

iPET: The Design, Development, and Assessment of a Web-Based Application for Pet Adoption

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ABSTRACT

The iPet web application was developed to assist in pet adoption and support for pets whose owners are unable to care for them, thereby reducing the risk of abandonment. This study utilized a developmental research method, following the six steps of the waterfall model: requirements analysis, design, implementation, testing, deployment, and maintenance. IT experts used ISO 25010 standards to evaluate the application's functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. Feedback from end-user respondents in Barangay Aduas Norte, Cabanatuan City, including both pet owners and non-pet owners, indicated a high level of satisfaction with iPet's effectiveness. Based on the study's findings, recommendations were made to enhance the application. It was suggested to develop iPet as a mobile-based application for convenient access on smartphones and tablets. The integration of chat features was also recommended to improve user communication and information exchange. Future researchers were advised to utilize these findings for their own research on pet adoption applications. Implementing these recommendations would improve the functionality, user experience, and efficiency of iPet, thereby facilitating the pet adoption process and enhancing the overall experience for pet owners and potential adopters.

INTRODUCTION

Technological advancements have contributed to the growth and improvement of various operations and processes across different aspects of today's generation (Qureshi, 2022). The evolution in the field of information technology has fueled such advancements. Castagna (2021) explains that computers are utilized to create, process, retrieve, and exchange electronically sent information. The overall quality of these processes has improved due to technological advancements in the ways people handle transactions and activities (Beer & Mulder, 2020). Animal management, welfare, and protection could significantly benefit from advancements in the field of information technology (Association of Equipment Manufacturers, 2021). Multi-functional devices, such as smartphones and smartwatches, have significantly improved communication, providing access to various mobile applications (Segwitztech, 2023). The use of computers has become more powerful than ever before, allowing for faster information processing and increased portability for electronic projects and website/application access. Individuals can use technology to improve and protect animal lives, especially those commonly considered as domestic pets. Animal-saving websites and applications play a crucial role in helping build a more humane society for all. These platforms are continuously being developed and innovated to address the growing number of abandoned pets due to financial constraints or unwanted behaviors.

Abdulkarim et al. (2021) noted that stray animal overpopulation is a significant global problem that negatively impacts the environment, communities, and public health. Stray animals reproduce unchecked, increasing their population and the likelihood of carrying and transmitting diseases, causing accidents, and spreading zoonotic diseases to other animals. In 2020, the Philippine Animal Welfare Society (PAWS) estimated that there were over 12 million stray cats and dogs in the Philippines, exacerbating the issue of animal homelessness.

Despite the increasing popularity of web-based applications for pet adoption, limited research has addressed their design, development, and assessment. The available studies have primarily focused on the functionality of the applications, such as their matching algorithms and database management. However, little attention has been given to the user experience, user interface design, and the impact of these applications on pet adoption rates. Furthermore, there is a lack of studies that compare the effectiveness of web-based applications for pet adoption to traditional adoption methods. Therefore, a research gap exists that needs to be addressed to better understand the design and development of web-based applications for pet adoption and their impact on animal welfare.

With this premise in mind, the researchers conducted a study to design, develop, and evaluate a web application for pet adoption called iPet. The aim was to provide a platform for easy and secure pet adoption.

Statement of the Objectives

The objective of this study was to design, develop, and assess a web-application for pet adoption.

Specifically, it aimed to answer the following questions:

1. How may the system be design and develop based on the stages of Waterfall Model in terms of;
 - 1.1. Requirements analysis;
 - 1.2. Design;
 - 1.3. Implementation;
 - 1.4. Testing;
 - 1.5. Deployment; and
 - 1.6. Maintenance?
2. How may the IT experts assess the technical aspect of the system based on the ISO 25010 criteria which include
 - 2.1. Functional Suitability;
 - 2.2. Performance efficiency;
 - 2.3. Compatibility;
 - 2.4. Usability;
 - 2.5. Reliability;
 - 2.6. Security;
 - 2.7. Maintainability; and
 - 2.8. Portability?
3. How may the end-users assess the quality of using the system based on
 - 3.1. Functional Suitability;
 - 3.2. Reliability; and
 - 3.3. Usability; and

METHODOLOGY

In this study, a developmental research design was employed. According to Seels and Richey (1994), developmental research is the 'systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness.' The research design was appropriate for this study because it served as a guide for systematically developing the web application for pet adoption. In the past, several studies employed such design such as the study conducted by Olipas (2019) and Olipas and Esperon (2020).

