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Save The Strays: an online adoption system for stray animals in Malaysia

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***Abstract*—The COVID-19 pandemic has caused an increase in the number of stray animals in Malaysia. Hence, this work proposed a web application called Save The Strays (STS) to manage these animals' welfare and help find new pet owners for better care. The chosen approach for the project development was the Agile+UX methodology. This project implemented the Laravel framework with MVC architecture for the backend implementation and Vue.js for frontend implementation. It also utilized PostgreSQL and Amazon S3 for data and file storage purposes. STS has undergone two types of testings, the Black Box and usability testing with actual users. The system testing phase resulted in a satisfying outcome as STS passed all conducted test cases and testers from usability testing were satisfied with the system. The finding suggested that STS is considered a platform to increase efficiency and optimize the process of stray animal adoption starting from adoption application until follow-up with new pet owners.**

Keywords-stray animals; adoption; agile+ux;

I. INTRODUCTION

COVID-19 has affected not only the community in Malaysia but also stray animals as there was an increasing trend in their numbers at several places such as markets, shops, and roads. Even numerous pet rescue teams in Malaysia still cannot guarantee the adoption of these strays due to constraints like location restrictions, remoteness of rescue locations, high investment cost, update of relevant news, and difficulties in publishing [6]. The fear is that these animals are left behind with severe hardship to find their needed supplies such as food and water during this pandemic due to people staying indoors. Extreme hunger might cause them to eat anything on the roadside or the leftover meals in the trash, which might lead to suffering from malnutrition.

Not all websites that offer pet adoption for the community in Malaysia have a focus on stray animals. The required data like name, status, type, gender, age, breed, color, size at maturity, fur length, vaccination status, health condition, adoption fee, pet pictures, etc., shows how one website mainly focuses on pets with owners. Some data like the animals' breed or vaccination status are not suitable to describe a stray animal as it can be uncertain.

The next problem is some websites do not provide a follow-up feature for new pet owners. This feature is considered a way to avoid animal cruelty. Some people might go for pet adoption as they might think of it as a companion during the Movement Control Order (MCO). The fear is the possibility of abandoning the pets when the pandemic ends. Plus, facing life pressure also can lead to pet neglect. The pace of people's lives has accelerated in recent years, putting more pressure on them and causing an increase in the number of abandoned pets [6].

Lastly, no platform offers a person to sign up as a volunteer to feed the strays. Although there are many animal lovers in Malaysia, not all can go for an animal adoption due to financial instability. The least they can do sometimes is voluntarily feed the strays with some food. Nonetheless, it is still a heroic action to prevent stray animal starvation cases. Hence, there is a need to provide the number of homeless animals and volunteers in each place.

All mentioned issues motivate the study to implore the most suitable technological solutions to address the challenge. The importance is to develop a system that can manage the welfare of stray animals while optimizing the process of stray animal adoption, starting from adoption application until follow-up with new pet owners. Thus, this project aims to gather the STS requirements from targeted stakeholders, design STS based on requirements analysis and design specification, develop STS based on the constructed design, and evaluate STS using suitable testing techniques.

II. BACKGROUND AND RELATED WORK

In Malaysia, many local organizations or pet shelters already own a website, but they mainly focus on pets under their protection which does not fit with the aim of STS. However, there exist two systems that have similarities with the project concept. The first one is Petfinder.my, a website that helps

enhance communication with potential adopters, a unified resource to put ads from rescuers, and an education platform on how to manage pets responsibly [5]. The second one is, Adopt a Pet, a website to assist decent people at shelters and rescue organizations in finding homes for their pets [4]. These systems are compared with STS to distinguish the features, strengths, and weaknesses in determining the best technology for the system's needs

A. PetFinder.my

PetFinder.my provides services such as pet adoption that allow users to create and view properly profiled pets that are up for adoption. Next, rescuers also can create an advertisement to raise awareness regarding a campaign or fundraising. Users also can join public forums, read articles, buy from online shop services, and view a list of contact information to report animal abuse cases.

Its strength is a provided cuteness meter that uses artificial intelligence to analyze pet photo attractiveness for good exposure, more potential adopters, and a higher chance of finding loving homes. Moreover, it also provides a visual map to ease pet adoption and an effective means to locate lost pets. This website provides a search bar for users to refine their search for a specific pet type, breed, location, status, or age.

Despite the mentioned strengths, it also has a few disadvantages. In terms of design, it is not user-friendly since various information is displayed on one page, causing difficulty for a first-timer and leading to a low usability quality. In addition, the listing of the pets' profiles also is inefficient. All are put in one listing without splitting under sale, adoption, or lost and found categories.

