Application of Web-Based Competency Test (UKSI) with Framework Code Igniter (CI)

Dedi Saputra¹, Windi Irmayani¹, Martias², Juniato Sidauruk², Haryani², Wanty Eka Jayanti², Kudiantoro Widianto³, Aan Rahman³.

¹Universitas Bina Sarana Informatika Kota Pontianak, Pontianak, Indonesia
²Universitas Bina Sarana Informatika Jakarta, Jakarta, Indonesia
Corresponding Author: dedi.dst@bsi.ac.id

Abstract

The development of information systems that is increasingly fast and always renewable triggers the emergence of many new innovations in the world of informatics. In the world of education, technological innovation as a medium supports the teaching and learning process so that it is more effective and efficient. Technology as a medium in education must also be well developed and in line with educational goals. The development of an application for example, at this time many are developing application programs that are ready to use from free to paid. Making a web-based Competency Test (UKSI) application specifically for Vocational High School (SMK) students aims to hone students' ability to learn, as well as to determine the level of student understanding of lessons. A student can be said to be competent and qualified after going through a Competency Test process on Competency Certification. In order for the Competency Certification process to run properly and effectively, a Competency Test application must be made. In making this application using the Framework Code Igniter (CI) with MySQL databases, PHP.V5 programming language and other open source software. Discussions in this research article include, analysis of needs in the system, design forms of Use Case Diagrams, Activity Diagrams, ERD (Entity Relationship Diagrams), LRS (Logical Structure Record), Class Models, Databases, PHP Basic Programming, and creating User forms of Web Competence Test.

Keywords: Information Systems, Application programs, web based, Competency Test, Competency Certification, Framework Code Igniter (CI)

1. Introduction

Information technology is a device that is made by utilizing computer technology. The development of information technology has an impact on the development of applications, especially in the processing of data that produces information. The development of information technology also has an influence on the increasingly varied information systems (information systems) which in principle are as a tool for humans to process data into information. The development of information that is fast and update at this time triggers new innovations in the world of informatics. Applications for example, currently many are developing programs that are ready to use from free to paid, such as Arif et al (2013: 27) explains "Applications come from the word Application which means application, an application, usage. Terminologically, application is a ready-made program that is designed to carry out a function for users or other applications and can be used by the intended target users. (Eviana, Lisnawanty, & Sihombing, 2017)

The Computer literacy (Computer literacy or Information Technology (IT) or Electronic literacy) is a widely discussed concept. Horton Jr (1983) defines computer literacy as the understanding of what the machine can do, through the knowledge of hardware and software. (Santos & Ramos, 2019). Besides that, having IT expertise or
competence is also very much needed. IT Skills, that is the competence of using technology of computers as well as its’ device and programme which is integrated with the computer itself, such as using Microsoft office, internet, website, email, messenger, downloading and uploading, applications, online conference etc. to access, gain, create, manage and expose information (Hadiyanto, Fajaryani, & Masbirorotni, 2018). With the rapid development of technology, almost all sectors started to benefit from Information Technology (IT). With the development in educational technologies, the learning requirements have also been increased. This change has necessitated a change in the learning and teaching methods (Goksu, 2016).

In web-based information systems, websites are very influential in the life of socializing in this fast-paced and instant, now the website is not only known as a page that is published now the website penetrated as a medium for exchanging information, storing data online and others. A web-based application is a process of developing a computer application based on a web page that displays various text, image, audio, video, and animated information using a hypertext transfer protocol (Arif, Nur Saiful; Wanda, 2013) (Suryono, Wibawanto, & Samsudi, 2018). According to Nugroho in Aprisa (2015) explains that the Website or site can be interpreted as a collection of pages that come from files containing interconnected programming languages used to display information, moving and not moving images, sound and or a combination of all of them both which is both static and dynamic (Hendini, 2016).

From the elaboration of the theory above, it is concluded that the website has now become a very useful medium for public and individual audiences in accessing information. Likewise with the information system that the writer is going to build, definitely requires tools that can help create a website that can provide information and technology. The information system includes the hardware and software used. Hardware as a network architecture and software as an application that regulates the work program.

In making this web-based Competency Test (UKSI) application, the writer uses open source, php and mysql software. In addition the authors also use the XAMPP software package. The author uses XAMPP as a helper tool to create this Competency Test application because XAMPP has combined several device application packages into one package. The scope of making this Competency Test Website includes the steps in database design, usecase diagram design, activity diagram design, Entity Relational Diagram (ERD) design, Logical Structure Record (LRS) design, class model design, sequence diagram and step making display from the website. Needs needed by website users, especially the participants who are the objects of the competency test website research who choose the competency test certification from login to completion of the exam. As an object of this research the authors take a case study in SMK 7 STATE Pontianak. To get a value that matches the standard in order to get an output in the form of a competency certificate from the State Vocational School 7 Pontianak that has been validated by the school principal. Also how to make admin access to manage data on the website, as well as how to access each of the users.

