



Implementation of Codeigniter Framework in the Development of Orchid Database Collection Information System Using Extreme Programming Method

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Abstract. Forest is an ecosystem consisting of land and natural resources, primarily dominated by trees, living in harmony with the environment and cannot be isolated from each other. Orchids, not only as a component of tropical forest systems, but also because they have many benefits and the potential to be managed and developed for their high value, are one of the natural resources whose biodiversity should be conserved. The database system for orchid collections has been developed to improve the management of cataloguing. It will provide readers with a more streamlined process for searching for orchid information online. The author decided to develop a Database System for Orchid Collections to help solve the problems encountered in cataloguing orchids. The system was developed using the codeigniter framework based on Hypertext Pre-processor (PHP), using the concept of Model, View and Controller (MVC) where the system is separated into 3 main parts by separating the part that will be displayed to the user and the part that manages and is directly related to the database. The MVC concept allows streamlined, customisable and faster development.

Keywords: codeigniter framework, extreme programming, orchid database

3 Introduction

Indonesia boasts a remarkable level of biodiversity, being home to thousands of species and ranking among the top three countries in the world in terms of mega biodiversity [5]. Indonesia's natural diversity ranges from woody plants to epiphytes and even orchid species. This requires follow-up in the form of data processing and monitoring activities so that the sustainability of plant biodiversity can be maintained. An effort should be made to integrate the data, documentation and inventory data that have been collected from different sources with a database system or application that has been developed [11].

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Currently, technology is advancing rapidly, making almost all information accessible online through e-commerce. The author aims to develop an e-commerce system, which will be built on a programmed database website. Technical terms will be explained where necessary, and the language used throughout will remain objective and value-neutral. Common academic structures will be adhered to throughout, with grammatical correctness and precise word choice a key consideration. This research importantly focuses on the design and implementation of an orchid plant biodiversity information system. Information regarding plant data specifications will be presented in the form of Latin names, descriptions of plant parts, and distribution locations. This study implements the extreme programming (XP) methodology, utilizing the programming language PHP customized to the MVC (Model, View Controller) methodology within the CodeIgniter framework context. This framework was selected due to its compact size, well-documented framework and widespread community. Extreme Programming (XP) is a widely recognized software development method that enables an agile and responsive approach to meet evolving user needs [4].

The aim of this study is to utilize the XP approach to build a web-based application that streamlines the process of searching for ang-grek plant information. The aim of this study is to utilize the XP approach to build a web-based application that streamlines the process of searching for ang-grek plant information. The proposed computerized system ensures that the information is accurately documented and effectively accessible for users' convenience. Moreover, the computerised system enables users to conduct online searches for information, eliminating the need to visit the gardens and independently identify orchid plants.

1 Research Method

1.1 Data Collection Method

Data collection methods refer to the techniques or tools employed to gather information necessary for study, analysis, or research. The choice of method is influenced by the research objectives, data requirements, and available sources. Participatory observation is a commonly used data collection method, wherein researchers actively engage in the daily activities of subjects, serving as a direct source of research data. Stainback suggests that participatory observation yields deeper insights into the experiences of the data source, allowing researchers to empathize with their joys and sorrows [7]. This approach fosters a more comprehensive understanding of obtained data, enabling researchers to grasp the meaning behind observed behaviors. In participant observation, researchers not only observe and listen but also actively participate in the activities of the subjects, contributing to a richer understanding of the research context.

1.2 Framework Codeigniter

A framework comprises scripts or tools that facilitate the development of applications for solving diverse programming issues [6]. Numerous frameworks exist, one of which is Codeigniter. Codeigniter, formulated using PHP language, enables rapid website development [10]. This framework is a popular choice due to its open-source development

by the user community, resulting in easy learning and minimal bugs, making it a strong contender among PHP frameworks [2]. Furthermore, it incorporates MVC (Model-View-Controller) architecture, simplifying website management [1].

1.3 MVC

MVC stands for Model, View, and Controller, representing a programming paradigm where an application is divided into two main parts: one handling program logic and the other managing the program's presentation or appearance. In the MVC concept, three interconnected components work together:

1. **View:** part that handles presentation logic. In a web application this part is usually an HTML template file, which is regulated by the controller. View functions to receive and represent data to the user. This section does not have direct access to the model section.
2. **Model:** deals directly with the database to manipulate data (insert, up-date, delete, search), handles validation from the controller, but cannot deal directly with the view.
3. **Controller:** responsible for managing the relationship between the model section and the view section, it receives the requests and data from the user and then decides how the application should proceed [9].

