

Object Data Modelling for Online Test Systems Based on Indicator of Competency Achievement Approach

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Abstract—This research aims at creating a system of exam online that can help the school in overcoming problems that occur in the process of examination, such as the process of examination which is still manual with using paper and stationery as a medium to answer the exam questions so that cost and time in the process of their implementation, are at risk of the occurrence of fraud or leaks reserved time of the test, students do not directly know the exam results due to the length of time the evaluation of exam results, archiving the results the test manual takes a lot of places because of the type of file is a hardcopy. The system is designed to use the model of the MVC (Model, View, and Controller) with the concept of OOP (Object Oriented Programming). Methodology used IE methodology RAD (Rapid Application Development). The programming language used, namely PHP using code igniter framework with the implementation of the MVC model. The existence of this system is expected to help students in the implementation of a national computer-based exam and can assist teachers in matters of cost and time.

Keywords—exam online system; MVC; OOP; RAD

I. INTRODUCTION

In the education field, manual exams are used as activities to find out students' learning outcomes. The manual exam uses paper and stationery as a support for exam activities both for making exam questions, multiplying exam questions, evaluating exams, and others. This causes a lack of time effectiveness for the implementation of the exam. In evaluating student learning outcomes, manual exams that have been running are seen to be less effective because they cost money and time. The cost in this case is the amount of funds spent by the school to provide exam questions. Time in this case is the length of the processing stages and the reporting of the test results. In the manual exam, it cannot be separated from the evaluation process and report on the student's value data that is done manually. In manual evaluation (conventional), it does not provide real-time evaluation results. Students must wait for days to find out the results of the evaluation, whether the student graduated or not in taking the competency exam at school.

Cheating in exams is one of the factors that invalidate students' ability assessment. One form of cheating behavior in the world of education is cheating. Cheating is an act of deception in an exam through the illegal use of information from outside. The length of the test process takes place undeniably there is a cheating factor among students in the classroom. These problems are not in accordance with the procedural assessment of student competence, because the factors of validity and reliability of questions are confidential.

In the development of information technology and manual exam communication has shifted towards computerization, one of which is the online exam. Exams with an online system have advantages that are not possible in conventional examinations with manual systems or exams. Online examinations in its use can provide exam results in real-time. The results of the exam can be known at that moment, when students end the exam without having to wait for days. To be able to make it easier for students to take exams and get information on fast exam results and make it easier for teachers to enter exam questions, an online exam system is needed to save costs and time needed.

II. LITERATURE REVIEW

A. Online Exam (CBT)

Computer Based Test is a test held by using computers as the main media in conducting test / exam activities. The characteristics of this test are the same as conventional tests, namely using one test set for several participants with the same test length [1].

B. Design

Designing is an electoral process and thought that connect facts based on assumptions related to the future by describing and formulating certain activities that are believed to be required to achieve certain goals and describe how they are achieved [2].

C. Web Technology

The web is an information dissemination system. The information sent can be in the form of text, sound (audio),

animation, images and even in video format that can be accessed through software called browsers, while the website is the entire web page contained in a domain containing information. A website is usually built on many interconnected web pages. The relationship between one web page and another is called a hyperlink, while the text used as a link is called hypertext. (Hyper Text Markup Language (HTML) is the standard language used to display web pages [3].

PHP (short for "PHP: Hypertext Preprocessor") is a common programming language created by Rasmus Lerdorf and first released in 1995. Although PHP can actually be used to create desktop-type applications, Command-Line Interface (CLI), and mobile applications (Android-based): but in general PHP is more widely used to develop web-based applications. Until now, many dynamic web sites have been developed using PHP compared to other languages such as ASP.NET, Java, Ruby, Python, and Perl.

XAMPP is free software, which supports many operating systems, is a compilation of several programs. Its function is as a stand-alone server (localhost), which consists of Apache HTTP Server programs, MySQL databases, and language translators written in the PHP and Perl programming languages. The name XAMP stands for X (four any operating system), Apache, MySQL, PHP and Perl. This program is available in the GNU (General Public License) and is free, is a web server that is easy to use that can serve dynamic web page views [4].

D. Software Testing (Black Box Testing)

Each software that has been created must be tested for the software, and there are so many methods that can be done, one of them is Black Box Testing. Black Box Testing will focus on the functional specifications of the software created. Tester as a person who will test the software that has been created will be able to define a set of input conditions and test the functional specifications of the program [5].

III. METHODOLOGY

The purpose of this study is to design and implement a web-based online exam system so that it can help the school in cost issues, as well as time in evaluating student learning outcomes.

The research was conducted at Motoling 1 Public Middle School, South Minahasa Regency. The study was conducted for 3 months, from August to November 2017. Concept of System Development Method had done by Rapid Application Development. The RAD method has 5 main stages as shown in Figure 1.

