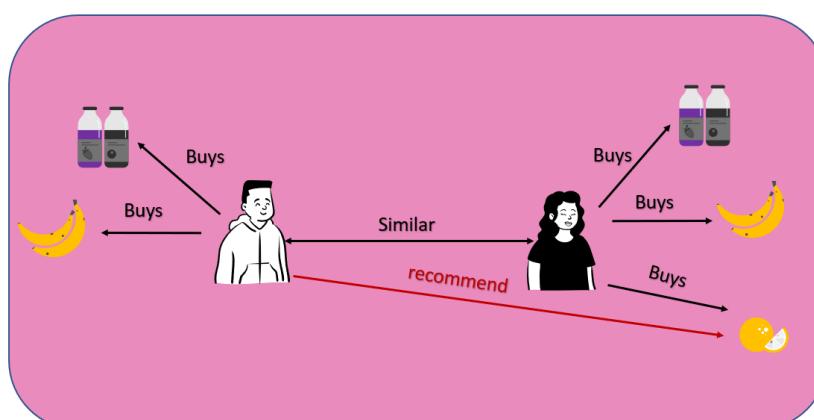


Figure 1. Collaborative filtering example

2.1.2 Content-Based Recommender Systems

Content-based recommender system makes recommendations based on the descriptive attributes of items. In response to the user's previous actions or feedback, it suggests similar items. (Aggarwal , 2018) [5] . This type of recommendation system treats the recommendation as a user-specific classification problem and then learns a classification based on the item's features for the user's likes and dislikes.

Advantages of using content-based models:

- It does not require any information about other users because the recommendations are exclusive to this user. This enables scaling to a big number of users easier.
- The model can capture a user's individual preferences and recommend specialized things that few other users are interested in.

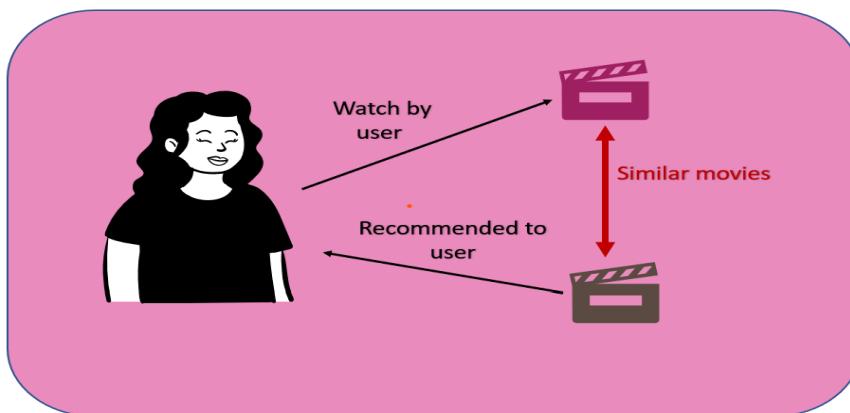


Figure 2. Content-Based example

2.2 Knowledge-Based Recommender Systems

Knowledge-based recommender systems are based on similarities between customer requirements, item descriptions or based on constraints that define the requirements of the user. It enables users to specify their needs clearly.

Advantages of using knowledge-based models:

- Assisting users in making knowledgeable decisions.
- Reviewing existing data and stored information to generate new knowledge.



2.3 Utility-Based Recommender Systems

The utility-based recommender system offers recommendations to the user depending on the utility of each object. The major benefit of using a utility-based recommender system is that it may integrate non-product variables like product availability into the utility computation. This enables the user to check the inventory of the object in real-time.

2.4 Demographic Recommender Systems

Demographic-based recommendation systems classify users and generate recommendations based on demographic classes. The algorithms must first conduct thorough market research in the targeted area, followed by a brief survey to collect data for categorization. The main advantage of using demographic-based recommender systems is that they do not require a history of user ratings [4]. In contrast to collaborative and content-based recommender systems, demographic models do not require a history of user ratings.

2.5 Hybrid Recommender Systems

When two or more recommendation systems are combined, a hybrid recommender system is created. many companies use this model since it integrates the capabilities of multiple recommender systems even while minimizing any flaws that may arise when only one recommender system is used [4]. Hybrid recommender systems have the advantage of examining collaborative data without relying only on it, reducing the system's sensitivity to the number of people who rated an item.

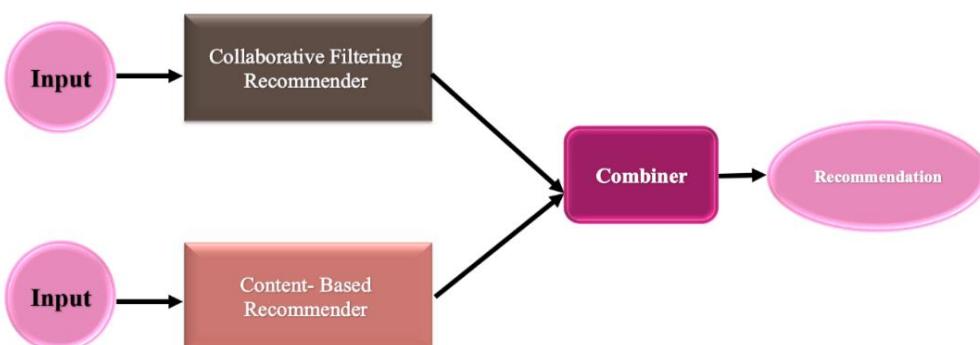


Figure 3. Hybrid Model example



As previously stated, our solution is an Android mobile application recommendation system which is based on content-based and collaborative filleting recommendation algorithms that provides adoptable pet recommendations. Content-based recommendation system depends on the data taken from the user about their pet. Using this data to generate a pet profile which is then used to suggest pets to the user. In contrast, the collaborative filleting recommender system uses previous interactions between customers and products to recommend new products. In addition, to construct this type of application, we required and used powerful languages such as Python that helped us build the recommendation algorithms.

Literature Review





3 Literature Review

In this section, we got a review of existing competitors. We examined competitors by defining and describing each one of them, as well as providing an explanation of their features, advantages, and disadvantages.

3.1 Competitive Product Analysis

3.1.1 Tbny Application



Name: Tbny-تبني

Overview: Tbny-تبني is the first Arabic mobile application in Egypt for pet adoption, it provides all type of pet for adoption, see figure 4 below.

Application Features:

- Register in the application.
- Add pets for adoption with information like age, gender, and city or country of pets.
- Find the nearest shelters and veterinary clinics.
- Blog with information and tips like how to care for pet, save them, etc.
- Help users find their lost pet by announcing them in the app.
- This application has the flexibility to change lost pets into pet that are found or remove them.
- View pet available for adoption.
- Changing the language.



Application advantages:

- Supports Arabic language.
- Supports changing the language.
- There is a blog to help users to care for pets.

Application disadvantages:

- It is limited to people in Egypt, not in Saudi Arabia.
- There is no filter search to help users find what they want easily.
- It does not provide the type or categories of pet that are available for adoption.

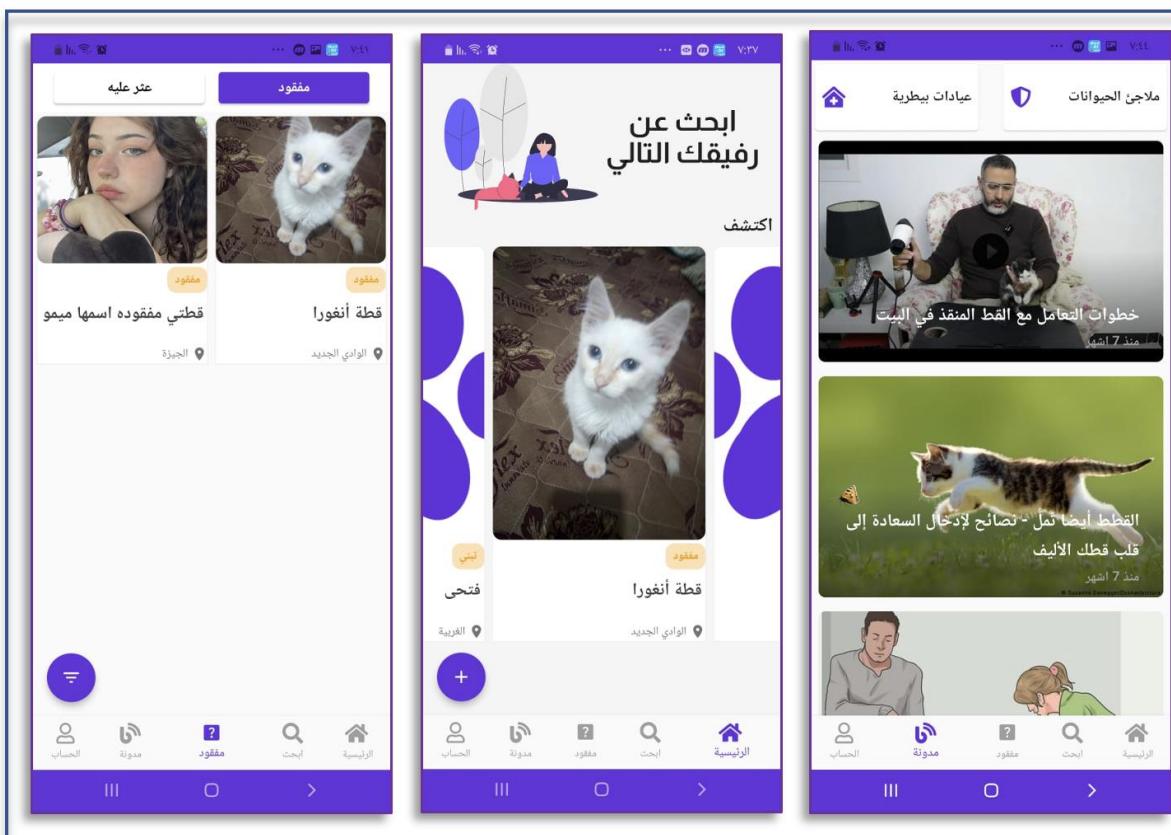


Figure 4. Tbny Application



3.1.2 Pet Adoption Application



Name: Pet Adoption

Overview: Pet adoption is a mobile application to adopt a pet or post pets for adoption. This application will help to find cute puppies, cats, rabbits, and any other pets that are searching for a new owner, see figure 5 below.

Application Features:

- Register in the application.
- When the user adds their location, the app suggests nearby pets and how much distance between them.
- Suggest new pets which are added to the application for adoption.
- Filter search based on the pet's category like a cat, dog, etc. And the date on which pets were added.
- Enables sharing pet information through social media.
- Views a list of pets that have already been adopted.

Application advantages:

- Provides a nearby pet and how much distance between the pet adopter and that pet.
- Helps use to search easily based on category and date.
- Provides a new pet which is added to the application for adoption.

Application disadvantages:

- Not supporting Arabic language.
- Difficult to use search feature; user should select the red square in figure 5 this way many users maybe did not know about this filtered search.

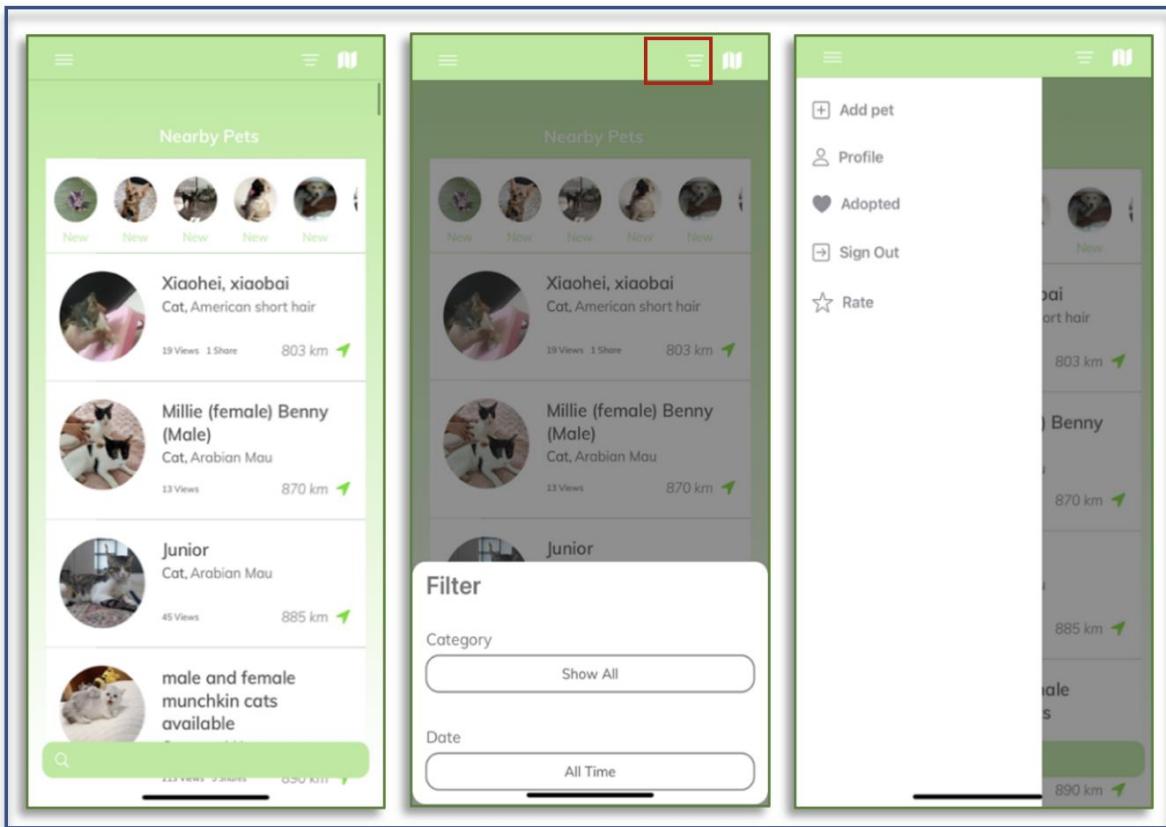


Figure 5. Pet Adoption Application



3.1.3 PetMatch Application



Name: PetMatch

Overview: PetMatch is a mobile application that enables users to add pets for adoption or breeding and they can check the profiles of the listed pet and chat with their owner for adoption or breeding, see figure 6 below.

Application features:

- Register in the application.
- Browsing cats, dogs, birds, reptiles, horses, fish and much more.
- Adding a new pet for adoption or breeding.
- Filtering based on pet characteristics and lifestyle preferences.
- Viewing the location of the selected pet and some details about the pet.
- Checking photos and videos of the selected pet.
- Sharing pet profiles with family and friends.
- Contacting with other pet owners and chatting easily.
- Adding pets to the favorites.
- Changing the language easily.

Application advantages:

- Simple interface.
- The existing filters are clear.
- Can't do anything before creating an account except view the profiles of the pet and filter the pet.



Application disadvantages:

- Not supporting Arabic language.
- Log in / register using a link that sends to the entered email rather than a regular username and password.

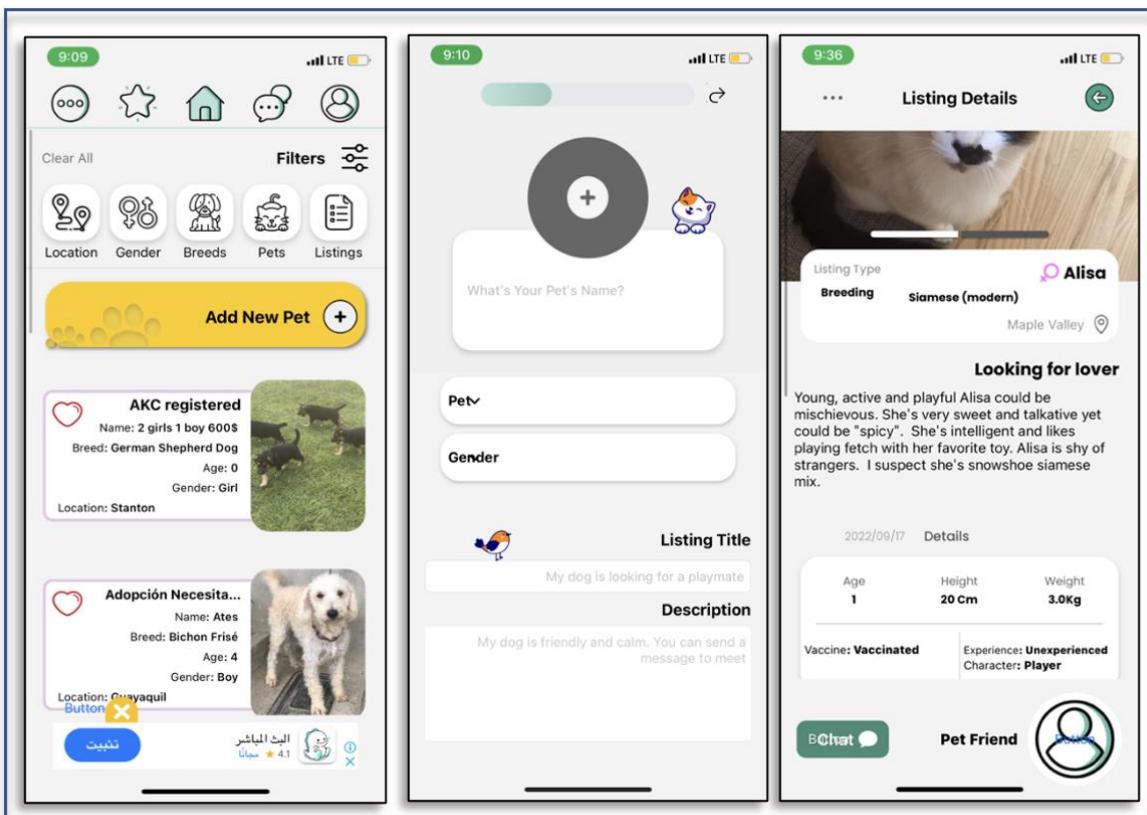


Figure 6. PetMatch Application



3.1.4 PetFinder Application



Name: PetFinder

Overview: PetFinder is a mobile application that aims to connect organization and pet shelters with pet adopters, by allowing adopters to browse and search for their favorite pets using the filter feature, and then the adopter sends an adoption inquiry to the charity so that the rest of application for adoption will be processed outside the website, see [figure 7](#) below.

Application features:

- Two registration options (pet owner or pet adopter).
- Adding a pet (One or multiple).
- Providing section of pet care and awareness.
- Browsing pet via categories like dogs, cats, shelters...etc.
- Searching for available pets by applying a filter.
- Sending adopters an available pet alert through SMS or email.
- Displaying available pet information like pics, name, breed, age, gender. etc.
- Providing owner or shelter information section.
- Enabling sharing pet's information through social media.
- Including like feature to add a pet to favorite pets list.
- Sending an adoption inquiry or request to pet owner.

Application advantages:

- Helps adopters to know the story behind offering this pet for adoption.
- The application provides general information and tips about pets for new adopters (cat adoption articles, dog adoption articles).
- The application has a friendly user interface.



Application disadvantages:

- Not supporting Arabic language.
- The application is limited to the United States Appstore.

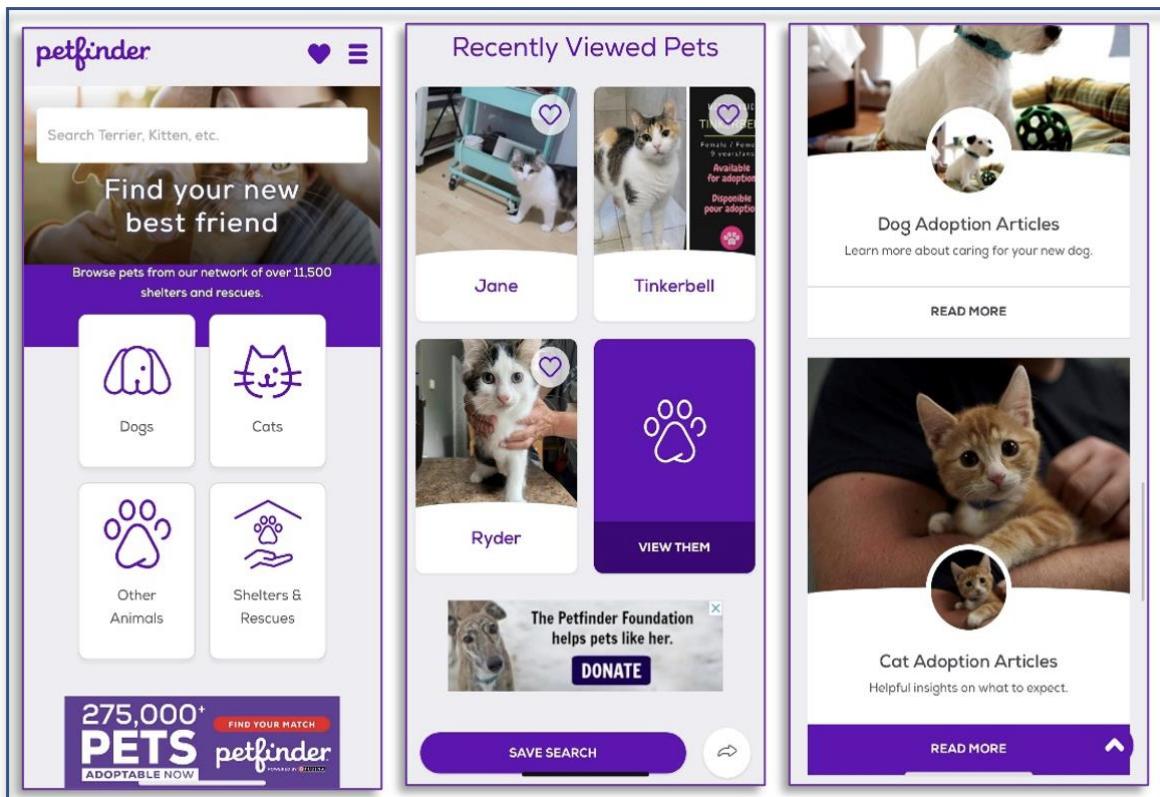


Figure 7. PetFinder Application



3.1.5 Pet Adopter Application



Name: Pet Adopter

Overview: Pet adopter is an application for mobile phones in which the adopter or the owner of the pet is required to register first, and then it allows owners of pets to offer their pets for adoption by listing the pet's information, his story and the owner's information in the application so that the adopters can reach them, see [figure 8](#) below.

Application features:

- Two registration options (pet owner or pet adopter).
- Adding a pet (One or multiple).
- Adding pet's information like pics, name, breed, age, gender. etc.
- Adding pet's story and needs.
- Search for pets by applying filter on all pet characteristics.
- Search for pets by location.
- Search by writing animal type, breed, details.
- Displaying available pets by their pics and quick information.
- Providing a like feature to add a pet to your favorite pets list.
- Providing messages section or chat rooms between pet owners and adopters.
- Providing a section for pet's posts, where people can post about adoption offers and requests.
- Like and reply on a post about a pet.



Application advantages:

- The application provides a section for pet's posts, where people can post about adoption offers and requests, or they even can discuss anything related to pets in this section, which creates a network of pet lovers.
- The application provides flag option to flag inappropriate pets offers or fake adoption offers.

Application disadvantages:

- Search for a pet by applying filter results is not accurate.
- The provided pet owner's information is unreliable, or some owners enter fake information.
- Messages section or chat rooms is not clear because it doesn't show who's the sender and receiver.
- The account page doesn't show the desired information.
- Not a very friendly user interface.

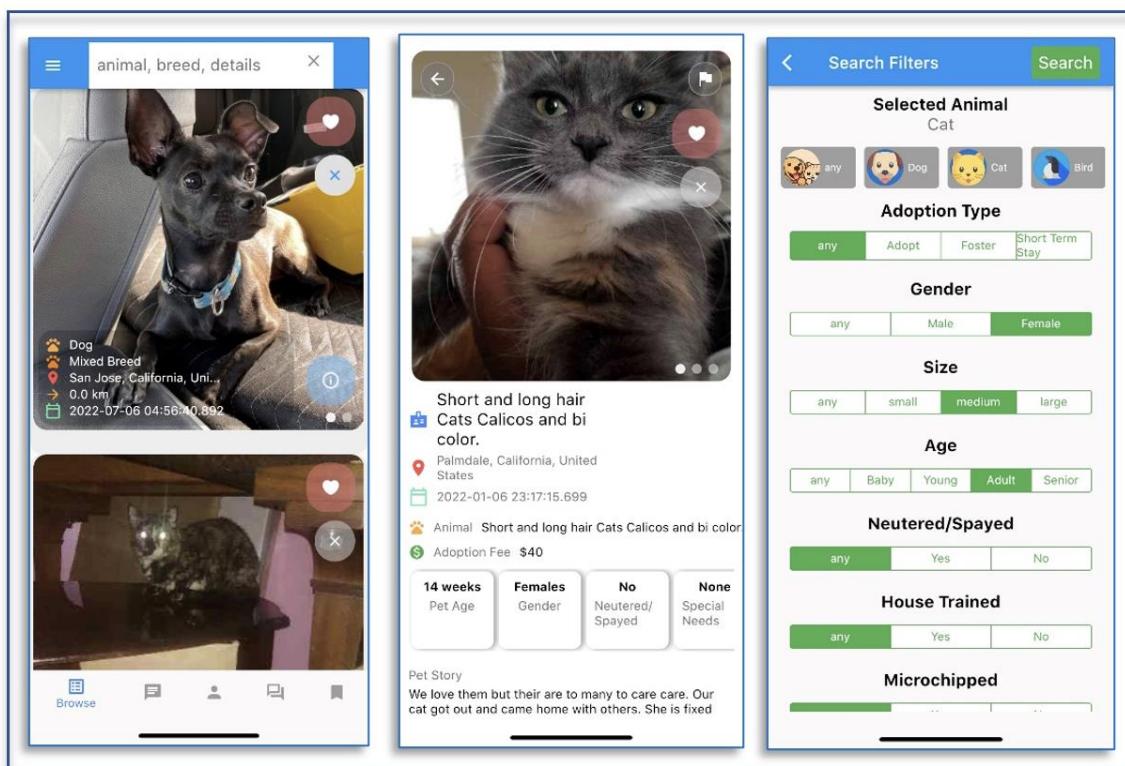


Figure 8. Pet Adopter Application



3.2 Comparison Table of Competitors Features

Applications / Features	تبني	Pet Adoption	PetMatch	petfinder	Pet Adopter	ابواء (Our application)
Registration for pet owner and adopter.				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Browse categories for pets.				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Filter search.		<input checked="" type="checkbox"/>				
Send adoption request.				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Provide nearby pets for adoption (search by location).		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Add pets for adoption.	<input checked="" type="checkbox"/>					
Available pet alert through SMS or email.				<input checked="" type="checkbox"/>		
Supports the Arabic language.	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>
Section of pets' care and awareness (Blog of information and tips about pets).	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Provide suggestions of pets based on the user preferences (recommender system).				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Like or add pets to your favorite.			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Share pets' profiles through social media.		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
Messages section or chat rooms.			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Owners' and adopters' information is kept private unless the adoption request is accepted.						<input checked="" type="checkbox"/>
Attractive interface				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>

Table 1.Comparison table of competitors features

System Design and Development





4 System Design and Development

4.1 Methodology

We implemented this project using an [Agile](#) development methodology. [Agile](#) is a type of software development methodology that focuses on the clean delivery of individual pieces or part of the software and not on the entire application. [Agile](#) is the best methodology for this project because the requirements of our system usually change rapidly during the development process, also because we need to deliver a working software quickly to the users who can then propose new changes and requirements to be included in the next iteration.

[Agile](#) has different frameworks but our chosen framework is [Scrum](#), it is an [Agile](#) development methodology based on incremental and iterative development of a software. And it helps teams' structure and manage their work to set values, principles and practices [6]. [Scrum](#) requires three key roles: scrum master, product owner, and development team. Scrum masters guide teams and ensure scrum is done correctly. Additionally, a product owner understands the needs of stakeholders and customers and prioritizes the work accordingly. Finally, the development team is a group of skilled developers. They will develop the project jointly and carry out the stories they committed to at the start of each sprint [7].

[Scrum](#) facilitates the adaptation of product, process and progress through using sprints, sprint planning, daily scrum, sprint review and sprint retrospective. Sprints break down a project into small units of work. Depending on the results of the previous sprint, the team plans future sprints accordingly. Moreover, the daily scrum serves as an evaluation and synchronization meeting for all aspects of the sprint. A sprint review shows what work has been completed for future deliveries in the product backlog. During a sprint retrospective, the team reviews the completed goals and writes down what went well and what went wrong to avoid repeating any mistakes.

Artifacts are another element of [Scrum](#). In decision-making, scrum artifacts provide key information transparency. The product backlog is a prioritized list of all the user's requirements and everything that needs to be done to complete the project, the sprint backlog is a subset of the product backlog containing the work that needs to be done in the current sprint, and increments are the sum of all the products, tasks and use cases.



In the **Agile** methodology we are breaking up the work into small tasks, so since the start, the team has divided all the needed work into user stories, which represent features that users need and want. In **EWAA** project, the scrum framework was used to establish the product backlog and sprint backlog. Each sprint contained a set of user stories that made a usable product for users. Sprints two and three lasted for about 3 weeks and sprint four lasted for about 4 weeks. Before the start of each sprint the team plans for it to make sure they understand the user stories and features that should be implemented in the current sprint. While, during the sprint, the team meets weekly with the supervisor to review and discuss progress. The supervisor reviews the output of every sprint in addition to discussing the workflow and the work that has been done by the team.

Tools we used:

Jira: The Jira software is used to organize scrum-related tasks such as tracing progress, organizing sprint backlogs, and documenting meetings [\[8\]](#).

GitHub: GitHub is a free code hosting application for version control and collaboration. It allows us to work together on the Ewaa project from anywhere, as well as track our work [\[9\]](#)

[GitHub Ewaa.](#)



4.2 System Requirements

4.2.1 System Users

Our application potential users are pet owners and pet adopters. Pet owners can be a person or a shelter representative. Our users are assumed to be 18 years or older. Our user needs an internet connection to use **EWAA** application. User is not requiring a high level of technical expertise; all they need to do is understanding the Arabic language and how to use the internet, in order to upload pets that need to be adopted, send adoption requests, accept or reject an adopter's request, complete registration, etc.

Users are assumed to be responsible adults who have the financial ability to provide the necessary care for pets and keep them safe. Also, they need to be familiar with using WhatsApp for phone numbers or email to communicate and complete the adoption process outside our application if needed.

4.2.2 Requirements Elicitation and Analysis

We used interviews and questionnaires to elicit our requirements, in this section we briefly review our results. Interviews, questionnaire questions and transcriptions details and results are listed in [Appendix A and B section](#).

4.2.3 Interviews Results

We conducted three interviews. Two out of three interviewees are conducted with pet owners. All of our interviewees are interested in the pet adoption process. Most of the interviewees have thought of offering their pets for adoption due to reasons like proliferation of pets or a family member has an allergy to pets. Some of the difficulties they face while offering their pets for adoption are how to find a reliable platform for adoption, and how to find a trustworthy adopter. All the interviewees are interested in having an application that facilitates pet adoption process, they suggested useful application features. Additionally, interviewees provided useful information they wish to know about a pet before adopting it. See [Appendix A](#) for more details.



4.2.4 Questionnaires Results

In the questionnaire phase 55 questionnaires have been conducted. Our sample consisted of 85.5% female and 14.5% male. The age of the majority of the responders was between 19 and 24 years and most of them had a college or high school degree. We asked 11 closed-ended questions and 1 open-ended question. We found that while 43.6% of respondents had no prior experience with pets, 56.4% of respondents have a pet or they have owned one before, we noticed that 45.8% of respondents who don't have a pet want to adopt a pet. Also, we found that 48.4% of pet owners thought that they may encounter difficulties offering their pets for adoption, and this can indicate that there is a high rate of pet owners who still and will face the same difficulties. In the open-ended question, we asked the users to name important features they like to have in the application. We received many helpful suggestions which we used to elicit our requirements. See [Appendix B](#) for more details.