The study was conducted in Barangay Aduas Norte, Cabanatuan City, Philippines. Using a purposive sampling technique, the researchers identified the respondents who participated in the assessment of the web application. The respondents included IT experts and end-users. Specifically, end-users had to be residents of Aduas Norte with a high interest in pet adoption. Table 1 presents the distribution of the respondents.

Table 1. Distribution of the Respondents

Type of Respondents	Frequency	Percentage
IT Experts	20	50.00%
End-Users	20	50.00%
Total	40	100.00%

Two sets of survey questionnaires were utilized by the researchers to evaluate the technical aspects of the system in accordance with ISO 25010 quality standards. The initial set aimed to assess the system's technical features, while the second set was designed to gather feedback from end users, enabling an evaluation of the system's usage quality.

Throughout the data gathering process, the researchers effectively conveyed the study's objective to the respondents, emphasizing the voluntary nature of their participation. Informed consent was obtained from all respondents, accompanied by comprehensive explanations of the study's procedures. The researchers placed a high priority on maintaining strict confidentiality and anonymity for all collected data. Furthermore, they strictly adhered to using the collected data solely for the purpose of the study.

RESULTS AND DISCUSSION

The Development of iPet Based on the Stages of the Waterfall Model

A. Requirements Analysis Stage

In this stage, the researchers documented all potential requirements for developing the system. They performed a requirements feasibility analysis to assess their viability. During this stage, the researchers conducted a series of observations, brainstorming sessions, and interviews to develop a plan that aligned the system with existing processes and addressed the challenges encountered. Furthermore, they created a Gantt chart illustrating the stages of the Waterfall Model to guide them throughout the construction of the system.

Gantt charts hold considerable significance in the realm of software development for a multitude of reasons. Firstly, they facilitate precise planning and coordination of work, including the timely delivery of essential materials and equipment, in addition to team and subcontractor assignments (Novak, Sobko, & Sumariuk, 2023). Secondly, Gantt charts allow for the monitoring of actual work performance in comparison to the planned schedule, enabling timely rectifications and adjustments, if deemed necessary (Scully-Allison & Isaacs, 2021). Lastly, Gantt charts serve as a means to visualize and comprehend communication patterns in extensive parallel programs, aiding in the analysis of execution traces and the identification of similarities between structures on varying scales (Evdokimov, Tsarev, Yamskikh, & Pupkov, 2018). Table 2 presents the Gantt chart of activities.

Table 2. Gantt Chart of Activities

Activities	May 2022				June 2022				July 2022				August 2022				September 2022				October 2022			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Requirements Analysis	█	█	█	█																				
Design					█	█	█	█	█	█	█	█												
Implementation													█	█	█	█	█	█	█	█				
Testing																	█	█	█	█				
Deployment																					█	█	█	█
Maintenance																								█

B. Design Stage

The goal of the design stage is to convert the requirements into comprehensive specifications that encompass all elements of the system (Maulana, Susanto, Shilo, Gunawan, Pangestu, & Budi Raharja, 2021). This stage encompasses various activities, including architectural, function-oriented, and object-oriented design (Sharma & Pandey, 2015). In this stage, the researchers created different process diagrams to fully understand and analyse the important activities and process involved in the developed system.

Figures 1 and 2 depict the data flow diagram and the use-case diagram utilized in this study.