1.4 Extreme Programming Method

Extreme Programming (XP) is an agile software development methodology that aims to improve the efficiency, adaptability and flexibility of system development. The fundamental values of XP are as follows:

1. **Communication:** Focusing on effective communication between software developers and users, as well as amongst programmers themselves.
2. **Courage:** Software developers should maintain trust, courage and integrity as they carry out their responsibilities.
3. **Simplicity:** Make everything easy.
4. **Feedback:** Relying on feedback so qualified team members are needed.
5. **Quality Work:** High quality software is the result of a high-quality process.

Extreme Programming (XP) is a software development approach that extends beyond just coding, encompassing various stages in the system development method. The key stages in the XP process are [8]:

1. **Planning**
Involves gathering activity requirements for a system to help users understand business processes, key features, functionality, and desired outcomes.
2. **Design**
At the design phase, system modelling is conducted relying on obtained results from the needs analysis. Technical terms will be explained when used for the first time. This is followed by the creation of a database model to represent the data relationships. The Unified Modelling Language (UML) is utilised for system modelling and encompasses Use Case and Activity Diagrams. For database modelling, Entity Relationship Diagrams (ERD) and Logical Record Structure (LRS) are employed.

3. Coding

This stage involves the execution of the system model design, which has been coded to create a software prototype.

4. Testing

This stage involves the testing of the built application, whereby the system user determines and evaluates its comprehensive features and functionality. Subsequently, the system user conducts a review of the entire system.

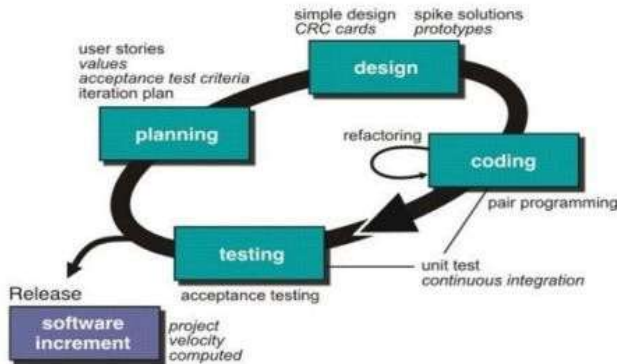


Fig. 1. Stages of extreme programming method [3].

Extreme Programming (XP) methodology for developing an orchid collection database system involves several key elements:

1. Adaptive Planning and Design:

- a. **Planning Game:** Collaborative planning involving both the client and developer to design features at each stage, allowing quick adjustments to shifting requirements.
- b. **Simple Design:** Encourages efficient and straightforward design, discouraging the addition of unnecessary features and avoiding excessive complexity.

2. Integrated Testing:

- a. **Planning Game:** Collaborative planning involving both the client and developer to design features at each stage, allowing quick adjustments to shifting requirements.
- b. **Simple Design:** Encourages efficient and straightforward design, discouraging the addition of unnecessary features and avoiding excessive complexity.

3. Pair Programming:

Encourages pair programming, where two developers collaborate on a single workstation. This enhances code quality, promotes knowledge sharing, and reduces development risk as changes are monitored by a pair of individuals.

4. Frequent Releases:

Encourages the release of smaller, more frequent software versions instead of larger, infrequent releases. This approach provides users with swift access to new features and allows developers immediate feedback opportunities.

5. Continuous Communication:

Emphasizes ongoing and transparent communication among developers, clients, and end-users. This promotes a comprehensive understanding of user requirements and enables developers to promptly address emerging modifications or concerns.

Using Extreme Programming (XP) to create a database system for an orchid collection can have many notable benefits, such as:

1. **Development Efficiency:** With automated testing, simple design, and frequent updates, XP can improve efficiency in software development.
2. **Adaptability:** The adaptive approach of XP enables teams to make swift adjustments to shifting user needs or changes in the project environment, thereby enhancing the database system's adaptability.
3. **Flexibility of the Development Process:** XP principles such as frequent software updates and combinative planning provide flexibility in managing the development process.

2 Discussion

The result of the study was a web-based inventory system for collecting orchid data, designed to integrate with the data collection application of the National Research and Innovation Agency. Utilising the XP programme, it promotes active risk identification and continuous evaluation by teams. If a risk is identified, measures can be taken to mitigate or eliminate it.