B. Adopt a Pet

Adopt a Pet offers pet adoption services that allow users to create and view properly profiled pets. It guides users in choosing a pet through tips or adoption info according to preference or personality and articles as assistance in keeping pets healthy for a new pet owner. Plus, there are also volunteer opportunities provided.

Its strength is the opportunities offered for volunteers to lend a helping hand to any shelter or rescue group. To begin with, a user needs to specify a location before the system can display an available opportunities list around the area.

Despite its strength, it also has a disadvantage. As mentioned, a user needs to specify a location to view the available opportunities. However, after a user enters a state or capital name inside the text field, the system keeps displaying errors without telling whether the format is incorrect or there are no available opportunities around the area.

A comparison table (see Table 1) is provided to highlight the similarities in the application business model and service domain characteristics. They use their platform to run their application and provide pet adoption services. These systems only share three features, view a list of available pets, create a pet profile for potential adopters' reference, and view pet care and health articles. STS offers an additional follow-up feature that is not offered by others. It aims to prevent the neglect of animals adopted from the website. The remaining characteristics like platform used, area of service, and other features are the same as one of the existing systems. These characteristics are proven to be functioning well and meet the user's needs resulting in a smooth adoption process and good care of stray pets' welfare.

TABLE I. COMPARISON BETWEEN EXISTING SYSTEMS WITH THE PROPOSED FEATURES FOR SAVE THE STRAYS (STS)

Characteristic	**PetFinder.my**	**Adopt a Pet**	**Save the Strays**
Platform	Web, iOS, Android	Web	Web
Application Business Model	Platform	Platform	Platform
Service Domain	Pets Adoption	Pets Adoption	Pets Adoption
Area of Service	Malaysia	North America	Malaysia
View List of Available Pets	Yes	Yes	Yes
Create a Pet Profile	Yes	Yes	Yes
Follow-Up with New Pet Owners	No	No	Yes
View Pet Care and Health Articles	Yes	Yes	Yes
View Volunteer Opportunities	No	Yes	Yes

III. METHODOLOGY

In this project, the chosen methodology was Agile UX. Agile UX is the update of the Agile methodology with UX design approaches that aim to bring Agile developers and UX designers together during project development [9]. Agile is an iterative approach that allows for rapid changes, quick delivery, and risk reduction [1]. It supports future demand changes and provides the flexibility to handle attributes in line with the demand. However, Agile does not always address the usability of the software product. As the importance of a good UX has grown, the necessity to integrate the two areas arose [8]. As UX design focuses on the easy navigation quality, this integration helps improve a software's usability and makes it user-friendly. The Agile UX approach contains three phases modified to suit the project's requirements.

A. Requirements and Design Phases

The requirements were gathered and elicited at this phase via online questionnaires conducted among a community concerned about stray animals in Malaysia. The goal was to determine the user's needs and design the system based on the survey analysis and UX comments. Fig. 1 shows the 19 use cases derived based on the elicited requirements. Each use case defines a different functional requirement of the proposed system.

