

## Development of a Web-Based Pet Welfare Community

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### Abstract

This project revolves around the domain of pet welfare and addresses a critical issue where essential information is often withheld due to the prevalence of traditional methods. This platform aims to provide a centralized space for community engagement, streamline the pet adoption process through digitization, and establish a reliable lost and found system. The project's scope includes connecting individuals with a shared commitment to pet welfare, facilitating easy communication on missing or found pets, and simplifying the search and filtering of pet ads. Implemented in phases using the Waterfall Model technique, the project utilizes Visual Studio Code for web development and phpMyAdmin to administer the system's database. The developed website is an enhanced pet welfare platform that can easily post adoption listings, and report lost and found pets, which not only improves pet welfare but also fosters a supportive community dedicated to the well-being of animals. Some of the future works that can be enhanced for this platform include the integration with social media and enhancement to the existing module where the data can be used to make informed decisions.

## 1. Introduction

Pet welfare, also known as animal welfare is a term used to describe how animals are treated ethically and humanely, especially when they are kept as pets or as domesticated animals. It includes a range of elements, such as their physical, mental, and emotional wellness [1]. Currently, traditional approaches to pet welfare in Malaysia frequently rely on physical documentation and face-to-face interactions. For some prospective adopters, the procedure is more difficult to complete because it requires trips to adoption facilities or shelters [2]. Data is kept on centralised servers, which, while efficient, may be improved to suit a larger audience.

Some listed pet welfare systems for the user to interact with the community are ready for use. For instance, in Malaysia, we have PetFinder.my [3] which makes it possible for people to adopt and find their lost pet with help from the community. Another available system is Missing Pets - Find Lost Pet which is specially designed for lost & found function inquiries. On the other hand, there is also an initiative taken by fellow students to develop a similar system which is Aplikasi #KitaJagaMeowdanWoo. But for a variety of reasons, such as not reaching the intended audiences or fearing the revelation of personal information, these systems are usually underutilised. A few factors to take into account while implementing an online system are preventing hackers and the expense of updating and implementing the system.

This project aims to develop a web-based pet community to establish a comprehensive community, revolutionizing pet adoption procedures and providing a robust platform for lost and found pet inquiries. Upon finishing the project, the system enables users to adopt pets digitally. In addition, the developed system is a user-friendly platform where adopters will be able to make a knowledgeable judgement through information provided

by in-depth pet profiles. This change will improve both the security and accessibility of data while also streamlining the entire user experience.

This proceeding consists of four parts where in part 1, the pet welfare-related system, the Pet Welfare Community is introduced. Next, in part 2, more thorough research is being conducted to fully understand the concept of pet welfare before developing this project. Other than that, the existing related system is also being reviewed in part 2 for comparison. After that, the methodology used to develop the project is stated and discussed in part 3 while part 4 will consist of the result and discussion. Lastly, this proceeding will conclude with a conclusion of the developed website.

## 2. Related Work

### 2.1 Study of Pet Adoption

Pet adoption, the act of taking responsibility for an unwanted or abandoned animal from an animal shelter or rescue organisation, is a growing trend worldwide [4]. The global pet adoption landscape is diverse, with varying adoption rates, practices, and challenges across different countries and regions. In the United States, an estimated 3.1 million dogs and cats are adopted from shelters annually, accounting for approximately 40% of all pet acquisitions [5]. These days, Malaysians are encouraged to adopt pets instead of purchasing them as the number of stray animals is increasing. However, it is also urged future adopters to think carefully before they get a pet to avoid abandoning them in the future [6]. Pet adoption can also be influenced by cultural norms, societal attitudes towards animal welfare, and the availability of adoption resources and support.

### 2.2 Existing Process Applied

In Malaysia, unlike purchasing from breeders or pet stores, individuals interested in adopting must proactively engage in research to identify the nearest pet shelters in their vicinity [7]. Adopters, upon identifying potential shelters, are then confronted with logistical challenges. Scheduling appointments necessitates aligning one's timetable with the shelter's availability. Moreover, the financial implications of transportation to these shelters should not be underestimated.

In contrast to commercial pet purchases that often provide a comprehensive online catalogue, prospective adopters in Malaysia encounter a unique challenge — the lack of available information about shelter pets online. Without an online database, adopters must physically visit shelters to explore the available animals. The absence of an online catalogue, coupled with the unpredictable nature of shelter populations, raises the spectre of potential disappointment. Adopters may invest time, money, and emotional energy into visiting a shelter only to find that their desired pet is not available [8]. This not only results in frustration and disappointment but can also lead to a sense of wasted resources.

### 2.3 Technology Used

For creating and debugging contemporary web and cloud applications, Visual Studio Code, or VS Code, is a redesigned and optimised code editor. The most well-known one supports practically all programming languages and is called Visual Studio Code. VS Code editor's features enable the user to customise it to suit their needs. [9] Visual Studio Code is a well-known code editor that in 2022 Stack Overflow's Developer Report, was ranked as the most popular development environment overall [10].

### 2.4 Comparison with Related System

As stated in the introduction, the pet welfare existing system is compared with the developed web-based pet welfare community. Table 1 shows the comparison of Petfinder. my, Missing Pets – Find Lost Pet, Aplikasi #KitaJagaMeowdanWoo and Pet Welfare Community. In summary, the Pet Welfare Community is the best system listed as it offers many features that will help the Pet Welfare community to become much more in the future.