4.2.5 User Interactions

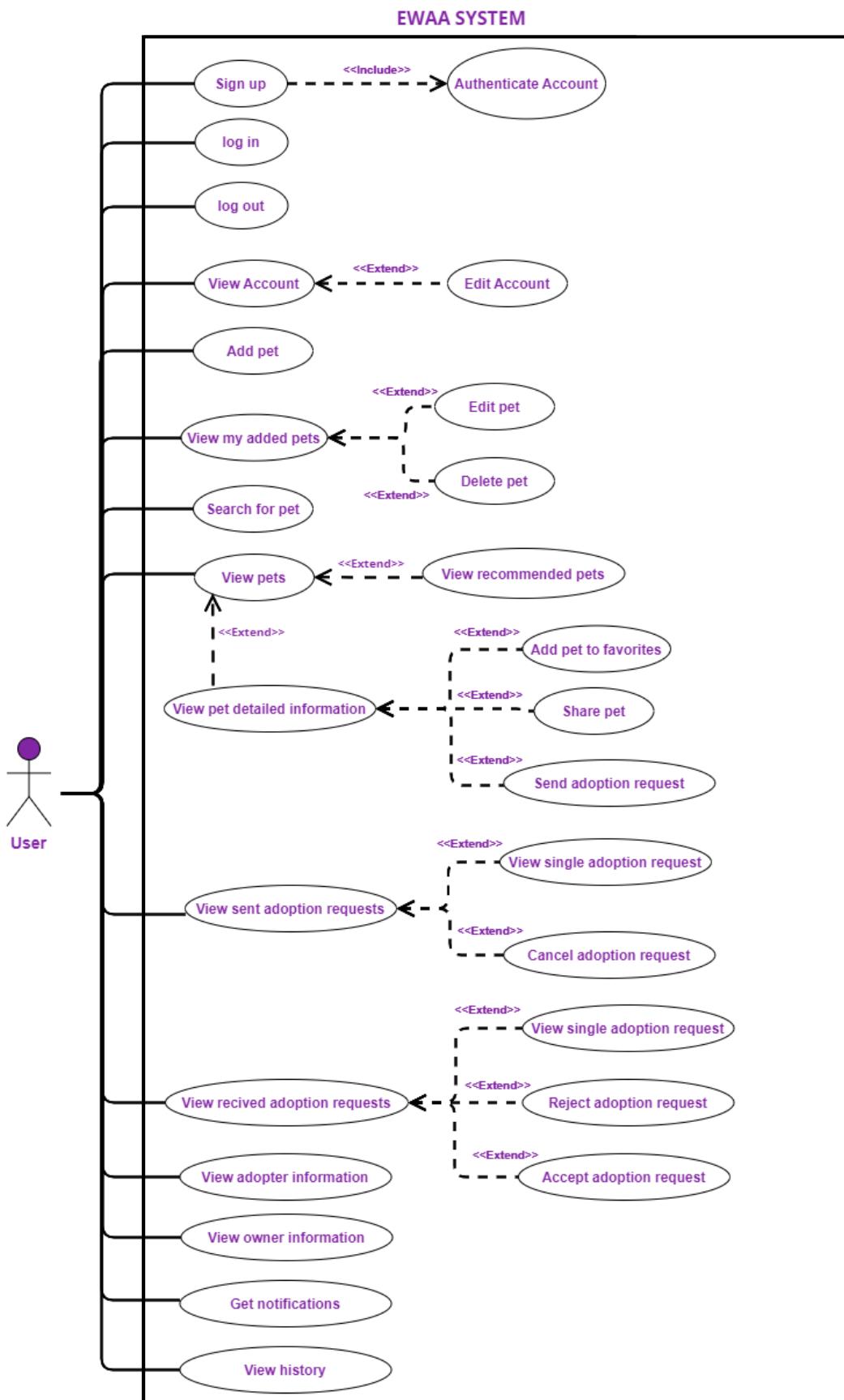


Figure 9. Use case diagram



4.2.6 Roadmap and Product Backlog

• Roadmap

In the beginning, we analyzed the domain of the project, and we prepared the environment and set up the tools and downloaded all the necessary programs that we needed for the development like Xcode IDE, Visual Studio Code, dart language, and PyCharm. After that, in sprint 1, we started with developing many features which are: registering and signing into the app, adding/deleting pet for adoption, viewing available pet information, and testing that. In sprint 2, we developed: browsing and categorizing available pets for adoption by many features, adding a pet to the favorite pet section, and sharing pet profiles on social media. For sprint 3, we worked on allowing users to send/receive adoption requests, view adoption requests, accept/reject adoption requests, as well as providing a recommender system on the pet, and view owner contact information. For sprint 4, we worked on providing users with a content-based and collaborative filtering recommender system, viewing history, and receiving notifications. Finally, on sprint 5, we implemented the UAT of the application and we completed the document and delivered a complete mobile application.

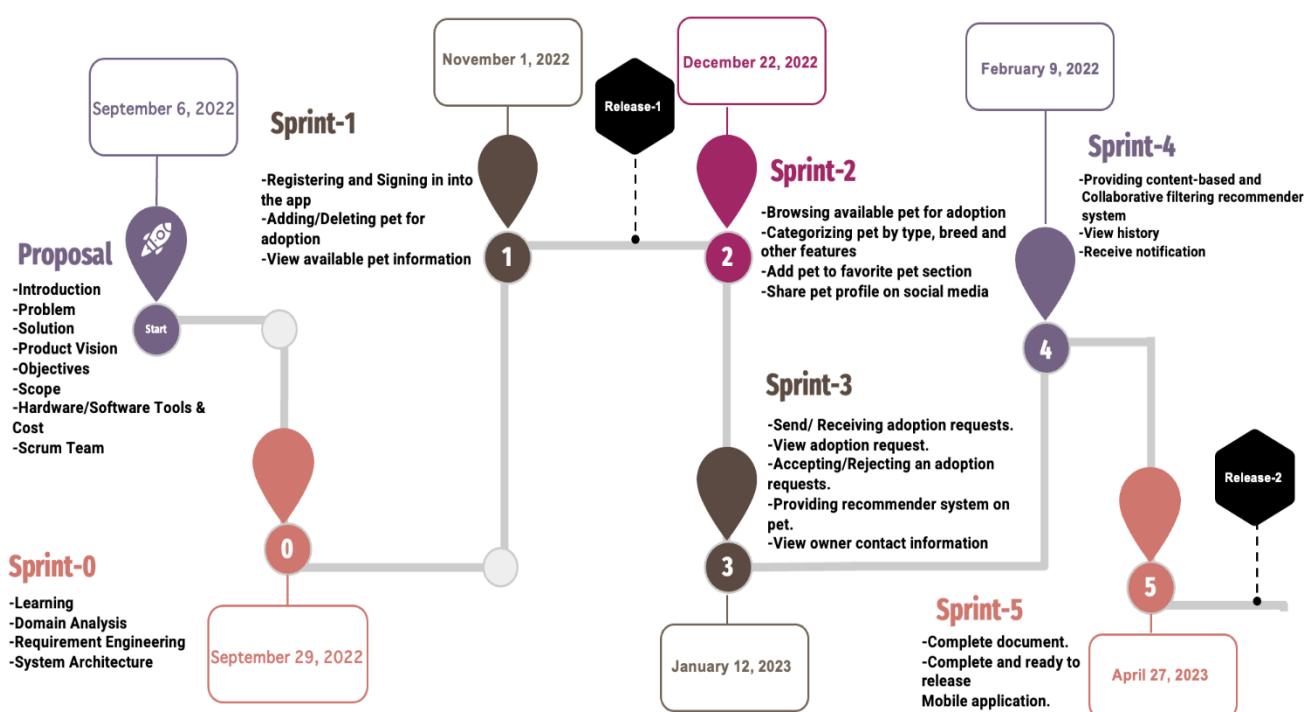


Figure 10. Road map



- Product Backlog

ID	PBI	Size	Type	Status	Acceptance Criteria
1	As a user, I want to sign up, so that I can create my own account in the application.	3	Feature	Done	<p>Given I am a user, if I go to the sign-up page and fill in all required fields (username, email, mobile number, password and repeated password) correctly and click on sign up, then a message should appear indicating that I am signed up successfully.</p> <p>Given that I'm a user, if I go to the sign-up page, fill out all the required fields, but my mobile number isn't Saudi (Saudi number should start with 9665 and be 12 characters long, or start with 5 and be 9 characters long or start with 05 and be 10 characters long) then I'll get a message saying that the mobile number is incorrect and the sign up won't be successful.</p> <p>Given I am a user, if I go to the sign-up page and fill in all required fields but the password is less than 6 characters then there is a message that indicates the password is not correct and the sign up will not be complete.</p> <p>Given I am a user, if I go to the sign-up page and fill in all required fields but the repeated password is not the same as the password then there is a message that indicates the password does not match and the sign up will not be complete.</p> <p>Given I am a user, if I go to the sign-up page and forget to complete one or all required</p>



					<p>fields and click to sign up then there is a message indicating me to complete these required fields.</p> <p>Given I am a user, if I go to the sign-up page and fill all required fields but the email is already existed in the firebase then there a message indicts me that email is already exist and the sign up will not complete.</p> <p>Given I am a user, if I go to the sign-up page and fill all required fields but the email is not correct like doesn't contain @ and .com then there a message indicts me that email is not corrects and the sign up will not complete.</p>
2	As a registered user, I want to log in with my email and password, so that I can access my account.	3	Feature	Done	<p>Given I am a user, if I go to the login page and enter my email and password correctly and click on log in, then the system should allow me to access my account successfully.</p> <p>Given I am a user, if I go to the login page and enter my email but the password is not correct then there is a message that indicates to me that the password is not correct, and the login will not complete.</p> <p>Given I am a user, if I go to the login page and enter my email and password but the email does not exist in firebase then there is a message indicate me that email does not exist, and the login will not complete.</p> <p>Given I am a user, if I go to the login page and then click on log in button without filling</p>



					<p>all the fields then there is a message indicate me to complete the empty fields.</p> <p>Given I am a user, if I go to the login page and enter my email and password correctly but my email not authenticated yet, then there is a message indicate me to authenticate my email first.</p>
3	As a registered user, I want to reset my password, so that I can access my account when I forget password.	1	Feature	Done	<p>Given I am a user, if I go to the login page and click on forget password, then it will direct me to a page asking for my email, and after I enter my email and click send, a message will appear letting me know that a link to reset my password has been sent to my email. Once I click this link and change my password to a new one, the system should assist me in logging in using the new password.</p> <p>Given that I'm a user, if I go to the login page and click on forget password, it will take me to a screen that asks for my email, then I enter an email doesn't exist, however, after I input it, a message will appear to let me know that it doesn't exist and the link of reset my password won't be sent.</p>
4	As a logged in user, I want to log out easily, so that I can keep my account secure from people who may be using my devices.	1	Feature	Done	<p>Given I am a user, if I go to my profile and then click on the log out button, then the system should remove all my authentication information from the application and then it will direct me back to the home page.</p> <p>Given I am a user, if I go to the menu and then click on the log out button, then the system should remove all my authentication information from the application and then it will direct me back to the home page.</p>



					<p>Given I am a user, if I go to the add page (no1) and complete all the fields and click on the next button then it will direct me to the add page (no2) successfully.</p> <p>Given I am a user, if I go to the add page (no1) and complete all the fields except the pet's name and click on the next button then it will direct me to the add page (no2) successfully.</p> <p>Given that I am a user, if I go to the add pet page and upload my pet image, then the image appears to me, and it should allow me to change the image if I want.</p> <p>Given I am a user, if I go to the add page (no1) and complete all the fields and click on the next button then it will direct me to the add page (no2) and the personalities that display there should be those of the breed I choose.</p> <p>Given I am a user, if I go to the add page (no1) and complete all the fields except the pet (image/breed/type/gender/color/age) and click on the next button then there is a notify message indicate me to complete this required fields.</p> <p>Given I am a user, if I complete the add page (no1) successfully and then complete all the fields of the add page (no2) and click on the add button then a message should appear to confirm the success of adding the pet.</p>
5	As a logged in user, I want to add my pets for adoption so that people can find my pets to adopt it.	5	Feature	Done	



					<p>Given I am a user, if I complete the add page (no1) successfully and then complete all the fields of the add page (no2) and except the fields (reasons for offering the pet to the adoption/ pet supplies / personalities) and click on the add button then a message should appear to confirm the success of adding the pet.</p> <p>Given I am a user, if I complete the add page (no1) successfully and I click on the next button then it will direct me to the add page (no2) and in this page if I answer “yes” about if my pet has health profile or not then a field will appear to ask me about the name of hospital.</p> <p>Given I am a user, if I complete the add page (no1) successfully and I click on the next button then it will direct me to the add page (no2) and in this page if I answer “no” about if my pet has health profile or not then the field of the name of the hospital will not appear.</p> <p>Given I am a user, if I complete the add page (no1) successfully and then complete all the fields of the add page (no2) except (inoculation /neutering/health passport/health profile/name of hospital ‘if the pet has health profile ‘) and click on the add button then there is a notify message indicate me to complete this required field .</p>
6	As a logged in user, I want to view my added	2	Feature	Done	Given I am a user, if I go to (my profile / the menu) and click on my pets, then I should see all my added pets along with their information.



	pet, so that I can see my added pet information.				Given I am a user, if I go to (my profile / the menu) and then click on my pets button but I don't have pets, then a notice will let me know that I don't have any pets.
7	As a logged in user, I want to edit my pet's information, so that I can keep my pet's information updated.	3	Feature	Done	<p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change or delete the pet's name in the edit page(no1) and click on the next button then it will direct me to the edit page (no2) successfully.</p> <p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change the pet (breed /color/ age/ gender/ image) in the edit page(no1) and click on the next button then it will direct me to the edit page (no2) successfully.</p> <p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change the pet type in the edit page(no1) and click on the next button then there is a notify message indicate me to select the pet breed.</p> <p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change the pet type and then select the pet breed in the edit page(no1) and click on the next button then it will direct me to the add page (no2) successfully.</p> <p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change or delete the fields of (reasons for offering the pet to the adoption/ pet supplies / pet</p>



				<p>personalities) in the edit page(no2) and click on the update button update then a message should appear to confirm the success of editing my pet's information, and this update should appear in my pet's information page.</p> <p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change (inoculation /neutering/health passport/health profile 'change it to "no") in the edit page(no2) and click on the update button then a message should appear to confirm the success of editing my pet's information, and this update should appear in my pet's information page.</p> <p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change (health profile to 'yes') in the edit page(no2) and click on the update button without filling the name of the hospital then there is a notify message indicate me to complete this required field.</p> <p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change (health profile to 'yes') in the edit page(no2) and then fill field of (the name of the hospital)and click on the update button then a message should appear to confirm the success of editing my pet's information, and</p>
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					this update should appear in my pet's information page.
8	As a logged in user, I want to delete my pet, so that I can be more flexible when it comes to adding my pets for adoption.	3	Feature	Done	<p>Given I am a user, if I go to my added pets page and then click on the delete button on a pet, then a warning message will appear to confirm the deletion, and if I click on ok button, then my pet should be deleted from my added pets list and from available pets for adoption in the application.</p> <p>Given I am a user, if I go to my added pets page and then click on the delete button on a pet and then click on delete my pet button, then a warning message should appear to confirm the deletion, and if I click on cancel button, then the pet shouldn't be deleted from my added pets list.</p>
9	As a logged in user, I want to view my account, so that I can see my account information.	2	Feature	Done	Given I am a logged-in user, if I click on the account icon located in the top nav bar, then I should be directed to my account page to see all my information that is associated to my account.
10	As a user, I want to view detailed information about the selected pet, so that I can learn more about the pet to adopt it.	2	Feature	Done	Given I am a user, if I select a pet by clicking on view pet button, then I should be directed to its page that shows its detailed information.
11	As a user, I want to view available pets categories, so that I can find the desired pets category faster.	1	Feature	Done	Given I am a user, if I go to the application home page, then I should view the available pets categories so that I can select what category I want to explore more.
					Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I upload my personal image,



12	As a logged in user, I want to edit my account, so that I can keep my account and information updated.	3	Feature	Done	<p>then the image appears to me, and it should allow me to change the image if I want.</p> <p>Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I change my (name/mobile number) correctly and click on the update button without/uploading my personal image, then a message should appear to confirm the success of editing my account.</p> <p>Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I remove my (name/mobile number) and click on the update button, then there is a message indicating me to complete these required fields.</p> <p>Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I change my name and click update button, then a message should appear to confirm the success of editing my account.</p> <p>Given I am a logged-in user , if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I change my mobile number but the mobile number isn't Saudi (Saudi number should start with 9665 and be 12</p>
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					<p>characters long, or start with 5 and be 9 characters long or start with 05 and be 10 characters long) and click on the update button ,then I'll get a message saying that the mobile number is incorrect.</p> <p>Given I am a logged-in user , if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I change my mobile number and the mobile number is Saudi (Saudi number should start with 9665 and be 12 characters long, or start with 5 and be 9 characters long or start with 05 and be 10 characters long) and click on the update button , then a message should appear to confirm the success of editing my account.</p>
13	As a user, I want to search for available pets that match my preference, so that I can find available pets that match my preferences faster.	5	Feature	Done	<p>Given I am a user, if I click on the filter bar in the (home page / pets list page), then I should be directed to a filter page that allows me to choose my preferences on the pet based on their (type, breed, color, gender, age), and if there are results that match my preferences, then it will show it.</p> <p>Given I am a user, if I click on the filter bar in the (home page / pets list page), then I should be directed to a filter page that allows me to choose my preferences on the pet based on their (type, breed, color, gender, age), and if there aren't results that match my preferences, then there is a message indicating me that there are no pets available that match my preferences.</p>



					<p>Given I am a user, if I click on the filter bar in the (home page / pets list page) , then I should be directed to a filter page that allows me to choose my preferences on the pet based on their (type, breed, color, gender, age), and if I use the filter search and then click on the reset icon , then the filter search will reset and will show all the available pets.</p>
14	As a user, I want to view available pets for adoption that match my search criteria, so that I can select a suitable pet.	5	Feature	Done	<p>Given I am a user, if I searched for a pet using the filter search, and there are available pets that match with my search then I should be able to view a list of available pets that match my search criteria.</p> <p>Given I am a user, if I searched for a pet using the filter search, and there aren't available pets that match with my search, then there is a message indicating me that there are no pets available that match my search criteria.</p>
15	As a user, I want to add a pet to the favorites pets section, so that I can check it later.	3	Feature	Done	<p>Given I am a user, if I click on the favorites button (empty heart) on a pet profile, then this profile will exist in my pets favorites section and this button will change to (filled heart).</p>
16	As a user, I want to remove a pet from the favorites pets section, so that I can be flexible when I like pets.	3	Feature	Done	<p>Given I am a user, if I click on the favorites button (filled heart) on a pet profile, then this pet profile will be removed from my favorites pets section and this button will change to (empty heart).</p>
17	As a user, I want to share a profile of a pet throw social media, so that I can show it to people who are interested to adopt pets.	2	Feature	Done	<p>Given I am a user, if I click on the share button on a pet profile, then this pet's information will be shared through the social media platform that I will select.</p>



18	As a user, I want to authenticate myself with my email when I register so that I make sure that the email I have entered is correct.	2	Feature	Done	<p>Given I am a user, if I go to the sign-up page and fill all required fields and the email does not correct (not real) and click on the sign-up button, a link will be sent to the entered email ,since the user can't click on the link , his/her account will not be authenticated and then he/she can't log in.</p> <p>Given I am a user, if I go to the sign-up page and fill all required fields and the email was correct (real) and click on the sign-up button, a link will be sent to the entered email, if the user clicks on the link , his/her account will be authenticated and then he/she can log in.</p>
19	As a user, I want the application to authenticate my email and password, so that I can ensure that the application is secured.	3	Feature	Done	Given I am a user, I want the application to authenticate my email and password, by sending me an authentication email to my email address while the sign-up process and then log in using this email and the password.
20	As a logged in user, I want to send a pet adoption request, so that I can get an Accept/reject response from the owner of the pet.	5	Feature	Done	<p>Given I am a user, if I select a pet and click on view the detailed information and after that click on send adoption request, if I didn't complete filling (the information required for adoption) page then this page will appear and if I fill all the fields and then click on save button, and then click on send adoption request button again, then a message should appear to confirm the success of sending the adoption request.</p> <p>Given I am a user, if I select a pet and click on view the detailed information and after that click on send adoption request, if I complete filling (the information required for adoption) page, then a message should</p>



					appear to confirm the success of sending the adoption request.
21	As a logged in user, I want to view received adoption requests on my pet, so that I can find a suitable adopter for my pet.	3	Feature	Done	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on received adoption requests button, then the system should display to me all the received adoption requests.
22	As a logged in user, I want to view a sent pet adoption request, so that I can see my adoption request information and status.	3	Feature	Done	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on sent adoption requests button, then the system should display to me all the sent adoption requests.
23	As a logged in user, I want to cancel a sent pet adoption request, so that I can be more flexible in sending/canceling adoption requests.	5	Feature	Done	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on sent adoption requests button and then click on the cancel adoption request button on a pet, then a warning message should appear to confirm the success of canceling the adoption request.
24	As a logged in user, I want to accept the adoption request on my pet, so that I can approve a suitable adopter.	3	Feature	Done	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on received adoption requests button and then click on the accept adoption request button on a pet, then the system should show me the adopter contact information. Given I am a user, if I go to the notification and after that click on a received adoption request and then click on the accept adoption



					request button, then the system should show me the adopter contact information.
25	As a logged in user, I want to reject the adoption request on my pet, so that I can be more flexible to decline an adopter.	3	Feature	Done	<p>Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on received adoption requests button and then click on the reject adoption request button on a pet, then the system will not show me the adopter contact information.</p> <p>Given I am a user, if I go to the notification and after that click on a received adoption request and then click on the reject adoption request button, then the system will not show me the adopter contact information.</p>
26	As a logged in user, I want to view adopter contact information when I accept his/her adoption request, so that I can get in touch with them easily after approving their request.	2	Feature	Done	Given I am a user, if I add my pets for adoption and the adopter sends me an adoption request, if I accept his/her request, then I should view the adopter's contact information (mobile number, email).
27	As a logged in user, I want to view owner contact information when she/he accept my adoption request, so that I can get in touch with them easily after accepting my request.	2	Feature	Done	Given I am a user, if I send an adoption request, and the pet's owner accept my request, then I should view the owner's contact information (mobile number, email).
28	As a user, I want to view the recommended pets in the application, so that I can see pets that could match my preferences.	5	Feature	Done	Given that I am a user, I can view two types of recommendations based on content and collaborative filtering if I go to the homepage.



29	As a logged in user, I want to view my history, so that I can see previous pets I have adopted.	5	Feature	Done	Given I am a user, if I go to (my account / the menu) and click on my previous adoption processes, then click on ‘pets I have adopted’ button, then I should see all previous pets I have adopted.
30	As a logged in user, I want to view my history, so that I can see previous pets that someone has adopted from me successfully.	5	Feature	Done	Given I am a user, if I go to (my account / the menu) and click on my previous adoption processes, then click on ‘pets adopted from me’ button, then I should see all previous pets that someone has adopted from me successfully.
31	As a logged in user, I want to receive notifications from the application when I receive new adoption request, so that I can be notified when I receive one.	2	Feature	Done	Given I am a user, if I click on the notifications section in the application, then a list of received adoption requests notifications should be displayed to me.
32	As a logged in user, I want to receive notifications from the application when my sent adoption request is accepted, so that I can be notified if my adoption request is accepted.	2	Feature	Done	Given I am a user, if I click on the notifications section in the application, then a list of accepted adoption requests notifications should be displayed to me.
33	As a logged in user, I want to receive notifications from the application when my sent adoption request is rejected, so that I can be notified if my adoption request is rejected.	2	Feature	Done	Given I am a user, if I click on the notifications section in the application, then a list of rejected adoption requests notifications should be displayed to me.

Table 2. Product Backlog



4.3 System Design

4.3.1 Architectural Diagram

We used a **client-server** system architecture for our mobile application architecture, because this type of architecture matches our project's goal, since we will have data stored in a shared database that can be accessed from a range of locations, as shown in [figure 11](#) below, which will be discussed in the following paragraph. In addition, the client-server architecture is used when the flow of the data forms a cycle which means that the client requests some data then the server processes the request and sends some data back to the client via a protocol, and that's why the **client-server** architecture is also known as **Request-Response** architecture.

There is only one user in the **EWAA** application, this user can interact with the system as a pet owner or an adopter, while still having the same sign-in page and features. As an example, if a user adds a pet to the system and accepts or rejects an adoption request, that user is considered to be the owner of that pet. Users who are viewing recommended pets, searching for pets, and sending adoption requests are considered to be pet adopters. The owner of a pet may become the adopter of a pet, and the other way around. Using a **Dart** language interface and a **Flutter** framework interface, **EWAA** application connects users to collect their data, to build recommendations depending on how users interact with the system (such as: like). After gathering data, the application sends it to the Firebase database, which is a cloud-based database. In order to make pet recommendations for each user, recommendation algorithms will acquire data, such as a favorite list of pets based on a user's ID through Firebase. A list of recommended pets will be submitted to the **EWAA** application and displayed on the home page as illustrated in [figure 11](#) below.

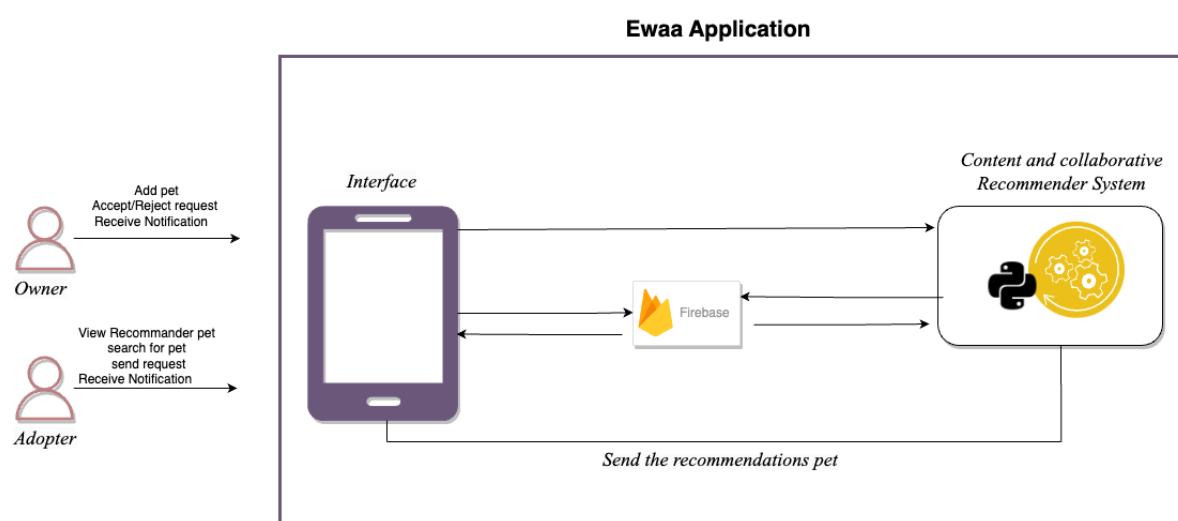


Figure 11. Architectural Diagram



In addition to the above information, there are some other systems architectures that do not meet our project's objectives and requirements, such as: repository architecture that consists of a central data structure (e.g. Database) and a collection of independent components that operate from that central data structure [31]. This type of system architecture does not fit and match our system requirements because **EWAA** consists of two components (firebase database, application written in Dart language and Flutter framework) so we do not have a group of components that can perform different operations on the central data structure.

4.3.2 Class Diagram /DFD

In this section, we constructed a class diagram of **EWAA**, which is a static model that shows the classes and the relationship among classes that remain constant in the system.

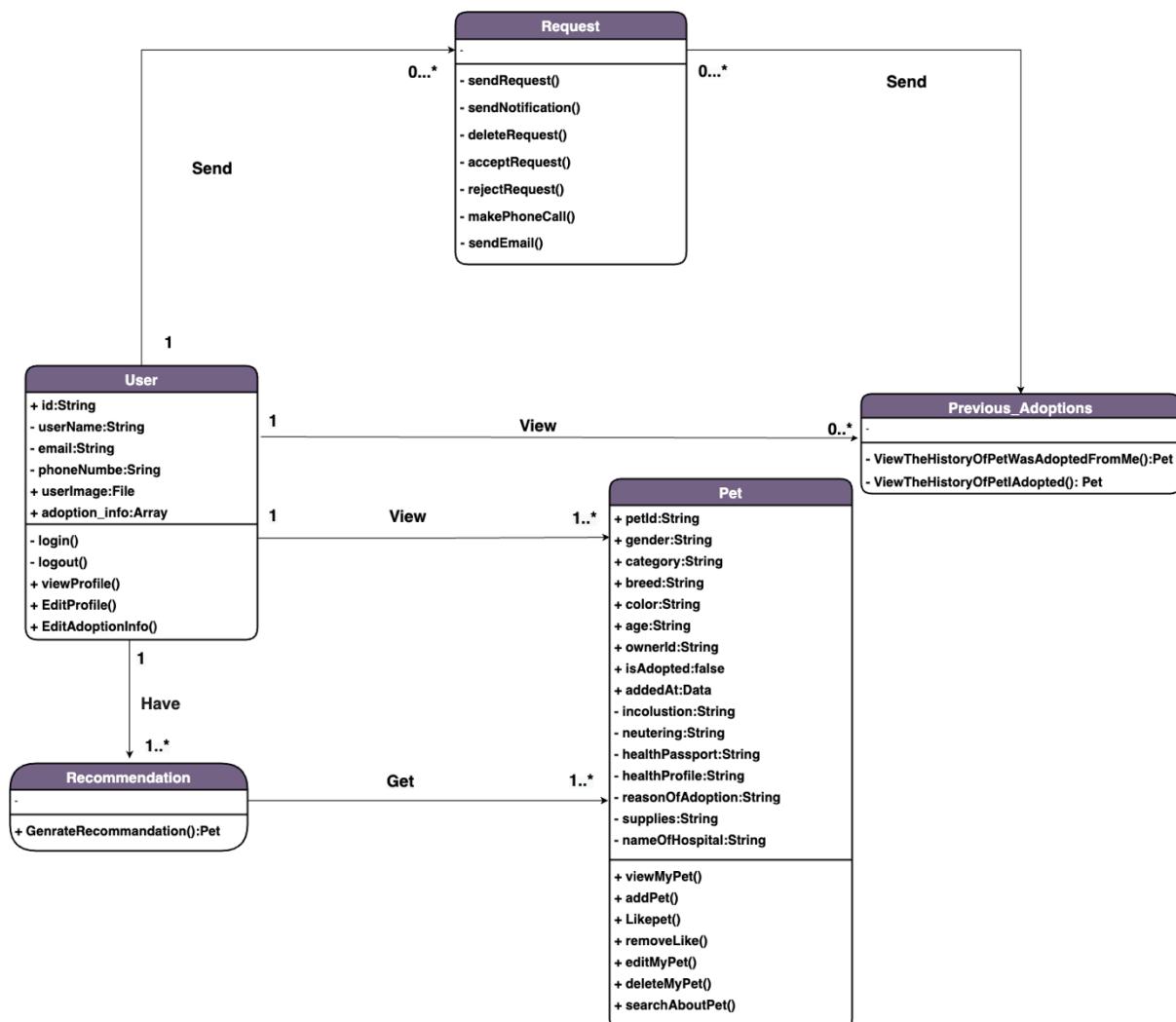


Figure 12. Class Diagram



The **EWAA** application has several classes (**User**, **Request**, **Pet**, **Recommendation**, **Previous_Adoptions**). **User** class lets users log in, view and edit their profiles, and log out to keep their accounts safe. In addition, since some of our users are seeking pets to adopt, the **Recommendation** class returns pets that fit their preferences. And with the class **Pet**, users can add a pet for adoption, save a pet as a favorite pet, search for a pet, etc. We help adopters and owners to contact each other using class **Request**. An adopter can send an adoption request to the owner of the pet they wish to adopt, and the owner can accept or reject the request. Once the owner accepts or rejects the adopter's request, the owner can call or email the adopter and vice versa. Both owner and adopter will receive a notification when a request is received, as well as when an owner accepts or rejects an adoption request. Lastly, **Previous_Adoptions** is a class that contains all the previous adoption requests that were accepted.