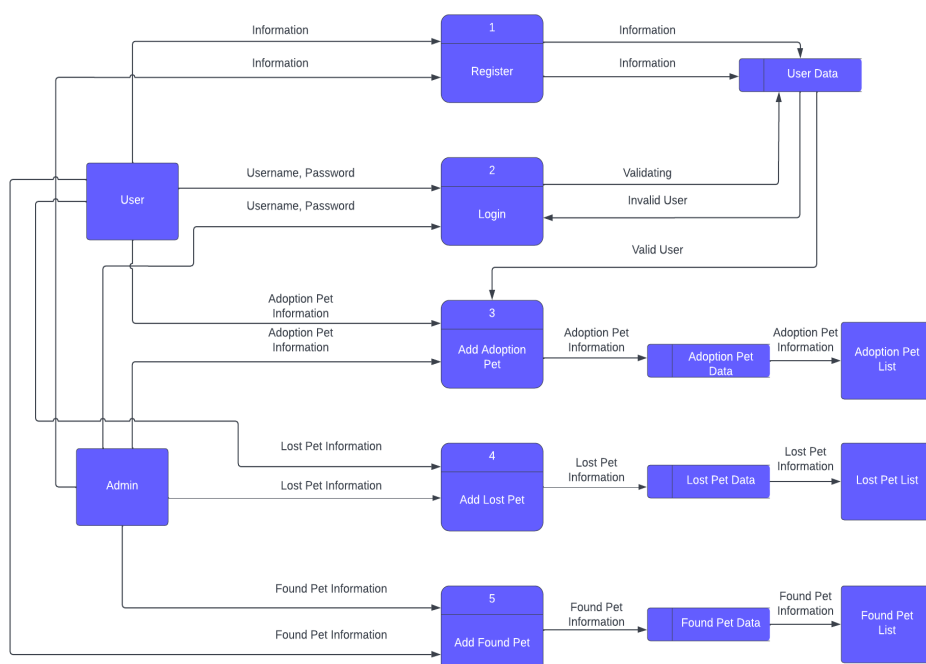


Figure 1. Level 1 representation of the Data Flow Diagram

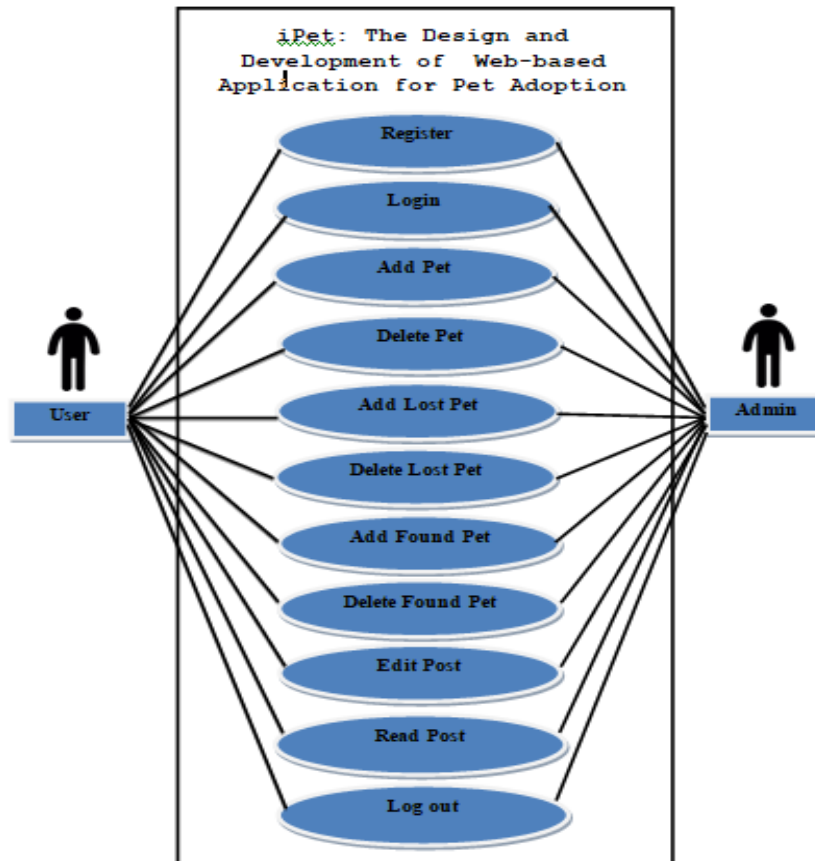


Figure 2. Use Case Diagram

To visualize the modules covered in the developed system, figure 3 shows the Hierarchical-Input-Process-Output chart.