**Table 1** Comparison between the existing system and the developed system

Features / Tools	PetFinder.my	Missing Pets- Find Lost Pet	Aplikasi #KitaJagaMeowdanWoo	Pet Welfare Community
Monitoring system	Web-based	Mobile-based	Mobile-based	Web-based
Diverse users	√	X	√	√
Digitizing the organization's adoption process	X	X	X	√
Lost & found	√	√	√	√
Discussion community forum	√	X	X	√
Users profile management	√	√	√	√
Comprehensive search & filter function	√	X	√	√
Services Directory	√	X	√	√
In-depth information listing	√	√	√	√
Dashboard menu	√	X	√	√

### 3. Methodology

Structured Analysis (SA) is the process of interpreting the design of a system using a structured methodology, whereas Structured Design (SD) typically focuses on building the modules and creating the module hierarchy to represent the idea for your IT system [11]. Methodology refers to practices that are widely used across an industry or scientific discipline in a particular research study or to accomplish a particular project [12]. The Waterfall Model is the technique model selected for this project. In addition, when the project stages are broken down into smaller phases, it helps to ensure the accuracy of the contents of the developed system. For instance, users will have to fill in their details during the adoption process. In this case, if the analysis process of the adoption form for adoption could not be finished before implementation, there will be a chance that the developer has to edit the content multiple times which might delay the whole progress at the end. Thus, it will be easy to make sure that the progress of the project sticks to the schedule if using the Waterfall Model.

#### 3.1 Planning Phase

The Waterfall Model consists of six phases: planning, requirements analysis, design, implementation, testing, and deployment where each phase concludes with an intermediate result or milestone. For this project, a Gantt Chart is created as the project schedule and plan which is placed in Appendix A. Table 2 shows the task and output for each phase in the waterfall model.

**Table 2** Software Development Activities and Their Task

Phase	Task	Output
Planning	<ul style="list-style-type: none"> <li>Developed project</li> <li>Identify project details</li> <li>Set up work plan</li> <li>Research previous project</li> <li>Study existing system features</li> </ul>	<ul style="list-style-type: none"> <li>Project proposal</li> <li>Gantt Chart</li> <li>Literature review</li> <li>Comparison between existing system and developed system</li> </ul>
Analysis	<ul style="list-style-type: none"> <li>Analyse hardware and software requirements</li> </ul>	<ul style="list-style-type: none"> <li>Hardware and software specifications</li> <li>Functional and non-functional requirements</li> </ul>
Design	<ul style="list-style-type: none"> <li>Illustrate wireframe</li> <li>Design database</li> </ul>	<ul style="list-style-type: none"> <li>Wireframe</li> <li>Database specifications</li> </ul>

Implementation	System module and connect database	Develop system
Testing	<ul style="list-style-type: none"> <li>Conduct system testing</li> <li>Identify bugs and improvements</li> </ul>	<ul style="list-style-type: none"> <li>User acceptance test</li> <li>Fix and improve bugs</li> </ul>

### 3.2 Analysis Phase

Tables 3 and 4 show the hardware and software requirements during the project development process

**Table 3** *Hardware requirements*

Hardware	Specification
Model	VivoBook_ASUSLaptop
Central Processing Unit (CPU)	AMD A9-9425 RADEON R5, 5 COMPUTE CORES 2C+3G to 3.10 GHz
Graphic Processing Unit (GPU)	AMD Radeon™ R5 Graphics
Random Access Memory (RAM)	8GB
Operating System (OS)	Windows 10 64-bit operating system

**Table 4** *Software requirements*

Software	Specification
Microsoft Word	Used for documentation.
Canva	Used to create presentation slides and design logo
Microsoft Project 2021	Used to generate the project’s Gantt chart.
One Drive	Used for sharing of project-related work.
Visual Studio Code	Used to develop web-based systems.
XAMPP	Used to access phpMyAdmin and MySQL.
Draw, io	Used to draw project-related diagrams.
Figma	Used to draw project wireframes.

Functional requirement analysis in general will explain how a system behaves under circumstances while non-functional requirements will specify how the system should operate rather than anything to do with functionality. Table 5 shows the functional and non-functional requirements of the Pet Welfare Community.

**Table 5** *Functional requirements*

Module	Functionalities
Register	Allow users to sign up to become new system users.
Login	Allow users to input valid username and password.
Logout	Allow users to log out of the website after using it.
Forgot Password	Allow users to change their current password in case are forgotten.
Profile Update	Allow users to update their information on the website
Adoption Form	Allows organizations to collect information regarding the adoption process from future adopters
Adoption Status	Allows users to update the status of the listings whether it has been adopted, in discussion or available.

Lost & Found Listings	Allow users to list lost or found pets.
Lost & Found Status	Allow users to update the status of lost or found pets.
Community Forum	Allows users to post and read listings regarding pet welfare in the forum.
Find Inquiries	Allow users to make a search and inquiries through the search function.
View Services	Allow users to view services listed by the organization.
Administration Panel	Allow the administrator to perform the CRUD process in the system.

**Table 6** *Non-functional requirements*

Requirement	Description
Usability	The user interface must be intuitive, and it will have a low perceived workload.
Security	Users will be able to adopt pets and organizations will be able to list pets after they log into their accounts while administrators must log in to perform operations.
Reliability	The website should be simple so functions will be able to deliver as it is required.
Operational	The website be able to update the database in real-time by having an always-on data connection
Availability	The website should be available to access 24/7 unless for regular maintenance.
Performance	When utilising an LTE mobile connection, the page must load in no more than two seconds.

### 3.3 Design Phase

The diagram was drawn during the design phase to make sure the system was created in compliance with the needs of the user and operated without a hitch. It displays a system's conceptual model, which outlines the system's overall interactions and structure.

#### 3.3.1 Data Flow Diagram Context Diagram (DFD CD)

An illustration of the relation between data and processes is called a context diagram. The three primary components of this diagram are data flows, system processes, and external entities. It serves as instances and variables that must be considered when creating a system. It can be used to ascertain the parameters, restrictions, and system specifications [13]. The diagram for the system that needs to be created is shown in Appendix B.

#### 3.3.2 Data Flow Diagram Level 0 (DFD Level 0)

Appendix C shows the DFD Level 0 of the developed websites. It illustrates the seven processes that users perform which are Register, Login, manage accounts, manage adoptions, manage lost & found, manage community, and Manage system. User and organizations must register to access all available features while able to reset their password in case of forgotten after login. All users will be able to log in and control their accounts except for deleting their accounts which only be able to access by the administrator. Users and organizations will be able to post listings of adoption or lost & found pets and view them on the homepage. They are also able to update their post status of listings.