4.3.3 Component Level Design

- Add Pet

ID	PBI	User story tasks with effort estimation in hours			Sum of hours
5	As a logged in pet owner/adopter, I want to add my pets for adoption so that I can find people who want to adopt my pet.	Create the interface.	Create fields to get data from users with validation for two pages.	Backend for two pages.	100 hours
		4 hours	72 hours	24 hours	

Table 3. Add pet component

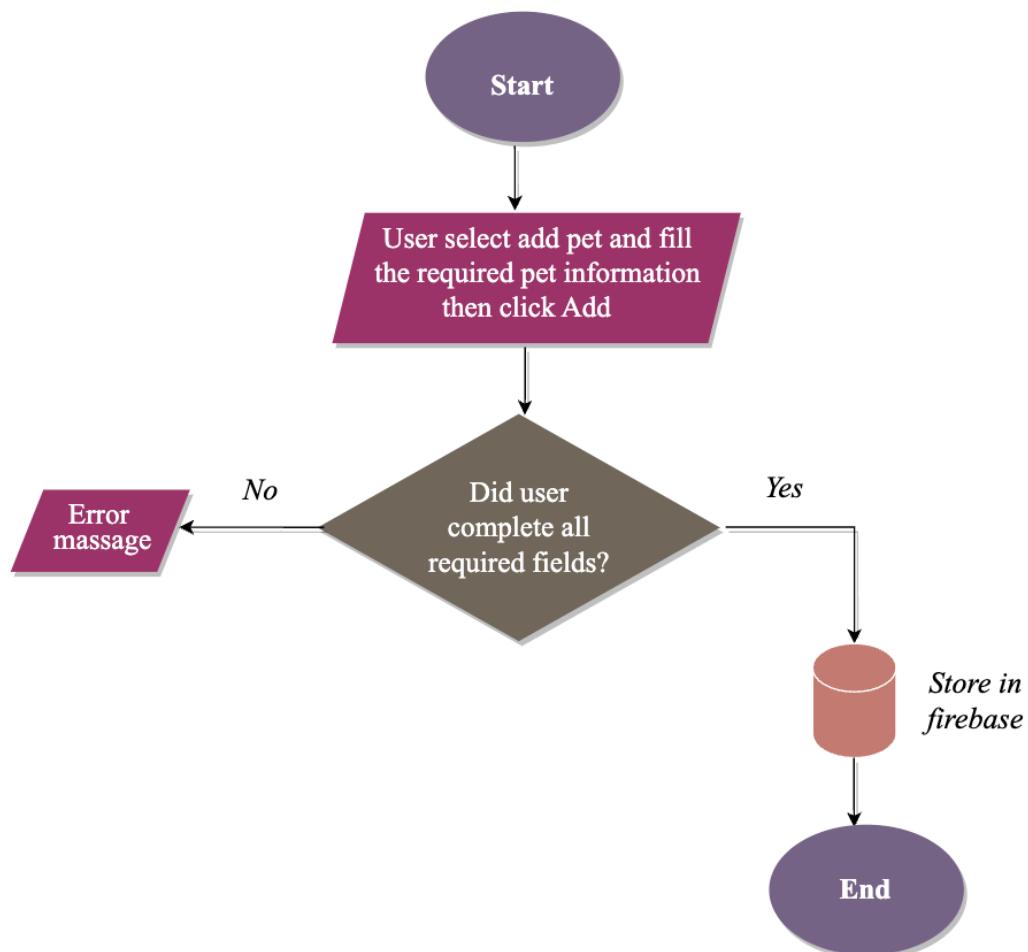


Figure 13. Add pet flowchart



- Send Request

ID	PBI	User story tasks with effort estimation in hours			Sum of hours
5	As a logged in user, I want to send a pet adoption request, so that I can get an Accept/reject response from the owner of the pet.	Create the interface.	Create fields to get data from users.	Backend	24 hours
		2 hours	5 hours	17 hours	

Table 4. Send request component

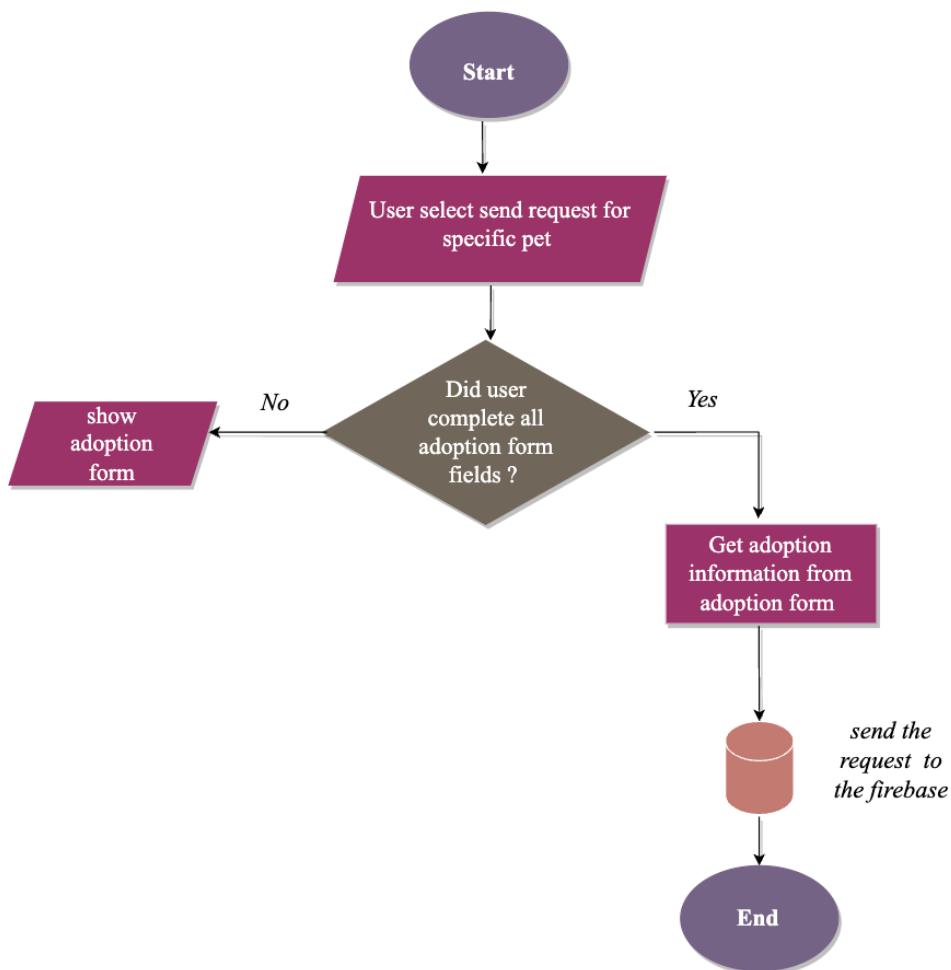


Figure 14. Send request flowchart



- Like Pet

ID	PBI	User story tasks with effort estimation in hours		Sum of hours
15	As a user, I want to add a pet to the favorites pets section, so that I can check it later.	Create the interface.	Backend	7 hours
		2 hours	5 hours	

Table 5. Like pet component

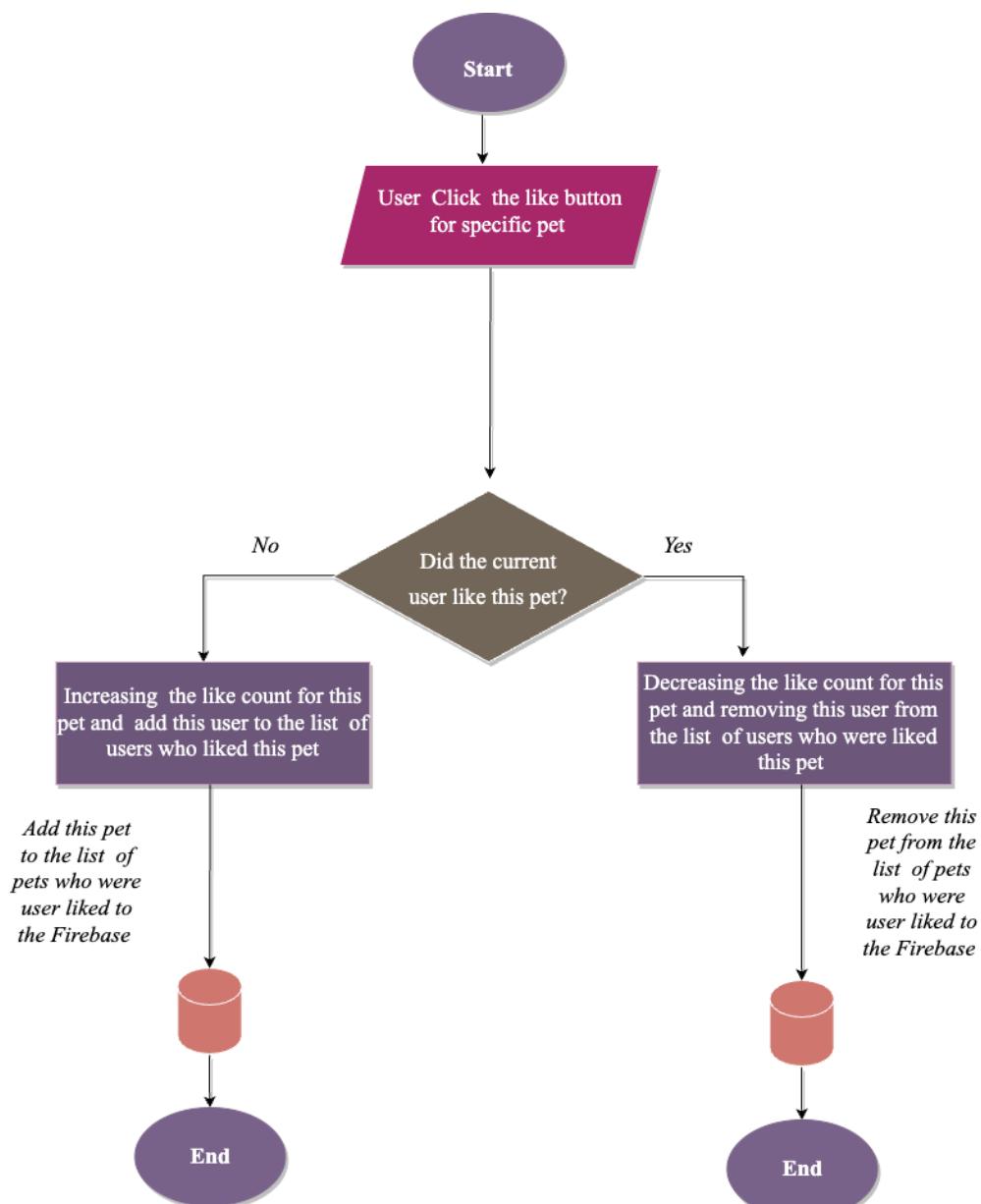


Figure 15. Like pet flowchart



- Recommendation and Recommender Systems

In this section we describe **EWAA** recommendation algorithms. In **EWAA** each user will get two types of recommendations. The first one is based on content-based filtering and the second is based on collaborative-filter. In addition, **EWAA** handles different types of users which are: new users, existing users, and non-registered users as shown in [figure 16](#) below. Existing users are users who have been using **EWAA** for some time and have liked some pets. New users are users who are registered but don't have any likes. Non-registered users are users who are exploring the app but are not registered.

```
/* FOR each user show two types of recommendation
IF user is an existing user
    Recommend pets based on content-based recommender
    Recommend pets based on collaborative-filtering
ELSE
    IF user is new user OR user is unregistered user:
        Recommend pets based on most popular pets
        Recommend pets based on custom formula based on most popular
```

Figure 16. Pseudocode of recommender systems cases

Described below is the component-level design of the content-based and collaborative-based recommender systems.



- Content-Based Recommender System

EWAA content-based recommender system focuses on building a profile for each user from four features (categories, breed, age, color) in a way to generate recommendations.

We will review an example to help clarify the concept:

Weight of color “c” means the rank for each value of color (the rank is calculated by taking the mean for each value, so for example, if the user likes three pets, and the color of two is white. For this user, the weight of the white color is $2/3$, and if the other pet is mixed-colored, then the weight of mixed-colored is $1/3$; the other colors, like black and orange, are given zero weight. We do that for all features (age, category, breed). The total weight of each pet is calculated by multiplying the user profile by the feature matrix. For example, a Persian cat that is mixed-colored and an adult will result in a weight of 2.5 when this pet is multiplied with the user profile, because according to the user profile, the weight is $1/3, 1/2, 1, 2/3$ respectively for the mixed-colored and adult cats of the breed Persian.

ID	PBI	User story tasks with effort estimation in hours			Sum of hours
28	As a user, I want to view recommended pets in the application, so that I can see pets that could match my preferences.	Write the recommender code using python language.	Integrate python code with flutter.	Hosting.	94 hours
		60 hours	10 hours	24 hours	

Table 6. Content-based recommender system component



L = set of liked pets for current user

FOR pet **i** in **L** **THEN**

GET color, breed, category, and age of pet **i**

COMPUT the weight of color **c**

COMPUT the weight of breed **b**

COMPUT the weight of category **t**

COMPUT the weight of age **a**

ENDFOR

SAVE **c**, **b**, **t** and **a** to the userprofile

RETRIVE all pet **p** that not in **L**

FOR **j** in **p** **THEN**

CALCULATE total weight **w** for pet **j** by **multiply j with userprofile**

ADD the total weight **w** of pet **j** to the list **A**

ENDFOR

RETURN top similar pets from list **A**

Figure 17. Content-based recommender system pseudocode



- Collaborative-Filtering Recommender System

EWAA system also offers a collaborative recommender system based on the likes of similar users. When a user browses the home page, the system automatically sends an HTTP request to the recommender system with the active user's ID and then gets a list of pets liked by that user in the recommender system. Afterward, it calculates the similarity between all users and returns only those who are more similar to the active user. As a final step, the top ten pets most similar users liked with the highest weight will be returned to the application. For example:

If User 1 likes cats [”مايك“، ”بيكسي“، ”لولو“]

User 2 likes cats [”بيكسي“، ”جوجو“]

User 3 likes cats [”لولو“، ”لونا“، ”روكي“]

User 1 will be recommended these cats [”لونا“، ”روكي“، ”جوجو“]

ID	PBI	User story tasks with effort estimation in hours			Sum of hours
28	As a user, I want to view recommended pets in the application, so that I can see pets that could match my preferences.	Write the recommender code using python language.	Integrate python code with flutter.	Hosting.	52 hours
		48 hours	2 hours	2 hours	

Table 7. Collaborative filtering recommender system component



```
GET active user u

FOR each user v (that is not u) THEN
    COMPUTE cosine similarity s between u and v
    IF s greater than 0.5 THEN # 0.5 IS THE THRESHOLD
        ADD user v to list L
    ENDIF
ENDFOR

FOR each pet i liked by users in L and not liked by user u
    INITIALIZE numberOfUserLikeThisPet to equal zero
    INITIALIZE total weight for this pet totalW to equal zero
    FOR each user v in L that liked pet i
        COMPUTE cosine similarity s between u and v
        MULTIPLY liked pet i with cosine similarity s (w=i * s)
        SUM w with totalW
        INCREASE numberOfUserLikeThisPet by one
    ENDFOR
    Divide the weight totalW of pet i by numberOfUserLikeThisPet and add it to the list A
ENDFOR

RETURN the top highest-weight pets from list A
```

Figure 18. Collaborative filtering recommender pseudocode



4.4 Data Design

4.4.1 Data Models

- The ER Diagram:

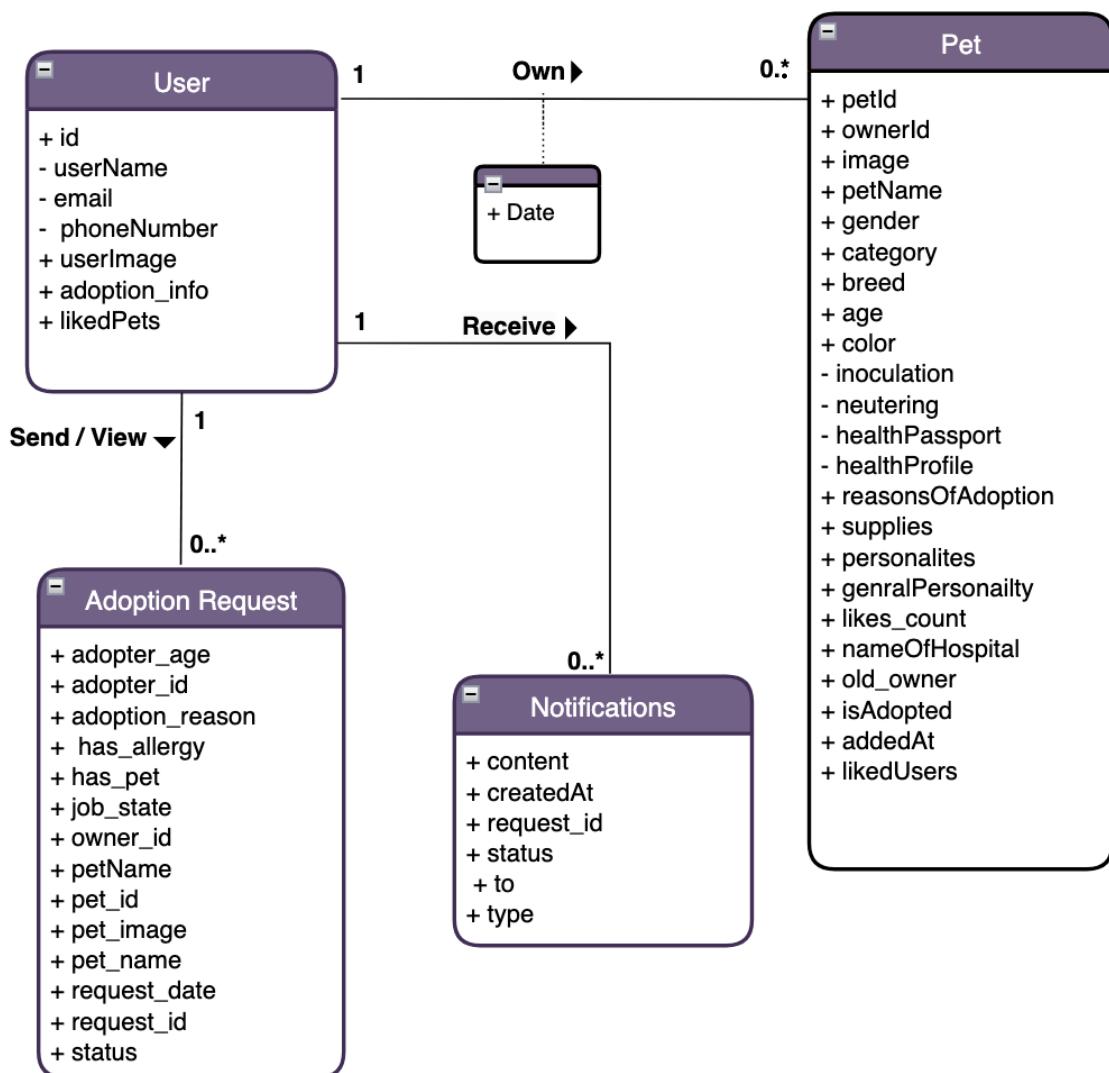


Figure 19. ER diagram



The above figure shows that **EWAA** application consists of four entities (**User**, **Pet**, **Adoption request**, and **Notifications**). There is a one-to-many relationship between (**User**, **Pet**), named (**Own**) because the user may or may not own a pet. A date will appear on the pet page when a pet is added to the system, which refers to the date the pet was added to the system. Also, (**User**, **Adoption request**) has the same one-to-many relationship named (**Send / View**) because the user can send a request to other users and view adoption requests sent to other users for their pets. It is possible that the user does not send or receive any requests if they have not interacted with the system enough, to receive any notifications like sending adoption requests to other users. Additionally, there is a one-to-many relationship between (**User**, **Notifications**) named (**Receive**), so that the user can receive notifications from the system and also may not receive any notifications.

- o The non-relational data model:

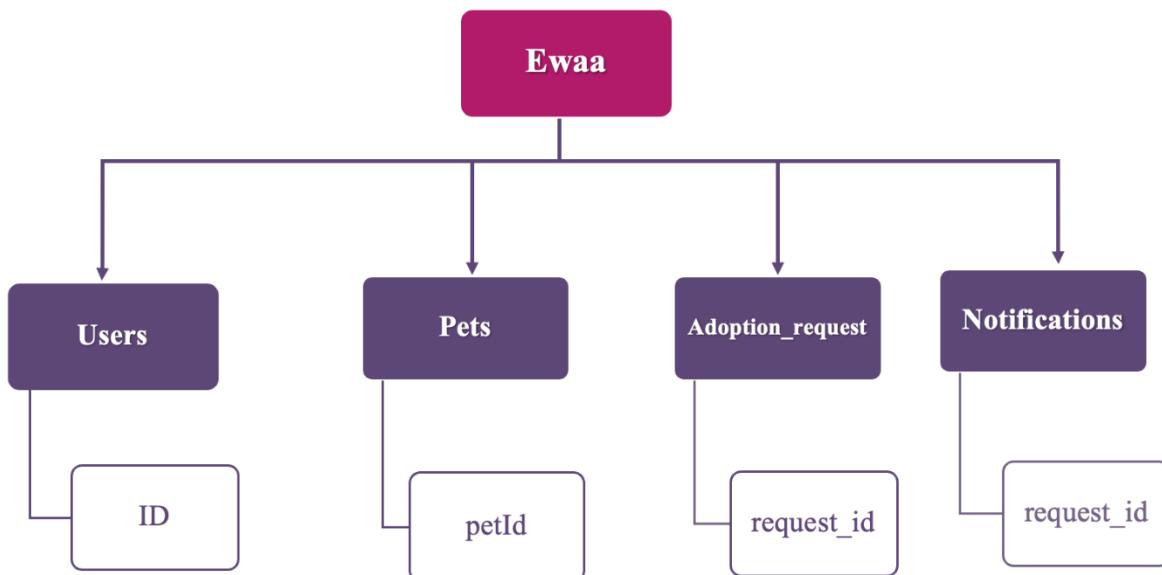


Figure 20. Non-relational data model

EWAA application has four collections which are: **Users** collection, **Pets** collection, **Adoption_requests** collection and **Notifications** collection. Each collection of the four collections contains multiple documents and has a unique id, In the **Users** collection it's (**ID**), and in the **Pets** collection it's (**petId**), finally in the **Adoption_requests** collection and **Notifications** collection it's (**request_id**).



4.4.2 Data Collection and Preparation

In this section we describe the process we used to collect our data. In **EWAA** we focus on two types of pets: **Cats and Dogs**. In the beginning we conducted interviews with shelters to determine the most and common types of cats and dogs breed that are adopted in Saudi Arabia , and based on the interviews we found the main types of pet breed listed in [Appendix C](#). Then, we specified the main types of pet unique characteristics. This includes collecting the main personality characteristics for each breed. Pet personality is defined as behavioral and physiological differences between individuals of the same species [11]. By understanding your pet personality, you can improve the welfare of your pet since you will be able to provide all the care and attention it needs. It's not only about caring for your pet, but even about providing the food and supplements they prefer.

Based on [10] [12] important factors related to cats and dogs are taken into consideration, such as: energy, affection, emotional reactivity and intelligence. Each pet breed is associated with some personality characteristics, for more details see [Appendix C](#). In addition, each pet regardless of its breed has its own unique personality [13].

After we collected the main breeds and their unique characteristics, we began pet data collection. Part of **EWAA** application functionalities is to provide recommendations on pets through the application, generally any recommendation algorithm needs data because data is considered the most important asset to a recommender system. To generate recommendations on pets, essentially, we need to know and have some details about our user's pets, but since **EWAA** application is not deployed, we don't have real users using the application, therefore we don't have any real pets data in the application, so we decided to start a pet data collection process, where we need to collect data about real pets from our targeted users and add this data in the application and use it to help with generating pet recommendations.

We began the pet data collection process by publishing an online Google form (questionnaire) dedicated to our targeted users which are real pet owners, were we asked them to fill their pets information such as:

- Pet nickname.
- Pet gender, age and color.
- Pet type and breed.



- Pet health information such as vaccination, sterilization, health passport and health profile.
- Pet personality traits.

After publishing the questionnaire, we gained 61 responses from 61 real pet owners, so we started the second phase which is pets data analyzing, where we analyzed all the responses that we got, and we concluded that out of 61 responses, there are 37 responses from cat owners, and 24 responses from dog owners, for full details see [Appendix D](#).

Finally, after collecting and analyzing pets data from the published questionnaire, we started the third phase of pets data collection which is storing the collected data, where we stored each pet data by adding them in our application through using “add a pet for adoption” function, so that we have 61 real pets added successfully in our application, and we can use these pets data with the recommendations through the application. Pets data collection results, questionnaire questions and transcriptions details are listed in [Appendix D](#).



4.5 Interface Design

4.5.1 Navigation Diagram

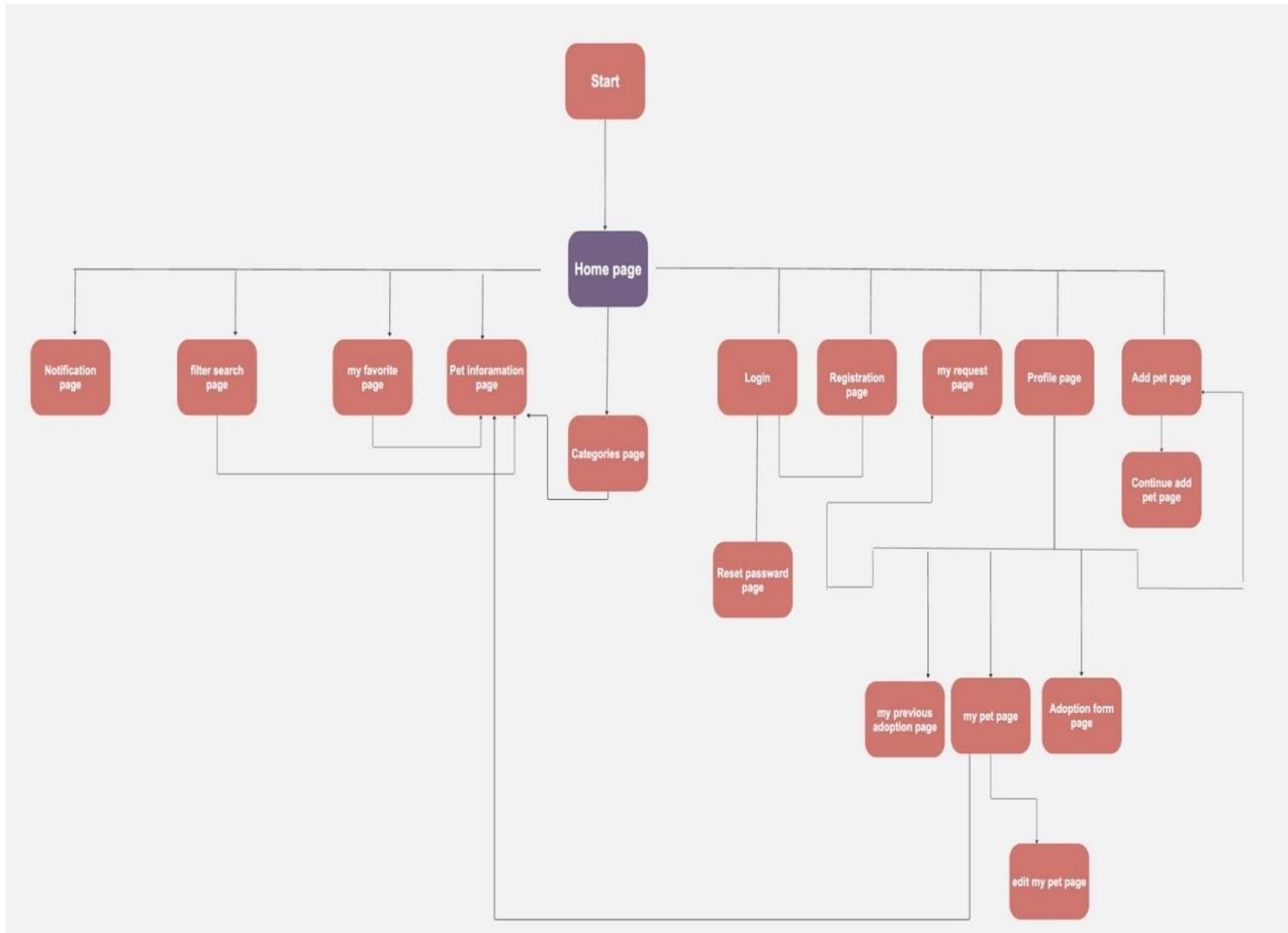


Figure 21. Navigation diagram

Navigation diagrams provide an overview of how the entire system will be interconnected. For EWAA application, users will start on the homepage and navigate to different pages in the application based on their needs and desires. For an example, users have to navigate from the home page to the Login page in order to log in; if users forget their password, they can navigate to the reset password page from the Login page. In addition, if a user wants to filter the search for a pet, then the user can simply click the filter search icon from the home page to go to the filter search page. After filtering the pets based on the user desires and needs, the user can view detailed information about the pet that matched the filtering results by going to the pet information page.



4.5.2 UX Guidelines

This section will review some important user experience design guidelines that were used in the **EWAA** application. By adhering to these rules, we improved the user experience's usability and accessibility inside the application.

1. Offer information feedback:

Users want to know what is going on while they are using product/mobile applications. Giving users feedback and making the system status visible helps users understand the outcome of their interaction and decide the next steps. This rule has been applied in **EWAA** application because when users add a pet there is a message that give users feedback if the pet is added successfully, also when users complete registration/login information and click on the login button, the button changes to a circular progress indicator and this relays to the user that the system is working and loading the data needed, so this helps to reduce the user's uncertainty about the performed action.

2. Permit easy reversal of actions:

This feature relieves anxiety since users know that errors can be undone. As we always tend to make mistakes, there must be a way to reverse the action. This rule has been applied in the **EWAA** application. For example, when a user accidentally uploads an incorrect image when trying to add pets, they can undo it, or change it to a new image they want.

3. Reduce short-term memory load:

Recognizing something is easier than trying to remember it, therefore you can minimize the users' cognitive load. This rule has been applied in the **EWAA** application by providing common icons to symbolize a specific function inside the application, like garbage icon to symbolize the delete function, and a camera icon to make it clear to the user that they should use this button for image uploading. By using these common icons, we help users to recognize actions rather than recall.



