

Enabling Collaboration of CodeIgniter Framework and RESTful API for Utilize Web Mobile Interface Implemented on Final Project Management System

Bayu Wijaya PUTRA^{1*}, Ariansyah SAPUTRA², M. Rudi SANJAYA³, Dedy KURNIAWAN⁴

¹*Department of Informatics Management, Universitas Sriwijaya, Indonesia*

²*Computer Engineering, Politeknik Sriwijaya, Indonesia*

³*Instrumentation and Application Nanotechnology Laboratory, Universitas Sriwijaya, Indonesia*

⁴*Data Engineering and Business Intelligence Laboratory, Universitas Sriwijaya, Indonesia*

*Corresponding author: bayuwijayaputra@unsri.ac.id

Abstract

The PHP framework is often used on medium and large scales but is also often used in the development of small-scale information systems. The selection of frameworks and database access methods became an important factor in developing information systems. CodeIgniter is a PHP framework that offers speed and integration with RESTful API between 2 applicable servers. In addition to the performance of an information system, jQuery delivers an attractive interface and enhances the performance of each CodeIgniter process. The model selection of the Framework sourced from existing research to produce a model of information system development is best for the development of small-scale information systems. The implementation of a system developed is a final project management system in college. These results were measured using the SUS method which delivers excellent results reaching 80.88

Keywords: *CodeIgniter, RESTful API, final project management system*

Introduction

The beginning and development of the Internet changed the world. Once an unresolved limit is not only crossed but erased by the expansion of the virtual space. Today's interconnected business environment has created competition on a global scale, characterized by time pressures, complexity, and rapid changes. The system development cycle has been disrupted by demands of new technology for abbreviated high customization, and a shorter lifecycle, all of which delivers upward pressure on optimization costs. Technological change also complicate universities, which work privately, to develop and maintain a competitive edge [1]. Especially on the development of technology-based software website. Websites are widely developed using the PHP programming language.

In recent years, the PHP programming language has evolved as a scripting language of choice by most developers; There has been an explosion of upcoming PHP frameworks. This framework for PHP development has many benefits and is one of the most important developments in the design and IT development practices over the last 20 years [2]. There are several reasons why developers want to choose PHP frameworks, especially since they offer developers the ability to create more complex, secure and complete web information systems faster than ever before. Thanks to the easy-to-use file structure, they allow to organize the files and the developer's code and to improve their productivity. The PHP Framework is available in all shapes and sizes and has targeted developers with varying levels of experience,

application requirements, hosting capabilities, and time of development.

The Web Based PHP Framework has technical and organizational advantages compared to classic development methods, such as faster development and cleaner structures. Applications developed by implementing a CodeIgniter (CI) Framework that supports model-view-Controller (MVC) programming techniques to reduce application development time [3]. Using CodeIgniter, developers no longer need to develop applications from scratch and can directly focus on code that builds the functionality of an app developed [4]. The MVC Model allows developers to access the database resources of multiple servers. In accordance with the rules of integrated system, and to reduce redundant data should use a Web service that can access the database simultaneously.

The WEB service corresponding to the CodeIgniter framework is REST stands For Representational State Transfer [5]. It is an architectural style describing the quality attributes of the World Wide Web, seen as an open, distributed and decentralized hypermedia application, which has been upgraded from multiple Web pages in 1990 to billions of resources The Web that can be addressed today [6]. It is an architectural style describing the quality attributes of the World Wide Web, seen as an open, distributed and decentralized hypermedia application, which has been upgraded from multiple Web pages in 1990 to billions of resources The Web that can be addressed today [7], Basic standards along with the URI and HTML that have made it possible to build the Web [8].