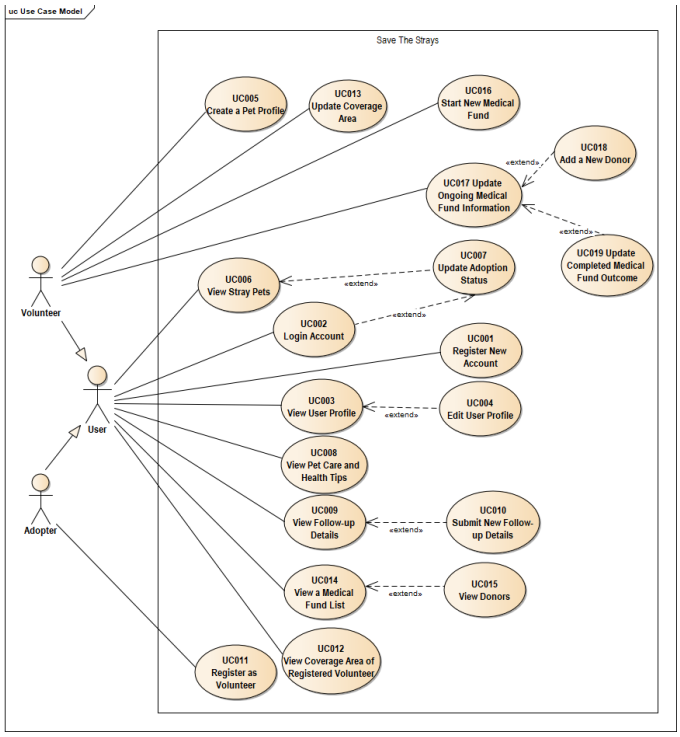

Figure 1. Use case diagram of STS

In addition, the component diagram was designed in this phase too as a reference for the development phase. It demonstrated the chosen Model-View-Controller (MVC) architectural style for the backend implementation. This architecture is popular among developers for creating scalable and extendable applications. MVC framework is considered the gold standard in modern software development [2]. This style consists of 3 logical components, model, view, and controller. A model component is capable of data management, a view component is responsible for displaying the model data on the UI, and the controller acts as a barrier between model and view components. The controller manages the flow of data in the model and updates the display as the data changes. This design ensures that the operation of subsystems is unaffected by the critical failure of others. Fig. 2 demonstrates a component diagram that illustrates how each component communicates with others to complete each task.

B. Development Phase

This phase includes code development and turning the design documentation into a system that is considered the backbone of the entire process. The development followed the requirements gathered in the previous phase to ensure customer satisfaction. The developed UIs were also based on the feedback gained during the online survey for UX enhancement. Table II shows the software utilized during the development stage.

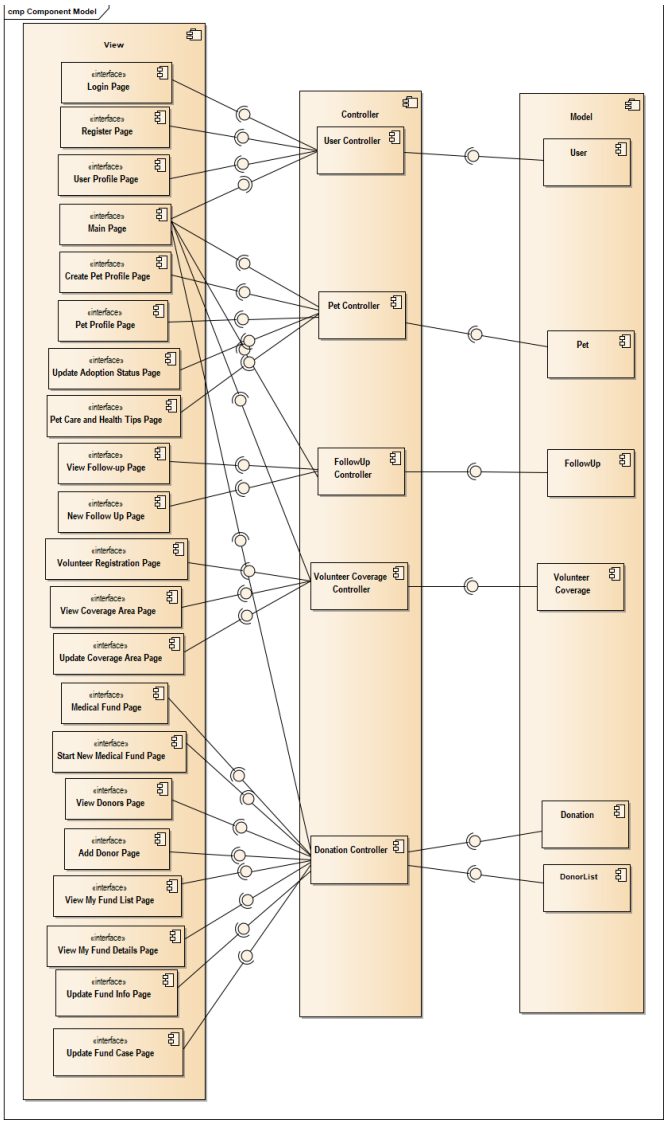

Figure 2. Component diagram of STS

TABLE II. SOFTWARE USED

Software Name	Description
Visual Studio Code	A coding platform used for the project implementation.
Google Chrome	A web browser used to run and test the web application.
Enterprise Architect	UML modeling tool to develop software architecture and design.
Microsoft Office	Used to manage all documentation of the project.
Laravel	A framework that emphasizes the MVC architecture.
MySQL	A database to manage CRUD operation on data during the development phase.
PostgreSQL	A database to manage CRUD operation on data during the deployment and testing phase.

Amazon S3	Object storage to store files.
Git Bash	To run and install Laravel and to connect the project with GitHub.

C. *Test and Review Phases*

This stage aims to validate that the system is bug-free and no requirements are lacking. All possible issues were listed and had them fixed before the deliverable. In this stage, the system testing conducted were the dynamic and usability testing. Dynamic testing aims to verify the system's consistency via a black box testing, while usability testing aims to ensure a high-level familiarity of the system to a user.