4. Strive for consistency:

The layout, fonts, colors, and terminology are all consistent across all the pages of **EWAA** application.

5. Offer simple error handling:

If an error is made, then the system should be able to detect this error and offer simple and comprehensive mechanisms for handling the error. This rule has been applied in the **EWAA** application. For example, when the user forgets to complete required fields, these fields will be highlighted with a message to help the user to know where this specific error is and how it can be fixed. Another example, when users establish their accounts and they mismatched the password and the repeated password, the text box of the repeated password will be highlighted and will inform the user that the password is mismatched.



4.6 Implementation

In this section, we describe the processes of implementing the **EWAA** application, which is entirely software-based, since we have no hardware at present.

EWAA application was developed using the **Flutter** framework and the **Dart** language and **Python** language for the recommender system. As a first step, we created all the user interfaces that appear to users (the front end). Next, we implemented all the application's classes, and a connection was established between the classes and Firebase. Most of the back-end development was implemented using Firebase. Firebase is a **Backend-as-a-Service (BaaS)**. It provides developers with a variety of tools and services to help them develop high quality applications, grow their user base, and earn profit. It is built on Google's infrastructure. Firebase is categorized as a **NoSQL** database program, which stores data in JSON-like documents [\[14\]](#).

As we move forward in this sub section, we will discuss and illustrate some features that were challenging to us and how we implemented them and solved them.



4.6.1 Add Pet

Feature name	Add Pet
Description	This feature enables the user to add their pets to the application for adoption when they decide to do so. Some of the information requested on the add pet page is required by the system, while some are not, meaning the user can still add their pet without filling it out.
Function flow	As the first step, we require the user to upload a picture of their pet, either from the gallery or directly using their camera. To implement this feature, we use the <code>image_picker</code> plugin. In the second step, the user has to enter the pet's name, gender, category, color, and age. We define three lists to make it easier for users to find a breed of their pet: <code>petType</code> , <code>petBreeds</code> , and <code>breedsList</code> (empty list for later adding breeds based on the type of pet selected by the user). In the third step, we ask for information about the pet's health (inclusion, neutering, health passport, and health profile) using the <code>RadioListTile</code> widget. Finally, users explain the reasons for offering their pets for adoption, pet supplies, and the personality of their pets.
Code segment	<pre>//-----upload image from camera----- void pickImageCamera() async { PickedFile? pickedFile = await ImagePicker() .getImage(source: ImageSource.camera, maxWidth: 1000, maxHeight: 1000); setState(() { imageFile = File(pickedFile!.path); }); } //-----upload image from gallery----- void pickImageGallery() async { PickedFile? pickedFile = await ImagePicker() .getImage(source: ImageSource.gallery, maxWidth: 1000, maxHeight: 1000); setState(() { imageFile = File(pickedFile!.path); }); }</pre>

Table 8. Add pet imp.



4.6.2 View Pet

Feature name	View Pet
Description	With this feature, users can view pet options in both cat and dog categories on EWAA application.
Function flow	To retrieve the pet data when the user clicks the "اكتشف المزيد" button, we call the "pets" collection and specify the dictionary with the same ID as the pet ID the user clicked. To display the information to the user we use TabBar widget to view pet information as a section and TabBarView widget to display information for each section of pet information.
Code segment	 <pre>signinUser = _user; var ownerId = widget.owner; if (ownerId == signinUser.uid) { setState(() { IssameUser = true; }); } else { setState(() { IssameUser = false; }); } final DocumentSnapshot petInfo = await FirebaseFirestore.instance .collection('pets') .doc(widget.petId) .get(); setState(() { petName = petInfo.get("petName"); petGender = petInfo.get("gender"); petCategory = petInfo.get("category"); personalites2 = petInfo.get("personalites"); personalites2.forEach((p) { Avoid using "forEach" with a function literal. if (p != "") personalites.add(p); }); petAge = petInfo.get("age"); petBreed = petInfo.get("breed"); Timestamp uploadedAt = petInfo.get("addedAt"); var uploadedAtDate = uploadedAt.toDate(); addedAt = '\${uploadedAtDate.year}-\${uploadedAtDate.month}-\${uploadedAtDate.day}'; petColor = petInfo.get("color"); incolustion = petInfo.get("incolustion"); // المخلص Neutering = petInfo.get("Neutering"); // المولع healthProfile = petInfo.get("healthProfile"); healthPassport = petInfo.get("healthPassport"); nameOfHospital = petInfo.get("nameOfHospital"); reasonsOfAdoption = petInfo.get("reasonsOfAdoption"); supplies = petInfo.get("supplies"); image = petInfo.get("image"); })</pre>

Figure 23. Add pet code

Table 9. View pet imp.



4.6.3 Request

Feature name	Request
Description	A user can adopt a pet by sending a request to the pet owner, who will approve or decline it. There is no limit to the number of adoption requests that can be sent by users.
Function flow	The first step is to create an adoption form. It will include all relevant user information regarding the adoption, such as whether the adopter has a family member who is allergic to pets. A user's information from the adoption form will be used as part of their request when they click to send a request to a specific pet so the owner can decide whether to approve the adoption. To take this information, we will display the form to the user once a user logs into the application. It is optional for the user not to complete it at this time, but it will be required if they request adoption at any time. When a user fills out the form once they sign in, the system won't ask them to do it again, and it will be saved via the method <code>save()</code> ; which will be passed to the "adoption_info" attribute in the User collection the information that user entered in the adoption form. The adoption form is displayed to the user when they log in by checking "adoption_info." If it is null, the user is redirected to the adoption form, and the parameter "after_login" is set to true. Otherwise, it redirects the user to the home page.
Code segment	<pre> } else { FirebaseFirestore.instance .collection("Users") .doc(value.user!.uid) .get() .then((info) { var data = info.data(); if (data!['adoption_info'] == null) { Navigator.push(context, MaterialPageRoute(builder: (context) => AdoptionForm(after_login: true,), // AdoptionForm), // MaterialPageRoute); } else { Navigator.pushNamedAndRemoveUntil(context, HomePage.screenRoute, (route) => route.isF) } }) } }</pre>

Table 10. Request imp.



4.6.4 Like Pet

Feature name	Like Pet
Description	With this feature, users can add a pet to their favorite list, and later request it for adoption if they wish. It would also be helpful to return the recommended pet based on their favorite list to this user.
Function flow	Once the user clicks the like button, if they do not have this pet in their favorite list, we call the like function and pass true to it; otherwise, we pass false, meaning the user wants to remove this pet from their favorite list. Then, inside the like function, we check if the parameter is true; if it is, we update the likedPets of this user with this pet's ID; otherwise, if it was false, we remove the id of this pet from the likedPets.
Code segment	<pre>void Like(bool isLiked) { // The variable name 'Like' isn't a lowerCamelCase identifier.=Try changing var userID = FirebaseAuth.instance.currentUser?.uid; print(isLiked); // Don't invoke 'print' in production code.=Try using a logging framework. if (isLiked) { // if isLiked is true that mean user want to likethis pet FirebaseFirestore.instance .collection("pets") .doc(widget.petId) // add this user to likedusers for this pet .update(["likedUsers":FieldValue.arrayUnion(userID)]); // add this pet to likedPets list for this user FirebaseFirestore.instance .collection("Users") .doc(_auth.currentUser?.uid) .update(["likedPets":FieldValue.arrayUnion([widget.petId])]); } setState(() { // It means that the user likes this pet, so the heart button will be red isNotLike = false; // increase the number of liked for this pet numberOfUserLike += 1; }); } else { // that mean the user want to remove like from this pet FirebaseFirestore.instance .collection("pets") .doc(widget.petId) .update(["likedUsers":FieldValue.arrayRemove(userID)]); FirebaseFirestore.instance .collection("Users") .doc(_auth.currentUser?.uid) .update(["likedPets":FieldValue.arrayRemove([widget.petId])]); }</pre>

Table 11. Like imp.



4.6.5 Filter Search

Feature name	Filter Search
Description	In our application, we used multiple filters. multiple filters may be applied to take a broad range of items and refine them into a narrower selection, allowing the end-user to retrieve the most relevant search results based on the criteria they've selected.
Function flow	The filter search page has a similar code to the “add a pet page”. This page has multiple dropdown lists (gender, breed, type, age, color) and when the user selects from these lists then the value will be stored in a variable called selected (Gender, Breed, Type, Age, Color). To make the filter, we will call <code>getPets()</code> function every time the user changes the values of the lists. As shown in figure, in this function we checked every time the value of the variables (<code>selectedGender</code> , <code>selectedBreed</code> , <code>selectedType</code> , <code>selectedAge</code> , <code>selectedColor</code>), if the variable has a value, then it will check the value itself and check in the <code>FireStore</code> if the pets have the same value and then it will return a list of pets.
Code segment	<pre>getPets() { Query query=FirebaseFirestore.getInstance() .collection("pets"); if(selectedGender!=null) { var gender = petGender for (Element element-> element['id'].toString() == selectedGender) .toList() .first['gender']; query=query.where('gender',isEqualTo: gender); } if(selectedType!=null) { var type = petType for (Element element-> element['id'].toString() == selectedType) .toList() .first['type']; query=query.where('category',isEqualTo: type); } if(selectedBreed!=null) { var breed = breedsList for (Element element-> element['id'].toString() == selectedBreed) .toList() .first['breed']; query=query.where('breed',isEqualTo: breed); } if(selectedColor!=null) { var color = petColors for (Element element-> element['id'].toString() == selectedColor) .toList() .first['color']; query=query.where('color',isEqualTo: color); } if(selectedAge!=null) { var age = petAge for (Element element-> element['id'].toString() == selectedAge) .toList() .first['age']; query=query.where('age',isEqualTo: age); } return query.orderBy("addedAt", descending: true).limit(5).snapshots(); }</pre>

Table 12. Filter search imp.



4.6.6 Recommender System Tables

- Content Filtering based

Feature name	Content-Based Recommender
Description	A Content-based recommendation system tries to recommend pets to users based on their profile. The user's profile revolves around that user's preferences and tastes based on their favorite list of pets.
Function flow	In order to get the pet recommendations we first integrate the python with flutter using flask [15] and we send to the python the user Id of the current user and the credentials of the Firebase as JSON format. Then, using the resource [16], we created a user profile by encoding [17] the features of pets users like by using a crosstab function to encode each of its features. We built a user profile based on breed, categories, colors, and ages of pets that users like. For example, when we applied the crosstab between the pet ID and the pet's color that the user liked, we saw that the first pet's color was represented by 0000100, which indicates brown. The same was true for other features. Last but not least, in terms of user profile, we assign weight to each value of color, breed, category, and age based on the mean of those values. Then, we generate a feature matrix by encode the pet through the one-hot encoding approach [17]. Each pet's one-hot encoding is obtained by using crosstabs for each feature and merging them. Finally, to return the best recommendation of pet for user we use a Weighted matrix by multiplying the user profile with feature matrix and then we sort them based on the total weight.



Code segment

```
Category = pd.crosstab(df['petId'], df['category'])
pd.crosstab(df['petId'], df['category'])
likeCategory = Category[Category.index.isin(np.array(likeList.petId))]
likeCategory
likeCategory.mean()

Weight = []
# Weight.append(1)
for i in likecolor.mean().values:
    Weight.append(i)
for i in likebreed.mean().values:
    Weight.append(i)
for i in likeage.mean().values:
    Weight.append(i)
for i in likeCategory.mean().values:
    Weight.append(i)

# generate crossed tab to choose the color for each pet
color = pd.crosstab(df['petId'], df['color'])

color

likecolor = color[color.index.isin(np.array(likeList.petId))]
print(likecolor)
print(likecolor.mean())

breed = pd.crosstab(df['petId'], df['breed'])
print(breed)
likebreed = breed[breed.index.isin(np.array(likeList.petId))]
print(likebreed)
print(likebreed.mean())

age = pd.crosstab(df['petId'], df['age'])
pd.crosstab(df['petId'], df['age'])
likeage = age[age.index.isin(np.array(likeList.petId))]
print(likeage)
print(likeage.mean())

Category = pd.crosstab(df['petId'], df['category'])
pd.crosstab(df['petId'], df['category'])
likeCategory = Category[Category.index.isin(np.array(likeList.petId))]
likeCategory
likeCategory.mean()

# define list of DataFrames
dfs = [pd.DataFrame(color), pd.DataFrame(
    breed), pd.DataFrame(age), pd.DataFrame(Category)]

# merge all DataFrames into one
final_df = reduce(lambda left, right: pd.merge(left, right, on=['petId'],
                                                how='outer'), dfs)

list_user_like = likeList['petId']

final_df = final_df.drop(list_user_like, axis=0)
```

Table 13. content-based recSys imp.



- Collaborative Filtering based

Feature name	Collaborative Filtering Recommender
Description	The collaborative filtering recommender is user-based, so the pet is recommended based on the pet that similar users have liked.
Function flow	Because our collaborative recommender is user based, we generate a $n \times m$ matrix containing n users and m items, which in our case are pets, by using a crosstab function between user ID and pet liked. And then to find the most similar users with active user. We use a cosine similarity measure [18] to determine how similar the active user is to other users, and we then set a threshold to only select the most similar ones. Based on this resource [19], the threshold was set to 0.5 because the higher threshold, the lower the distance, so to get strong similarity, set the threshold to 0.5. Lastly, to return recommendations pet we multiply each pet that liked by the top similar users with cosine similarity between this user and active user we do this to calculate the total weight for each pet, and then we normalize the pet weight by divide each pet weight with the number of users that liked this pet and then we return the top ten pet that have highest weight.



Code segment

```
users_similarity_cosine
users_similarity_cosine.drop(
    index=request_data['userID'], inplace=True)
users_similarity_cosine

# we uses the threshold to find similarity between the users and decide whether two users
threshold = 0.5
# specify the maximum number of similar users since the recommended pet at must be 10
n = 10
# then we picked the most simiries users based on the threshold
most_similar_user = \
    users_similarity_cosine[users_similarity_cosine[request_data['userID']] > threshold][
        request_data['userID']].sort_values(ascending=False)[:n]
print(most_similar_user.empty)
if most_similar_user.empty:
    print(True)
    return {"similarity_pets": recommendation, "similarity_users": least_like}

# drop the pets that user was liked
user_item_for_most_sim_users = user_item_coll.drop(
    np.array(list_user_like), axis=1)
user_item_for_most_sim_users
print(user_item_for_most_sim_users)
# drop the users that is not similar with active user
user_item_for_most_sim_users = user_item_for_most_sim_users[
    user_item_for_most_sim_users.index.isin(most_similar_user.index)]
```

```
# multiplay each row for each user by the cosine similarity between this user and the active user to
for index, row in return_like_pet_for_all_most_sim_users.iterrows():
    print(row * most_similar_user[index])
    y = row * most_similar_user[index]
    # print(y.values)
    a.append(y.values)

# weighted matrix
c = pd.DataFrame(a, index=return_like_pet_for_all_most_sim_users.index,
                  columns=return_like_pet_for_all_most_sim_users.columns)
```

```
# multiplay each row for each user by the cosine similarity between this user and the active user to
for index, row in return_like_pet_for_all_most_sim_users.iterrows():
    print(row * most_similar_user[index])
    y = row * most_similar_user[index]
    # print(y.values)
    a.append(y.values)

# weighted matrix
c = pd.DataFrame(a, index=return_like_pet_for_all_most_sim_users.index,
                  columns=return_like_pet_for_all_most_sim_users.columns)
```

Table 14. Collaborative-filtering recSys imp.



4.6.7 Packages

- Get contact information

Feature name	Get Contact Information
Description	With this feature, the owner and adopter can contact each other by call or email once the owner accepts the adopter's request.
Function flow	to open the phone in mobile or email we use <code>url_launcher</code> package [20].
Code segment	<pre>Future<void> _makePhoneCall(String phoneNumber) async { final Uri launchUri = Uri(scheme: 'tel', path: phoneNumber,); await launchUrl(launchUri); } Future<void> _sendEmail(String emailAddres) async { final Uri launchUri = Uri(scheme: 'mailto', path: emailAddres,); await launchUrl(launchUri); }</pre>

Table 15. Get contact information imp.



- Share

Feature name	Share
Description	Users can share pet profiles on social media.
Function flow	To share pet information in EWAA application we used “share plus” plugin it is a Flutter plugin to share content from Flutter app to any other platform's share dialog.
Code segment	<pre>Row(children: [IconButton(onPressed: () async { var petInfo="الاسم:"+petName+"\n"; petInfo=petInfo+"النوع:"+petCategory+"\n"; petInfo=petInfo+"النوعية:"+petBreed+"\n"; petInfo=petInfo+"الجنس:"+petGender+"\n"; petInfo=petInfo+"اللون:"+petColor+"\n"; petInfo=petInfo+"العمر:"+petAge+"\n"; petInfo=petInfo+"الصورة"+"\n"+image; await Share.share(petInfo); })],)</pre>

Table 16. share imp.



4.6.8 Challenges

In the following paragraphs, we discuss the challenges we faced when building **EWAA** application. The first challenge we faced was when we retrieved data from Firebase because there was an error displayed to the users; this error only lasts a minute or so. To solve this, we took several days to figure out the reason, and after searching, we found that the reason is because the application was waiting for the data to be retrieved from Firebase, so we solved this issue by defining a variable called `isloading` which show to users a circular indicator when the system is waiting for data retrieval from Firebase, this variable equals false when the system is waiting and after getting data from Firebase we change its value to true to offer users the information.

Moreover, during our journey to develop **EWAA** application, building the recommender systems from scratch was one of our greatest challenges. It took us many hours of reading and researching to understand how to build a recommendation system and what data we need to use. First, with the content-based recommender system, our biggest challenge was to build the user profile, since we want to provide pet recommendations that highly match the user taste. As well as the weight calculation, since we have a number of features that need to be considered. Another challenge could be retrieving the pets data from Firebase, which was unexpected for us.

And then we faced another significant and most challenging part after the recommender system, which is returning pet recommendations for all users because we are new developers with a lack of experience in this particular subject, we first set our Python code to run locally on our laptops, then we figured out that we had to upload it to run directly on a server. Therefore, to fix this problem we used the `Heroku` server to upload the Python code using flask to solve this issue. Although this solution worked successfully, it was also challenging to us because we got a lot of errors while implementing it.

System Evaluation





5 System Evaluation

In this section, we describe all the aspects of the test's methodologies used to evaluate our application, four test methodologies were used which are: user story acceptance testing, integration testing, user acceptance testing and finally non-functional requirements testing.

We focused only on the user acceptance testing and non-functional requirements testing during this section. As stated before, we tested the application using both of user story acceptance testing and Integration testing, so to get more details about them check [Appendix E](#) and [Appendix F](#).

Regarding user acceptance testing, we described all the aspects of the testing design process and implementation, then we provided the demographics of our test participants, after that we discussed the results obtained from evaluating our application with our end users using both questionnaire and interview methods.

Afterwards, we described all the non-functional requirements of the system along with their testing methods and presented their testing results. Finally, we concluded this section by discussing and providing some interpretations of the results that we got from the entire application testing and how we can improve our system based on the testing results.

5.1 User Acceptance Testing

By performing user acceptance testing, we aim to increase our knowledge about our end users and their interactions with the application, and make sure that the application fulfills all of its business requirements and can be used by the end users. To perform the user acceptance testing, we started the process by creating a team that consisted of 20 test participants who all meet our system users criteria discussed previously in section 4.2.1. After choosing test participants, we implemented the test with them by using the questionnaires method, where the 20 test participants used the application and tested all of its functions, and then we published an online questionnaire form that contained 12 questions related to our application user acceptance testing, and we asked these 20 test participants to answer these questions after their interaction with the application.

Other than the questionnaires method, additionally we used the interviews method to implement the user acceptance testing of our application in a more efficient way, where we conducted 6 interviews with an additional 6 test participants, during the interviews we asked



these 6 participants to use the application by performing 11 given test scenarios related to the main functionalities of the application.

In the following two sub sections, we first discuss the demographics of the test participants, then we illustrate the results obtained from performing user acceptance testing using both questionnaires and interviews methods.

5.1.1 Demographics of Participants

Demographics are statistics that describe our test participants and their characteristics. Demographic analysis is the study of test participants based on some factors such as the test participant's educational level, age, and gender. The following charts illustrate the demographics of our user acceptance test participants:

- Test participants age

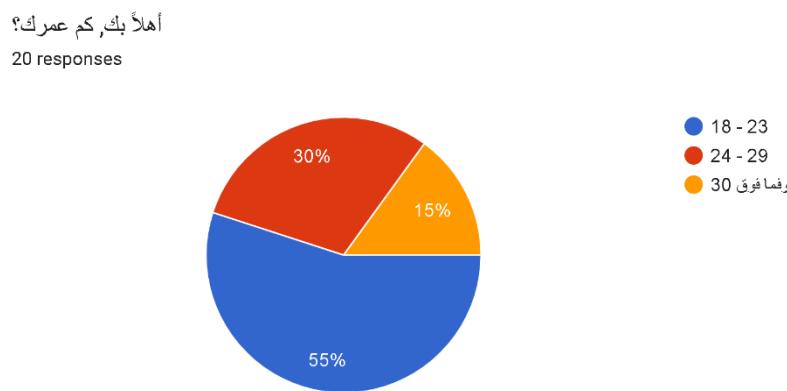


Figure 25. Participants age demographic

- Test participants educational level

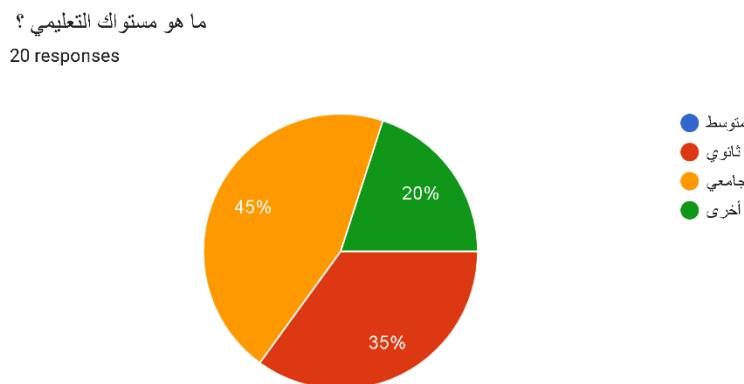


Figure 26. Participants educational level demographic



- Test participants Gender

ما هو جنسك؟

20 responses

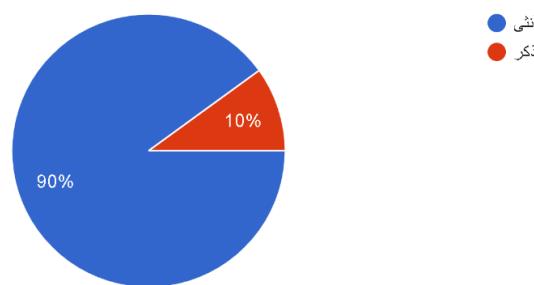


Figure 27. Participants gender demographic

5.1.2 Questionnaire/Interview Results

As discussed previously, we used both questionnaires and interviews to implement the user acceptance test of our application with our end users. For questionnaires, we first asked 20 test participants to use and test the application functions as well as to answer the questions of an online questionnaire form. Then for interviews, we chose an additional 6 participants to conduct 6 interviews with them and notice their interactions with the given test scenarios.

First, Questionnaires results:

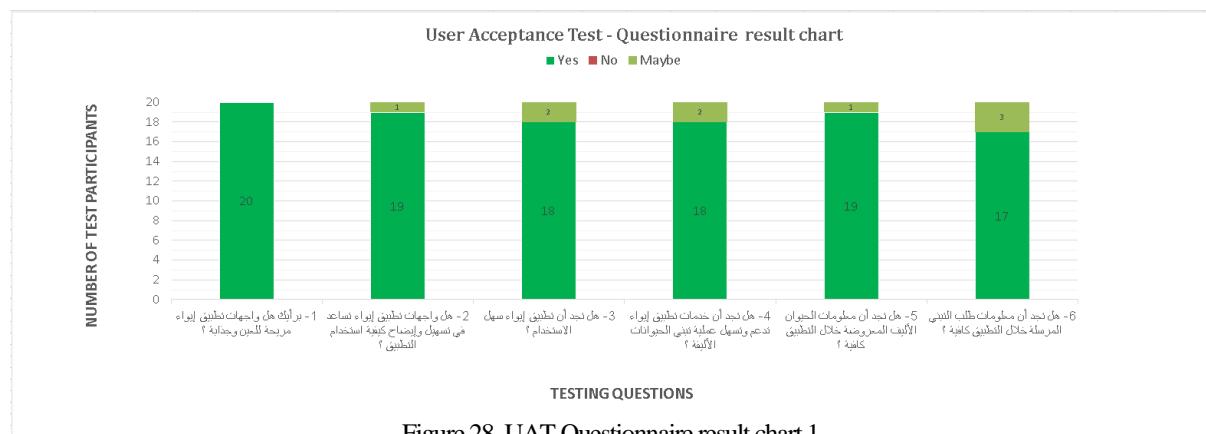


Figure 28. UAT Questionnaire result chart 1

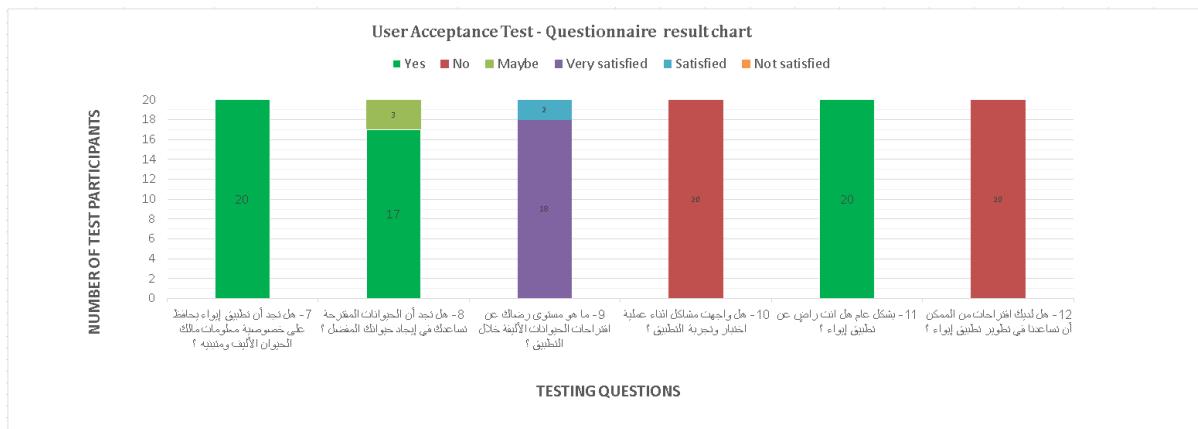


Figure 29. UAT Questionnaire result chart 2

From the two charts above, we conclude that the user acceptance test was performed by using the questionnaire method. First, we prepared 12 closed-end questions in an online questionnaire form then we conducted the questionnaire with 20 test participants, where these 20 participants were asked to use and test the application functions then afterwards answer the 12 questions of the questionnaire form.

As illustrated in figure 28 above, all the test participants agreed that the interfaces of the application were attractive and most of them agreed that the interfaces of the application helped facilitate and clarify how to use the application. Also, most of the participants agreed the application was clear and easy to use. Most of the test participants agreed that the EWAA services support and facilitate the process of adopting pets and they agreed that the pet information offered for adoption in the application is sufficient and the information sent when requesting to adopt a pet is also sufficient.

And as illustrated in figure 29 above, all the test participants agreed that the application maintains the privacy of both the pet owner and adopter. Regarding the pet's recommender, most of the participants were very satisfied with the pet recommendations inside the application and they agreed that the pet's recommender helped them to find their favorite pet. Finally, none of the participants encountered any problems during the testing process and none of them had any suggestions. Overall, they were all satisfied with using the EWAA application. Questionnaire questions and details are listed in the [Appendix G](#) section.



Second, Interviews results:

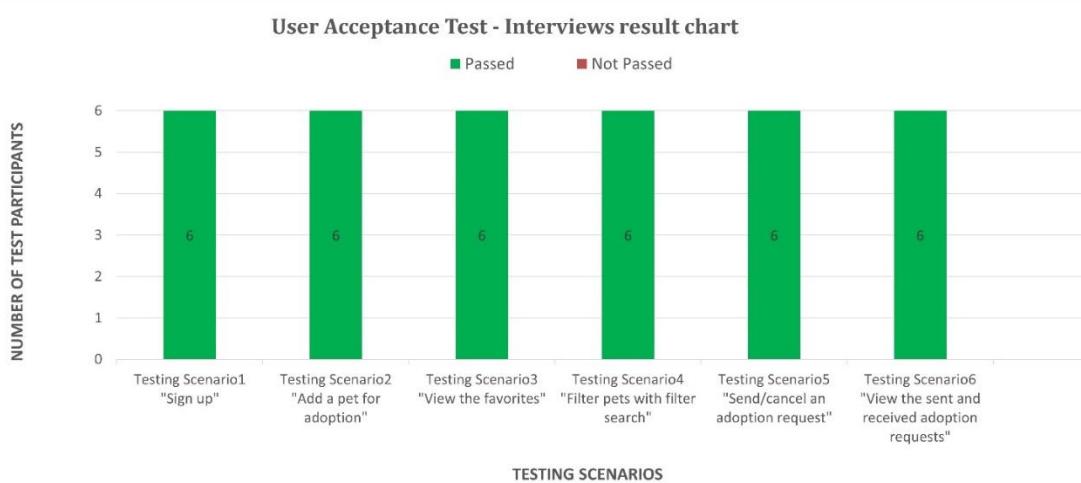


Figure 30.UAT Interviews result chart 1

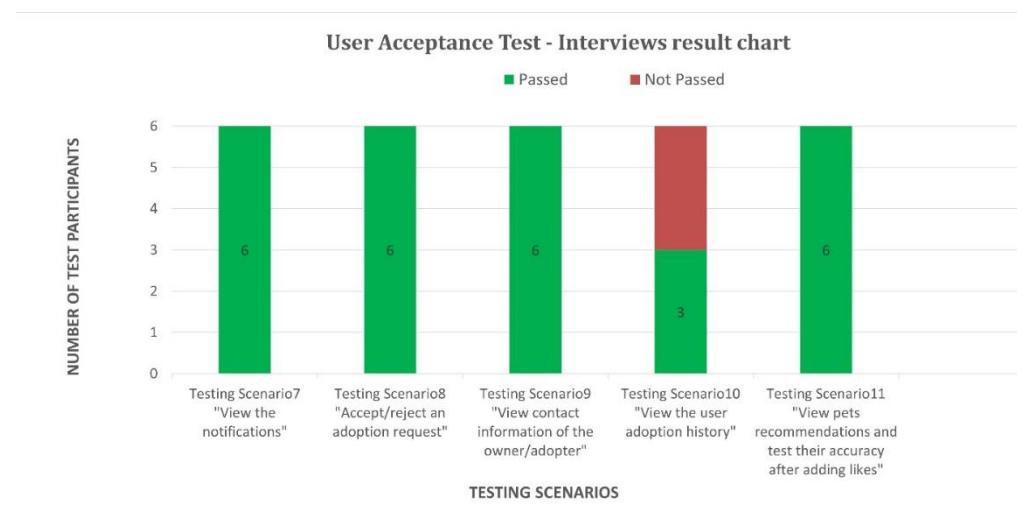


Figure 31. UAT Interviews result chart 2

From the two charts above, we conclude that the user acceptance test was performed using the interviews method as an addition to the questionnaire method, where we conducted 6 interviews with 6 additional test participants. During the interviews, we asked each test participant to perform 11 application test scenarios that are related to the main functionalities of the application.