### 3.3.3 Entity Relationship Diagram (ERD)

Appendix D shows the ERD of the developed websites. It is used to visualise and comprehend the existing database for this system. ERD are crucial to laying down the fundamental structure of the project. In the ERD, it contains the table name, its attributes, and the Key for each data involved.

## 3.4 Implementation Phase

Implementation in an IT project is the process of execution and running of designed and developed programs, coding, software, applications, and websites. The process will have the programs to be run in a normal environment to test for their functions and effectiveness, while also checking for any errors and bugs before publishing the works.

### 3.4.1 User Interface Design

The user interface is how users will interact with the system. Thus, it is important to design and implement user interfaces that are aesthetically pleasing, simple in usage, and easy to navigate. The following are some of the interfaces that have been designed based on each process in different figures by using HTML, CSS, JavaScript, and PHP codes.

Figure 1 shows the user interface of the register user page where users need to fill in the information such as their username, email, contact number, password, and portfolio for the adoption process.

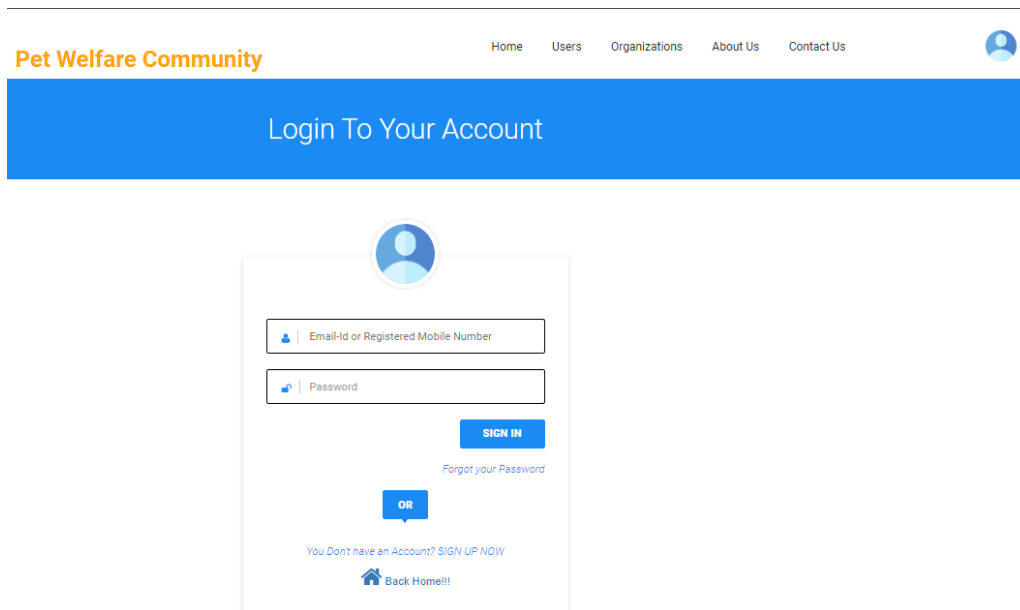
The screenshot shows a registration form titled "User". At the top, there is a blue header with the word "User". Below this is a green box containing the text "Have an Account?" and "If you don't have an account you can create one below by entering your email address." with a "SIGN IN NOW" button. The main form area includes the following fields:

- User Name\***: Input field with placeholder "User Name".
- Your Email\***: Input field with placeholder "you@domain.com".
- Contact Number\***: Input field with placeholder "e.g. 60123456783".
- Password\***: Input field with placeholder "e.g. 'Pass@20178'".
- Portfolio\* (Only pdf and doc files allowed)**: File upload field with a "Choose File" button and "No file chosen" text.

A blue "SIGN UP" button is positioned at the bottom of the form.

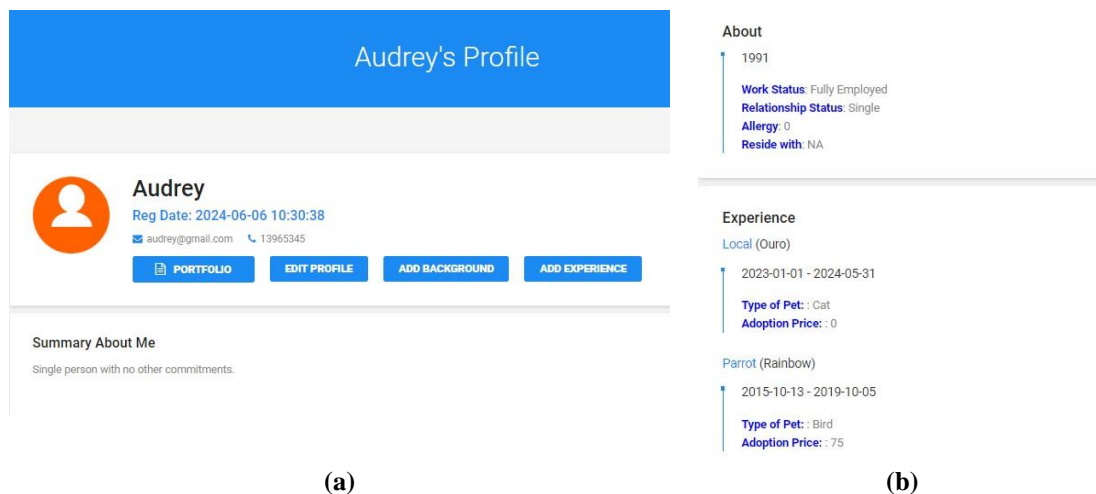
Fig. 1 User Interface of Register Page

Figure 2 depicts the visual presentation of user interface on Login page where they will be redirected there after successfully registering as a new user.



**Fig. 2** User Interface of Login Page

Figure 3 shows the user interface for the profile page where the user will be able to update their portfolio, edit their profile, add their background details and experience in caring for a pet. All these details are necessary to users as they will be shown if they are applying for pet adoptions.