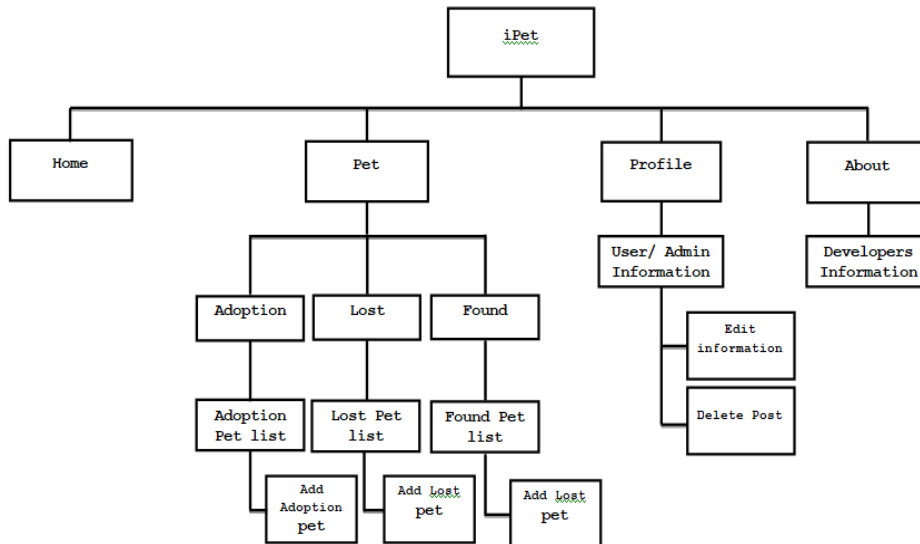


Figure 3. HIPO Chart

Entity-relationship diagram was necessary to show the connections of the entities involved in the developed system. Figure 4 presents the ERD used in this study.

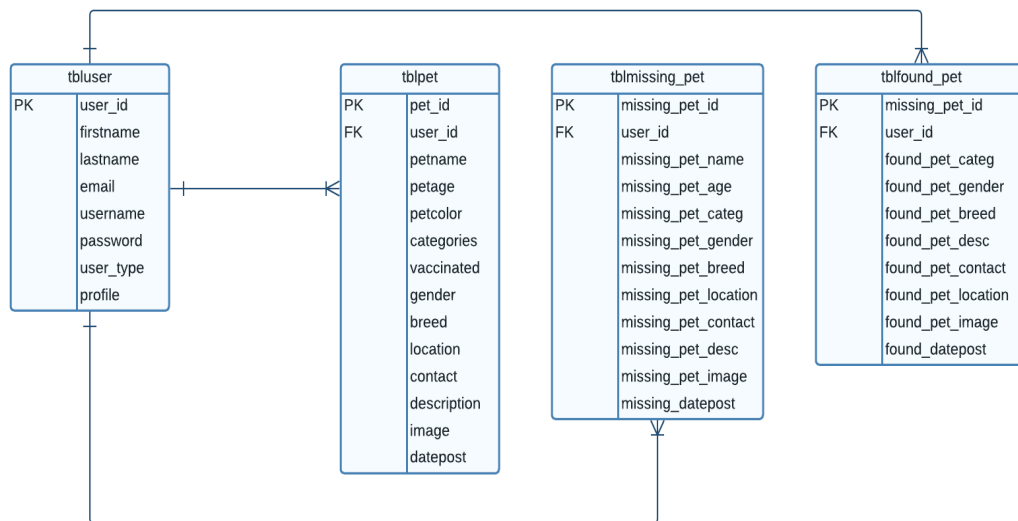


Figure 4. Entity-Relationship Diagram

C. Implementation Stage

The implementation stage of the waterfall model was also referred to as the coding stage. The objective of this phase is to transform the software design into source code and implement all module components (Muthuselva, Somasundaran, & Rajaprakash, 2020). During this stage, the researchers utilized the development environment, programming language, database, and other necessary tools. They converted all the information gathered during the design stage into an operational system. The developed system was coded using Visual Studio Code, and the database was created using PhpMyAdmin.