As illustrated in figure 30 and 31 above, 10 out of 11 test scenarios were passed and performed successfully by all test participants, only one test scenario related to “view the user’s adoption history” was not completely passed by all the test participants, the participants that didn’t pass this test scenario have explained to us that it was not very clear to them from where they could view the adoption history, because there was not any explicit button or option for the adoption history. The details and the solution to this issue will be more clarified in discussion section 5.3.

Listed below the outline for all the interviews of the user acceptance testing, as well as the transcriptions of all the conducted interviews:

USER ACCEPTANCE TEST INTERVIEWS OUTLINE	
Objectives:	
<ul style="list-style-type: none">• Testing whether the application fulfills its requirements and can be used by the end users.• Close knowledge of end users and their interactions with the system.	
Agenda: <ul style="list-style-type: none">• Background on project• Testing scenarios• Closing	Approximate Time: <ul style="list-style-type: none">• 1 minute• 30 minutes• 1 minute
General Observations: All test participants were cooperating during the tests, they performed all of the required test scenarios to fulfil the user acceptance testing.	
Unresolved Issues, Topics Not Covered: None.	

Table 17.Test interview outline



User acceptance test interviews transcriptions:

USER ACCEPTANCE TEST INTERVIEW 1 TRANSCRIPTION	
Test supervised by: Rahaf	Test participant: Omar
Location / Medium: zoom meeting	Appointment Date: 24/3/2023 Start Time: 10:00 am End Time: 10: 35 am
Reminders: The interviewee is 33 years old, owns a pet, and is interested in pets.	
Testing scenarios:	
Testing scenario 1: Asking test participant to sign up in the application.	Passed? Yes Comments: the user clicked on the menu icon on the top nav bar and then he clicked on sign up. after that, he filled in all the fields correctly and then he clicked on sign up.
Testing scenario 2: Asking test participant to add a pet for adoption in the application.	Passed? Yes Comments: the user clicked on the menu icon on the top nav bar and then he clicked on add a pet for adoption, after that he filled in the fields correctly then he clicked on add pet button.
Testing scenario 3: Asking test participant to view the favorites in the application.	Passed? Yes Comments: the user tried to add some pets to the favorites and then he clicked on the favorites section on the bottom nav bar.
Testing scenario 4: Asking test participant to use the filter search to find specific characteristics for pets.	Passed? Yes Comments: from the home page, the user clicked on the filter icon and then he tried to filter the pets by selecting the characteristics. Also, he tried the filter that exist in (dogs / cats / all) page.
Testing scenario 5: Asking test participant to send/cancel an adoption request for a pet.	Passed? Yes Comments: the user clicked on send adoption request on a pet and then from the same page he clicked on the view adoption information button. after that, he clicked on the cancel button.



Testing scenario 6: Asking test participant to view the sent/received adoption requests.	Passed? Yes Comments: the user clicked on the adoption requests section on the bottom nav bar and then she tried to view the sent/received adoption requests by clicking the (sent requests button/received requests button) .
Testing scenario 7: Asking test participant to view the notifications.	Passed? Yes Comments: the user clicked on the notifications section on the bottom nav bar.
Testing scenario 8: Asking test participant to accept/reject the adoption request for his/her added pet.	Passed? Yes Comments: (I sent an adoption request to his pet) so he tried to reject the request first and after that he accept the request.
Testing scenario 9: Asking test participant to view contact information of the owner/adopter of the pet.	Passed? Yes Comments: the user clicked on the notifications section and then he clicked on the view adoption request button on the received request. after that, he tried clicking on the ‘message’ button and the ‘call’ button.
Testing scenario 10: Asking test participant to view his/her pet adoption history.	Passed? Yes Comments: the user clicked on the menu icon on the top nav bar and then he clicked on my pets. after that, he clicked on the (pet I adopted/pet adopted from me) button.
Testing scenario 11: Asking test participant to test the accuracy of the recommender in the home page after adding some pet to the favorite.	Passed? Yes Comments: the user tried adding some pets to his favorite (cats and dogs and their color مختار), after that he checked the recommender and he notice the difference in the recommender because it showed now pets similar to the pet's characteristics that he put in the favorite.

Table 18.Test interview 1



USER ACCEPTANCE TEST INTERVIEW 2 TRANSCRIPTION

Test supervised by: Rahaf	Test participant: Sara
Location / Medium: zoom meeting	Appointment Date: 27/3/2023 Start Time: 11:00 pm End Time: 11: 40 pm
Reminders: The interviewee is a cyber security student whose 22 years old, she is interested about pets and wishes to adopt a pet .	
Testing scenarios:	
Testing scenario 1: Asking test participant to sign up in the application.	Passed? Yes Comments: the user clicked on the profile icon on the top nav bar and then she filled in all the fields correctly then she clicked sign up. She recommended that is better for the profile icon to redirect us to the log-in page rather than sign up.
Testing scenario 2: Asking test participant to add a pet for adoption in the application.	Passed? Yes Comments: the user clicked on the profile icon on the top nav bar and then she clicked on add a pet for adoption, after that she filled in the fields correctly then she clicked on add pet button.
Testing scenario 3: Asking test participant to view the favorites in the application.	Passed? Yes Comments: the user clicked on the favorites section on the bottom nav bar. also, she tried to add some pets to the favorites and again she views the favorites.
Testing scenario 4: Asking test participant to use the filter search to find specific characteristics for pets.	Passed? Yes Comments: from the home page, the user clicked on the filter icon and then she tried to filter the pets by selecting the characteristics.
Testing scenario 5: Asking test participant to send/cancel an adoption request for a pet.	Passed? Yes Comments: the user clicked on send adoption request on a pet and then she go to the adoption requests section and then she clicked on the cancel button.
Testing scenario 6: Asking test participant to view the sent/received adoption requests.	Passed? Yes



	<p>Comments: the user clicked on the adoption requests section on the bottom nav bar and then she tried to view the sent/received adoption requests by clicking the (sent requests button/received requests button).</p>
Testing scenario 7: Asking test participant to view the notifications.	<p>Passed? Yes</p> <p>Comments: the user clicked on the notifications section on the bottom nav bar</p>
Testing scenario 8: Asking test participant to accept/reject the adoption request for his/her added pet.	<p>Passed? Yes</p> <p>Comments: (I sent an adoption request to her pet) so she tried to reject the request first and after that she accept the request.</p>
Testing scenario 9: Asking test participant to view contact information of the owner/adopter of the pet.	<p>Passed? Yes</p> <p>Comments: the user clicked on the adoption requests section on the bottom nav bar, and she clicked on the received requests button. after that, she selected 'accepted' from the dropdown list and then tried clicking on the phone icon.</p>
Testing scenario 10: Asking test participant to view his/her pet adoption history.	<p>Passed? No</p> <p>Comments: she tried to find the section that will view the history, but she failed since there is no explicit section called history.</p>
Testing scenario 11: Asking test participant to test the accuracy of the recommender in the home page after adding some pet to the favorite.	<p>Passed? Yes</p> <p>Comments: the user tried adding some pets to the favorite (cats, Persian شيرازي, gray), after that she checked the recommender and she notice the difference in the recommender because it showed now pets similar to the pets that she put in the favorite.</p> <p>But she noticed that the pet that she added appeared in the recommendation</p>

Table 19. Test interview 2



USER ACCEPTANCE TEST INTERVIEW 3 TRANSCRIPTION

Test supervised by: Rahaf	Test participant: lama
Location / Medium: zoom meeting	Appointment Date: 28/3/2023 Start Time: 12:00 am End Time: 12: 40 am
Reminders: The interviewee is a student whose 20 years old, she wishes to adopt a pet.	
Testing scenarios:	
Testing scenario 1: Asking test participant to sign up in the application.	Passed? Yes Comments: the user clicked on the profile icon on the top nav bar and then she filled in all the fields correctly then she clicked sign up.
Testing scenario 2: Asking test participant to add a pet for adoption in the application.	Passed? Yes Comments: the user clicked on the menu icon on the top nav bar and then she clicked on add a pet for adoption, after that she filled in the fields correctly then she clicked on add pet button.
Testing scenario 3: Asking test participant to view the favorites in the application.	Passed? Yes Comments: the user tried to add some pets to the favorites and then she clicked on the favorites section on the bottom nav bar.
Testing scenario 4: Asking test participant to use the filter search to find specific characteristics for pets.	Passed? Yes Comments: the user clicked on the cat category and then she clicked on the filter icon and then she tried to filter the pets by selecting the characteristics.
Testing scenario 5: Asking test participant to send/cancel an adoption request for a pet.	Passed? Yes Comments: the user clicked on send adoption request on a pet and then she go to the adoption requests section and then she clicked on the cancel button.
Testing scenario 6: Asking test participant to view the sent/received adoption requests.	Passed? Yes Comments: the user clicked on the adoption requests section on the bottom nav bar and then she tried to view



	the sent/received adoption requests by clicking the (sent requests button/received requests button).
Testing scenario 7: Asking test participant to view the notifications.	Passed? Yes Comments: the user clicked on the notifications section on the bottom nav bar
Testing scenario 8: Asking test participant to accept/reject the adoption request for his/her added pet.	Passed? Yes Comments: (I sent an adoption request to her pet) so she tried to reject the request first and after that she accept the request.
Testing scenario 9: Asking test participant to view contact information of the owner/adopter of the pet.	Passed? Yes Comments: the user clicked on the adoption requests section on the bottom nav bar, and she clicked on the received requests button. after that, she selected 'accepted' from the dropdown list and then tried clicking on the message / phone icon.
Testing scenario 10: Asking test participant to view his/her pet adoption history.	Passed? Yes Comments: the user clicked on the menu icon on the top nav bar and then she clicked on my pets. After that, she clicked on the (pet I adopted/pet adopted from me) button. she recommended making the history section on a separate page.
Testing scenario 11: Asking test participant to test the accuracy of the recommender in the home page after adding some pet to the favorite.	Passed? Yes Comments: the user tried adding some pets to the favorite (cats, female, صغير), after that she checked the recommender and she notice the difference in the recommender because it showed now pets similar to the pet's characteristics that he put in the favorite.

Table 20. Test interview 3



USER ACCEPTANCE TEST INTERVIEW 4 TRANSCRIPTION

Test supervised by: Rawan	Test participant: Maram
Location / Medium: coffee shop	Appointment Date: 21/3/2023 Start Time: 9:00 pm End Time: 9:35 pm

Reminders: The interviewee is a 31 year old business analyst who is interested in adopting a pet.

Testing scenarios:

Testing scenario 1: Asking test participant to sign up in the application.	Passed? Yes Comments: from the top right corner the user clicked on the top navigation bar icon then chose the sign-up option, then the user entered all her required information and clicked on sign up button.
Testing scenario 2: Asking test participant to add a pet for adoption in the application.	Passed? Yes Comments: from the top application bar, the user clicked on the account icon, then from the profile page the user clicked on add a pet for adoption, then the user entered all required pet information and finally clicked on add pet button.
Testing scenario 3: Asking test participant to view the favorites in the application.	Passed? Yes Comments: from the bottom application navigation bar, the user clicked on the favorites option, and saw the pets that she liked previously there.
Testing scenario 4: Asking test participant to use the filter search to find specific characteristics for pets.	Passed? Yes Comments: from the home page the user clicked on the filter search icon, then in the filter page the user chooses some characteristics to filter pets in the application with.
Testing scenario 5: Asking test participant to send/cancel an adoption request for a pet.	Passed? Yes Comments: from the pet page the user clicked on send adoption request button, and from the bottom application navigation bar, the user clicked on the adoption requests option, and from the sent adoption request the user clicked on the cancel request button.



Testing scenario 6: Asking test participant to view the sent/received adoption requests.	Passed? Yes Comments: from the bottom application navigation bar, the user clicked on the adoption requests option, and from the requests page the user saw the sent and received requests by clicking on each one of them.
Testing scenario 7: Asking test participant to view the notifications.	Passed? Yes Comments: from the bottom application navigation bar, the user clicked on the notifications option, and from the notifications page the user saw all the received notifications.
Testing scenario 8: Asking test participant to accept/reject the adoption request for his/her added pet.	Passed? Yes Comments: from the bottom application navigation bar, the user clicked on the adoption requests option, then on the received requests (2 requests were already sent to the user) so the user accepted one of them and rejected the other.
Testing scenario 9: Asking test participant to view contact information of the owner/adopter of the pet.	Passed? Yes Comments: after the user accepted an adoption request for her pet, the user clicked on the calling button that appeared and was directed to the phone number of the adopter.
Testing scenario 10: Asking test participant to view his/her pet adoption history.	Passed? No Comments: the user didn't notice that from my pets page she can see her adopted pets, or the pets someone adopted from her. The user recommended that it's better to have a separate page to view the adoption history.
Testing scenario 11: Asking test participant to test the accuracy of the recommender in the home page after adding some pet to the favorite.	Passed? Yes Comments: first the user added likes on Persian cats their age big and small, then from the home page the user saw the new recommendations which consisted of similar pets with similar characteristics to what she added to her favorites.

Table 21. Test interview 4



USER ACCEPTANCE TEST INTERVIEW 5 TRANSCRIPTION

Test supervised by: Rawan	Test participant: Rahaf Khalid
Location / Medium: zoom meeting	Appointment Date: 26/3/2023 Start Time: 11:00 am End Time: 11:35 am

Reminders: The interviewee is a 19 year old student who owns a cat.

Testing scenarios:

Testing scenario 1: Asking test participant to sign up in the application.	Passed? Yes Comments: from the top navigation bar the user clicked on the account icon then she was directed to the sign-up page, then the user entered all her required information and clicked on sign up button.
Testing scenario 2: Asking test participant to add a pet for adoption in the application.	Passed? Yes Comments: from the top right corner the user clicked on the top navigation bar icon then choose the add a pet for adoption option, then the user entered all required pet information and finally clicked on add pet button.
Testing scenario 3: Asking test participant to view the favorites in the application.	Passed? Yes Comments: from the bottom application navigation bar, the user clicked on the favorites option, at the start her favorite was empty so she added some likes on pets and then she saw her favorites again containing the liked pets.
Testing scenario 4: Asking test participant to use the filter search to find specific characteristics for pets.	Passed? Yes Comments: from the cat category page, the user clicked on the filter search icon, then in the filter page the user chooses some cat characteristics to filter the cat's category with.
Testing scenario 5: Asking test participant to send/cancel an adoption request for a pet.	Passed? Yes Comments: from the pet page the user clicked on send adoption request button, and from the same page the user clicked on view adoption information button, after the



	<p>user saw the information, she clicked on the cancel request button.</p>
Testing scenario 6: Asking test participant to view the sent/received adoption requests.	<p>Passed? Yes</p> <p>Comments: from the bottom application navigation bar, the user clicked on the adoption requests option, and from the requests page the user saw the sent and received requests by clicking on each one of them.</p>
Testing scenario 7: Asking test participant to view the notifications.	<p>Passed? Yes</p> <p>Comments: from the bottom application navigation bar, the user clicked on the notifications option, and from the notifications page the user saw all the received notifications.</p>
Testing scenario 8: Asking test participant to accept/reject the adoption request for his/her added pet.	<p>Passed? Yes</p> <p>Comments: from the bottom application navigation bar, the user clicked on the adoption requests option, then on the received requests (2 requests were already sent to the user) so the user accepted one of them and rejected the other.</p>
Testing scenario 9: Asking test participant to view contact information of the owner/adopter of the pet.	<p>Passed? Yes</p> <p>Comments: after the user accepted an adoption request for her pet, the contact buttons appeared then the user clicked on the calling and mail buttons and saw the number and email of the adopter.</p>
Testing scenario 10: Asking test participant to view his/her pet adoption history.	<p>Passed? Yes</p> <p>Comments: from the top navigation bar the user clicked on account icon, then the user clicked on my pets option, then from my pets page the user saw the history (clicked on pets she adopted, or someone adopted from her).</p>
Testing scenario 11: Asking test participant to test the accuracy of the recommender in the home page after adding some pet to the favorite.	<p>Passed? Yes.</p> <p>Comments: first the user added likes on white Persian cats with different genders, then from the home page the user saw the new recommendations which consisted of similar pets with similar characteristics to what she added to her favorites.</p>

Table 22. Test interview 5



USER ACCEPTANCE TEST INTERVIEW 6 TRANSCRIPTION

Test supervised by: Rawan	Test participant: Raseel
Location / Medium: zoom meeting	Appointment Date: 29/3/2023 Start Time: 11:00 am End Time: 11:35 am

Reminders: The interviewee is a 19-year-old student who owns four cats and a turtle.

Testing scenarios:

Testing scenario 1: Asking test participant to sign up in the application.	Passed? Yes Comments: from the top right corner the user clicked on the top navigation bar icon then chose the sign-up option, then the user entered all her required information and clicked on sign up button.
Testing scenario 2: Asking test participant to add a pet for adoption in the application.	Passed? Yes Comments: from the top application bar, the user clicked on the account icon, then from the profile page the user clicked on add a pet for adoption, then the user entered all required pet information and finally clicked on add pet button.
Testing scenario 3: Asking test participant to view the favorites in the application.	Passed? Yes Comments: after adding likes for pets, from the bottom application navigation bar, the user clicked on the favorites option, and saw the pets that she liked previously there.
Testing scenario 4: Asking test participant to use the filter search to find specific characteristics for pets.	Passed? Yes Comments: from the home page the user clicked on the filter search icon, then in the filter page the user chooses some characteristics such as small dogs to filter pets in the application with.
Testing scenario 5: Asking test participant to send/cancel an adoption request for a pet.	Passed? Yes Comments: from the pet page the user clicked on send adoption request button, and from the bottom application navigation bar, the user clicked on the adoption requests



	option, and from the sent adoption request the user clicked on the cancel request button.
Testing scenario 6: Asking test participant to view the sent/received adoption requests.	Passed? Yes Comments: from the bottom application navigation bar, the user clicked on the adoption requests option, and from the requests page the user saw the sent and received requests by clicking on each one of them.
Testing scenario 7: Asking test participant to view the notifications.	Passed? Yes Comments: from the bottom application navigation bar, the user clicked on the notifications option, and from the notifications page the user saw all the received notifications.
Testing scenario 8: Asking test participant to accept/reject the adoption request for his/her added pet.	Passed? Yes Comments: 2 requests were already sent to the user, so from the notifications page, the user clicked on view request button for the first request, and from the request page the user accepted the request. And for the second request she did same steps but rejected the request.
Testing scenario 9: Asking test participant to view contact information of the owner/adopter of the pet.	Passed? Yes. Comments: after the user accepted an adoption request for her pet, the user clicked on the calling button that appeared and was directed to the phone number of the adopter, then she clicked on email button and saw the adopter email.
Testing scenario 10: Asking test participant to view his/her pet adoption history.	Passed? No Comments: the user couldn't find a clear button or section to view the adoption history. So, she recommended that it will be clearer if there is a separate button or section to view the adoption history.
Testing scenario 11: Asking test participant to test the accuracy of the recommender in the home page after adding some pet to the favorite.	Passed? Yes Comments: first the user added likes on husky dogs with different colors, then from the home page the user saw the new recommendations which consisted of similar pets with similar characteristics to what she added to her favorites.

Table 23. Test interview 6



5.2 Quality Attributes (NFR Testing)

We tested the non-functional requirements of the application which are Performance, Learnability and Reliability. To implement the test for each non-functional requirement we asked 20 users to perform 11 use cases (test scenarios) related to the main functionalities of the application which are listed in the table below:

Test scenario
1-Sign up in the application.
2-Add a pet for adoption in the application.
3-View the favorites in the application.
4-Use the filter search to find specific characteristics for pets.
5-Send / cancel an adoption request for a pet.
6-View the sent / received adoption requests.
7-View the notifications.
8-Accept / reject the adoption request for an added pet.
9-View the contact information of the owner / adopter of the pet.
10-View the user's pet adoption history.
11-Test the accuracy of pet recommendations in the home page after adding some pet to the favorites.

Table 24.NFR test scenario



The following table illustrates all the non-functional requirements of the application, the quality attribute for each one of them, the measures we used to test them, and finally the results of testing all the non-functional requirements.

User story	Quality Attribute	Measure	Results
As a user, I want to load the application pages within 5-20 seconds on my request, so that I can reach the application pages quickly.	Performance: How responsive is the system and its components?	Unit of measurement: Compute the time needed by the system to load the application pages which shouldn't exceed 20 seconds maximum.	<p>The 20 users were asked to perform the 11 test scenarios to compute the time needed to load the application pages and these are the results:</p> <p>20 out of 20 users completed all the given test scenarios. For each user we computed the minimum time to load the application pages, as well as the maximum time, as follows:</p> <p>5 users: the minimum time is 1 second while maximum time is 8 seconds.</p> <p>4 users: the minimum time is 2 seconds while maximum time is 7 seconds.</p> <p>2 users: the minimum time is 1 second while maximum time is 12 seconds.</p> <p>5 users: the minimum time is 1 second while maximum time is 9 seconds.</p> <p>1 user: the minimum time is 1 second while maximum time is 11 seconds.</p> <p>3 users: the minimum time is 2 seconds while maximum time is 9 seconds.</p>



<p>As a user, I want to learn how to use the main functionalities of the application within 5 to 10 minutes maximum, so that I can save my time and don't get frustrated to find another system to use.</p>	<p>Learnability: How fast is it for the users to learn and complete the main functionalities of the application once they see the interface.</p>	<p>Unit of measurement: Compute the time needed by users to learn and complete the main functionalities of the application once they see the interface, which shouldn't exceed 10 minutes maximum.</p>	<p>The 20 users were asked to perform the 11 test scenarios to compute the time needed to learn the application functions and these are the results: 20 out of 20 users completed all the given test scenarios. For each user we computed the minimum time taken to complete a given test scenario, as well as the maximum time that was taken, as follows: 2 users: the minimum time is 2 minutes while maximum time is 6 minutes. 2 users: the minimum time is 3 minutes while maximum time is 8 minutes. 2 users: the minimum time is 2 minutes while maximum time is 5 minutes. 2 users: the minimum time is 1 minute while maximum time is 6 minutes. 1 user: the minimum time is 1 minute while maximum time is 5 minutes. 1 user: the minimum time is 3 minutes while maximum time is 7 minutes. 6 users: the minimum time is 1 minute while maximum time is 2 minutes. 4 users: the minimum time is 1 minute while maximum time is 3 minutes.</p>
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As a user, I want the application to perform without failure in 95% of the use cases, so that I can perform what I need from the application without any failure most of the time.	Reliability: The application must perform without failure or without any critical bugs in 95% of the use cases or the main functions of the application that the user is going to use.	Unit of measurement: Compute the number of use cases that were performed without any failure or critical bugs, and this number most represent 95% at least of the total use cases. 95% in this scenario means that on the user request, at least 10 out of 11 use cases must be performed without failure to consider the application preformed successfully.	The 20 users were asked to perform the 11 use cases (test scenarios) to compute the number of use cases performed successfully and these are the results : 20 out of 20 users completed all the given test scenarios. For each user we computed the number of use cases that were performed successfully without any failures by the application, as follows: 20 users: 11 out of 11 given use cases performed without failure by the application.
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Table 25. NFR testing



5.3 Discussion

We conclude this section by discussing and providing some interpretations of the results that we got from the overall system evaluation and how we can improve our application according to these results.

As for the user acceptance test results that were discussed previously in section 5.1, we noticed that the results of evaluating **EWAA** application with our end users were overall good and satisfying, the application fulfilled all of its requirements and the user's needs.

However, the results of testing the application with some users have shown us that there are some issues we did not notice before conducting the user acceptance test and were noticed by our end users while they performed the test. These issues revolved around the need to improve the accessibility of some sections of the application such as the “View user adoption history”, since some of the users during performing the user acceptance test were confused when we asked them to view their adoption history in the application because they couldn't find an explicit option or button to view the adoption history as discussed previously in the interviews results.

So when we noticed this common issue, we analyzed the issue and discussed it with these users and we asked them how do they prefer to solve this issue, most users recommended that the adoption history should be in a separate and clear page, so to solve this issue we decided to change the location of the adoption history in the application which was previously and before modification combined with the user added pets in “My pets page”, and after modification the adoption history became in a separate page as illustrated in figure 32 below.

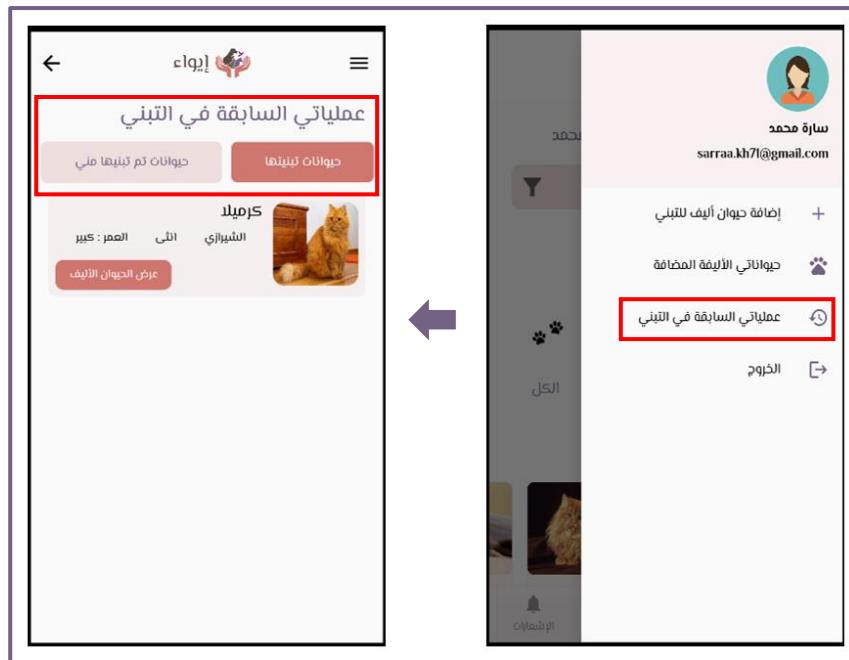


Figure 32.Adoption history after modification

Also, during the user acceptance testing some users have recommended that when the user is not logged in the application, then clicking on the “Account icon” on the top nav bar should direct the user to the “Login page” rather than the “Signup page”, so we implemented all these changes in the application based on the testing results and to fulfill all of our users notes regarding testing the application.

Regarding the non-functional requirements testing, where we tested the application operational capabilities and constraints, the results discussed previously in section 5.2 have shown that the application operated effectively by satisfying all of its quality attributes which are performance, learnability and reliability. Regarding performance the application loaded all the required pages in a reasonable time, as well as for learnability where all the functionalities of the application were learned easily and completed in a short time by all users, and finally for reliability the application performed all of its functionalities without any failure.

Finally, we can say that the system evaluation results were overall satisfying and helped us in improving **EWAA** application to meet our targeted users’ expectations and needs, as well as to enable our users to use the application in the most effective and efficient way.

Conclusions and Future Work





6 Conclusions and Future Work

This Document describes our journey with **EWAA** from its earliest phases to its completion. At the beginning, we proposed a short introduction to **EWAA**, followed by an explanation of the problem **EWAA** will solve, then the solution. Second, we provided necessary background information. Then during the literature review, we evaluated the existing competitors of our system by defining and describing each one of them so we could determine their advantages and disadvantages to design the **EWAA** system by considering the competitors advantages and avoiding their disadvantages. After that, as part of the system description, we outlined the users of the system, the methods we used in collecting requirements from users, the interactions between the system and the user using the "use case" diagram, and the product backlog. Furthermore, we discussed the main components of **EWAA** and how they interact to facilitate the implementation of **EWAA** application and to support the understanding of **EWAA**. After analyzing and designing the system, we built **EWAA** using **Flutter** framework and **Dart** language, finally we tested the application to make sure there were no bugs or errors.

Regarding the global impact, pet adoptions have increased since Covid-19 hit [21]. This has caused the adoption process to be lengthened for many pet lovers [22]. So, **EWAA** overcomes these challenges by offering a mobile application that includes two different pets recommendation systems as well as many features that facilitate both the adoption process and the communication between pet owners and adopters.

As for the local impact, **EWAA's** Arabic interface, along with its dedicated and focused scope make the application valuable to many people in Riyadh, Saudi Arabia. So that the application helps to improve their adoption experience. In support of **Vision 2030**, which aims to digitize everything.

Our journey to develop the **EWAA** application, as expected, was not easy. Since it was our first time developing a real mobile application in a new environment, many challenges were encountered and overcome. These challenges included configuring **Virtual Studio Code** and **Flutter** settings and versions. Hosting the application and recommender systems on the **Heroku** platform took a long time to work. Aside from our lack of knowledge and experience in this particular subject, learning the recommendation system has been one of the most challenging aspects of the project.



EWAA is an Arabic mobile application designed mainly to help users to offer their pets for adoption, and to help adopters in finding pets to adopt, as well as to enable pet owners and adopters to contact each other's via email or phone numbers whenever an adoption request is made and accepted. Users profile also allows them to add, delete and modify their pets or even modify their own information. **EWAA**, however, does not support the English language and does not provide nearby pets. **EWAA** application will be constantly improved in the future as we continue to develop and maintain it. Firstly, we will publish **EWAA** application on Google Play in order to let people download and use it, also we will consider adding location services such as finding shelters or veterinary clinics near users, providing pet supplies, and offering powerful recommendation algorithms.



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Insha'Allah, this journey will not be stopped, we are sincerely grateful for the opportunity to collaborate and have each other, for the knowledge, the love, and the sharing of experiences.

References





8 References

- [1] ANIMAL FRIENDS, “10 BENEFITS OF OWNING A PET - ANIMAL FRIENDS PET INSURANCE,” AFI, 23-FEB-2016. [ONLINE]. AVAILABLE: [HTTPS://WWW.ANIMALFRIENDS.CO.UK/DOG/DOG-BLOG/10-BENEFITS-OF-OWNING-A-PET/](https://www.animalfriends.co.uk/DOG/DOG-BLOG/10-BENEFITS-OF-OWNING-A-PET/). [ACCESSED: 27-MAR-2023].
- [2] حياة الرسول مع سائر المخلوقات , حياة الرسول صلى الله عليه وسلم مع سائر المخلوقات (NO DATE) مع الحبيب ﷺ مع الحبيب ﷺ . كالحيوان والطير - مع الحبيب ﷺ
- [3] “THE HEALTH BENEFITS OF ADOPTING A PET,” MEDICARE & MEDICARE ADVANTAGE INFO, HELP AND ENROLLMENT, 17-MAR-2021. [ONLINE]. AVAILABLE: [HTTPS://WWW.MEDICARE.ORG/ARTICLES/THE-HEALTH-BENEFITS-OF-ADOPTING-A-PET/](https://www.medicare.org/articles/the-health-benefits-of-adopting-a-pet/). [ACCESSED: 27-MAR-2023].
- [4] C. C. AGGARWAL, RECOMMENDER SYSTEMS: THE TEXTBOOK. USA, NY: SPRINGER, 2018.
- [5] “RECOMMENDATION SYSTEMS,” RECOMMANDER SYSTEM. [ONLINE]. AVAILABLE: [HTTPS://WWW.ENGATI.COM/GLOSSARY/RECOMMENDATION-SYSTEMS](https://www.engati.com/glossary/recommendation-systems). [ACCESSED: 27-MAR-2023].
- [6] A. ATLISSIAN, “SCRUM - WHAT IT IS, HOW IT WORKS, AND WHY IT'S AWESOME,” SCRUM. [ONLINE]. AVAILABLE: [HTTPS://WWW.ATLISSIAN.COM/AGILE/SCRUM](https://www.atlassian.com/agile/scrum). [ACCESSED: 27-MAR-2023].
- [7] N. W. PR, “WHAT IS SCRUM?,” WHAT IS SCRUM METHODOLOGY? & SCRUM PROJECT MANAGEMENT, 04-MAR-2023. [ONLINE]. AVAILABLE: [HTTPS://WWW.NIMBLEWORK.COM/AGILE/SCRUM-METHODOLOGY/?AMP=1#SCRUM-ROLES](https://www.nimblework.com/agile/scrum-methodology/?amp=1#scrum-roles). [ACCESSED: 27-MAR-2023].
- [8] ATLISSIAN, “JIRA SOFTWARE FOR TEAMS,” WHO USES JIRA SOFTWARE? [ONLINE]. AVAILABLE: [HTTPS://WWW.ATLISSIAN.COM/SOFTWARE/JIRA/GUIDES/GETTING-STARTED/WHO-USSES-JIRA#FOR-DEVOPS-TEAMS](https://www.atlassian.com/software/jira/guides/getting-started/who-uses-jira#for-devops-teams). [ACCESSED: 27-MAR-2023].
- [9] “HELLO WORLD,” GITHUB DOCS. [ONLINE]. AVAILABLE: [HTTPS://DOCS.GITHUB.COM/EN/GET-STARTED/QUICKSTART/HELLO-WORLD](https://docs.github.com/en/get-started/quickstart/hello-world). [ACCESSED: 27-MAR-2023].
- [10] C. A. LITCHFIELD, G. QUINTON, H. TINDLE, B. CHIERA, K. H. KIKILLUS, AND P. ROETMAN, “THE 'FELINE FIVE': AN EXPLORATION OF PERSONALITY IN PET CATS (FELIS CATUS),” PLOS ONE, 23-AUG-2017. [ONLINE]. AVAILABLE: [HTTPS://JOURNALS.PLOS.ORG/PLOSONE/ARTICLE?ID=10.1371%2FJOURNAL.PONE.0183455](https://journals.plos.org/plosone/article?id=10.1371%2FJOURNAL.PONE.0183455). [ACCESSED: 27-MAR-2023].