(a)

(b)

**Fig. 3** User Interface of Profile Page (a) Registered Details; (b) Additional Information

Figure 4 depicts the visual presentation of the administrator interface for the first page they will see after login which is the dashboard. The dashboard will contain a few management pages such as organization, user, and page management.

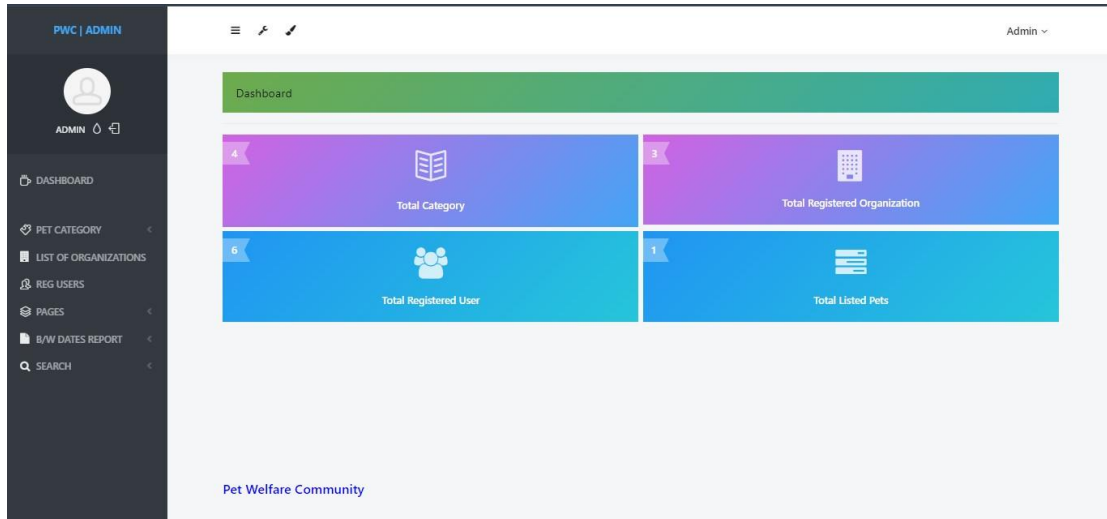


Fig. 4 Administrator Interface of Dashboard

Figure 5 shows the interface for administrators while managing the organizations. Administrator will be able to view their profiles, see their listing and delete their account if it is known they have conducted a suspicious activity or posted any unrelated activities related to pet welfare.

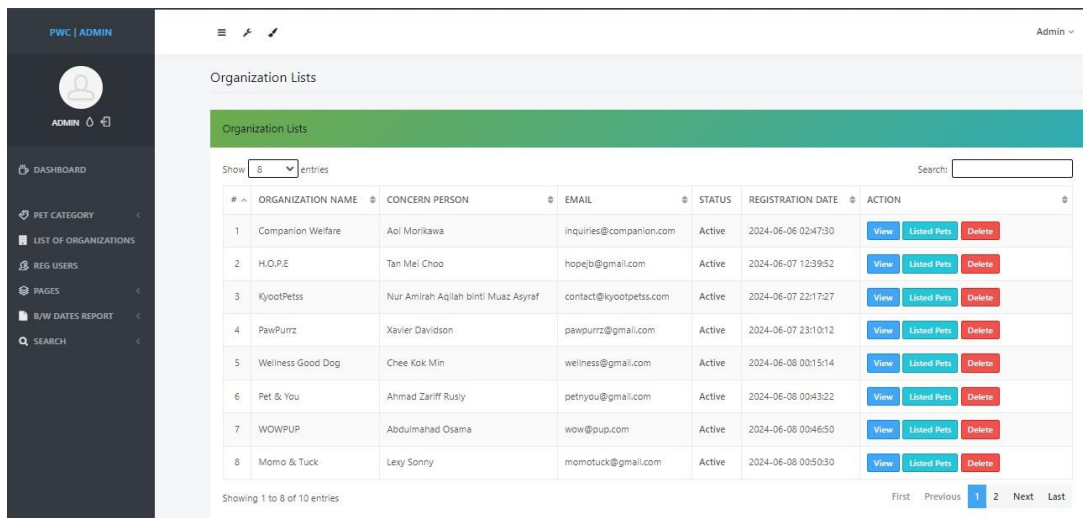


Fig. 5 Administrator Interface of Organization Listing

Figure 6 shows the interface of the Update Contact Us Page that are being managed by administrator. Administrator can update the page title, their email, mobile number, and page description easily.

**Fig. 6** Administrator Interface of Contact Us Page

Figure 7 depicts the visual presentation of administrator interfaces when they are generating a between-dates report for the users.

#	USER NAME	CONTACT NUMBER	EMAIL	STATUS	REGISTRATION DATE	ACTION
1	Audrey	13965345	audrey@gmail.com	Active	2024-06-06 10:30:38	<a href="#">View</a>
2	Fattah Amirul	174359967	Fattahzakri@gmail.com	Active	2024-06-08 09:08:27	<a href="#">View</a>
3	Erni	189438211	a1210263@student.uthm.edu.my	Active	2024-06-08 09:11:02	<a href="#">View</a>
4	Iyilia Atheerah	176328823	iyilie92@gmail.com	Active	2024-06-08 09:13:47	<a href="#">View</a>
5	Widad	198371282	wiwidad.91@gmail.com	Active	2024-06-08 09:17:15	<a href="#">View</a>
6	Chay Win Kai	193727281	notchay88@yahoo.com	Active	2024-06-08 09:21:58	<a href="#">View</a>
7	Balvengers	193723271	balvengers999@gmail.com	Active	2024-06-08 09:23:02	<a href="#">View</a>

**Fig. 7** Administrator Interface of Between Dates Reports

Figure 8 shows the interfaces when an organization post a listing whether it is about adoptions, lost & found, services or any community events. All the details must be filled in to make sure the listing a complete and easy for users to knows the related information regarding the listings.

The form is titled "Organizations | Post a Listing" and contains the following fields:

- Category\*: A dropdown menu with "Select" as the current selection.
- Title: A text input field.
- Type: A dropdown menu with "Adoption" as the current selection.
- Price: A text input field.
- About: A text input field.
- Health: A text input field.
- Location: A text input field.
- Expiration Date: A date picker showing "dd/mm/yyyy".
- Description: A large text area.