IV. IMPLEMENTATION

The technology used for the frontend and backend of this project is Laravel and Vue.js. For the backend implementation, this project fully uses the Laravel framework, an open-source PHP web framework that uses the MVC pattern to develop web applications. For the frontend implementation, this project used the Blade template and Vue.js. The blade template is a simple and powerful templating engine provided in the Laravel [3]. Any frontend component that requires a JavaScript function to build interactive user interfaces is implemented using Vue.js, a JavaScript framework. Overall, the programming languages used in the system development were PHP and JavaScript only.

The system development was divided into five short sprints, representing modules User, Pet, Follow Up, Volunteer Coverage, and Donation. All code implementations were developed according to sprint duration to ensure the project deliverable. Fig. 3-5 show the UIs of STS for the Medical Fund page, Follow-up page, and View Coverage Area page, respectively.

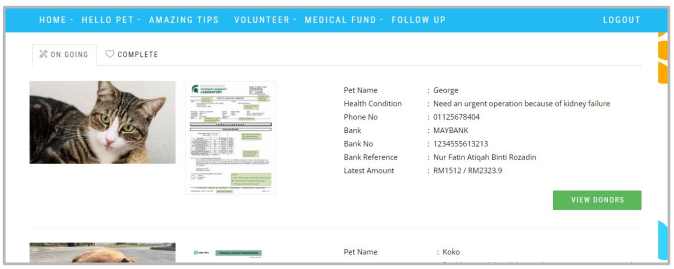

Figure 3. Medical Fund Page

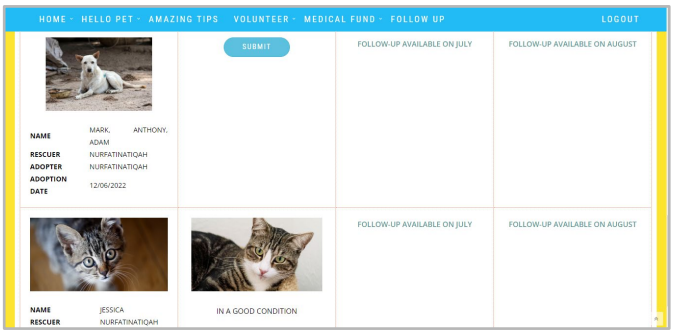

Figure 4. Follow-up Page

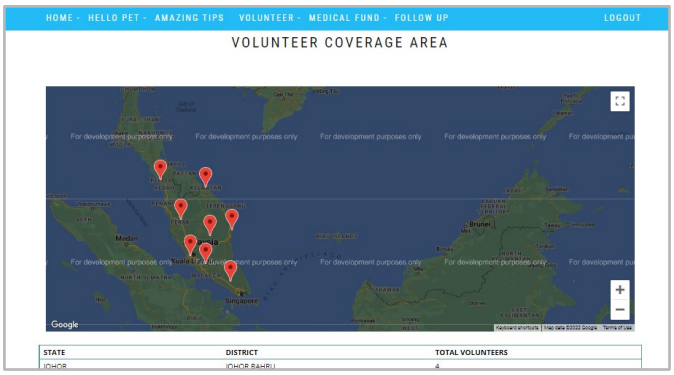

Figure 5. View Coverage Area Page

The STS applies a consistent design for each UI as it adheres to the most recent UI/UX design trends where usability and user-friendliness improve when similar components have a repetitive appearance and behave similarly [7].

V. TESTING AND RESULTS

Dynamic testing and usability testing were the two types of system testing used in this project. Dynamic testing aims to verify the system's consistency by identifying defects in the code behavior while usability testing aims to ensure a high-level familiarity of the system to a user. In this phase, the chosen method of dynamic testing was the Black Box testing.

A. *Black Box Testing*

Black-box testing concentrates on various forms of input data and the produced output. It provides a technique called equivalence class partitioning to help a tester in deriving the test cases. There were 19 designed test cases that was conducted to verify the system consistency. Each test case was purposely designed with valid and invalid inputs to see whether the expected result matched the actual one. All executed test cases resulted in a 100% pass rate, indicating that the expected output matched the actual output.

B. *Usability Testing*

The usability testing was performed with a community that is concerned with stray pets. This group consists of 8 people, 4 assigned as a volunteer, and another 4 as an adopter. The prerequisite for the system testing is a stable internet connection and a laptop or mobile phone that has a web browser. Each user was provided with instructions on how to perform the usability testing and a Google Form for the system feedback. Before performing the usability testing, the user was requested to play around with the system to ensure high familiarity. This is to guarantee that the user can perform each given task efficiently during the usability testing. After testing, the user was asked to fill in the provided Google Form to rate their satisfaction through the provided questionnaire.