- [11] C. S. DE AZEVEDO AND R. J. YOUNG, “ANIMAL PERSONALITY AND CONSERVATION: BASICS FOR INSPIRING NEW RESEARCH,” ANIMALS : AN OPEN ACCESS JOURNAL FROM MDPI, 04-APR-2021. [ONLINE]. AVAILABLE: [HTTPS://WWW.NCBI.NLM.NIH.GOV/PMC/ARTICLES/PMC8065675/#:~:TEXT=ANIMAL%20PERSONALITY%20CAN%20BE%20DEFINED,TIME%20AND%20ACROSS%20DIFFERENT%20CONTEXTS](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8065675/#:~:text=ANIMAL%20PERSONALITY%20CAN%20BE%20DEFINED,TIME%20AND%20ACROSS%20DIFFERENT%20CONTEXTS). [ACCESSED: 27-MAR-2023].
- [12] B. TURCSÁN, L. WALLIS, Z. VIRÁNYI, F. RANGE, C. A. MÜLLER, L. HUBER, AND S. RIEMER, “PERSONALITY TRAITS IN COMPANION DOGS-RESULTS FROM THE VIDOPET,” PLOS ONE, 10-APR-2018. [ONLINE]. AVAILABLE: [HTTPS://JOURNALS.PLOS.ORG/PLOSONE/ARTICLE?ID=10.1371%2FJOURNAL.PONE.0195448](https://journals.plos.org/plosone/article?id=10.1371%2FJOURNAL.PONE.0195448). [ACCESSED: 27-MAR-2023].
- [13] C. LARSON, “YOUR DOG'S PERSONALITY MAY HAVE LITTLE TO DO WITH ITS BREED,” AP NEWS, 28-APR-2022. [ONLINE]. AVAILABLE: [HTTPS://APNEWS.COM/ARTICLE/SCIENCE-ODDITIES-HEALTH-LIFESTYLE-GENETICS-F6395D4D4AA78D6AFBC2B9E0BCAF3C7A8](https://apnews.com/article/science-oddities-health-lifestyle-genetics-f6395d4d4aa78d6afc2b9e0bcacf3c7a8). [ACCESSED: 27-MAR-2023].
- [14] WHAT IS FIREBASE?, 2023. [ONLINE]. AVAILABLE: [HTTPS://WWW.EDUCATIVE.IO/ANSWERS/WHAT-IS-FIREBASE](https://www.educative.io/answers/what-is-firebase). [ACCESSED: 27-MAR-2023].
- [15] TIMOTHY, “BUILDING A FLASK(PYTHON) CRUD API WITH CLOUD FIRESTORE(FIREBASE) AND DEPLOYING ON CLOUD RUN.,” MEDIUM, 29-AUG-2019. [ONLINE]. AVAILABLE: [HTTPS://MEDIUM.COM/GOOGLE-CLOUD/BUILDING-A-FLASK-PYTHON-CRUD-API-WITH-CLOUD-FIRESTORE-FIREBASE-AND-DEPLOYING-ON-CLOUD-RUN-29A10C502877](https://medium.com/google-cloud/building-a-flask-python-crud-api-with-cloud-firestore-firebase-and-deploying-on-cloud-run-29a10c502877). [ACCESSED: 27-MAR-2023].
- [16] M. TOPRAK, “CONTENT-BASED RECOMMENDER SYSTEM,” MEDIUM, 26-APR-2020. [ONLINE]. AVAILABLE: [HTTPS://MEDIUM.COM/@TOPRAK.MHMT/CONTENT-BASED-RECOMMENDER-SYSTEM-BDFC60B1BEE8](https://medium.com/@toprak.mhmt/content-based-recommender-system-bdfc60b1bee8). [ACCESSED: 27-MAR-2023].
- [17] J. BROWNLEE, “WHY ONE-HOT ENCODE DATA IN MACHINE LEARNING?,” MACHINELEARNINGMASTER.COM, 30-JUN-2020. [ONLINE]. AVAILABLE: [HTTPS://MACHINELEARNINGMASTER.COM/WHY-ONE-HOT-ENCODE-DATA-IN-MACHINE-LEARNING/](https://machinelearningmaster.com/why-one-hot-encode-data-in-machine-learning/). [ACCESSED: 27-MAR-2023].
- [18] M. NANDI, “RECOMMENDER SYSTEMS THROUGH COLLABORATIVE FILTERING,” DOMINO DATA LAB, 05-JUL-2022. [ONLINE]. AVAILABLE: [HTTPS://WWW.DOMINODATALAB.COM/BLOG/RECOMMENDER-SYSTEMS-COLLABORATIVE-FILTERING](https://www.dominodatalab.com/blog/recommender-systems-collaborative-filtering). [ACCESSED: 27-MAR-2023].
- [19] “WHAT IS A GOOD THRESHOLD FOR COSINESIMILARITY MEASURE?,” RAPIDMINER COMMUNITY. [ONLINE]. AVAILABLE: [HTTPS://COMMUNITY.RAPIDMINER.COM/DISCUSSION/56700/WHAT-IS-A-GOOD-THRESHOLD-FOR-COSINESIMILARITY-MEASURE#:~:TEXT=THE%20HIGHER%20SIMILARITY%2C%20THE%20LOWER,CHART%20FOR%20ANOTHER%20USE%20CASE](https://community.rapidminer.com/discussion/56700/what-is-a-good-threshold-for-cosinesimilarity-measure#:~:text=THE%20HIGHER%20SIMILARITY%2C%20THE%20LOWER,CHART%20FOR%20ANOTHER%20USE%20CASE). [ACCESSED: 27-MAR-2023].
- [20] “URL_LAUNCHER: FLUTTER PACKAGE,” DART PACKAGES, 22-FEB-2023. [ONLINE]. AVAILABLE: [HTTPS://PUB.DEV/PACKAGES/URL_LAUNCHER](https://pub.dev/packages/url_launcher). [ACCESSED: 27-MAR-2023].



- [21] P. D. MATTHEW SALOIS AND P. D. GAIL GOLAB DVM, “THE COVID-19 PET ADOPTION BOOM: DID IT REALLY HAPPEN?,” DVM 360, 23-SEP-2021. [ONLINE]. AVAILABLE: [HTTPS://WWW.DVM360.COM/VIEW/THE-COVID-19-PET-ADOPTION-BOOM-DID-IT-REALLY-HAPPEN-.](https://www.dvm360.com/view/the-covid-19-pet-adoption-boom-did-it-really-happen-.) [ACCESSED: 27-MAR-2023].
- [22] J. HO, S. HUSSAIN, AND O. SPARAGANO, “DID THE COVID-19 PANDEMIC SPARK A PUBLIC INTEREST IN PET ADOPTION?,” FRONTIERS, 09-APR-2021. [ONLINE]. AVAILABLE: [HTTPS://WWW.FRONTIERSIN.ORG/ARTICLES/10.3389/FVETS.2021.647308/FULL#:~:TEXT=COMPARING%20THE%20WORLDWIDE%20RSV%20BETWEEN,INCREASED%20BY%20UP%20TO%20250%25.](https://www.frontiersin.org/articles/10.3389/fvets.2021.647308/full#:~:text=COMPARING%20THE%20WORLDWIDE%20RSV%20BETWEEN,INCREASED%20BY%20UP%20TO%20250%25.) [ACCESSED: 27-MAR-2023].

Appendices





9 Appendices

9.1 APPENDIX A: Requirements Elicitation Interviews

REQUIREMENTS ELICITATION INTERVIEWS OUTLINE

Objectives:

- Gathering data about system requirements and functionalities.
- Close knowledge of users, their requirements, and desires.

Agenda:

- Introduction
- Background on project
- Overview of interview
- Topics to be covered
- Interview questions
- Summary of the main points
- Closing

Approximate Time:

- 30 seconds
- 1 minute
- 1 minute
- 1 minute
- 10 minutes
- 1 minute
- 30 seconds

General Observations: All interviewees were cooperative and responsive during the interviews, and they suggested some ideas that helped and inspired us in eliciting some of the requirements for our mobile application.

Unresolved Issues, Topics Not Covered: None.

Table 26. Interviews outline



Requirements Elicitation Interviews transcriptions:

INTERVIEW 1 TRANSCRIPTION

Interviewee: Fai bin Khidhr.	Interviewer: Rawan Alqarni.
Location / Medium: Online interview through Zoom.	Appointment Date: 18/09/2022 Start Time: 10:00pm End Time: 10:15pm

Reminders: The interviewee is a female Internet of things senior student whose 22 years old, she owns multiple pets, and she is interested in rescuing pets.

Questions:	Notes:
Question 1: As a pet owner, have you ever thought of offering your pet for adoption? And why?	Answer: Yes, since I have many pets, health care costs might be a reason to offer them for adoption, and I do not have enough room to house them all.
Question 2: What are the difficulties that you may face when you want to offer your pet for adoption?	Answer: Finding a reliable platform for adoption only and not pet trading, and how to find a trustworthy adopter.
Question 3: As a pet adopter, how would you adopt a pet, what methods would you use to find a pet?	Answer: By taking and helping stray animals in the street, I do not prefer to go to pet shelters because of the overcrowding there.
Question 4: What are the difficulties that you may face when you want to adopt a pet?	Answer: If the pet owner is not honest about the pet's and its health condition, it may lead to deception towards adopters.
Question 5: Would you be interested in an application that facilitates pet adoption process? Why?	Answer: Yes 100%, due to the lack of technical solutions in pets adoption filed.
Question 6: What kind of features do you wish to have in an application for pets adoption?	Answer: The existence of trust between both the adopter and pet owner, for example, the existence of a written consent provided by the adopter clarifying the guarantee of his ability to adopt with his name, his approval, and signature.



Question 7: What information you like to know about a pet before adopting it?	Answer: Nicknames that a pet responds to, its age, the types of its supplies such as food and sand, an explanation of whether there is a file in a veterinary clinic, an explanation of the pet's personality and level of activity.
Question 8: Do you think displaying a pet owner or adopter information in the adoption process is helpful for you? And why?	Answer: Yes, it is helpful to keep communication with the adopter.
Question 9: If you want to offer your pet for adoption. Do you care who is the person that will adopt it? And why?	Answer: Yes, I care, to ensure the reliability and credibility of this adopter.

Table 27. Interview 1 transcriptions

INTERVIEW 2 TRANSCRIPTION

Interviewee:	Rawan Alqarni.
Location / Medium:	Online interview through Zoom. Appointment Date: 17/09/2022 Start Time: 5:00pm End Time: 5:15pm
Reminders: The interviewee is a female Information technology student whose 20 years old, she owns 6 pets which are: 3 birds, 2 cats and 1 turtle. And she is interested in the pet adoption field.	
Questions:	Notes:
Question 1: As a pet owner, have you ever thought of offering your pet for adoption? And why?	Answer: Yes, because of the proliferation of pets, which increased their number and affected my ability to take care of them, also some members of my family suffer from asthma, so the presence of pets in the house affects them.
Question 2: What are the difficulties that you may face when you want to offer your pet for adoption?	Answer: Some people may request unreasonable conditions to adopt pets, also the process of offering pets for adoption through social media platforms is random and unreliable, also I may not know who the adopter of my pet is, which may lead to deception.



Question 3: As a pet adopter, how would you adopt a pet, what methods would you use to find a pet?	Answer: Ask people around me, or by going to pet shelters.
Question 4: What are the difficulties that you may face when you want to adopt a pet?	Answer: How to find my perfect match of a pet, going to shelters may be tiring due to the crowding there and some shelters policies could be time and effort consuming, also some shelters may charge fees for adoption.
Question 5: Would you be interested in an application that facilitates pet adoption process? Why?	Answer: Yes, because we need to motivate people to adopt and raise their awareness about pet adoption to differentiate between buying and adopting pets, and also having a solution like this could reduce the number of pets abandoned on the streets.
Question 6: What kind of features you wish to have in an application for pets adoption?	Answer: Providing options for communication, whether using a chat or a direct number, and the number is better. The possibility of following up with the adopter after adoption, Account for the pet owner and the adopter, providing pets sections or categories, providing filter for age or breed for example.
Question 7: What information you like to know about a pet before adopting it?	Answer: Providing an animal profile is important to show the photos of the pet, as well as to clarify its health condition and the presence of its health passport. providing information on pet's personality and its characteristics.
Question 8: Do you think displaying a pet owner or adopter information in the adoption process is helpful for you? And why?	Answer: I think so, to know reliability of this adopter, and to know his age and gender is enough I think, because if he/she was completely unknown might be suspicious for the owner.
Question 9: If you want to offer your pet for adoption. Do you care who is the person that will adopt it? And why?	Answer: Yes, also I wish to know whether there is any previous experience of this adopter in raising pets.

Table 28.Interview 2 transcriptions



INTERVIEW 3 TRANSCRIPTION

Interviewee: Abdulaziz Majed.	Interviewer: Rawan Alqarni.
Location / Medium: Online interview through Zoom.	Appointment Date: 17/09/2022 Start Time: 8:00pm End Time: 8:15pm

Reminders: The interviewee is a male Information system student whose 22 years old, he does not own any pet currently, but he wishes to adopt one.

Questions:	Notes:
Question 1: As a pet owner, have you ever thought of offering your pet for adoption? And why?	Answer: Currently I do not own or have a pet, but I am interested about pets in general and I wish to have one.
Question 2: What are the difficulties that you may face when you want to offer your pet for adoption?	Answer: I do not know exactly because at the moment I do not have a pet as I said.
Question 3: As a pet adopter, how would you adopt a pet, what methods would you use to find a pet?	Answer: Through specialized accounts in the social media for pets adoption, or by searching using “adopt” keyword on the internet, or through shelters such as Riyadh shelter.
Question 4: What are the difficulties that you may face when you want to adopt a pet?	Answer: The shelter is crowded and has a waiting list so it's time consuming, and the requirements for adoption may sometimes be a lot and illogical for those who want to adopt, and if the adoption is through social media, they are unreliable because they are not official platforms for adoption.
Question 5: Would you be interested in an application that facilitates pet adoption process? Why?	Answer: Yes, of course, so that it can be another solution than the traditional ones for pets adoption.



Question 6: What kind of features do you wish to have in an application for pets adoption?	Answer: Providing filter on animal characteristics such as age, also having priority to show pets for adoption “urgent adoptions”, but there must be credibility in this matter. Imposing a certain limit on the number of pets allowed to be adopted by each adopter per month, to not exploit pets.
Question 7: What information you like to know about a pet before adopting it?	Answer: Age and breed of the pet, its health vaccinations and whether it has been sterilized. The personality of the pet and how it behaves with children especially.
Question 8: Do you think displaying a pet owner or adopter information in the adoption process is helpful for you? And why?	Answer: It is important for the pet owner to know some information about the adopter so that he/she is not completely unknown, such age of the adopter, his name and number, and how many children are in his/her house.
Question 9: If you want to offer your pet for adoption. Do you care who is the person that will adopt it? And why?	Answer: Yes, to make sure he is capable of adoption.

Table 29. Interview 3 transcriptions

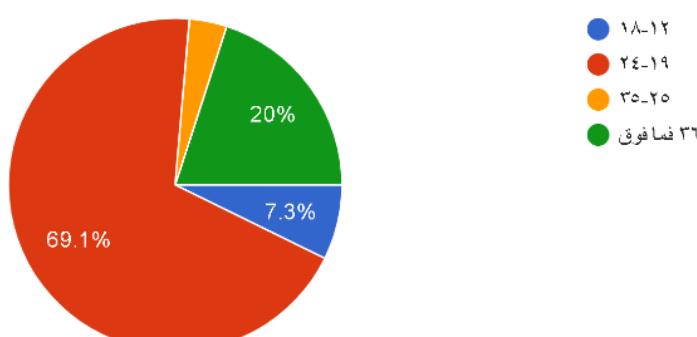
9.2 APPENDIX B: Requirements Elicitation Questionnaire

-Demographic questions:

- How old are you?

أهلاً بك, كم عمرك؟

55 responses

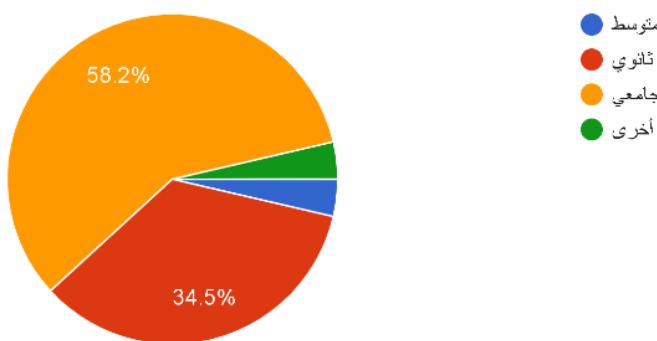




- What's your educational level?

ما هو مستواك التعليمي؟

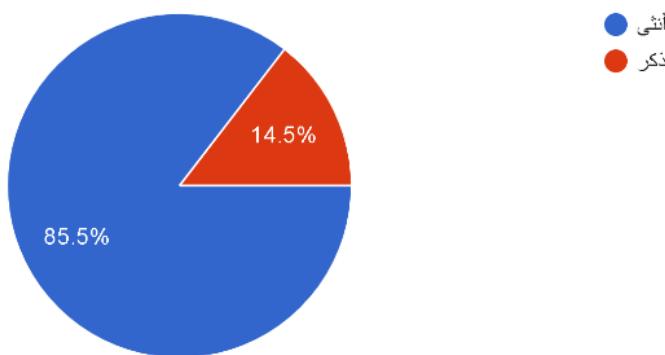
55 responses



- What is your gender?

ما هو جنسك؟

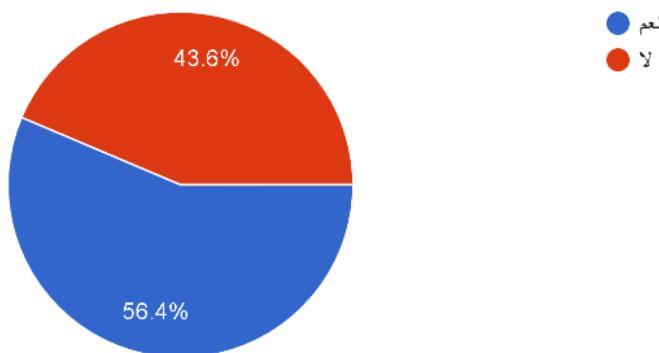
55 responses



- Do you have a pet, or have you ever owned one?

هل لديك أو هل سبق لك امتلاك حيوان أليف؟

55 responses



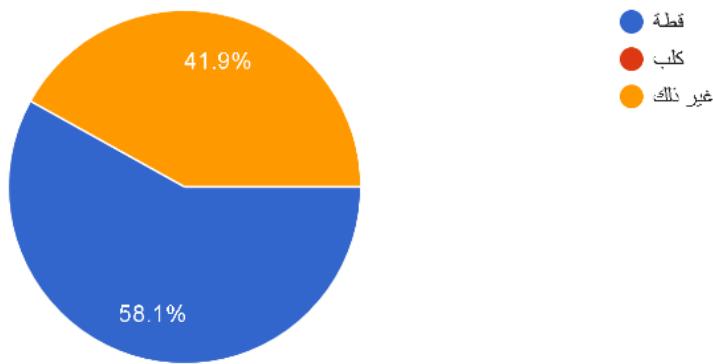


-Pet owner questions:

- If your answer is yes, what kind of pet do you have?

ما هو نوع صديقك الأليف؟

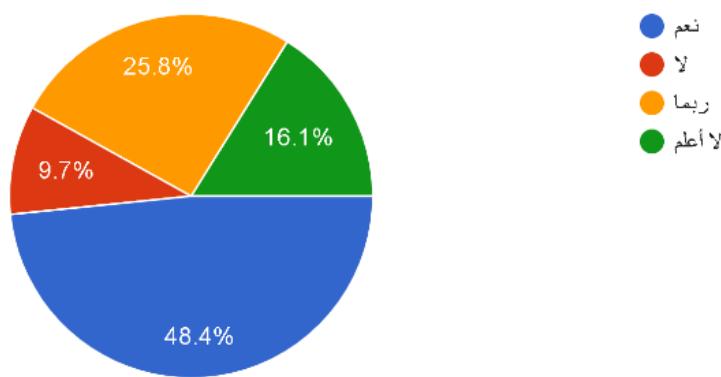
31 responses



- If you have a pet, do you think that you may encounter difficulties offering it for adoption?

هل تعتقد أنك قد تواجه صعوبات عند عرض صديقك الأليف للتبني؟

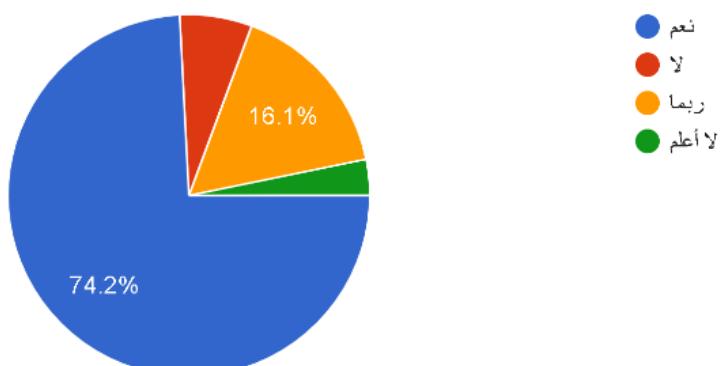
31 responses



- If you have a pet and you want to offer it for adoption. Do you care who the person that will adopt it?

هل قد تهتم بمعرفة هوية متبني صديقك الأليف؟

31 responses

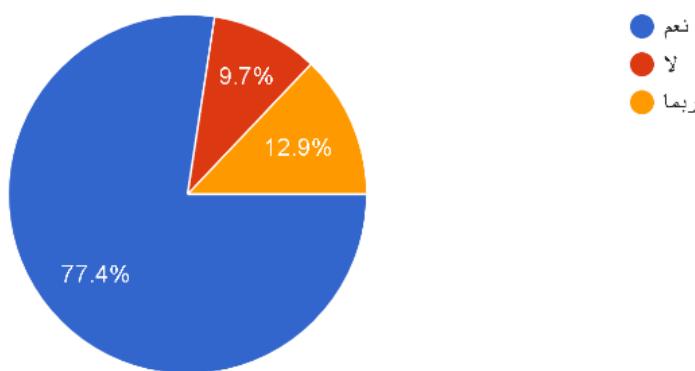




- Would you be interested in application that facilities pet adoption?

هل أنت مهتم بوجود تطبيق يسهل عملية تبني الحيوانات الأليفة؟

31 responses



- If your answer is yes, what feature would you like this application to have?

إذا كانت إجابتك نعم، فما الميزات التي ترغب في أن يمتلكها هذا التطبيق؟

18 responses

التصویر ، البحث بحسب نوع الاليف ممكن ان يتم اضا

يتأكد لي من اسم المتبني الصدقى، طريقة للتواصل معه بعض المعلومات عن عاينته اللي معه بالبيت عشان اتأكد ان حيواني بيبيه مناسبه صراحه الموضوع قوي بالنسبة لي كام قطوه فلازم تحرصون على اشياء كثير عشان مايأخذون الحيوانات ناس مب كفو ويستأذنون فيه

متابعة المتبني ومعرفة أحوال الاليف

عرض الحيوانات الممكن تبنيها ومواصفاتها، و عند طلب تبني معرفة الشخص المتبني للحيوان وارسال صور لحيوانك المتبني منه لك، ربما متجر الكترونى صغير بيع فقط للاعتماد بالحيوانات

معلومات حول الحيوان (العمر و النوع و الجنس ..)
و نصائح حول كيفية الاعتناء بالحيوان الاليف و ما هي الاطعمة المناسبة لهم

عرض صور للحيوان الاليف مع معلومات عنه كالعمر و صفات الشخصية

ان يحتوى التطبيق على صور للحيوان وشرح بسيط عن زي عمره وشخصيته وايش الاكل اللي متعود عليه

- Would you like to participate in a short online interview about pets and adoption for 10 minutes? If yes, write your number please.

إذا كنت ترغب بالمشاركة في مقابلة قصيرة عبر الانترنت حول عملية تبني الحيوانات الأليفة لمدة 10 دقائق، الرجاء إدخال رقم هاتفك:

2 responses

05

05

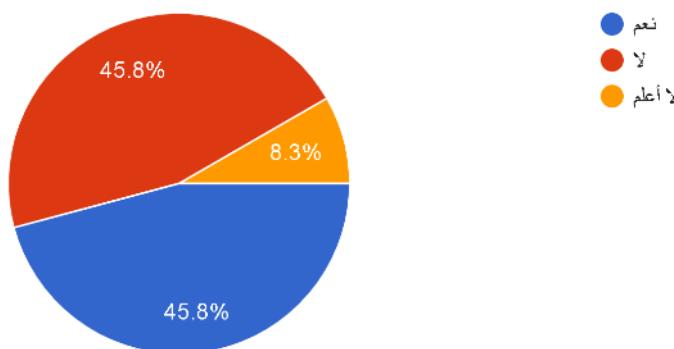


-Pet adopter questions:

- Have you ever considered adopting a pet?

هل فكرت يوماً في تبني حيوان أليف؟

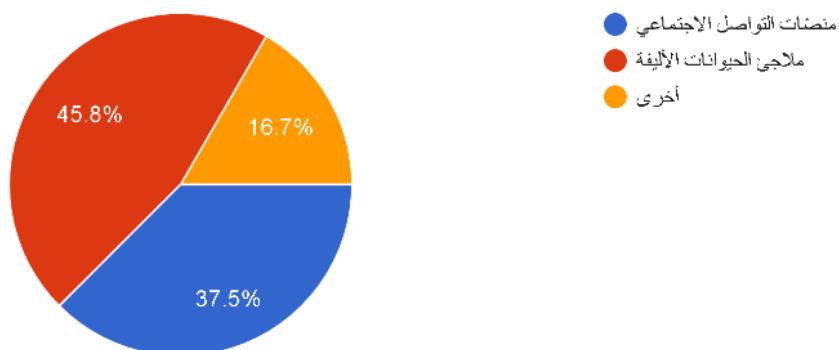
24 responses



- If you are considering adopting a pet, where do you think you will find one?

إن كنت تفكّر في تبني حيوان أليف، باعتقادك أين يمكنك أن تجد ذلك الصديق الأليف للتبني؟

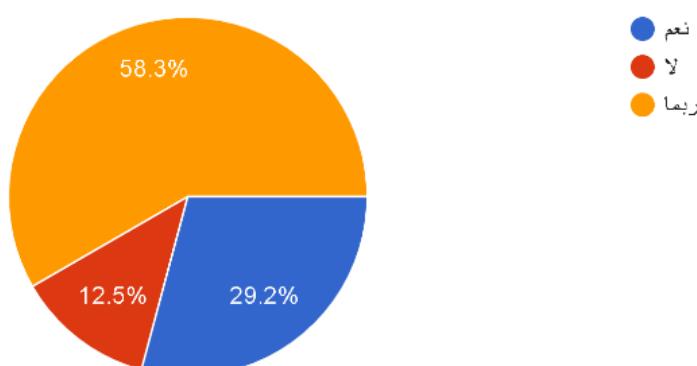
24 responses



- Is it difficult to find a pet that matches your preferences and aspirations?

هل تجد صعوبة في إيجاد الحيوان الأليف الذي يناسب اهتماماتك وتحصيلاتك؟

24 responses

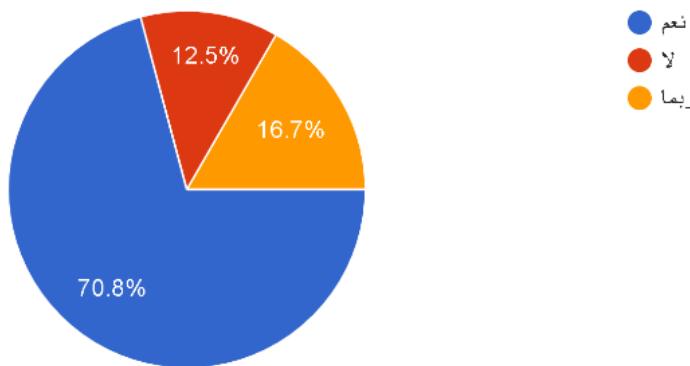




- Would you be interested in application that facilities pet adoption?

هل أنت مهتم بوجود تطبيق يسهل عملية تبني الحيوانات الأليفة؟

24 responses



- If your answer is yes, what feature would you like this application to have?

إذا كانت إجابتك نعم، فما الميزات التي ترغب في أن يمتلكها هذا التطبيق؟

24 responses

ميزة تمكن المستخدمين من عرض حيواناتهم الأليفة للتبني.

وجود كامل بيانات التطعيمات والتعقيم. تصنف حالات التبني بحسب ضرورة التخلص من الحيوان (بعض الاهالي يهددون بترك الحيوان بالشارع اذا ما طلعنوه من البيت)

وجود ملف واضح ومفصل لكل حيوان أليف مع امكانية التواصل مع الموظفين لاستفسار بشكل اكتر

ان يكون التطبيق ثقة و تعرض فيه جميع تفاصيل الحيوان المعروض للتبني

المصداقية

صور للحيوان ومعلومات عنه

ممكن يصبر فيه تعليمات ل التربية الحيوانات الاليفة لانه فيه ناس تبغى تبني لكن لكن مايعرفون كيف يربونها وبهتمون فيها

توفر جميع انواع الحيوانات الاليفة الصغيرة مثل البط والسمك والسلحفاة

- Would you like to participate in a short online interview about pets and adoption for 10 minutes? If yes, write your number please.