2. Research Method

According to Nazir (2009:19) The usefulness of research is to investigate the state of, reasons for, and consequences of a specific set of circumstances. To obtain that goal, it is necessary to use appropriate methods in research. In this research article, the writer uses descriptive method. Descriptive method is a method in examining the status of a group of people, an object, a set of conditions, a system of thought, or a class of events at present. The aim is to make a systematic, factual and accurate description, picture or picture of the facts, characteristics and relationships between the phenomena investigated (Nazir, 2009). Creswell (2008) describes the process of determining the method to be used based on the
problem to be answered or understood (Raco, 2010). For that the methods that the authors use in making competency test web application include several methods including:

The method used in developing this software uses the waterfall model. According to Shalahuddin (2010: 39) which is divided into five stages, namely: (Saputra & Ishak, 2019)

1. **Communication**

This step is an analysis of software requirements, and a stage for conducting data collection both directly on the object of research and from references.

2. **Planning**

The planning process is a continuation of the communication process (analysis requirements). This stage will produce user requirements documents or can be said to be data related to the user's wishes in making software, including plans that are carried out.

3. **Modeling**

This modeling process will translate the needs requirements into a software design that will be estimated before coding is made.

4. **Construction**

Construction is the process of making code. Coding is a design translator in a language that can be recognized by computers.

5. **Deployment**

This stage can be said to be final in making a software or system. After conducting analysis, design and coding thus the finished system will be used by the user.

To obtain supporting data in using the theoretical basis and concepts relating to this discussion, including:

1. Observation

Activities that conduct observations of a process or object, with the intention of understanding the knowledge of a competency test process, from preparation to the test or certification test.

2. Literature

Literature study which is a method of taking data from several existing printed books, journal references, ebooks and other reference sources from the internet as a theoretical reference for making the application.

3. **Results and Analysis**

The teaching and learning process aims to produce quality outcomes. The process is carried out both conventionally and by using technology. Conventional learning and learning that results in mastering the concepts and learning attitudes of low students, need to be improved by applying several models, approaches, and learning strategies that use media assistance (Saputra, 2014). While the learning process that uses the method of collaboration with technology will certainly produce better outcomes, according to the objectives to be achieved in teaching. This method will certainly require a strategy especially for the teacher to know the extent to which the method is effective in helping produce good outcomes. In the aspect of evaluating learning, especially looking at the extent to which learning outcomes can be achieved can be done through an examination or assessment process. Examination or assessment is a process in learning to make decisions using information obtained through the measurement of learning outcomes both
using tests and non-tests. One form of assessment is Competency Test. Based on the Vocational Expertise Competency Test handbook for 2018/2019 school year published by the Directorate of Vocational High School Development Directorate General of Primary and Secondary Education Ministry of Education and Culture 2018, the Expertise Competency Test hereinafter referred to as UKK is an assessment of the achievement of 2 (two) level qualifications or 3 (three) KKNI are held at the end of the study period by a Professional Certification Agency or an accredited education unit with business / industry partners by taking into account the passport of skills and / or portfolios. UKK is an assessment process through gathering relevant evidence to determine whether someone is competent or not yet competent in a certain qualification. UKK examines aspects of knowledge, skills, and attitudes in 1 (one) assessment event. (Kebudayaan, 2018). Competency test is a test intended to determine that a student has met the minimum standards set based on skills and knowledge, so that it meets the requirements for recognition achievements such as graduation, certification and others. (Nurjaya Wk & Yudha Saputra, 2014).

3.1 Framework Code Igniter (CI)

In making this Competency Test application the author uses the CI framework with a combination of Template Bootstrap 3. CodeIgniter is a web framework for the PHP programming language, created by Rick Ellis in 2006, inventor and founder of Ellis Lab (www.ellislab.com). EllisLab is a work team which was established in 2002 and is engaged in the manufacture of software and tools for web developers. Since 2004 until now, EllisLab has been awarded ownership rights of CodeIgniter to the British Columbia Institute of Technology (BCIT) to further the development process. Currently, the official website of CodeIgniter has been changed from www.ellislab.com to www.codeigniter.com. (Wibawa et al., 2018). In the official codeigniter website, (Official Website CodeIgniter, 2002) states that codeigniter is a strong PHP framework and has few bugs. Codeigniter is built for developers with PHP programming language who need tools to create a full-featured web.(Destiningrum & Adrian, 2017). According to Purbadian (2016: 18) the most striking thing about Codeigniter compared to other frameworks is that Codeigniter has the fastest execution compared to other frameworks.(Purbadian, 2016)