A blue "SUBMIT" button is located at the bottom left of the form.

Fig. 8 Organizations Interface of Post Listing

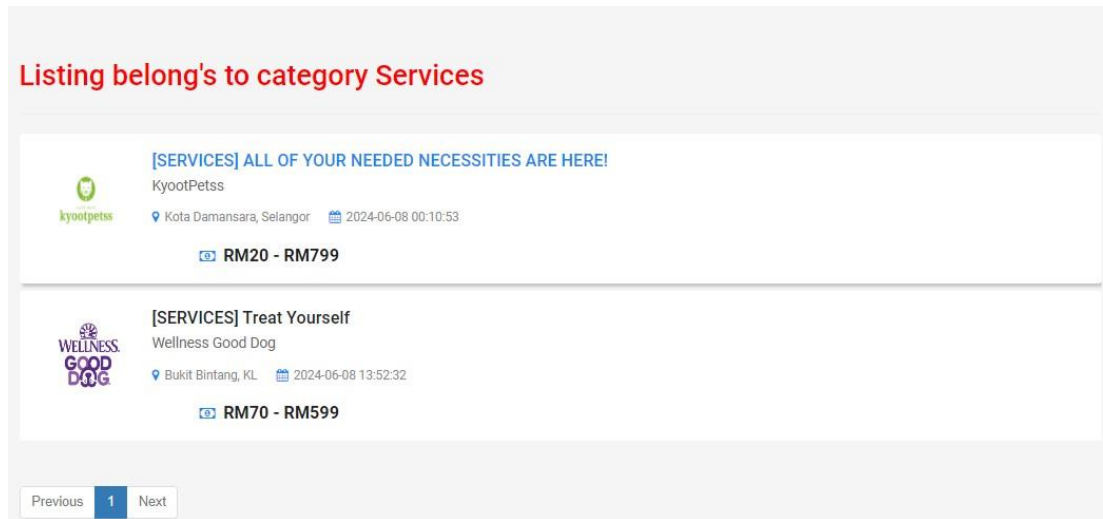
Figure 9 displays the result when users are using the search function when they are searching a listing for adoptions. The pages will then display all the related results with the listing title as "adoptions".

The search results are displayed under the heading "Listing search against adoptions". Each result includes a logo, title, organization name, location, date, and price:

- [ADOPTIONS] Potty trained and kid-friendly**  
WOWPUP  
Sungai Besi, KL | 2024-06-08 10:20:34  
RM129.99
- [ADOPTIONS] Blind dog**  
WOWPUP  
Sungai Besi, KL | 2024-06-08 10:15:51  
RM189
- [ADOPTIONS] CANCER SURVIVOR!**  
PawPurrz  
Dengkil, Selangor | 2024-06-07 23:36:30  
RM49.99
- [ADOPTIONS] New batch of pup arrived !**  
PawPurrz  
Dengkil, Selangor | 2024-06-07 23:33:19  
RM100
- [ADOPTIONS] Retired Police Dog**  
Companion Welfare  
Subang Jaya, Selangor | 2024-06-06 02:55:41  
RM120

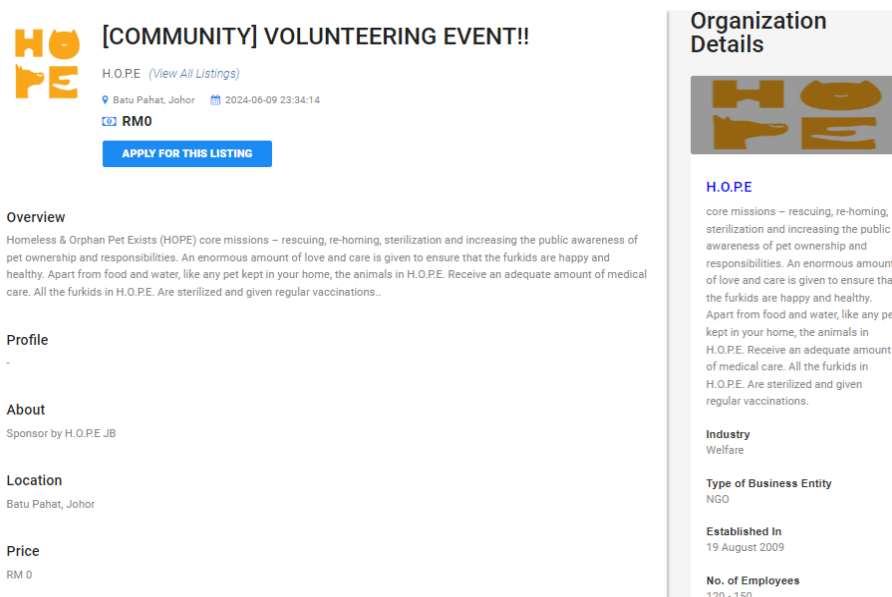
Fig. 9 User Interface of Listing Search

Figure 10 depicts the visual presentation of services directory pages. Users will be able to see all the listed services provided by the registered organizations account.



**Fig. 10** User Interface of Services Directory

Figure 11 shows the user interface for the listed community activities that has been listed by the related organizations.



**Fig. 11** User Interface of Community Forum

## 4. Result and Discussion

It is essential to test the system to make sure it functions as planned and to look for any faults or issues that can cause problems during deployment or alternatively irritate users and make their experience unpleasant. Two kind of testing are being carried out in order to assess the system: Test cases and User Acceptance Testing (UAT).

### 4.1 System Testing

System testing is testing done by the developers to evaluate the system before full deployment to find out whether the requirements are fulfilled. The testing is based on the test plan designed in the analysis and design phase.