إذا كنت ترغب بالمشاركة في مقابلة قصيرة عبر الانترنت حول عملية تبني الحيوانات الأليفة لمدة 10 دقائق، الرجاء إدخال رقم هاتفك:

2 responses

050

050



9.3 APPENDIX C: EWAA Pet Description

Siamese Cats



Personality	
In English	In Arabic
It gets along with other animals.	يتكيف مع الحيوانات الأخرى.
Curious and smart.	ذكي وفضولي.
Affectionate and need lots of attention	حنون ويحب الاهتمام.
Does not prefer to isolate or stay away from others.	لا يحب العزلة كثيراً.
Social and enjoys interacting with people.	اجتماعي ويحب الناس كثيراً.
Quiet and gentle.	هادئ ولطيف.
Very active and enjoys chasing and playing.	نشيط ويحب اللعب كثيراً.



Persian Cats



Personality	
In English	In Arabic
It gets along with other animals.	يتكيف مع الحيوانات الأخرى.
Love to play with children.	يحب اللعب مع الأطفال.
Loves cleaning and washing.	يحب النظافة والاغتسال.
Loves to be noticed and fore played.	يحب الاهتمام والمداعبة.
Lazy, love to sleep.	كسول ويحب النوم.
Quiet and gentle.	هادئ ولطيف.
Funny, playful	لعوب ومرح.



Himalayan Cats



Personality	
In English	In Arabic
It gets along with other animals.	يتكيف مع الحيوانات الأخرى.
Curious and smart.	ذكي وفضولي.
Affectionate and need lots of attention.	حنون ويتطلب الكثير من الاهتمام.
Does not prefer to isolate or stay away from others.	لا يحب العزلة.
Antisocial and do not like to interact with people.	غير اجتماعي، لا يحب الاختلاط بالناس كثيراً.
Quiet and gentle.	هادئ ولطيف.
Very active and enjoys chasing and playing.	نشيط ويحب اللعب.



Scottish Fold Cats



Personality	
In English	In Arabic
It gets along with other animals.	يتكيف مع الحيوانات الأخرى.
Smart.	ذكي.
Affectionate and need lots of attention.	حنون ويحب الاهتمام.
Easily adapt to new people and situations.	سريع التكيف والتدريب.
Social and enjoys interacting with people.	اجتماعي، يحب الاختلاط بالناس كثيراً.
Quiet and gentle.	هادئ ولطيف.
Very active and enjoys chasing and playing.	نشيط ويحب اللعب



Poodle Dogs



Personality	
In English	In Arabic
It gets along with other animals.	ينسجم مع الكلاب الأخرى.
Curious and smart.	ذكي وفضولي.
Affectionate and need lots of attention.	حنون ويحب الاهتمام.
Quick to learn and train.	سريع التعلم والتدريب.
Social and enjoys interacting with people.	اجتماعي، يحب الاختلاط بالناس كثيراً.
Quiet and gentle.	هادئ ولطيف.
Kind and friendly.	عطوف، ودود.
Very active and enjoys chasing and playing.	نشيط ويحب اللعب.
Enjoy chasing and playing.	يحب المطاردة.
Excellent at guarding.	يجيد الحراسة.



Husky Dogs



Personality	
In English	In Arabic
It gets along with other animals.	ينسجم مع الكلاب الأخرى.
Curious and smart.	ذكي وفضولي.
Affectionate and need lots of attention.	حنون ويحب الاهتمام.
Quick to learn and train.	سريع التعلم والتدريب.
Social and enjoys interacting with people.	اجتماعي، يحب الاختلاط بالناس كثيراً.
Love to play with children.	يحب اللعب مع الأطفال.
Very active and enjoys chasing and playing.	نشيط ويحب اللعب.
love outdoors and hiking.	يحب التجول خارج المنزل.
Excellent at guarding.	يجيد الحراسة.



Pitbull Dogs



Personality	
In English	In Arabic
It gets along with other animals.	ينسجم مع الكلاب الأخرى.
Aggressive.	شرس و عدواني.
Quick to learn and train.	سريع التعلم والتدريب.
Social and enjoys interacting with people.	اجتماعي، يحب الاختلاط بالناس.
Excellent at obeying orders and following directions.	يحسن التصرف، مطيع.
Very active and enjoys chasing and playing.	نشيط ويحب اللعب.
Enjoy chasing and playing.	يحب المطاردة والهروب.
Excellent at guarding.	يجيد الحراسة.



Maltese Dogs



Personality	
In English	In Arabic
It gets along with other animals.	ينسجم مع الكلاب الأخرى.
Smart and energetic.	ذكي، حيوي.
Quick to learn and train.	سريع التعلم والتدريب.
Social and enjoys interacting with people.	اجتماعي، يحب الاختلاط بالناس.
Affectionate and need lots of attention.	حنون ويريد الاهتمام.
Love to play with children.	يريد اللعب مع الأطفال.
Very active and enjoys chasing and playing.	نشيط ويريد اللعب.



9.4 APPENDIX D: Pets Data Collection Questionnaire

-Pet owner questions:

- What is your pet nickname?

:اسم حيوانك الأليف او شاركنا باسم مستعار في حال كنت لا ترغب بمشاركة الاسم

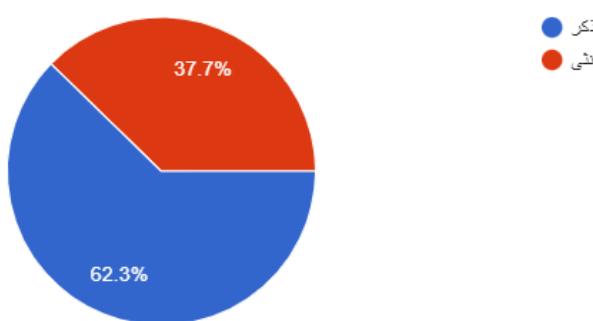
61 responses

برونو
لونا
ماكسي
جيجي
بيكسي
لوكى
بولو
مارك
نوفا

- What is your pet gender?

:جنس حيوانك الأليف

61 responses

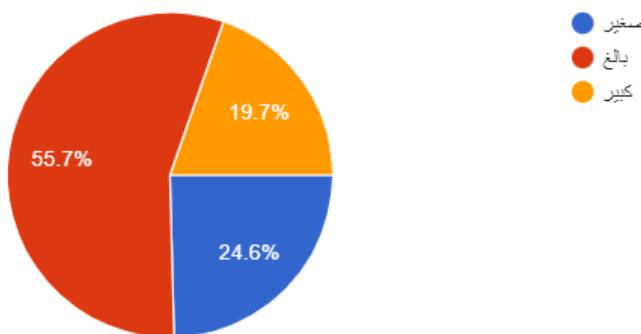




- What is your pet age?

عمر حيوانك الأليف:

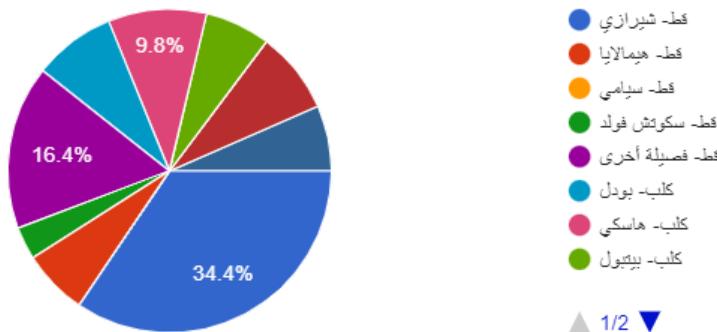
61 responses



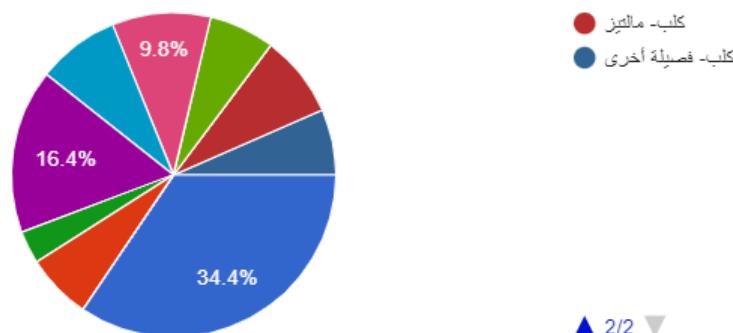
- What is your pet type and breed?

نوع حيوانك الأليف:

61 responses



▲ 1/2 ▼



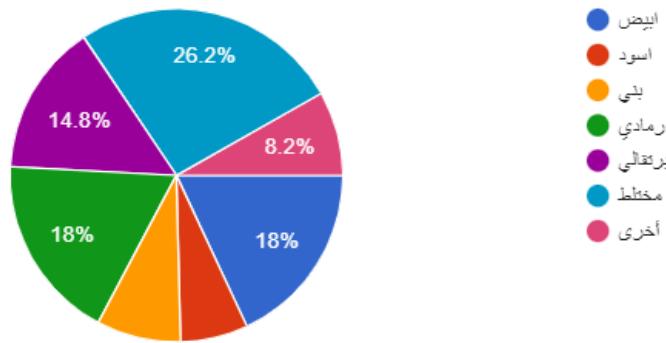
▲ 2/2 ▼



- What is your pet color?

لون حيوانك الأليف:

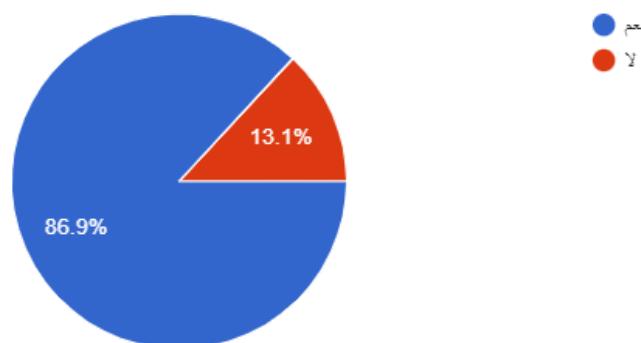
61 responses



- Is your pet vaccinated?

هل حيوانك الأليف مطعم او سيتم تطعيمه:

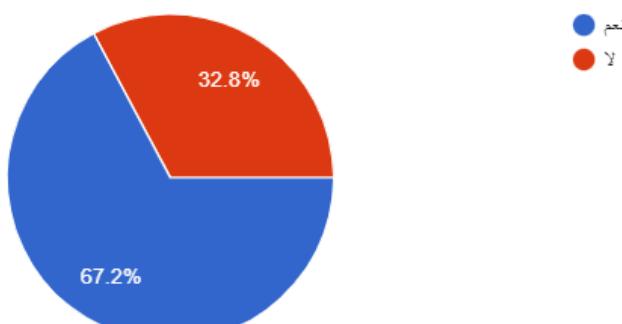
61 responses



- Is your pet sterilized?

هل حيوانك الأليف معقم او سيتم تعقيمه:

61 responses

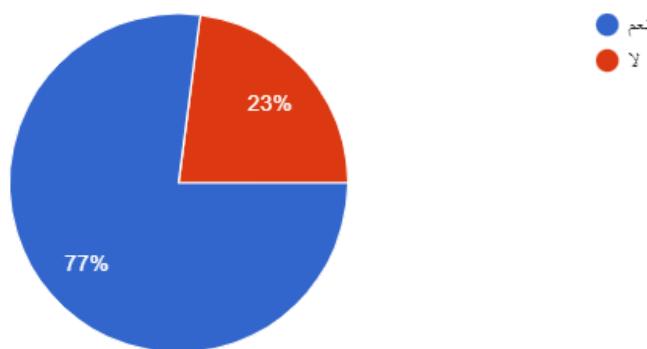




- Does your pet have a health passport?

: هل حيوانك الأليف يمتلك جواز صحي

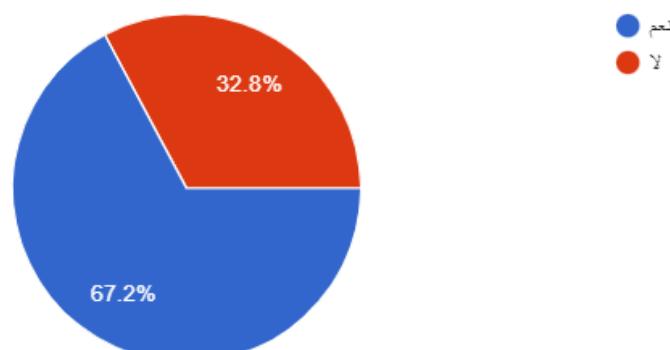
61 responses



- Does your pet have a health profile in a vet clinic?

: هل حيوانك الأليف يمتلك ملف صحي في عيادة بيطرية

61 responses

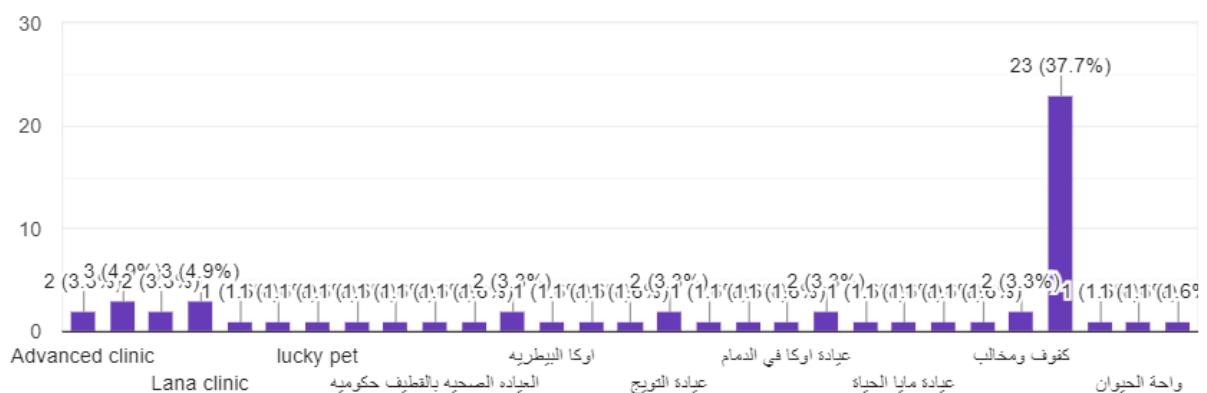




- if your pet has a health profile in a vet clinic, what is the name of this clinic?

إذا كان حيوانك الأليف يمتلك ملف صحي في عيادة بيطرية الرجاء كتابة اسم العيادة او قم بكتابه لا

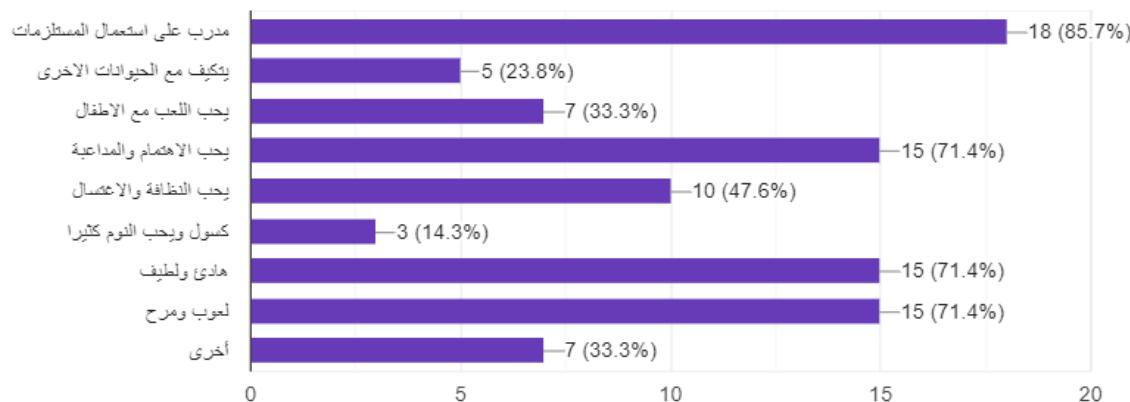
61 responses



- What are the personality traits of your pet?

الرجاء اختيار الصفات الشخصية التي تنطبق على حيوانك الأليف:

21 responses





9.5 APPENDIX E: User Story Acceptance Testing

Sprint Number	User story	Acceptance criteria	Test action(s)	Pass?	Comments
Sprint 1	As a user, I want to sign up, so that I can create my own account in the application.	Given I am a user, if I go to the sign-up page and fill all required fields (username, email, mobile number, password and repeated password) correctly and click on sign up, then a message should appear indicating that I am signed up successfully.	Going to sign up page and try fill all required fields correctly and click on sign up.	Yes	
		Given that I'm a user, if I go to the sign-up page, fill out all the required fields, but my mobile number isn't Saudi (Saudi number should start with 9665 and be 12 characters long, or start with 5 and be 9 characters long or start with 05 and be 10 characters long) then I'll get a message saying that the mobile number is incorrect and the sign up won't be successful.	Going to sign up page try to complete all the fields correctly and try to write a mobile number does not start with 05 and its length is 10 and click on sign up. Going to sign up page try to complete all the fields correctly and try to write a mobile number that start with 05 and its length not 10 and click on sign up. Going to sign up page try to complete all field and try to write a mobile number does not start with 5 and its length is 9 and click on sign up. Going to sign up page try to complete all the fields correctly and try to write a mobile number that start with 5 and its length not 9 and click on sign up.	Yes	



		<p>Going to sign up page try to complete all the fields correctly and try to write a mobile number does not start with 9665 and its length is 12 and click on sign up.</p> <p>Going to sign up page try to complete all the fields correctly and try to write a mobile number that start with 9665 and its length not 12 and click on sign up.</p>		
	<p>Given I am a user, if I go to the sign-up page and fill all required fields but the password less than 6 characters then there a message indicts me that the password does not correct and the sign up will not complete.</p>	<p>Going to sign up page and try fill all required fields correctly and enter a password with length less than 6 characters and click on sign up.</p>	Yes	
	<p>Given I am a user, if I go to the sign-up page and fill all required fields but the repeated password not the same as the password then there a message indicts me that the password does not match and the sign up will not complete.</p>	<p>Going to sign up page and try fill all required fields correctly and mismatch the repeated password with the password and click on sign up.</p>	Yes	
	<p>Given I am a user, if I go to the sign-up page and forget to complete one or all required fields and click to sign up then there is a message indicating me to complete these required fields.</p>	<p>Going to sign up page and try to leave a required field and click on sign up.</p> <p>Going to sign up page and try to leave all the required fields and click on sign up.</p>	Yes	



	Sprint 1	Given I am a user, if I go to the sign-up page and fill all required fields but the email is already existed in the firebase then there a message indicts me that email is already exist and the sign up will not complete.	Going to sign up page and try fill all required fields and enter an email that is already exists in firebase and click on sign up.	Yes	
		Given I am a user, if I go to the sign-up page and fill all required fields but the email is not correct like doesn't contain @ and .com then there a message indicts me that email is not corrects and the sign up will not complete.	Going to sign up page and try fill all required fields correctly and enter email that does not contain @ and .com and click on sign up.	Yes	
As a registered user, I want to log in with my email and password, so that I can access my account.		Given I am a user, if I go to the login page and enter my email and password correctly and click on log in, then the system should allow me to access my account successfully.	Going to log in page and try entering email and password correctly and click on log in.	Yes	
		Given I am a user, if I go to the login page and enter my email but the password is not correct then there is a message that indicates me that the password is not correct, and the login will not complete.	Going to log in page and try entering email correctly with incorrect password and click on log in.	Yes	
		Given that I'm a user, if I go to the login page and enter my email and password but the email does not exist in firebase then there is a message indicate me that email does not exist, and the login will not complete.	Going to log in page and try entering an email does not exist in firebase and password and click on log in.	Yes	
		Given I am a user, if I go to the login page and then click on log in button without filling all the fields then there is a message indicate me to complete the empty fields.	Going to log in page and try to leave all the required fields and click on login.	Yes	



		<p>Given I am a user, if I go to the login page and enter my email and password correctly but my email not authenticated yet, then there is a message indicate me to authenticate my email first.</p>	<p>Going to log in page and try to enter email and password correctly but the email not authenticated yet and click on login.</p>	Yes	
Sprint 1	<p>As a registered user, I want to reset my password, so that I can access my account when I forget password.</p>	<p>Given I am a user, if I go to the login page and click on forget password, then it will direct me to a page asking for my email, and after I enter my email and click send, a message will appear letting me know that a link to reset my password has been sent to my email. Once I click this link and change my password to a new one, the system should assist me in logging in using the new password.</p>	<p>Going to log in page and try clicking on forget my password and then the application will direct me to another page to enter my email then clicking on send.</p> <p>Then I going to the email and click on the link that sent to me and then change the password.</p>	Yes	
		<p>Given that I'm a user, if I go to the login page and click on forget password, it will take me to a screen that asks for my email, then I enter an email doesn't exist, however, after I input it, a message will appear to let me know that it doesn't exist and the link of reset my password won't be sent.</p>	<p>Going to log in page and clicking on forget my password and then the application will direct me to another page asking me about my email.</p> <p>and I try to enter wrong email.</p>	Yes	
Sprint 1	<p>As a logged in user, I want to log out easily, so that I can keep my account secure from people who may be using my devices.</p>	<p>Given I am a user, if I go to my profile and then click on the log out button, then the system should remove all my authentication information from the application and then it will direct me back to the home page.</p>	<p>Going to profile page and try clicking on logout button.</p>	Yes	
		<p>Given I am a user, if I go to the menu and then click on the log out button, then the system should remove all my authentication</p>	<p>Going to the menu and try clicking on logout button.</p>	Yes	



		information from the application and then it will direct me back to the home page.			
Sprint 1 As a logged in user, I want to add my pets for adoption so that I can find people who want to adopt my pet.		Given I am a user, if I go to the add page (no1) and complete all the fields and click on the next button then it will direct me to the add page (no2) successfully.	Going to add pet page (no1) and complete all the fields and click on the next button.	Yes	
		Given I am a user, if I go to the add page (no1) and complete all the fields except the pet's name and click on the next button then it will direct me to the add page (no2) successfully.	Going to add pet page (no1) and complete all the fields except the pet's name and click on the next button.	Yes	
		Given that I am a user, if I go to the add pet page and upload my pet image, then the image appears to me, and it should allow me to change the image if I want.	Going to add pet page (no1) and upload my pet's picture. After I upload it, I click to edit the picture of my pet.	Yes	
		Given I am a user, if I go to the add page (no1) and complete all the fields and click on the next button then it will direct me to the add page (no2) and the personalities that display there should be those of the breed I choose.	Going to add the pet page (no1) and complete all the fields and click on the next button; then it will direct me to the add page (no2), and I will see the personalities that appear on the add page (no2) If these personalities of the breed that I have chosen from the previous page.	Yes	
		Given I am a user, if I go to the add page (no1) and complete all the fields except the pet (image/breed/type/gender/color/age) and click on the next button then there is a notify message indicate me to complete these required fields.	Going to add the pet page (no1) and complete all the fields except the pet (image/breed/type/gender/color/age) and then I click on the next button.	Yes	



	<p>Given I am a user, if I complete the add page (no1) successfully and then complete all the fields of the add page (no2) and click on the add button then a message should appear to confirm the success of adding the pet.</p>	<p>Going to the add the pet page (no1) and complete all the fields and click on next. And after directing me to add page (no2) I finish all the fields on this page and then click on the add button.</p>	Yes	
	<p>Given I am a user, if I complete the add page (no1) successfully and then complete all the fields of the add page (no2) and except the fields (reasons for offering the pet to the adoption/ pet supplies / personalities) and click on the add button then a message should appear to confirm the success of adding the pet.</p>	<p>Going to the add the pet page (no1) and complete all the fields and click on next. And after directing me to add page (no2) I finish all the fields except the fields (reasons for offering the pet to the adoption/ pet supplies / personalities) and click on the add button.</p>	Yes	
	<p>Given I am a user, if I complete the add page (no1) successfully and I click on the next button then it will direct me to the add page (no2) and in this page if I answer “yes” about if my pet has health profile or not then a field will appear to ask me about the name of hospital.</p>	<p>Going to the add the pet page (no1) and complete all the fields and click on next. And after directing me to add page (no2) I answer “yes” about if my pet has health profile or not then the field should appear.</p>	Yes	
	<p>Given I am a user, if I complete the add page (no1) successfully and I click on the next button then it will direct me to the add page (no2) and in this page if I answer “no” about if my pet has health profile or not then the field of the name of the hospital will not appear.</p>	<p>Going to the add the pet page (no1) and complete all the fields and click on next. And after directing me to add page (no2) I answer “no” about if my pet has health profile or not then the field will not appear.</p>	Yes	
	<p>Given I am a user, if I complete the add page (no1) successfully and then complete all the fields of the add page (no2) except (inoculation /neutering/health passport/health</p>	<p>Going to the add the pet page (no1) and complete all the fields and click on next. And after directing me to add page (no2) I finish all the fields except the fields (inoculation</p>	Yes	



		profile/name of hospital ‘if the pet has health profile ‘) and click on the add button then there is a notify message indicate me to complete this required field .	/neutering/health passport/health profile/name of hospital ‘if the pet has health profile ‘) and click on the add button		
Sprint 1	As a logged in user, I want to view my added pet, so that I can see my added pet information.	Given I am a user, if I go to (my profile / the menu) and click on my pets, then I should see all my added pets along with their information.	Going to (my profile / the menu) and click on my pets.	Yes	
		Given I am a user, if I go to (my profile / the menu) and then click on my pets button but I don't have pets, then a notice will let me know that I don't have any pets.	Going to (my profile / the menu) and click on my pets and then remove every pet I have.	Yes	
Sprint 1	As a logged in user, I want to edit my pet's information, so that I can keep my pet's information updated	Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change or delete the pet name in the edit page(no1) and click on the next button then it will directs me to the edit page (no2) successfully.	Going to my added pets page and select a pet to edit its information then click on edit icon and then try to (remove / change) the pet name and click on next button.	Yes	
		Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change the pet (breed /color/ age/ gender/ image) in the edit page(no1) and click on the next button then it will direct me to the edit page (no2) successfully.	Going to my added pets page and select a pet to edit its information then click on edit icon and then try to change the pet (breed /color/ age/ gender/ image) and click on next button.	Yes	
		Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change the pet type in the edit page(no1) and click on the next button then there is a notify message indicate me to select the pet breed.	Going to my added pets page and select a pet to edit its information then click on edit icon and then try to change the pet type and click on next button.	Yes	



		<p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I change the pet type and then select the pet breed in the edit page(no1) and click on the next button then it will directs me to the add page (no2) successfully.</p>	<p>Going to my added pets page and select a pet to edit its information then click on edit icon and then try to change the pet type and then select the pet breed and click on next button.</p>	Yes	
		<p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change or delete the fields of (reasons for offering the pet to the adoption/ pet supplies / pet personalities) in the edit page(no2) and click on the update button update then a message should appear to confirm the success of editing my pet's information, and this update should appear in my pet's information page.</p>	<p>Going to my added pets page and select a pet to edit its information then click on edit icon and then I complete all the fields successfully in the edit pet page(no1) and then try to (change / delete) the fields of (reasons for offering the pet to the adoption/ pet supplies / pet personalities) and click on update button.</p>	yes	
		<p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change (inoculation /neutering/health passport/health profile 'change it to "no" ') in the edit page(no2) and click on the update button then a message should appear to confirm the success of editing my pet's information, and this update should appear in my pet's information page.</p>	<p>Going to my added pets page and select a pet to edit its information then click on edit icon and then I complete all the fields successfully in the edit pet page(no1) and then try to change (inoculation /neutering/health passport/health profile 'change it to "no" ') and click on update button.</p>	Yes	



		<p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change (health profile to 'yes') in the edit page(no2) and click on the update button without filling the name of the hospital then there is a notify message indicate me to complete this required field .</p>	<p>Going to my added pets page and select a pet to edit its information then click on edit icon and then I complete all the fields successfully in the edit pet page(no1) and then try to change health profile to 'yes' and click on update button without filling the name of the hospital .</p>	Yes	
		<p>Given I am a user, if I go to my added pets page and select a pet to edit its information and then I complete all the fields successfully in the edit pet page(no1) and then change (health profile to 'yes') in the edit page(no2) and then fill field of (the name of the hospital)and click on the update button then a message should appear to confirm the success of editing my pet's information, and this update should appear in my pet's information page.</p>	<p>Going to my added pets page and select a pet to edit its information then click on edit icon and then I complete all the fields successfully in the edit pet page(no1) and then try to change health profile to 'yes' and then fill field of (the name of the hospital) and click on update button.</p>	Yes	
Sprint 1	<p>As a logged in user, I want to delete my pet, so that I can be more flexible when it comes to adding my pets for adoption</p>	<p>Given I am a user, if I go to my added pets page and then click on the delete button on a pet, then a warning message will appear to confirm the deletion, and if I click on ok button, then my pet should be deleted from my added pets list and from available pets for adoption in the application.</p>	<p>Going to my added pets page and select a pet to delete and then confirm the deletion process by clicking ok button.</p>	Yes	
		<p>Given I am a user, if I go to my added pets page and then click on the delete button on a pet and then click on delete my pet button ,then a</p>	<p>Going to my added pets page and select a pet to delete and then cancel the deletion process by clicking cancel button.</p>	Yes	



		warning message should appear to confirm the deletion, and if I click on cancel button, then the pet shouldn't be deleted from my added pets list.			
Sprint 1	As a logged in user, I want to view my account, so that I can see my account information.	Given I am a logged-in user, if I click on the account icon located in the top nav bar, then I should be directed to my account page to see all my information that is associated to my account.	Going to home page and try clicking on the profile icon.	Yes	
Sprint 1	As a user, I want to view detailed information about the selected pet, so that I can learn more about the pet to adopt it.	Given I am a user, if I select a pet by clicking on view pet button, then I should be directed to its page that shows its detailed information.	Going to home page and try choosing a category then click on view pet on a pet.	Yes	
Sprint 1	As a user, I want to view available pets' categories, so that I can find the desired pet's category faster.	Given I am a user, if I go to the application home page, then I should view the available pets' categories so that I can select what category I want to explore more.	Going to the home page and try select a category.	Yes	
Sprint 2	As a logged in user, I want to edit my account, so that I can keep my account and information updated.	Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I upload my personal image, then the image appears to me, and it should allow me to change the image if I want.	Going to the profile page and click on edit my account button and try upload an image after that try change this image .	Yes	
		Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account	Going to the profile page and click on edit my account button and try change the (name/mobile number) correctly and click on the update	Yes	



		<p>page that contains my current information, if I change my (name/mobile number) correctly and click on the update button without/with uploading my personal image, then a message should appear to confirm the success of editing my account.</p>	<p>button without/with uploading an image.</p>		
		<p>Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I remove my (name/mobile number) and click on the update button , then there is a message indicating me to complete these required fields.</p>	<p>Going to the profile page and click on edit my account button and try remove the (name/mobile number) and click on the update button.</p>	Yes	
		<p>Given I am a logged-in user, if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I change my name and click update button , then a message should appear to confirm the success of editing my account.</p>	<p>Going to the profile page and click on edit my account button and try change the name and then click on the update button.</p>	Yes	
		<p>Given I am a logged-in user , if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I change my mobile number but the mobile number isn't Saudi (Saudi number should start with 9665 and be 12 characters long, or start with 5 and be 9 characters long or start with 05 and be 10 characters long) and click on</p>	<p>Going to the profile page and click on edit my account button and try change the mobile number to non-Saudi mobile number and then click on the update button.</p>	Yes	