The workflow description of the Ci Framework can be described by the author below:

![CodeIgniter Application Flowchart](https://www.tutorialspoint.com/codeigniter/index.htm)

Figure 1.CodeIgniter Application Flowchart

Following is an explanation of the Ci workflow:

1. As shown in the figure, whenever a request comes to CodeIgniter, it will first go to index.php page.
2. In the second step, **Routing** will decide whether to pass this request to step-3 for caching or to pass this request to step-4 for security check.

3. If the requested page is already in **Caching**, then **Routing** will pass the request to step-3 and the response will go back to the user.

4. If the requested page does not exist in **Caching**, then **Routing** will pass the requested page to step-4 for **Security** checks.

5. Before passing the request to **Application Controller**, the **Security** of the submitted data is checked.

6. After the **Security** check, the **Application Controller** loads necessary **Models**, **Libraries**, **Helpers**, **Plugins** and **Scripts** and pass it on to **View**.

7. The **View** will render the page with available data and pass it on for **Caching**. As the requested page was not cached before so this time it will be cached in **Caching**, to process this page quickly for future requests.

### 3.2 Needs Analysis

Needs analysis is a scientific activity to identify the supporting and inhibiting factors of the learning process in order to select and determine the appropriate and relevant media to achieve learning objectives and lead to improving the quality of education. Needs analysis is intended to determine the needs or expectations that students want to have, after students complete an education level. This is done to anticipate the decline in quality of the qualifications that must be met. Need analysis is focused on what will or what or what should be done (what should be done) rather than what was done (what was done), as an evaluation of most programs (Nasrulloh & Ismail, 2017). Therefore this "Competency Test Website" has a very big role in improving qualifications in the world of education, with the increasing knowledge of information technology, it is necessary to have a legality of the capabilities they have to add value to objectivity in the world of work and advanced education.

This web-based competency test application consists of five users who interact with each other in the system, namely admin, teacher, school principal, participants and website visitors. These users have different access to the system and certainly have different needs to be able to fulfill the information contained on a website. Therefore the identification is needed.

In the program needs, of course there are functional and non functional requirements. Functional requirements are requirements that contain any processes or services that must be provided by the system, covers how the system must react to certain inputs and how the system behaves in certain situations. While non-functional requirements are requirements that emphasize the behavioral properties owned by the system. The following is functional and non-functional requirements of the system, namely:

### 3.2.1 Functional Needs

1) The system can register
2) The system can login.
3) The system can display the main menu.
4) The system can manage data of exam participant and exam schedules
5) The system can manage the question data.
6) The system can display participant test results.
7) The system can calculate the results of the answers from participants.
8) The system can issue test results in the form of certificates.
3.2.2. Non-functional Needs

1) The system can be run by several web browser software such as Google Chrome, and Mozilla Firefox

2) The process of this application the user must register to be able to access the login menu by entering the email and password as well as personal data, after registration the user will be directed to login to be able to access this application by entering the registered username and password, in order to maintain the security of each user's access rights.

3) The system must be able to ensure that the data used must be protected from unauthorized access.

4) The system can calculate the results of the competency test.

5) The user must logout after accessing the application.

3.2.3. User Needs

In this application on competency test, there are five users who interact with each other in the system, namely the admin as the data manager, the participant as the one carrying out the test. The teacher as the manager of the question data, the school principal as the decision giver, and website visitors. This certainly has different information needs, such as the following:

1. Admin Needs Scenario
   a) Login
   b) View the Admin Menu
   c) Manage User Data
   d) Manage Participant Data
   e) Manage Exam Data Recapitulation
   f) Manage Certification Data
   g) Manage Competency Data
   h) Manage Subcompetence Data
   i) Input Test Question Data
   j) Changing the Test Question Data
   k) Deleting Test Question Data
   l) Display Certificate Data

2. Teacher Needs Scenario
   a) Login
   b) View the Teacher's Menu
   c) Input Test Question Data
   d) Changing the Test Question Data
   e) Deleting Test Question Data
3. School Principal Needs Scenario  
a) Login  
b) View the Principal’s Menu  
c) View the Exam Recapitulation Report  
d) Certificate Validation  

4. Participant Needs Scenario  
a) Login  
b) View the Participant menu  
c) Choosing Competency Test Certification  
d) Doing competency test questions  
e) Checking the competency test results  

5. Visitor Needs Scenario  
a) View the type of competency certification  
b) Registering  

3.2.4. System Requirements  
1. Participants must register to be able to login and access the system by entering their email address and password, as well as personal data. After registering, the participant can login with the account that has been registered, and can access the competency test system.  
2. Participants carry out competency tests.  
3. Participants must check the questions that have been answered.  
4. Participants must logout if they have accessed the application.  