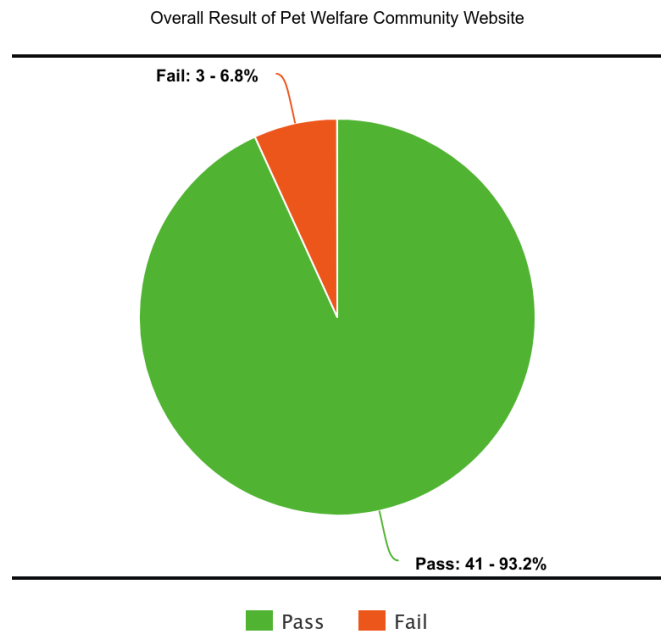
**Table 7** List of Test Cases

No.	Test Cases	Description	Actual Result
TEST_100 (User Management Module)			
1.	TEST_100_001	During sign-up, an alert message is displayed indicating that the field is empty.	Pass
2.	TEST_100_002	During sign-up, an alert message is displayed indicating that the password should be in a valid format.	Pass
3.	TEST_100_003	During sign-up, an alert message is displayed indicating that only a certain type of file is allowed to upload.	Pass
4.	TEST_100_004	After sign-up, the activation link is successfully sent to the user's email.	Fail
5.	TEST_100_005	The user's sign-up information is successfully entered into the database.	Pass
TEST_110			
6.	TEST_110_001	During login, an alert message is displayed indicating that the field is empty.	Pass
7.	TEST_110_002	During login, an alert message is displayed indicating that the field should be matched with information from the database.	Pass
8.	TEST_110_003	Login successfully and was redirected to my profile page.	Pass
TEST_120			
9.	TEST_120_001	During the forgot password process, an alert message was displayed indicating that the field was empty.	Pass
10.	TEST_120_002	During the forgot password process, an alert message was displayed indicating that the field should be matched with the database.	Pass
11.	TEST_120_003	Successfully sent OTP to the registered email address	Fail
12.	TEST_120_004	Successfully changed the password and recorded in the database	Pass
TEST_130			
13.	TEST_130_001	User successfully view their profile	Pass
14.	TEST_130_002	User and organization successfully edit their registered profile details	Pass
15.	TEST_130_003	User and organization successfully add additional information	Pass
16.	TEST_130_004	User and organization successfully changed their registered password to a new password	Pass
TEST_200 (Administrator Management Module)			

17.	TEST_200_001	During login, an alert message is displayed indicating that the field is empty.	Pass
18.	TEST_200_002	During login, an alert message is displayed indicating that the field should be matched with information from the database.	Pass
19.	TEST_200_003	Login successfully and was redirected to the administrator dashboard.	Pass
TEST_210			
20.	TEST_210_001	During the forgot password process, an alert message was displayed indicating that the field was empty.	Pass
21.	TEST_210_002	During the forgot password process, an alert message was displayed indicating input field must follow valid format	Pass
22.	TEST_210_003	During the forgot password process, an alert message was displayed indicating that the field should be matched with the database.	Pass
23.	TEST_210_004	Successfully changed the password and recorded in the database	Pass
TEST_220			
24.	TEST_220_001	Successfully view administrator profile page	Pass
25.	TEST_220_002	Administrator successfully change registered password to the new password	Pass
TEST_230			
26.	TEST_230_001	Administrator successfully perform CRUD operations for category, users, and organization	Pass
27.	TEST_230_002	Administrator successfully edit and manage About Us and Contact Us page	Pass
28.	TEST_230_003	Administrator successfully generate between dates reports for users and organizations	Pass
29.	TEST_230_004	Administrator successfully search against users and organizations	Pass
TEST_300 (Posting and Listing Module)			
30.	TEST_300_001	Organizations successfully perform CRUD operations to post a listing	Pass
31.	TEST_300_002	Applicants successfully apply for listing	Pass
32.	TEST_300_003	Organizations successfully update the status of listing (Approved, Sort-Listed, Rejected)	Pass
33.	TEST_300_004	Applicants successfully received updation status email	Fail
34.	TEST_300_005	Organizations successfully generate a between-dates report for applicants.	Pass
35.	TEST_300_006	Users successfully view the posting listed on their homepage	Pass
TEST_400			
36.	TEST_400_001	Users able to search against the listing title	Pass
37.	TEST_400_002	Successfully displayed the result of search against that has been entered	Pass
TEST_500			
38.	TEST_500_001	Organizations successfully perform CRUD operations to post their provided services	Pass
39.	TEST_500_002	Users successfully view the posts of services provided	Pass

TEST_600			
40.	TEST_600_004	Organizations successfully perform CRUD operations to post a community event	Pass
41.	TEST_600_002	Users successfully apply for community event	Pass
42.	TEST_600_003	Organizations successfully update the status of listing (Approved, Sort-Listed, Rejected)	Pass
43.	TEST_600_004	Organizations successfully generate a between dates report for applicants.	Pass
44.	TEST_600_005	Implementation of SSL throughout the website for a secure connection	Pass

Overall, more than 90% of the test passed successfully with a few exceptions which involving the email integration function. This happened as the coding is not working as expected resulting in not being able to send the activation link and OTP to the registered user. This also impacts applicants who will not be able to receive an updating status email related to their application. The result can be seen in Figure 12 below that will be shown in a pie chart.



**Fig. 12** Pie Chart Overall Test Case Result

## 4.2 User Acceptance Test

The purpose of the user acceptance test is to gather feedback from users regarding the overall satisfaction they are with the suggested system. The ultimate goal of the test is to ascertain how well the system meets and fulfils user and non-functional criteria. The test is done by having 10 students around Faculty of Science Computer & Information Technology to act as a user and organizations to try and use the developed website.