D. Testing Stage

The objective of the testing stage is to appraise the competence and usability of the software (Malik, 2017). This phase plays a crucial role in ensuring the quality of the software (Ahmad-Kamal, Yen, Hui, Ling, & Zahra, 2020). In this stage, the researchers utilized functional testing to assess each function of the system by providing appropriate input. Functional testing focused on evaluating the mainline functions, basic usability, accessibility, and error conditions of the system.

During mainline function testing, the researchers examined the system's primary functions to ensure their proper functionality. In basic usability testing, they evaluated the system's user interface, verifying the ease of navigation and the functionality of buttons. Accessibility testing was conducted to confirm that users could access the website without encountering any unidentified system errors. Lastly, the researchers performed error conditions testing to check if error messages were correctly displayed on the screen.

E. Deployment Stage

In this stage of the model, the researchers presented the developed system to potential IT experts and pet or non-pet owners of Barangay Aduas Norte, Cabanatuan City. Due to the pandemic, personal presentations to the users were not possible. Instead, the researchers created a video demo of the developed

system and attached it to a Google Form survey. Through the Google Form, IT experts and end users were able to watch the complete video demo of the developed system and evaluate its technical aspects based on ISO 25010.

F. Maintenance Stage

In this stage, the researchers planned to perform various types of maintenance, including corrective maintenance, adaptive maintenance, perfective maintenance, and preventive maintenance. In the corrective maintenance, modifications and updates will be applied to the system to resolve problems identified by users or the researchers. In adaptive maintenance, changes and updates will be made to the system to ensure its compatibility with other browsers and keep it up to date. Preventive maintenance will involve applying future modifications and updates to maintain the system's usability over an extended period. It will also include adding new features to enhance the user experience, improve system performance, usability, and functionality. Lastly, future preventive maintenance will aim to prevent future issues with the system. It will involve addressing minor issues that could potentially lead to significant problems in the future. The researchers will reconstruct the code to enhance its readability and optimize it for faster program execution.

Assessment on the Technical Features of iPet by IT Experts based on ISO 25010 Software Standards

The technical features of the system were evaluated by the IT experts based on the ISO 25010 software standards. These standards covered various aspects, including functional suitability, reliability, usability, performance efficiency, compatibility, maintainability, security, and portability. The assessment conducted by the IT experts is presented in Table 2, showcasing the results of their evaluation.

Table 2. Result of the Assessment on the Technical Features of iPet

Criteria	Mean Rating	Verbal Interpretation
Functional Suitability	3.50	Highly Functional
Reliability	3.50	Highly Reliable
Usability	3.40	Highly Usable
Performance Efficiency	3.50	Highly Efficient
Compatibility	3.40	Highly Compatible
Maintainability	3.50	Highly Maintainable
Security	3.40	Highly Secured
Portability	3.40	Highly Portable
Total	3.45	Highly Acceptable

Table 2 presents the results of the assessment conducted on the technical features of iPet. The table consists of different criteria, including functional suitability, reliability, usability, performance efficiency, compatibility, maintainability, security, portability, and the overall mean rating.

The results of the assessment indicate that iPet received high ratings across all criteria. Functional suitability, reliability, usability, performance efficiency, compatibility, maintainability, security, and portability all received mean ratings

of 3.40 to 3.50, which indicates that the system is highly functional, reliable, usable, efficient, compatible, maintainable, secure, and portable.