3.3 Design Use Case Diagram  
This Competency Test application is described using Unified Modeling Language (UML) diagrams. UML consists of grouping system diagrams based on design usability. One important diagram used to illustrate the requirements of the system is the use case (UC) diagram, which explains visually the context of the interaction between the actor and the system. Each use case states the behavior specifications (functionality) of the system being explained which is indeed needed by the actor to fulfill his purpose. (Kurniawan, 2018).  
The following is a use case design and in this article only a few sample descriptions of the use case for making a competency test application:
Source: Design Results (2019)

**Figure 2. UseCase diagram**

**Table 1. Description Use Case visitor registration**

<table>
<thead>
<tr>
<th>Use Case Name</th>
<th>Visitor registration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirements</td>
<td>Input data</td>
</tr>
<tr>
<td>Goal</td>
<td>Can follow exam online</td>
</tr>
<tr>
<td>Pre-Conditions</td>
<td>Choose the registration button</td>
</tr>
<tr>
<td>Post-Conditions</td>
<td>Can login</td>
</tr>
<tr>
<td>Failed end Condition</td>
<td>Unable to access the exam</td>
</tr>
<tr>
<td>Actors</td>
<td>Visitor</td>
</tr>
<tr>
<td>Main Flow/Basic Path</td>
<td>1. Input your data</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Input email and password</td>
</tr>
<tr>
<td>Alternate Flow/Invariant A</td>
<td>The system displays an incorrect e-mail message and password if the user is not registered in the database</td>
</tr>
<tr>
<td><strong>Use Case Name</strong></td>
<td><strong>Login</strong></td>
</tr>
<tr>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Requirements</strong></td>
<td>Enter email and password</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Participants can access the web exam online</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>Participants enter the competency certification menu</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>Participants can take an exam</td>
</tr>
<tr>
<td><strong>Failed end Condition</strong></td>
<td>Unable to login</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Participants</td>
</tr>
</tbody>
</table>
| **Main Flow/Basic Path** | 1. Participants open web pages  
2. Participants login using email and password |
| **Alternate Flow/Invariant A** | The system displays the wrong e-mail and password message if the participant incorrectly enters the e-mail and password |

**Table 3. Description of Use Case Participant Carrying Out the Exam**

<table>
<thead>
<tr>
<th><strong>Use Case Name</strong></th>
<th>Carrying out exams</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Requirements</strong></td>
<td>Can choose the type of competency certification</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Participants can take the exam online</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>Participants choose the competency certification menu</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>Participants can carry out exams</td>
</tr>
<tr>
<td><strong>Failed end Condition</strong></td>
<td>Unable to access the system</td>
</tr>
<tr>
<td><strong>Actors</strong></td>
<td>Participant</td>
</tr>
</tbody>
</table>
| **Main Flow/Basic Path** | 1. Participants choose the button to see the results of the test  
2. Participants can see the results of the exam |
| **Alternate Flow/Invariant A** | - |

**Table 4. Description of Use Case Participants View the results of the exam**

<table>
<thead>
<tr>
<th><strong>Use Case Name</strong></th>
<th>View the results of the exam</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Requirements</strong></td>
<td>Participants must take an exam</td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>Can view the results of the exam</td>
</tr>
<tr>
<td><strong>Pre-Conditions</strong></td>
<td>Participants can take an exam</td>
</tr>
<tr>
<td><strong>Post-Conditions</strong></td>
<td>Participants can view the results of the exam</td>
</tr>
<tr>
<td><strong>Failed end Condition</strong></td>
<td>Unable to access the system</td>
</tr>
</tbody>
</table>
3.4 Design Activity Diagram

Activity diagram is a diagram that illustrates the activities that occur in the system. From the first to the end, this diagram shows the steps in the work process of the system that we make.(Pratama, 2019). The activity diagram focuses on the activities that occur that are involved in a single process, in other words, this diagram shows how these activities depend on each other. Activity diagrams allow you to specify how your system will accomplish its goals. Activity diagrams show high-level actions chained together to represent a process occurring in your system.(Hamilton, 2006). The following is a picture of an activity diagram based on a use case diagram, in this article the author presents just a few samples:

1. **Activity diagram Visitors View Certification**

![Activity Diagram Visitors View Certification](source)

Source: Design Results (2019)

Figure 3. Visitor Activity Diagram See Types of Certification

2. **Activity Diagram Visitor Registration**

![Activity Diagram Visitor Registration](source)

Source: Design Results (2019)

Figure 4. Visitor Registration Diagram
3. **Participant Login Activity Diagram**

   ![Participant Login Activity Diagram]

   Source: Design Results (2019)

   **Figure 5. Participant Login Activity Diagram**

4. **Activity Diagram of Participants View Certification**

   ![Activity Diagram of Participants View Certification]

   Source: Design Results (2019)

   **Figure 6 Participant Activity Diagram See Certification**
5. **Activity Diagram Participants Carry out the Exam**

![Activity Diagram Participants Carry out the Exam](image1)

Source: Design Results (2019)

Figure 7. Activity Diagram Participants Carrying Out Exams

6. **Activity Diagram Participants View Exam Results**

![Activity Diagram Participants View Exam Results](image2)

Source: Design Results (2019)

Figure 8. Participant Activity Diagram See Exam Results
7. Activity Diagram of School Principal Login

![Activity Diagram of School Principal Login](image)

Source: Design Results (2019)

Figure 9. Headmaster Activity Diagram Login

8. Activity Diagram School Principal Print Certificate

![Activity Diagram School Principal Print Certificate](image)

Source: Design Results (2019)

Figure 10. Principal Activity Diagram Print Certificate
3.5 Design Logical Record Structure (LRS)

Source: Design Results (2019)

Figure 11. Logical Record Structure (LRS)

3.6 Design Entity Relationship Diagram (ERD)

In the opinion of Kroenke (2006: 37-40) Entity-Relationship Diagram (ERD) is a conceptual modeling specifically designed to identify entities that explain data and relationships between data, namely by writing in cardinality. (Hasan, 2017)
3.7 Results
In this article the author presents a number of results sample in the form of the competency test application, some displays are as follows:
a. display of the homepage

![Image of the homepage]

Gambar 13. Tampilan beranda

b. display of the admin page:

![Image of the admin page]

Gambar 14. Tampilan tamp-menu-admin

c. display of user_list when running on localhost //

![Image of user_list]

Figure 15. Display of user_list on the website
d. display data list of participants running on localhost

![Image: Display of data list participant on the website](image1)

**Figure 16. Display of data list participant on the website**

e. display list types of certification

![Image: Display list of certification](image2)

**Figure 17. Display list of certification**

f. Display list of exam questions

![Image: Display list of exam questions](image3)

**Figure 18. Display list of exam questions**
g. Display of Registration

![Registration Form](image)

**Figure 19. Registration Form**

h. Login Display

![Login Form](image)

**Figure 20. Login Form**

After registration then login to enter the exam page, and before participants start the exam, participants can choose the type of certification that they want to be tested. Participants can choose the competency certification exam in the participant's left menu, as follows:

i. Display Type of Certification

![Type of Certification](image)

**Figure 21. Type of Certification**
The form above is the action that will be carried out by the participant who wants to take the competency test, the participant must choose what certification and competency is in accordance with the ability of the participant, then the participant can immediately press the test button in the column to take the exam.

After that, if the participant has chosen the type of competency certification that they want to be tested in, they will display their test forms or question sheets which the participants will later work on, such as the following:

j. Display of Exam Form

![Figure 22. Display of Exam Form](image)

k. Display Results of Participants' Answers

![Figure 23. Display Results of Participants' Answers](image)
1. Display of the Certificate

![Certificate Image]

Figure 24. Display of Competency Certification

4. Conclusions

1. In making an application we need various aspects of support, starting from the analysis of needs, both functional, non-functional, supporting tools that must be appropriate, making a database that must be synchronous with what you want to be made in the application.

2. The application made is specifically for SMK Negeri 07 Pontianak as a learning media in the school and can be used as a reference to test student competencies in the field of basic knowledge of software and computer networks.

3. The questions presented are multiple choice. Passing from this competency test participants will get an output in the form of certification, which can be used as evidence of understanding basic knowledge.

4. Because it is online, this competency test will make it easier for participants to take the exam anywhere. This application has also been tested by trying to do the testing.

5. This application is an alternative to evaluate and know the extent of the success of the competency-based learning process, according to standards recognized by stakeholders.

REFERENCES