Education in a technology-based college is an excellent means of interaction in the administration and

management for students, education personnel and educators. Information systems are the result of technological developments that can be a means of academic operations [9]. Part of the education that is the main task for students is the final assignment or often referred to as a thesis. The final task has 5 processes [10], i.e. Submission of research titles, Submission of research seminars, Research Proposal seminars, Research, and Seminar on research results [11]. In completing its administration there is a prerequisite that must be resolved first before filing the final assignment seminar [12]. One of them is the history of guidance to supervising lecturers [13] during the final assignment research period [14]. This final task management system can accommodate the needs of recording the activities that the students have done [9]. The last section is the final task document collection created in the form of uploaded documents [15].

This research uses information from previous research on CodeIgniter, jQuery, and RESTful API so that it can develop a system with the best performance. We propose this literature study implemented on final project management system to be implemented in college so this system can be measured the results of the study.

RELATED WORKS

In research [16] explains the development of opensource-based information systems is to use PHP. It is also reinforced by [18] open source documentation is supported by PHP Programmer Forum. Information system development also needs to use the framework [2] to increase productivity. Research [19] describes the framework model used is the Model View Controller (MVC). The MVC Model has excellent security [20], durability, ease of use [21] and support in the long term. In research [22] describes of using PHP Framework adjusted to the scale of the project development. Research [2] demonstrates the CodeIgniter framework is suitable for the development of small and fast-scale information systems [21]. Then, the collaboration process with WEB service for multi-server access, CodeIgniter can be collaborated with RESTful API [6]. RESTful API have the ability to access more than one database in an information system architecture [23]. The benefits of using RESTful API can avoid redundant data. The purpose of this research is data efficiency by accessing databases from different servers using CodeIgniter and RESTful API. Additional Tools for improving CodeIgniter performance, [24] using jQuery. jQuery provides variety of user interface elements to enhance performance of CodeIgniter framework functions [25]. Including mobile interface with responsive function and JavaScript events in most CodeIgniter functions [26].

The implementation of CodeIgniter and RESTful API can be applied to systems that requiring data integration. This integration aims to produce a new system that is right on target without having to input data from scratch. In research [9] and [12] explain the presence of systems requiring academic data as the initial data of the final management system project. Followed by, final project e-filing [13] must be listed in the system. It has even been developed by [15] with Android application and web [27]. The final project management system was developed at a college. This system requires access to the college

academic database [27]. Analysis [28] explained that efficiency of the business process of the final project administration can be an indicator of successful system. This is in accordance with the rules of integration, which is a combination of data between existing databases (academic system) with a new database (final project management system) [10].

FRAMEWORK PHP

Frameworks are designed to save development time for programmers by providing built-in functionality to assist in common tasks and reducing the amount of code needed to produce the desired results [17]. Since evolution to the WEB 2.0, various frameworks are available for use under an open source license.

The authors [18] states that the PHP framework facilitates WEB programming and makes it more orderly in some way. First, PHP frameworks improve programming productivity because writing a piece of code that usually takes hours and retrieving hundreds of lines of code can be done in minutes using the embedded skeleton functionality. On the other hand, PHP frameworks usually come with support teams, documentation or important support forums where users can quickly get answers. Author [2] Emphasizing the importance of using PHP frameworks; They propose a modular workspace, consisting of a set of libraries, tools and conventions that allow focusing on the business logic of the application. It also provides a framework for applications, usually based on the use of the Model View Controller (MVC) Paradigm [19]. The authors [22], [29] argues that the PHP framework has a major security advantage as its users become long term. Testers. If a user finds a security issue, they can tell the infrastructure developer's website so that the development team can fix it [30]. Thus the author [31] States that the PHP framework has a feature that satisfies most web programmers depending on the development style they want. Actually, there are PHP frameworks with all kinds of features such as security, durability, ease of use.

CodeIgniter under the PHP platform, as a framework for working or developing PHP programs in a more systematic way [4]. Developers can directly and quickly produce the program, following the framework provided by the CodeIgniter. Programmers do not need to create a program from scratch, because CodeIgniter provides a set of libraries necessary to complete the common work, while maintaining a simple interface and logical structure to access its libraries. The interface easily combines with jQuery library to enhance the performance of dependency each process.