These positive results imply that iPet's technical features meet the desired standards and requirements. It suggests that the system is well-designed and well-developed, providing users with a highly functional, reliable, and efficient experience. The high ratings in usability and maintainability indicate that iPet is user-friendly and easy to maintain, ensuring a positive user experience. Additionally, the high ratings in security and portability demonstrate that iPet is highly secure and can be easily used across different platforms or environments. The highly acceptable mean rating of 3.45 suggests that iPet's technical features are well-received and meet the expected quality standards.

Assessment on the Quality of Using the iPet by End-Users based on the Selected ISO 25010 Software Standards

Table 3 displays the results of the end-users' assessment of iPet in terms of functional suitability, reliability, and usability. The assessment focused on evaluating the quality of use based on specific software standards.

Table 3. Result of the Assessment on the Quality of Using the iPet

Criteria	Mean Rating	Verbal Interpretation
Functional Suitability	3.70	Highly Functional
Reliability	3.60	Highly Reliable
Usability	3.60	Highly Usable
Total	3.63	Highly Acceptable

Table 3 presents the results of the assessment conducted on the quality of using the iPet system. The table includes various criteria, their corresponding mean ratings, and verbal interpretations.

In terms of functional suitability, the iPet system received a mean rating of 3.70, indicating that it is highly functional. This suggests that the system effectively meets the required functionalities and performs its intended tasks satisfactorily. For reliability, the iPet system achieved a mean rating of 3.60, indicating a high level of reliability. This implies that the system consistently operates without errors or disruptions, ensuring its stability and dependability. In terms of usability, the iPet system received a mean rating of 3.60, indicating that it is highly usable. This suggests that the system is user-friendly, intuitive, and easy to navigate, allowing users to efficiently interact with it. The assessment indicates that the iPet system has performed well in terms of functional suitability, reliability, and usability. The total mean rating of 3.63 reflects a highly acceptable level of quality. These positive results imply that the iPet system is likely to provide a satisfactory user experience and meet the needs and expectations of its users.

CONCLUSION AND RECOMMENDATION

The iPet application was designed to assist individuals in finding a pet for adoption and to provide support for pets whose owners are no longer able to care for them, reducing the likelihood of them running away. For this study, a developmental research method was employed, involving the systematic design, development, and evaluation of instructional programs, processes, and products. Following the six steps of the waterfall model, the iPet application was created, encompassing requirements analysis, design, implementation, testing, deployment, and maintenance.

The IT experts utilized the ISO 25010 standards established by the International Organization for Standardization to guide the development of iPet. The experts evaluated the application based on various criteria, including functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. Additionally, a quality of use assessment was conducted, with end-user respondents from Barangay Aduas Norte Cabanatuan City, consisting of both pet owners and non-pet owners, providing feedback on the functional suitability, performance efficiency, usability, and reliability of iPet. The application successfully met and surpassed the evaluation criteria set by the IT experts, demonstrating its effectiveness and user satisfaction.

FURTHER STUDY

Based on the conclusions and findings of this study, several recommendations have been proposed to further improve the iPet application. Firstly, it is recommended that the iPet be developed as a Mobile-based Application. By creating a mobile version of the app, it would provide users with greater convenience and accessibility, allowing them to access the application on their smartphones or tablets anytime and anywhere.

Secondly, it is suggested that the iPet integrate chat features to facilitate communication among users. This addition would enable pet owners and potential adopters to interact with each other, ask questions, and exchange important information about the pets available for adoption. The inclusion of chat features would foster better connections and relationships within the iPet community, making the adoption process more interactive and engaging.

Lastly, it is advised that future researchers utilize the findings of this study as a guide when conducting research related to the field of pet adoption applications. The insights and conclusions obtained from this study can serve as a foundation for future investigations, providing a valuable starting point for researchers interested in exploring similar topics or expanding upon the current findings.

These recommendations aim to enhance the functionality and user experience of the iPet application, making it more user-friendly, interactive, and efficient. By implementing these suggestions, the iPet application can further contribute to facilitating pet adoption and improving the overall experience for both pet owners and potential adopters.

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