The findings of the usability testing were analyzed using the feedback and suggestions provided by the users. To test the system functionality, the questionnaire provided 14 questions for adopter role tester, and 18 questions for volunteer role tester. Each question represents a task related to system functionality. In addition, both sets also have 7 rating-scale questions prepared

for the system quality scale and 1 open-ended question for the system feedback.

Based on the findings, each user was able to perform all given tasks during the usability testing indicating that STS has met all functionalities for both roles. Thus, most of them agreed that STS has achieved its objective and is satisfied with the overall features proposed. In terms of system quality, most of them think that STS has a high-performance level based on the response time, is reliable, and can protect their data efficiently. Plus, they also agreed that STS is easy to navigate. All users mentioned in their feedback that STS is a good system to manage stray animals' welfare and adoption. See Table III for details.

TABLE III. USER RATINGS

Satisfaction Level Regarding System Quality		
Objective fulfillment	5/5 (100%)	4/5 (25%) 5/5 (75%)
System performance based on response time	4/5 (75%) 5/5 (25%)	4/5 (50%) 5/5 (50%)
Data protection	5/5 (100%)	4/5 (25%) 5/5 (75%)
System reliability	4/5 (50%) 5/5 (50%)	4/5 (50%) 5/5 (50%)
System is easy to use	5/5 (100%)	5/5 (100%)
Web design is easy to understand	5/5 (100%)	4/5 (50%) 5/5 (50%)
Overall features proposed	5/5 (100%)	4/5 (25%) 5/5 (75%)

Some feedbacks from the participants during the usability testing of Save The Strays would be considered as part of the future work. P1 says, "*Good system to help managing stray animals*", while P2 mentions, "*Absolutely great system. It would be great if an organisation actually used the system for animals so we can help the animals around the world to create a better environment to live in*". P3 added, "*Overall, everything is good regarding the system. But, one thing I can comment on the Logout button, maybe it would be better if the cursor could be changed into a hand pointer while hovering over any element and not just a hyperlink.*"

VI. CONCLUSION

This paper provides a clear explanation of how STS helps to manage the welfare of stray animals and optimize the process of stray animal adoption, starting from adoption application until follow-up with new pet owners. It also includes information regarding each project phase, framework, and technology used during the project development. The outcomes of Black Box and usability testing also were shared to prove that STS has met the user needs.

The project objectives were accomplished by eliciting the requirements from the online survey, designing, and developing the system based on the specified requirements, and evaluating it using suitable testing techniques. In the future, the plan is to focus on mobile application development for Save The Strays.

ACKNOWLEDGMENT

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REFERENCES

[1] F. Hayat, A. U. Rehman, K. S. Arif, K. Wahab, and M. Abbas, 'The Influence of Agile Methodology (Scrum) on Software Project Management', 20th IEEE/ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD), pp. 145-149, 2019, doi: 10.1109/SNPD.2019.8935813.

[2] M. Jailia, A. Kumar, M. Agarwal, and I. Sinha, "Behavior of MVC (Model View Controller) based Web Application developed in PHP and .NET framework", International Conference on ICT in Business Industry & Government (ICTBIG), pp. 1-5, 2016, doi: 10.1109/ICTBIG.2016.7892651

[3] Laravel, "The PHP Framework For Web Artisans", (n.d.). Retrieved June 28, 2022, from https://laravel.com/docs/9.x/blade

[4] Kinship Partners Inc & Affiliates, "About Us. Adopt a Pet", (n.d.). Retrieved June 24, 2022, from https://www.adoptapet.com/public/about_us/

[5] A. Koh, "In The Beginning", 2008. Retrieved July 17, 2021 from https://www.petfinder.my/about.htm

[6] H. Liu, and X. Meng, "JSP-Based Pet Adoption System", 2019 International Conference on Virtual Reality and Intelligent Systems (ICVRIS), pp. 231-234, doi: 10.1109/ICVRIS.2019.00064

[7] A. Nikolov, "Design principle: Consistency - UX Collective", Medium, May 2020. Retrieved from https://uxdesign.cc/design-principle-consistency-6b0cf7e7339f

[8] S. Silva, M. S. Silveira, F. Maurer, and T. Hellmann, "User Experience Design and Agile Development: From Theory to Practice", Journal of Software Engineering and Applications, 5 (10), pp. 743-751, 2012, doi: 10.4236/jsea.2012.510087

[9] M. Treder, "Lean UX Vs. Agile UX – Is There a Difference?", 2020. Retrieved July 17, 2021 from https://www.uxpin.com/studio/blog/lean-ux-vs-agile-ux-is-there-a-difference/.