The CodeIgniter framework is a lightweight framework. leave a lot of flexibility for developers, especially combining with RESTful API. This API has been integrated with CodeIgniter framework. This can be a strong point to develop integrated system. And the community becomes more available [21]. In addition, CodeIgniter has dozens of libraries on GitHub to handle all the web developer needs. This [2] ensure that CodeIgniter is ideal for small and with limited time development projects.

RESTful API

The API (Application Programming Interface) consists of documentation consisting of interfaces, functions, classes, structures, and so on to build a software [32]. With this API, then create a programmer to "disassemble" a software to then be developed or integrated with other software. An API can be approved as a hub for application with other applications that allow programmers to use the system functions.

The representational status of the state, or in short, is the architectural style proposed by [23]. This style break has attracted web service providers like Amazon[33] and yahoo [34] to adopt it. Utilizing the existing Web protocols, the rest require a Web service that uses it simultaneously including five architectural patterns: client-server, statelessness, cache usage, a uniform interface, and a layered system. Implementation of Web Service Application programming interface that satisfies REST architecture style called RESTful API.

This is a RESTful Web service claim, which is designed following a REST architecture style [11], That emphasizes the scalability of component interactions, promotes reuse and generalization of component interfaces, reduces connections between components, and utilizes intermediate components to reduce interaction latency, enforce security, and Summarizes the legacy system [23].

REST has evolved from its original state where lack of support tools seemed to restrict the adoption of technology [35]. The situation has changed and with the increasing popularity of REST also a number of development frameworks have emerged with CodeIgniter [6].

jQuery

jQuery uses the MIT license, which supports open source and closed source projects. Because there are no other costs for tools or development, licenses and fees are suitable for any project. In terms of long-term eligibility, jQuery meets high-popularity demands as often mentioned in general developer reviews, literature, and forums [24]. As evidence of jQuery's success and thanks to several supporting companies, the development team promises further development that is stable and stable. Furthermore, a short update cycle in recent times predicts positive update behavior in the future, so that, overall, jQuery should remain viable for the long term [25].

jQuery provides a variety of user interface elements such as form elements, lists, toolbars, and grid layouts that enhance performance of CodeIgniter framework functions. The quality is sufficient because it is responsive to small screen sizes and touch-based interactions but does not achieve the original UI element quality. Page transitions can be improved with a series of animations and touch gestures can be detected by certain JavaScript events. Overall, support for the mobile UI is very good [26]. jQuery maker aims for an integrated user interface. A special adaptation of the original design is possible, as the design is mainly influenced by CSS [36]. Since the UI design is based on HTML markup, jQuery is easily accessible to teams that are expert in WEB development.

FINAL PROJECT MANAGEMENT

In this study has created a design in the form of a use case and a diagram class describing the built-in system. The system created aims to manage the final administration of the project where the report results are commonly referred to by a thesis on college. In this section will implement the results of this research into the Final Project management application.

The main factors that must be explained [9] to prepare the upload of the thesis file uploaded by the students themselves [15]. The same is also stated by [11], Who use student actors, lecturers and academic admins [13]. Each actor has a different role to shorten the business process [28]. Admins are tasked with managing all the final project administration activities [11], which are looking at research history [13], managing student research, and making exam schedules [37]. Students are given access in view of research that has been submitted must be approved by the course [27], So if the title is already listed in the database, then the student can find another solution in determining another title[9]. Students are provided with ease in the administration of guidance where there are binding rules that [10], Students must have a guidance record before the final seminar project [9]. Students can apply for seminars if all conditions are met [11]. Lecturers are given full access in managing to students who have been guided during the final project [14].

RESULTS AND DISCUSSION

In this paper using the RESTful API to connect to the database between 2 servers. The database consists of an academic database and final project database. Webpage is running by CodeIgniter as primary machine and adding the jQuery to make the display more responsive in terms of users, and make the interface fit to mobile smartphone. Client here is the user who will access the system, i.e. students, lecturers and admins. The design of framework can be seen Fig. 1.