**Table 8** *User Acceptance Testing for user and organization*

No	Acceptance Requirement	Score					Total
		1	2	3	4	5	
User System Function							
1.	Register function	-	-	-	2	3	5
2.	Login Function	-	-	-	-	5	5
3.	Profile Management	-	-	-	2	3	5
4.	Listing Function	-	-	1	2	2	5
5.	Search Function	-	-	-	2	3	5
Organization System Function							
6.	Register function	-	-	-	2	3	5
7.	Login Function	-	-	-	-	5	5
8.	Profile Management	-	-	1	1	3	5
9.	Listing Function	-	-	-	-	5	5
10.	Report Function	-	-	-	1	4	5
User Interface							
11.	Easy to use and understand	-	-	-	1	4	5
12.	Navigation	-	-	-	2	3	5
13.	Interface design	-	-	-	2	3	5

## 5. Conclusion

The Web-Based Pet Welfare Community provides a centralized platform that enhances user convenience and ensures that relevant information is readily available in one place. It also digitises the pet adoption process to increase the efficiency of both organizations and potential adopters. The developed website also simplifies lost and found reporting, and delivers a way for community involvement, effectively accomplishing its primary objectives, to sum up.

Even if the technology simplifies procedures well, there are still drawbacks to system functions. Fixing the problem and collaborating with cloud servers to optimize deployment are crucial steps towards improving the platform. Other than that, security concerns and data accuracy require continuous monitoring and engagement to ensure the platform remains a reliable resource for the community.

By enhancing the existing features such as report modules to make informed decisions, it is hoped to build on achievements and make a more robust and feature-rich platform. Integration with social media would also increase the visibility and engagement of the website to the community.

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## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

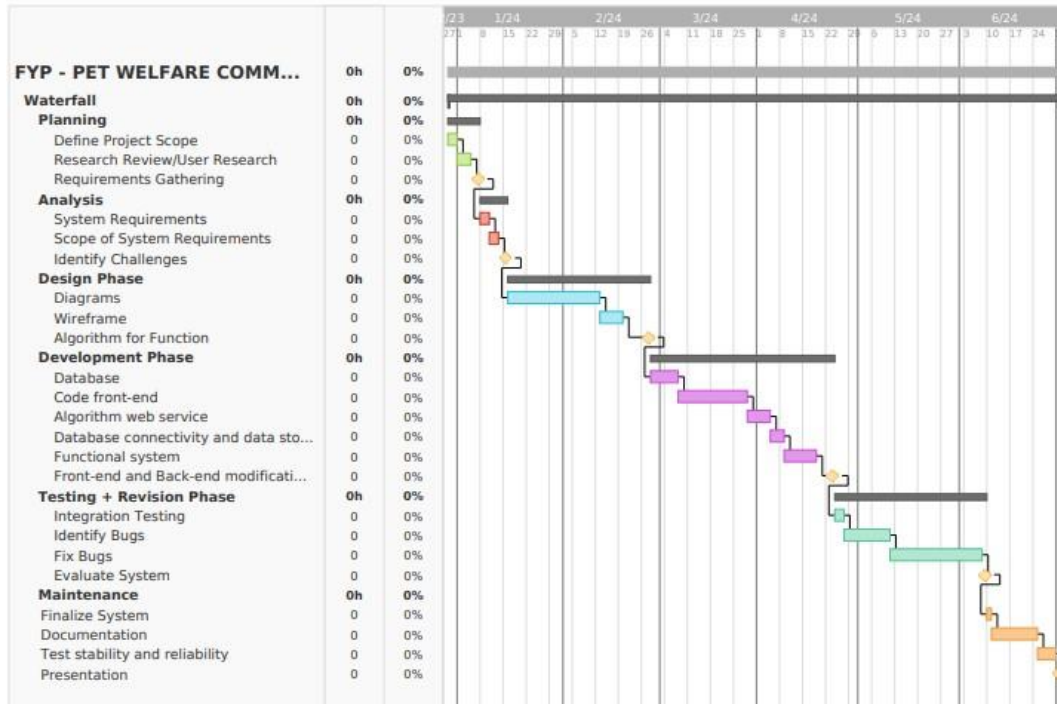
This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:

*The authors confirm contribution to the paper as follows: **study conception and design:** Nurfiryal Awatif binti Mahadi, Nayef Abdulwahab Mohammed Alduais; **data collection:** Nayef Abdulwahab Mohammed Alduais; **analysis and interpretation of results:** Nurfiryal Awatif binti Mahadi, Nayef Abdulwahab Mohammed Alduais, **draft manuscript preparation:** Nayef Abdulwahab Mohammed Alduais. All authors reviewed the results and approved the final version of the manuscript.*