3.1 Planning

Problem identification

The current problem is that there is no system that can store and process orchid collection data, especially for *Coelogyne marthae* orchids. The collection of orchid data is done manually and the storage is still logbook-based. In addition, the need for identification of new orchid species is needed due to limited human resources. Therefore, a database system is created that can process orchid data that can display complete information. Analysis of information system needs is described in User Story and UML.

Table 1. User story.

Code	User Story Description
US1	The system consists of three key features: landing page features, admin features and super admin features.
US2	The landing page function allows non-registered users to access the page without requiring login credentials.
US3	The landing page presents a collection of orchid databases and images.
US4	The webpage comprises a menu specifically designed for getting in touch in relation to the orchid database collection.
US5	Within the Administration module, there is a Data Management section, which includes the input and editing of information.
US6	There is a section in the Administrator tool to monitor the traffic of users accessing the application.
US7	There is a Help Ticket menu in the admin section to answer questions from application visitors.
US8	In the super admin feature, there is a menu for managing user accounts to add new admins.

3.2 Design UML

Usecase Visitors

The diagram below describes the function of the orchid database system for visitor features. Visitors can see the orchid database collection including orchid images that have been uploaded by the admin, besides that visitors can also ask questions about the orchid database collection by filling out the question form after that the question will be answered immediately by the admin via email.

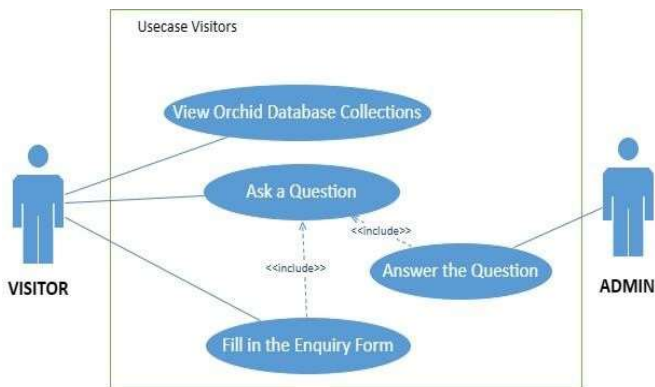


Fig. 2. Usecase visitors.

Usecase Admin and Super Admin.

The use case diagram shows the functions and services included in an information system. The Orchid Database Collection Information System presents features for managing databases and handling administrator accounts. The Administrator can access the database management feature after successfully logging in. Furthermore, the Administrator can upload photos of orchids that have been acquired from the field and modify orchid data in the case of changes. Furthermore, the amount of visitor traffic that accesses the landing page can be viewed by the administrator. To gain access to these features, the administrator must apply for access to the Super Admin and be granted a username and password.

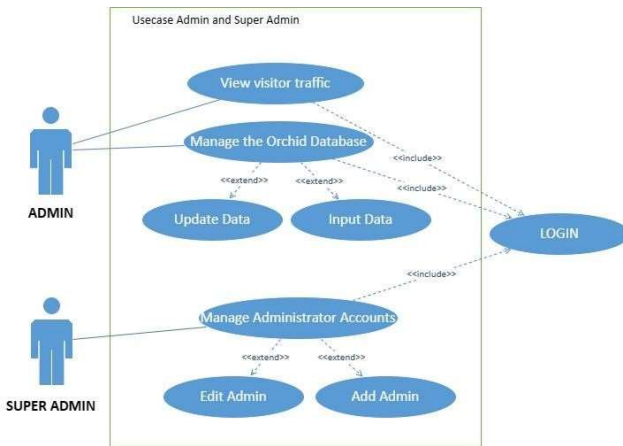


Fig. 3. Usecase admin and super admin.

Managing data in the Orchid Database Information System is the responsibility of an Administrator. Administrators enter orchid data and images so that they can be displayed on visitors' pages. The first step is that the administrator logs in. For those who have no account, the administrator should contact the Superadmin. The Super Admin will then create a form for the administrator account based on the NIP and email of the registered member. After logging in, the administrator shall input new orchid data and upload the corresponding photographs or images. In the event of changes to orchid data, the administrator shall promptly verify and update the data. The updated data shall be directly displayed on the landing page, accessible to visitors without the need to log in. Any inquiries pertaining to orchid seed requests or consultations should be submitted through the contact page.