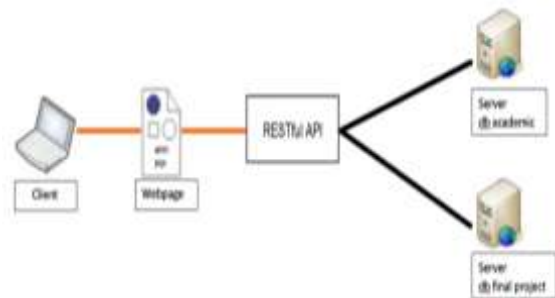


Figure 1. Framework of Final Project Management System

Research Page

Student can input the seminar titles and can be seen whether the title was received. This page (Fig.2) display about research that has been input by student and admin can manage the research and together with the head of study program agrees with the title of research.

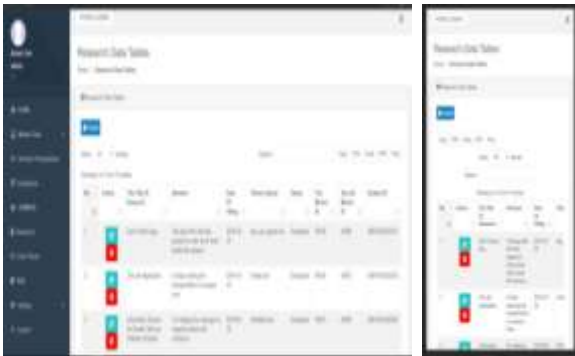


Figure 2. Responsive Research Page for widescreen and mobile view

Seminar Page

This page (Fig.3) display about seminar schedule, this page manage by admin. Admin can input seminar schedule.

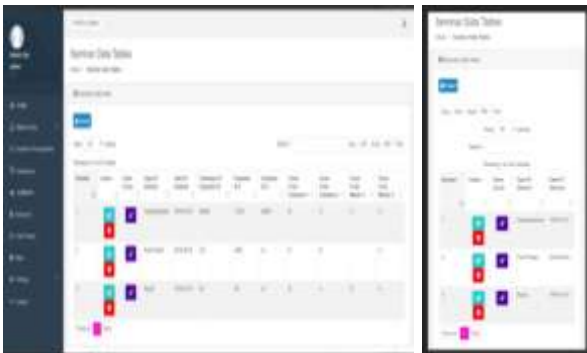


Figure 3. Seminar Page with responsive interface fit to smartphone

Research Title Search Page

This page (Fig.4) display about finding the title of research thesis. Student can search the title of research in this page.

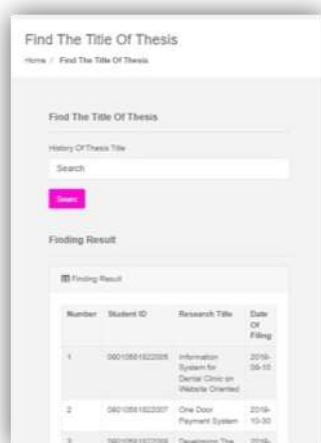


Figure 4. Allow student to search title of the research thesis

Student Guidance Page

This page (Fig.5) is used to monitoring student guidance during the research period. Each consultation to the lecturer is recorded on this page. Lecturers can give feedback on each student guidance.