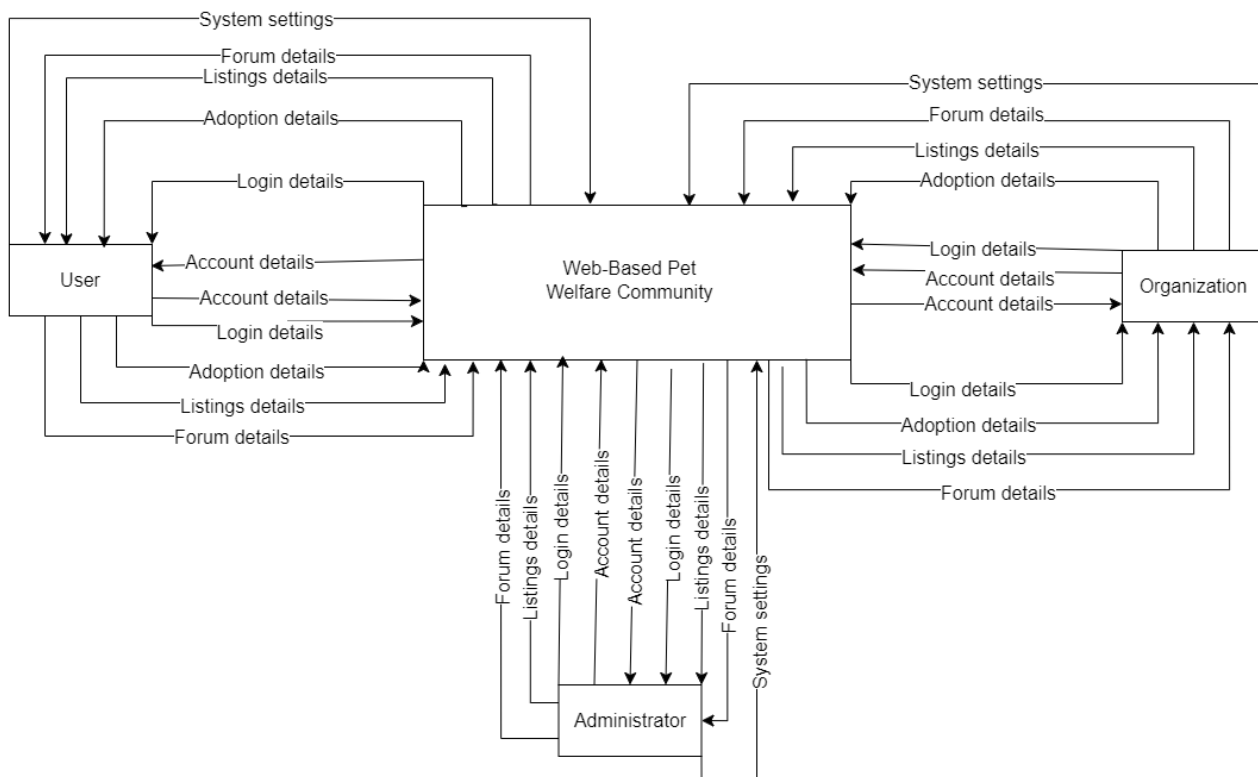
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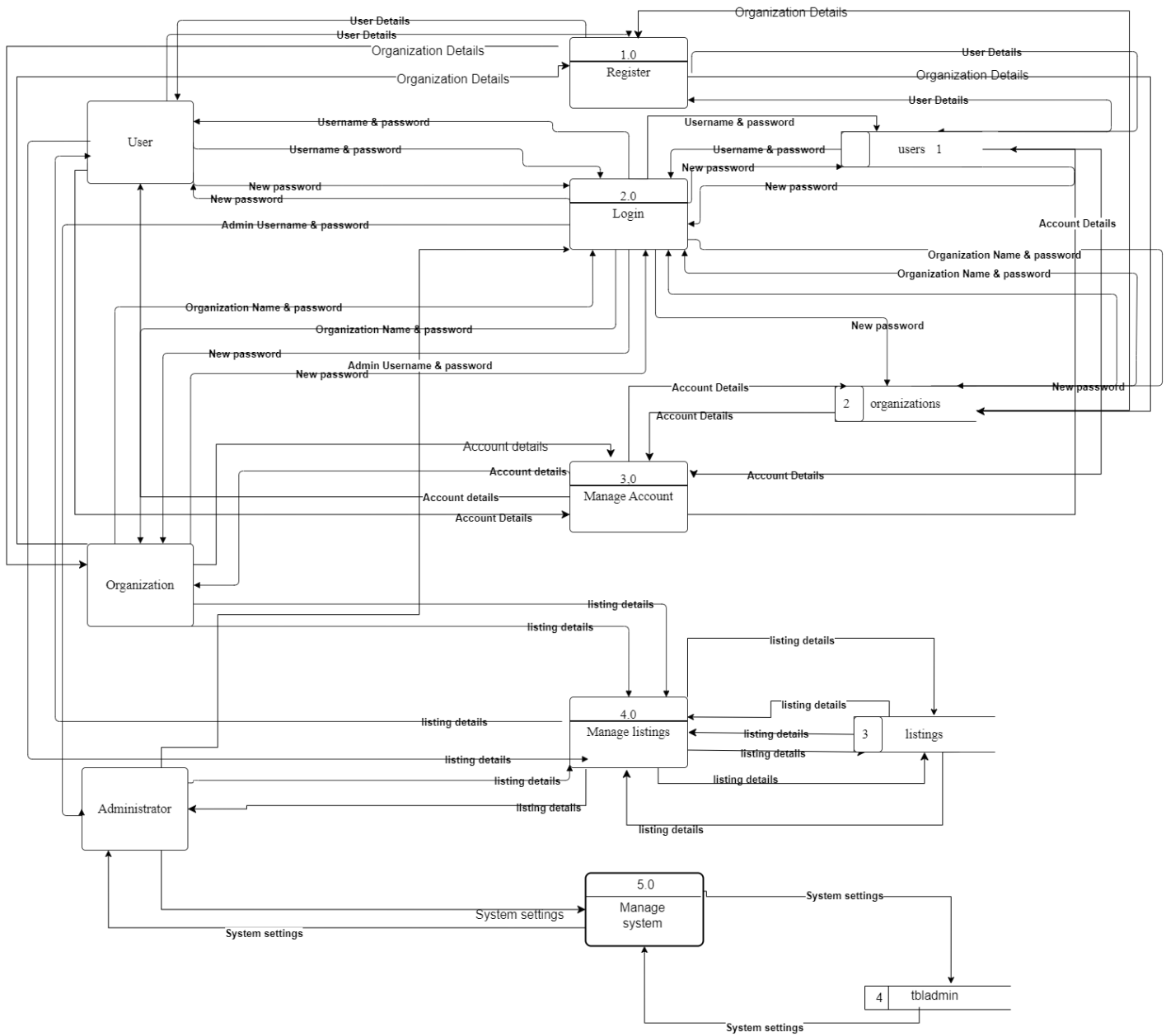
### Appendix A: Gantt Chart



### Appendix B: Data Flow Diagram Context Diagram



### Appendix C: Data Flow Diagram Level 0



### Appendix D: Entity Relationship Diagram