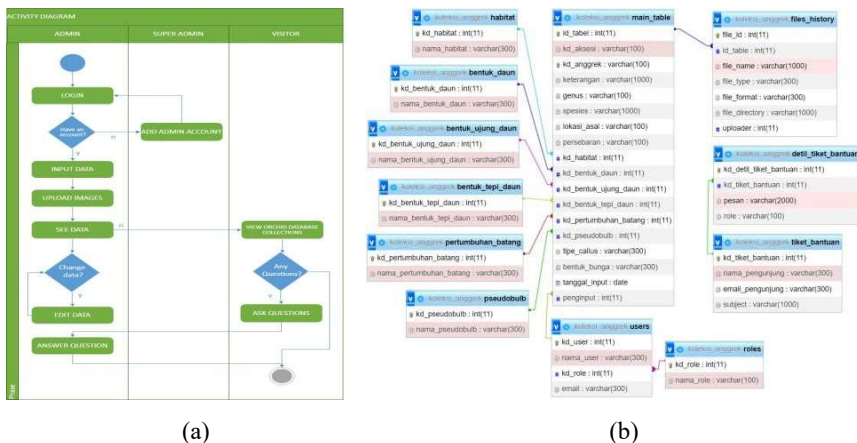


Fig. 4. (a) Activity diagram manage database (a) and (b) logical record structure (LRS)

3.3 Coding



Fig. 5. Menu in landing page for visitor.

The homepage presents orchid data that can be accessed by visitors without requiring them to log in. The data that can be accessed from this page includes orchid type, location, distribution and habitat. Visitors are also able to view images of orchids by clicking on the button within the image column. Additionally, visitors can search for orchid data.

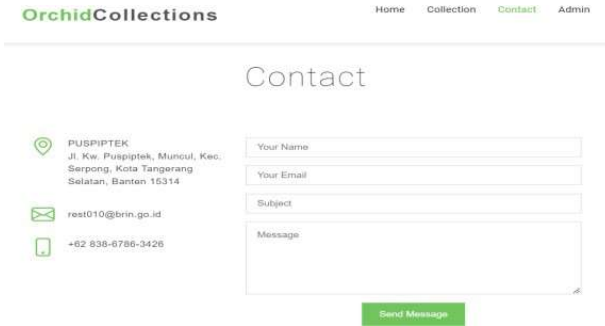


Fig. 6. Menu contact for ask question.

On this page (Fig. 6), visitors can ask questions by completing the form provided with their name, email, title, and message.

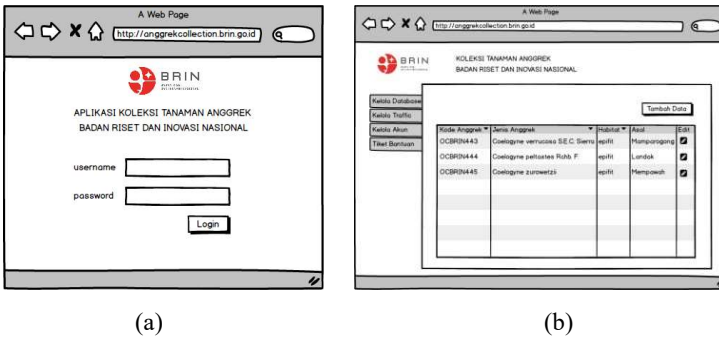


Fig. 7. Menu Login (a) and menu Manage Orchid Database (b)

This page in Fig. 7 is also a login page used by administrators and super admins to access orchid collection data. After login, the administrator is taken to the database management page. Here, the administrator has access to the database collection entered. In addition to editing the orchid data, the administrator can now add new collections and upload images of orchids.

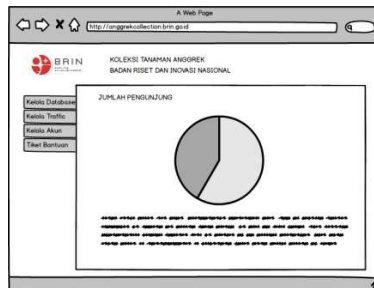


Fig. 8. Menu Visitor Traffic

This is a page for managing visitor traffic in Fig. 8. Administrators can see the number of visitors who have accessed the orchid database system. Number of visitors participating based on access date per month.