Figure 5. Student Guidance Page

System Evaluation

System Usability Scale (SUS) is a system usability testing method in simple terms with ten scales that give you an equal view through [38]. Questionnaires using the SUS method were distributed respondents were 100 college student randomly selected (Fig. 6). The SUS questionnaire has 10 questions from which respondents can choose 5 answer option from 0 to 4. Where the question number stand for :

- Q1 I think I want to use the website often
- Q2 I found a simple website
- Q3 I think the website is easy to use
- Q4 I think I can use the website without the support of a technical person
- Q5 I found various functions on the website that were well integrated
- Q6 I think there is a lot of consistency in the website
- Q7 I would imagine that most people will learn to use a website very quickly
- Q8 I found the site very intuitive
- Q9 I feel very confident using this
- Q10 I can use the website without having to learn anything new

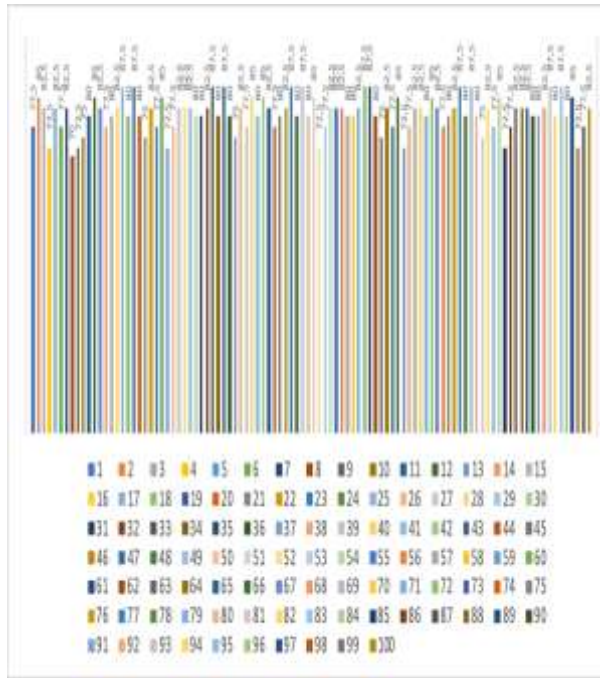


Figure 6. The Result of The SUS Questionnaire

Then convert the results of the questionnaire to get the SUS value with the following conditions. For odd statements, minus 1 of the response given by the user. For an even statement, 5 is subtracted from the response given by the user. Then add the converted response and multiply the number by 2.5 (Fig.6). The average of SUS conversion is 80.88 which is higher than the SUS standard with a value of 68 [38].

The summary of SUS questionnaire shown at Fig 7. This summary (Fig.7) describe summary of each question where the highest result is at Q8 and Q9. Thus the interesting questions for respondents are "I find this site very intuitive" and "I feel very confident using this".

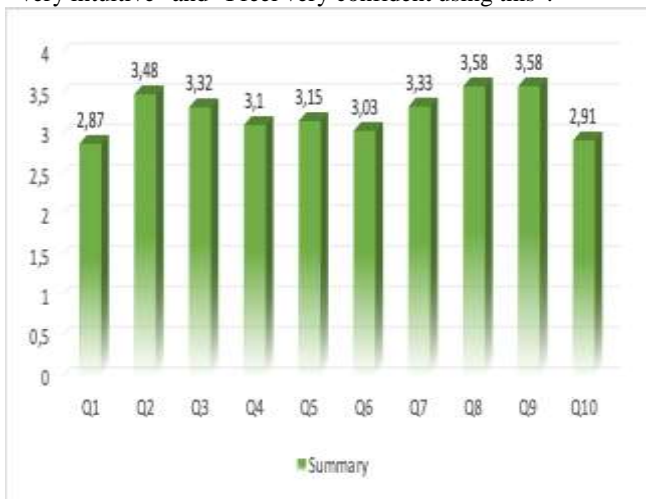


Figure 7. The Summary of SUS Questionnaires

CONCLUSIONS

Framework CodeIgniter combine with RESTful API shown a better integration final project management system. Adding with attractive responsive interface with

jQuery make this application seems great. Based on Fig.6 can be seen the results of the SUS conversion value for each respondent. To get average SUS value, the summary of the number of SUS values was divided by 100 respondents. The average SUS value reached 80.88. The value of the SUS test results is considered good value if it is above 68 [38]. It can be concluded for usability measurement that the system that has been developed has excellent result.

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