		<p>the update button ,then I'll get a message saying that the mobile number is incorrect.</p>			
		<p>Given I am a logged-in user , if I go to my account page and click on edit my account button, then I should be directed to edit account page that contains my current information, if I change my mobile number and the mobile number is Saudi (Saudi number should start with 9665 and be 12 characters long, or start with 5 and be 9 characters long or start with 05 and be 10 characters long) and click on the update button , then a message should appear to confirm the success of editing my account.</p>	<p>Going to the profile page and click on edit my account button and try change the mobile number to Saudi mobile number and then click on the update button.</p>	<p>Yes</p>	
Sprint 2	<p>As a user, I want to search for available pets that match my preference, so that I can find available pets that match my preferences faster.</p>	<p>Given I am a user, if I click on the filter bar in the (home page / pets list page) , then I should be directed to a filter page that allows me to choose my preferences on the pet based on their (type, breed, color, gender, age), and if there are results that match my preferences , then it will show it.</p>	<p>Going to the (home page/ pets list page) and click on the filter bar and then try choose from (type /breed/ color/ gender/ age) lists until some results show up.</p>	<p>Yes</p>	
		<p>Given I am a user, if I click on the filter bar in the (home page / pets list page) , then I should be directed to a filter page that allows me to choose my preferences on the pet based on their (type, breed, color, gender, age), and if there aren't results that match my preferences , then there is a message indicating me that there are no pets available that match my preferences .</p>	<p>Going to the (home page/ pets list page) and click on the filter bar and then try choose from (type /breed/ color/ gender/ age) lists until there are no results show up.</p>	<p>Yes</p>	



		<p>Given I am a user, if I click on the filter bar in the (home page / pets list page) , then I should be directed to a filter page that allows me to choose my preferences on the pet based on their (type, breed, color, gender, age), and if I use the filter search and then click on the reset icon , then the filter search will reset and will show all the available pets.</p>	<p>Going to the (home page/ pets list page) and click on the filter bar and then try choose from (type /breed/ color/ gender/ age) lists and then click on reset icon.</p>	Yes	
Sprint 2	<p>As a user, I want to view available pets for adoption that match my search criteria, so that I can select a suitable pet.</p>	<p>Given I am a user, if I searched for a pet using the filter search, and there are available pets that match with my search then I should be able to view a list of available pets that match my search criteria.</p>	<p>Going to the (home page/ pets list page) and click on the filter bar and then try it until some results show up.</p>	Yes	
		<p>Given I am a user, if I searched for a pet using the filter search, and there aren't available pets that match with my search, then there is a message indicating me that there are no pets available that match my search criteria.</p>	<p>Going to the (home page/ pets list page) and click on the filter bar and then try it until there are no results show up.</p>	Yes	
Sprint 2	<p>As user, I want to add a pet to the favorites pets section, so that I can check it later.</p>	<p>Given I am a user, if I click on the favorites button (empty heart) on a pet profile, then this profile will exist in my pets favorites section and this button will change to (filled heart).</p>	<p>Going to a pet profile page and then try to click on the favorite button (empty heart) .</p>	Yes	
Sprint 2	<p>As a user, I want to remove a pet from the favorites pets section, so that I can be</p>	<p>Given I am a user, if I click on the favorites button (filled heart) on a pet profile, then this pet profile will be removed from my favorites pets section and this button will change to (empty heart).</p>	<p>Going to a pet profile page that I added to the favorites before and then try to click on the favorite button (filled heart).</p>	Yes	



	flexible when I like pets.				
Sprint 2	As a user, I want to share a profile of a pet through social media, so that I can show it to people who are interested to adopt pets.	Given I am a user, if I click on the share button on a pet profile, then this pet's information will be shared through the social media platform that I will select.	Going to a pet profile page and then try to click on the share button.	Yes	
Sprint 2	As a user, I want to authenticate myself with my email when I register so that I make sure that the email I have entered is correct.	Given I am a user, if I go to the sign-up page and fill all required fields and the email does not correct (not real) and click on the sign-up button, a link will be sent to the entered email, since the user can't click on the link, his/her account will not be authenticated and then he/she can't log in.	Going to sign up page and then try to fill all the required correctly and try write an email that does not correct (not real) and click on sign up button and then try to log in using this email.	Yes	
		Given I am a user, if I go to the sign-up page and fill all required fields and the email was correct (real) and click on the sign-up button, a link will be sent to the entered email, if the user click on the link, his/her account will be authenticated and then he/she can log in.	Going to sign up page and then try to fill all the required correctly and try write an email that correct (real) and click on sign up button and then click on the link that send to this email, after that try to log in using this email.	Yes	
Sprint 2	As a user, I want the application to authenticate my email and password, so that I can ensure that the application is secured.	Given I am a user, I want the application to authenticate my email and password, by sending me an authentication email to my email address while the sign-up process and then log in using this email and the password.	Going to sign up page and then try to fill all the required correctly and then click on the link that send to this email, after that try to log in using this email.	Yes	



Sprint 3	As a logged in user, I want to send a pet adoption request, so that I can get an Accept/reject response from the owner of the pet.	Given I am a user, if I select a pet and click on view the detailed information and after that click on send adoption request, if I didn't complete filling (the information required for adoption) page then this page will appear and if I fill all the fields and then click on save button, and then click on send adoption request button again, then a message should appear to confirm the success of sending the adoption request.	Going to a pet profile page and click on send adoption request button (if I didn't complete filling (the information required for adoption) page then this page will appear and then try fill all the fields and then click on the save and then click on send adoption requests button again.	Yes	
Sprint 3	As a logged in user, I want to view received adoption requests on my pet, so that I can find a suitable adopter for my pet.	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on received adoption requests button, then the system should display to me all the received adoption requests	Going to (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on the received adoption requests button.	Yes	
Sprint 3	As a logged in user, I want to view a sent pet adoption request, so that I can see my adoption request	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on sent adoption requests button, then the	Going to (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on the sent adoption requests button.	Yes	



	information and status.	system should display to me all the sent adoption requests.			
Sprint 3	As a logged in user, I want to cancel a sent pet adoption request, so that I can be more flexible in sending/canceling adoption requests.	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on sent adoption requests button and then click on the cancel adoption request button on a pet, then a warning message should appear to confirm the success of canceling the adoption request.	Going to (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on the sent adoption requests button and then click on the cancel adoption request button on a pet.	Yes	
Sprint 3	As a logged in user, I want to accept the adoption request on my pet, so that I can approve a suitable adopter.	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on received adoption requests button and then click on the accept adoption request button on a pet , then the system should show me the adopter contact information .	Going to (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on the received adoption requests button and then click on the accept adoption request button on a pet.	Yes	
		Given I am a user, if I go to the notification and after that click on a received adoption request and then click on the accept adoption request button, then the system should show me the adopter contact information.	Going to the notification and after that click on a received adoption request and then click on the accept adoption request button.	Yes	
Sprint 3	As a logged in user, I want to reject the adoption request on my pet, so that I can be more flexible to decline an adopter.	Given I am a user, if I go to the (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on received adoption requests button and then click on the reject adoption request button on a pet, then the	Going to (profile page and click on adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on the received adoption requests button and then click on the reject adoption request button on a pet.	Yes	



		system will not show me the adopter contact information.			
		Given I am a user, if I go to the notification and after that click on a received adoption request and then click on the reject adoption request button, then the system will not show me the adopter contact information.	Going to the notification and after that click on a received adoption request and then click on the reject adoption request button.	Yes	
Sprint 3	As a logged in user, I want to view adopter contact information when I accept his/her adoption request, so that I can get in touch with them easily after approving their request.	Given I am a user, if I add my pets for adoption and the adopter sends me an adoption request, if I accept his/her request, then I should view the adopter's contact information (mobile number, email).	Going to (profile page and click on adoption requests /requests in the footer bar/ the menu and click on adoption requests) and after that click on the received adoption requests button and then click on the (mobile phone icon /email icon) on a pet.	Yes	
Sprint 3	As a logged in user, I want to view owner contact information when she/he accept my adoption request, so that I can get in touch with them easily after accepting my request.	Given I am a user, if I send an adoption request, and the pet's owner accept my request, then I should view the owner's contact information (mobile number, email).	Going to (profile page and click on view adoption requests /requests in the footer bar / the menu and click on adoption requests) and after that click on the sent adoption requests button and then click on the (mobile phone icon /email icon) on a pet that is already the owner accept the request.	Yes	
Sprint 4	As a user, I want to view the recommended pets in the	Given that I am a user, I can view two types of recommendations based on content and collaborative filtering if I go to the homepage.	Going to the homepage and see the results of the two types of recommendations.	Yes	



	application, so that I can see pets that could match my preferences.				
Sprint 4	As a logged in user, I want to view my history, so that I can see previous pets I have adopted.	Given I am a user, if I go to (my account / the menu) and click on my previous adoption processes, then click on 'pets I have adopted' button ,then I should see all previous pets I have adopted.	Going to (my account / the menu) and click on my previous adoption processes , then click on 'pets I have adopted' button.	Yes	
Sprint 4	As a logged in user, I want to view my history, so that I can see previous pets that someone has adopted from me successfully	Given I am a user, if I go to (my account / the menu) and click on my previous adoption processes, then click on 'pets adopted from me' button I should see all previous pets that someone has adopted from me successfully.	Going to (my account / the menu) and click on my previous adoption processes, then click on 'pets adopted from me 'button.	Yes	
Sprint 4	As a logged in user, I want to receive notifications from the application when I receive new adoption request, so that I can be notified when I receive one.	Given I am a user, if I click on the notifications section in the application, then a list of received adoption requests notifications should be displayed to me.	Try adding a pet for adoption , and if someone send an adoption request for this pet , go to the notification section to see the request .	Yes	
Sprint 4	As a logged in user, I want to receive notifications from the application when my sent adoption request is accepted, so that I can be	Given I am a user, if I click on the notifications section in the application, then a list of accepted adoption requests notifications should be displayed to me.	Try sending an adoption request for a pet , and if the owner accept the request, go to the notification section to see the request status (accepted) .	Yes	

	notified if my adoption request is accepted.			
Sprint 4	As a logged in user, I want to receive notifications from the application when my sent adoption request is rejected, so that I can be notified if my adoption request is rejected.	Given I am a user, if I click on the notifications section in the application, then a list of rejected adoption requests notifications should be displayed to me.	Try sending an adoption request for a pet , and if the owner reject the request, go to the notification section to see the request status (rejected) .	Yes

Table 30. User story acceptance testing

9.6 APPENDIX F: Integration Testing

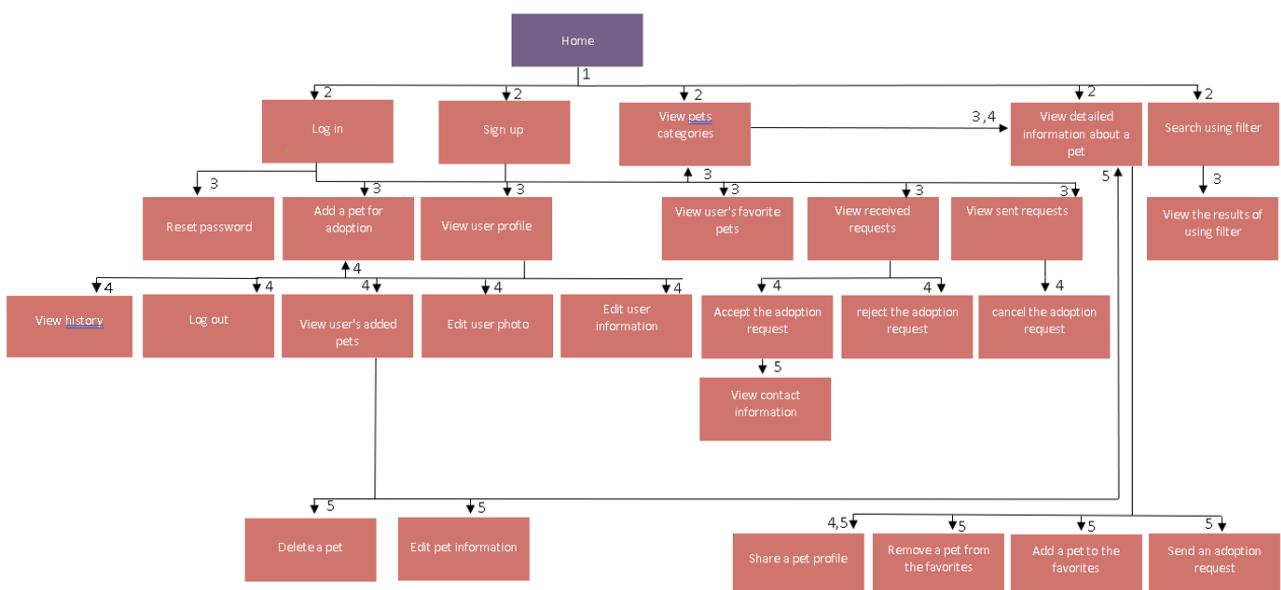


Figure 33. integration hierarchy



System components	New component	Test case	Passed?	Comments
- Home	Logging in the system	1- Home page has been shown 2- A user logging in the system	Yes	
- Home - Logging in the system	Add a pet for adoption	1- Home page has been shown 2- A user logging in the system 3- The logged-in user adds a pet for adoption	Yes	
- Home - Logging in the system	View user profile	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile	Yes	
- Home - Logging in the system - View user profile	View user's added pets	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user views his/her added pets	Yes	
- Home - Logging in the system - View user profile - View user added pets	Delete a pet	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user views his/her added pets 5- The logged-in user deletes a pet	Yes	
- Home - Logging in the system - View user profile - View user added pets	Edit pet information	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user views his/her added pets 5- The logged-in user edits a pet information	Yes	



- Home - Logging in the system - View user profile - View user added pets	View detailed information about a pet	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user views his/her added pets 5- The logged-in user views the detailed information about a pet	Yes	
- Home - Logging in the system - View user profile	Edit user photo	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user edits his/her photo	Yes	
- Home - Logging in the system - View user profile	Edit user information	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user edits his/her information	Yes	
- Home - Logging in the system - View user profile	View history	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user view the history (previous adoption processes)	Yes	
- Home - Logging in the system - View user profile	Logging out	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her profile 4- The logged-in user logging out from the system	Yes	
- Home - Logging in the system	Reset password	1- Home page has been shown 2- A user moves to the login page 3- the user resets his/her password	Yes	



- Home - Logging in the system	View user's favorite pets	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views his/her favorite pets	Yes	
- Home - Logging in the system	View received requests	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the received adoption requests	Yes	
- Home - Logging in the system	View sent requests	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the sent adoption requests	Yes	
- Home - Logging in the system - View received requests	Accept the adoption request	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the received adoption requests 4- The logged-in user clicks on the accept the adoption request button on a request	Yes	
- Home - Logging in the system - View received requests	reject the adoption request	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the received adoption requests 4- The logged-in user clicks on the accept adoption request button on a request	Yes	
- Home - Logging in the system - View received requests - Accept the adoption request	View contact information	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the received adoption requests	Yes	



		4- The logged-in user clicks on the accept adoption request button on a request 5- The logged-in user views the contact information		
- Home - Logging in the system - View sent requests	cancel the adoption request	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the sent adoption requests 4- The logged-in user clicks on the cancel adoption request button on a request	Yes	
- Home - Logging in the system	View pets categories	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the pets categories	Yes	
- Home - Logging in the system - View pets categories	View detailed information about a pet	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the pets categories 4- The logged-in user selects a pet to view the detailed information about it	Yes	
- Home - Logging in the system - View pets categories - View detailed information about a pet	Add a pet to the favorites	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the pets categories 4- The logged-in user selects a pet to view the detailed information about it 5- The logged-in user adds the pet to the favorite	Yes	
- Home - Logging in the system - View pets categories - View detailed information about a pet	remove a pet from the favorites	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the pets categories 4- The logged-in user selects a pet to view the detailed information about it	Yes	



		5- The logged-in user removes the liked pet from the favorite		
- Home - Logging in the system - View pets categories - View detailed information about a pet	Send an adoption request	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the pets categories 4- The logged-in user selects a pet to view the detailed information about it 5- The logged-in user sends an adoption request.	Yes	
- Home - Logging in the system - View pets categories - View detailed information about a pet	Share a pet profile	1- Home page has been shown 2- A user logging in the system 3- The logged-in user views the pets categories 4- The logged-in user selects a pet to view the detailed information about it 5- The logged-in user shares a pet profile .	Yes	
- Home	Signing up in the system	1- Home page has been shown 2- A user signing up in the system	Yes	
- Home - Signing up in the system	Add a pet for adoption	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user adds a pet for adoption	Yes	
- Home - Signing up in the system	View user profile	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views his/her profile	Yes	
- Home - Signing up in the system - View user profile	View user's added pets	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views his/her profile 4- The signed-up user views his/her added pets	Yes	



- Home - Signing up in the system - View user profile - View user added pets	Delete a pet	1- Home page has been shown 2- A user logging in the system 3- The signed-up user views his/her profile 4- The signed-up user views his/her added pets 5- The signed-up user deletes a pet	Yes	
- Home - Signing up in the system - View user profile - View user added pets	Edit pet information	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views his/her profile 4- The signed-up user views his/her added pets 5- The signed-up user edits a pet information	Yes	
- Home - Signing up in the system - View user profile - View user added pets	View detailed information about a pet	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views his/her profile 4- The signed-up user views his/her added pets 5- The signed-up user views the detailed information about a pet	Yes	
- Home - Signing up in the system - View user profile	Edit user photo	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views his/her profile 4- The signed-up user edits his/her photo	Yes	
- Home - Signing up in the system - View user profile	Edit user information	1- Home page has been shown 2- A user signing up in the system 3- The signing up user views his/her profile 4- The signing up user edits his/her information	Yes	
- Home - Signing up in the system - View user profile	View history	1- Home page has been shown 2- A user signing up in the system	Yes	



		3- The signing up user views his/her profile 4- The signing up user view the history (previous adoption processes)		
- Home - Signing up in the system - View user profile	Logging out	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views his/her profile 4- The signed-up user logging out from the system	Yes	
- Home - Signing up in the system	View user's favorite pets	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views his/her favorite pets	Yes	
- Home - Signing up in the system	View received requests	1- Home page has been shown 2- A user Signing up in the system 3- The signed -in user views the received adoption requests	Yes	
- Home - Signing up in the system	View sent requests	1- Home page has been shown 2- A user Signing up in the system 3- The signed -in user views the sent adoption requests	Yes	
- Home - Signing up in the system - View received requests	Accept the adoption request	1- Home page has been shown 2- A user Signing up in the system 3- The signed -up user views the received adoption requests 4- The signed -up user clicks on the accept the adoption request button on a request	Yes	
- Home - Signing up in the system - View received requests	reject the adoption request	1- Home page has been shown 2- A user Signing up in the system		



		3- The signed -up user views the received adoption requests 4- The signed -up user clicks on the accept adoption request button on a request	Yes	
- Home - Signing up in the system - View received requests - Accept the adoption request	View contact information	1- Home page has been shown 2- A user Signing up in the system 3- The signed -up user views the received adoption requests 4- The signed -up user clicks on the accept adoption request button on a request 5- The signed -up user views the contact information	Yes	
- Home - Signing up in the system - View sent requests	cancel the adoption request	1- Home page has been shown 2- A user Signing up in the system 3- The signed -up user views the sent adoption requests 4- The signed -up user clicks on the cancel adoption request button on a request	Yes	
- Home - Signing up in the system	View pets categories	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views the pets categories	Yes	
- Home - Signing up in the system - View pets categories	View detailed information about a pet	1- Home page has been shown 2- A user signing up in the system 3- The signed-up user views the pets categories 4- The signed-up user selects a pet to view the detailed information about it	Yes	
- Home - Signing up in the system - View pets categories - View detailed information about a pet	Add a pet to the favorites	1. Home page has been shown 2. A user signing up in the system 3. The signed-up user views the pets categories	Yes	



		<ol style="list-style-type: none">4. The signed-up user selects a pet to view the detailed information about it5. The signed-up user adds the pet to the favorite		
- Home - Signing up in the system - View pets categories - View detailed information about a pet	remove a pet from the favorites	<ol style="list-style-type: none">1- Home page has been shown2- A user signing up in the system3- The signed-up user views the pets categories4- The signed-up user selects a pet to view the detailed information about it5- The signed-up user removes the liked pet from the favorite	Yes	
- Home - Signing up in the system - View pets categories - View detailed information about a pet	Send an adoption request	<ol style="list-style-type: none">1- Home page has been shown2- A user signing up in the system3- The signed-up user views the pets categories4- The signed-up user selects a pet to view the detailed information about it5- The signed-up user sends an adoption request.	Yes	
- Home - Signing up in the system - View pets categories - View detailed information about a pet	Share a pet profile	<ol style="list-style-type: none">1- Home page has been shown2- A user signing up in the system3- The signed-up user views the pets categories4- The signed-up user selects a pet to view the detailed information about it5- The signed-up user shares a pet profile .	Yes	
- Home	View pets categories	<ol style="list-style-type: none">1- Home page has been shown2- A user views the pets categories	Yes	
- Home - View pets categories	View detailed information about a pet	<ol style="list-style-type: none">1- Home page has been shown2- A user views the pets categories3- The user selects a pet to view the detailed information about it	Yes	



- Home	View detailed information about a pet	1- Home page has been shown 2- A user selects a pet to view the detailed information about it	Yes	
- Home - View detailed information about a pet	Share a pet profile	1- Home page has been shown 2- A user selects a pet to view the detailed information about it 3- The user shares a pet profile	Yes	
- Home	Search using filter	1- Home page has been shown 2- A user search about a pet using the filter	Yes	
- Home - Search using filter	View the results of using filter	1- Home page has been shown 2- A user search about a pet using the filter 3- The user view the results of using filter	Yes	

Table 31. Integration testing

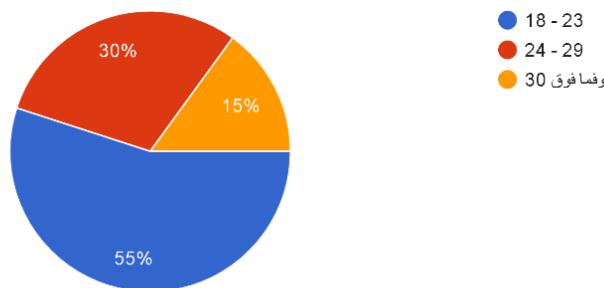
9.7 APPENDIX G: User Acceptance Testing Questionnaire

-Demographic questions :

- How old are you?

أهلاً بك, كم عمرك؟

20 responses

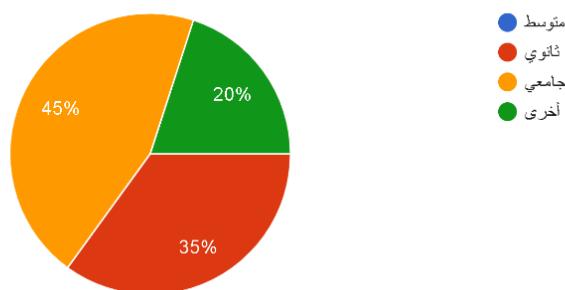




- What's your educational level?

ما هو مستوى التعليمي؟

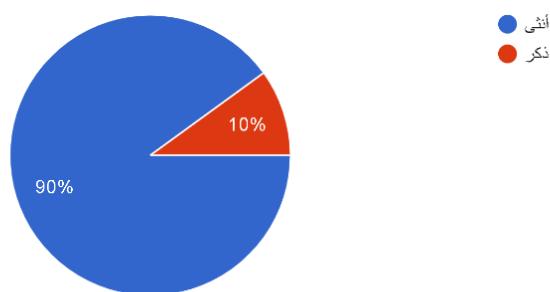
20 responses



- What is your gender?

ما هو جنسك؟

20 responses

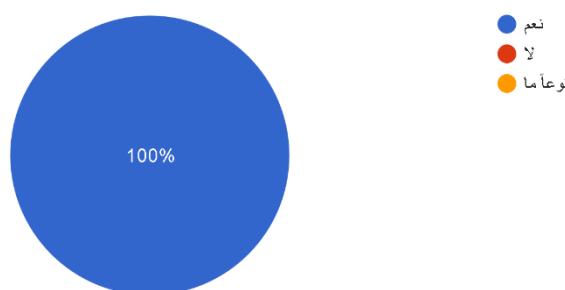


-User Acceptance testing questions:

- In your opinion, are the interfaces of the Ewaa application attractive?

برأيك هل واجهات تطبيق إبواه مريحة للعين وجذابة؟

20 responses

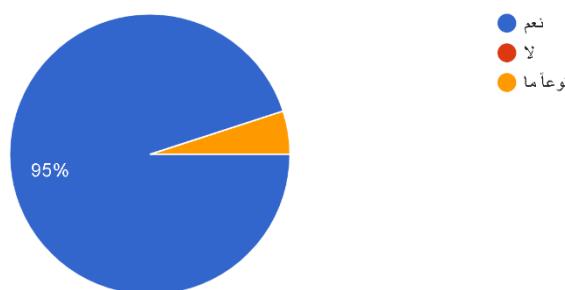




- Does the interface of the Ewaa application help in facilitating and clarifying how to use the application?

هل واجهات تطبيق إيواء تساعد في تسهيل وإيضاح كيفية استخدام التطبيق؟

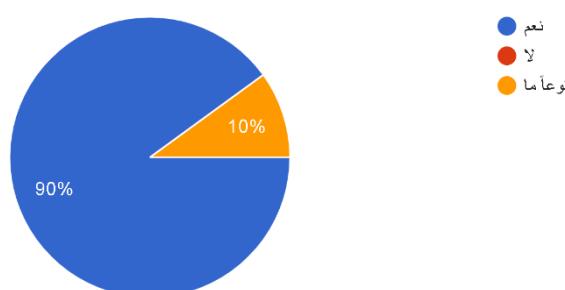
20 responses



- Do you find that the Ewaa application is easy to use?

هل تجد أن تطبيق إيواء سهل الاستخدام؟

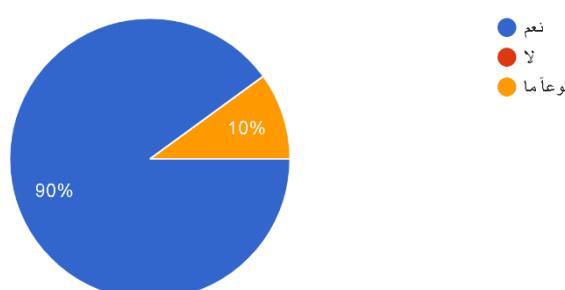
20 responses



- Do you find that the services of the Ewaa application support and facilitate the process of adopting pets?

هل تجد أن خدمات تطبيق إيواء تدعم وتسهل عملية تبني الحيوانات الأليفة؟

20 responses

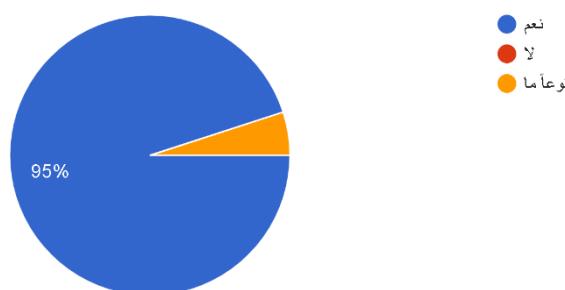




- Do you find that the pet's information displayed through the application is sufficient?

هل تجد أن معلومات الحيوان الأليف المعروضة خلال التطبيق كافية؟

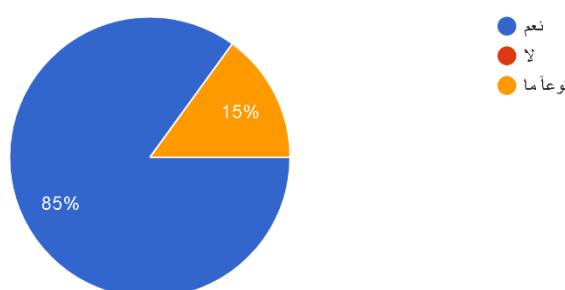
20 responses



- Do you find that the adoption request information sent through the application is sufficient?

هل تجد أن معلومات طلب التبني المرسلة خلال التطبيق كافية؟

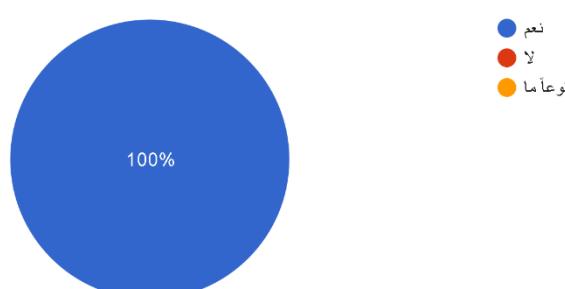
20 responses



- Do you find that the Ewaa application maintains the privacy of the information of both the pet owner and the pet adopter?

هل تجد أن تطبيق إيواء يحافظ على خصوصية معلومات مالك الحيوان الأليف ومتبنيه؟

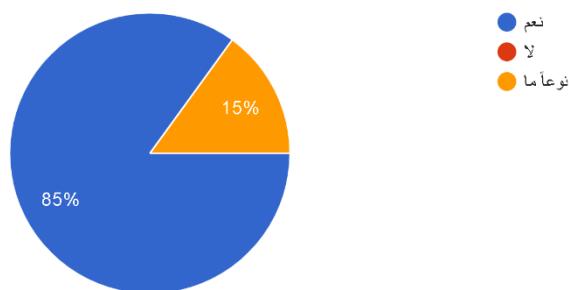
20 responses





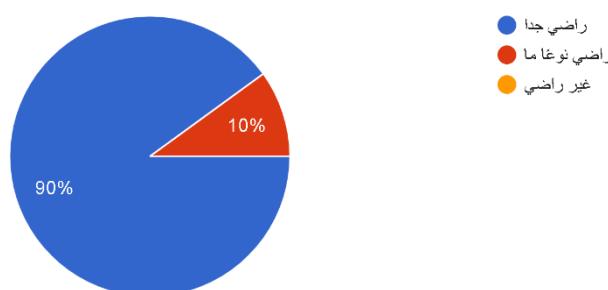
- Do you find that the recommended pets (suggestions) help you to find your favorite pet?

هل تجد أن الحيوانات المقترحة تساعدك في إيجاد حيوانك المفضل؟
20 responses



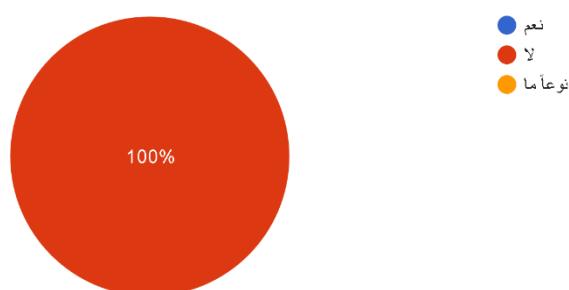
- What is the level of your satisfaction with the pet suggestions through the application?

ما هو مستوى رضاك عن اقتراحات الحيوانات الأليفة خلال التطبيق؟
20 responses



- Did you encounter problems during the process of testing the application?

هل واجهت مشكلات أثناء عملية اختبار وتجربة التطبيق؟
20 responses

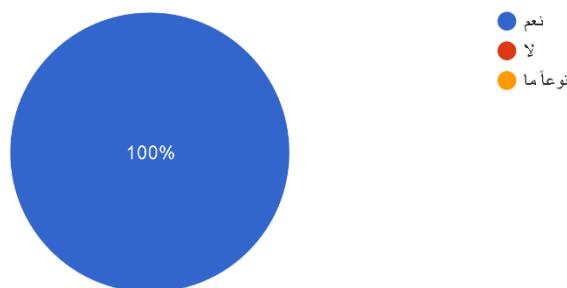




- In general, are you satisfied with Ewaa application?

بشكل عام هل انت راض عن تطبيق إيواء؟

20 responses



- Do you have suggestions that can help us to develop the application?

هل لديك اقتراحات من الممكن أن تساعدنا في تطوير تطبيق إيواء؟

20 responses