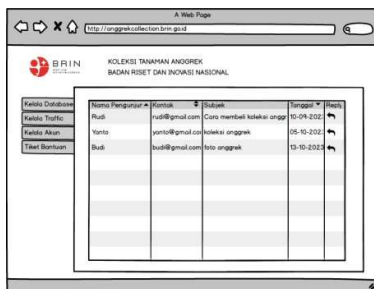


Fig. 9. Helpdesk ticket menu for answering questions.

This page in Fig. 9 serves as a help ticket platform administered by personnel to address queries or messages submitted by site visitors. Responses will be sent via email to the individual’s provided address.

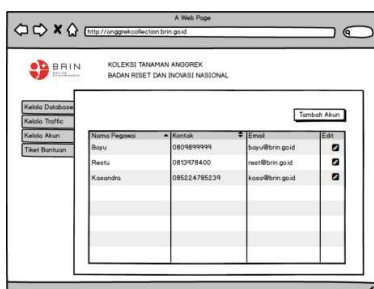


Fig. 10. Menu in administrator accounts.

This page in Fig. 10 is where the super admin can create a new account for the administrator, as well as modify the administrator's name, contact details, and email address, in line with the administrator's request.

3.4 Testing

Testing is carried out using the black box method. This is done in accordance with each user story to check the input and output validation of the system

Table 2. Testing table using blackbox method.

No	Scenario Testing	Test Case	Expected Results	Testing Results	Conclusion
1	US1 Selecting the orchid collection data menu	Click the collection navigation menu	The system displays a responsive table page containing orchid collection data	As expected	Valid
2	US1 Selecting the contact menu	Click on the contact navigation	The system will display customer service contact information and a question form for visitors.	As expected	Valid
3	US1 Fill in the enquiry form	Fill in the enquiry form and click send message.	The system displays the notification "Message successfully sent" or "Message failed to send".	As expected	Valid
4	Fill in the Username and password form to log in to the admin database menu	Fill in the username form with NIP and password then press the login button	The system will display a 'Login Failed' message if the username and password entered are either incorrect or not registered. On successful login, the system will redirect to the Admin Database page.	As expected	Valid
5	View the Orchids Database collection in responsive table form	Sort data, search, and move to the next table if data is not found.	The system displays orchid data in the form of a responsive table that can do sorting, pagination, and searching.	As expected	Valid
6	Input the new orchid data	Click the add orchid data button, fill in the orchid form, and click the submit button.	The system displays a modal form after the add data button is pressed. If the	As expected	Valid

7	Upload image	When inputting new orchid data or editing orchid data, click the upload image button to add a new image.	form has been filled in, the system will display a notification "Data successfully inputted" or "Data failed to be inputted". The system displays a "successful upload" notification if the file was uploaded successfully or "image not in format, failed upload" if the image failed to upload. The system will display the orchid data edit form modal to make changes to the data.	As expected	Valid
8	Edit the orchid data	Search for orchid data in the table and press the edit button to edit the orchid data.	If changes have been made, the system will display a notification "Data successfully changed" or "Data failed to be changed".	As expected	Valid
9	View visitor traffic data	Select the traffic menu to view the amount of visitor traffic.	The system displays a summary of visitor traffic in the form of a graph.	As expected	Valid
10	View the list of administrator accounts	Select the Manage account menu (accessible only by the Super Admin role).	The system displays a list of administrator accounts with buttons to add or edit administrator accounts.	As expected	Valid

11	Add a new administrator account	Press the add data button to add a new administrator account.	The system displays the form for adding a new administrator account and shows a notification "Account successfully added" or "Account failed to be added".	As expected	Valid
12	Change the administrator account	Select the edit administrator button to change the data.	The system will display the administrator data edit form to make data changes. The system displays a list of questions filled in by visitors. Admin will answer these questions, and the system will send the answer to the visitor's email.	As expected	Valid
13	View a list of visitor questions through the help ticket menu	Select the help ticket menu, then answer the visitor's question.	The system displays "successfully logged out" and destroys the session.	As expected	Valid
14	Log out of the admin database	Click the log-out menu to exit the application.	The system displays a form with an old password for verification and a new password for the password change. It then displays "failed password change" if the old password is entered incorrectly and "successfully changed pass-	As expected	Valid
15	Change admin password	Click the change password button to change the new password.			

word" if the password change is successful, and the session will be restarted.

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