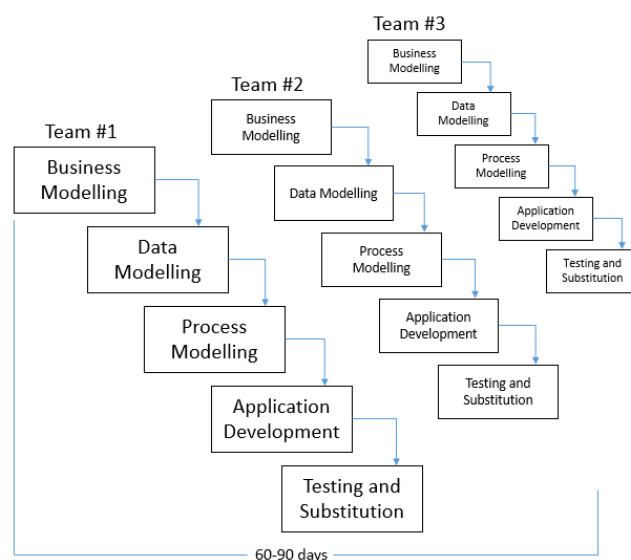


Fig. 1. The Development concept of RAD.

In business modeling, it will be explained how the flow of the online exam system will be made using a business flowchart. In data modeling, the steps that will be made are to create a database design and present the results of an online exam database implementation at Motoling 1 Public Middle School. Business process modeling is the stage for designing defined business functions related to defining data. Researchers began designing an online exam system with system design techniques using the AML (Unified Modeling Language). In application making, researchers implement process modeling into programming languages. Testing and substitution are carried out to find out all the functions that exist in the system that has been made.

IV. FINDING AND DISCUSSION

The flow of the system created is as follows:

- Admin is required to log in before entering the online exam system. After logging in, the data is in the form of a data master which contains class data, student data, teacher data, subject data, exam data, and exam class data inputted by the admin.
- The teacher must log in before entering the system, then after logging in the teacher has the duty to enter exam questions based on achievement indicators. Achievement indicators are included based on basic competencies and basic competencies are included based on competency standards.
- After the teacher inputs the exam questions, students can log in to start the exam according to the subjects entered.
- After the student completes the exam, the score can be seen by the teacher on the teacher's page and can score the test results of students who have taken the exam.

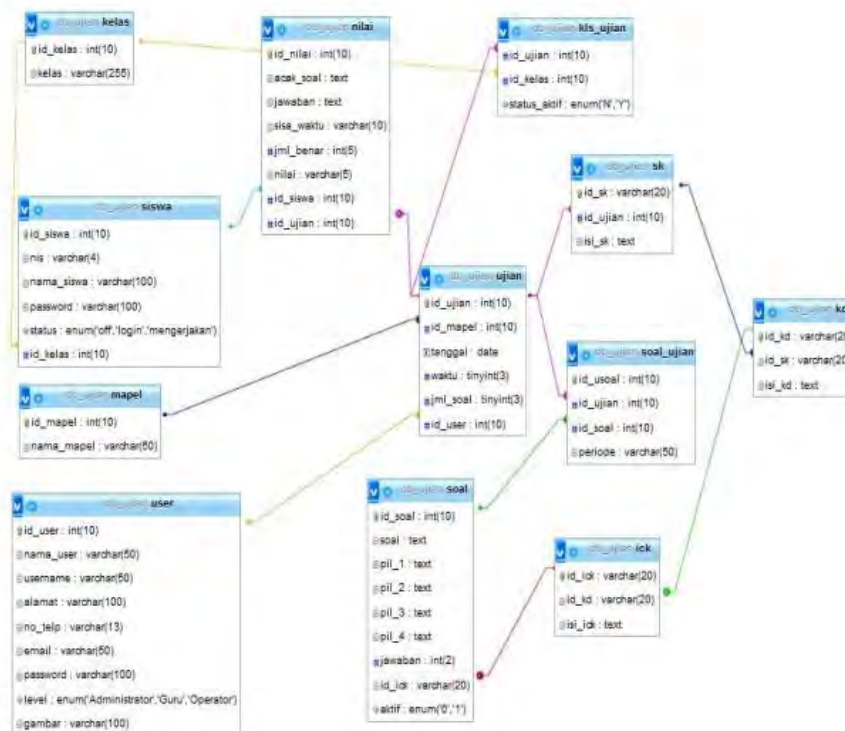


Fig. 2. The relational diagram of online exam data.

A. Using Case Diagram Admin

The following is an explanation of the Online Exam Data Relational Diagram as shown in figure 2:

- In the class table, id_class (PK) is the primary key from the class table and id_class (FK) from the class table to the foreign key in the student table. id_class (FK) in the class table also becomes a foreign key in the kls_ujian table.
- The student table has an id_sis student (PK) as the primary key. And id_siswa (FK) in the student table becomes the foreign to the value table.
- The map table has id_mapel (PK) as the primary key. Danid_mapel (FK) in the map table becomes a foreign key in the test table.

- The user table has id_user (PK) as the primary key. And in the test table, id_user (FK) from the user table to foreign to the test table.
- The test table has id_ujian (PK) as the primary key. And in the table kls_ujian, id_ujian (FK) from the test table to be foreign to the exam class table. The test table also becomes a foreign key in the table SK in the form of id_ujian (FK) and becomes a foreign key in the test table and becomes a foreign key in the value table in the form of id_ujian (FK).

On stage process modeling researchers began designing an online exam system with system design techniques using UML (Unified Modeling Language).

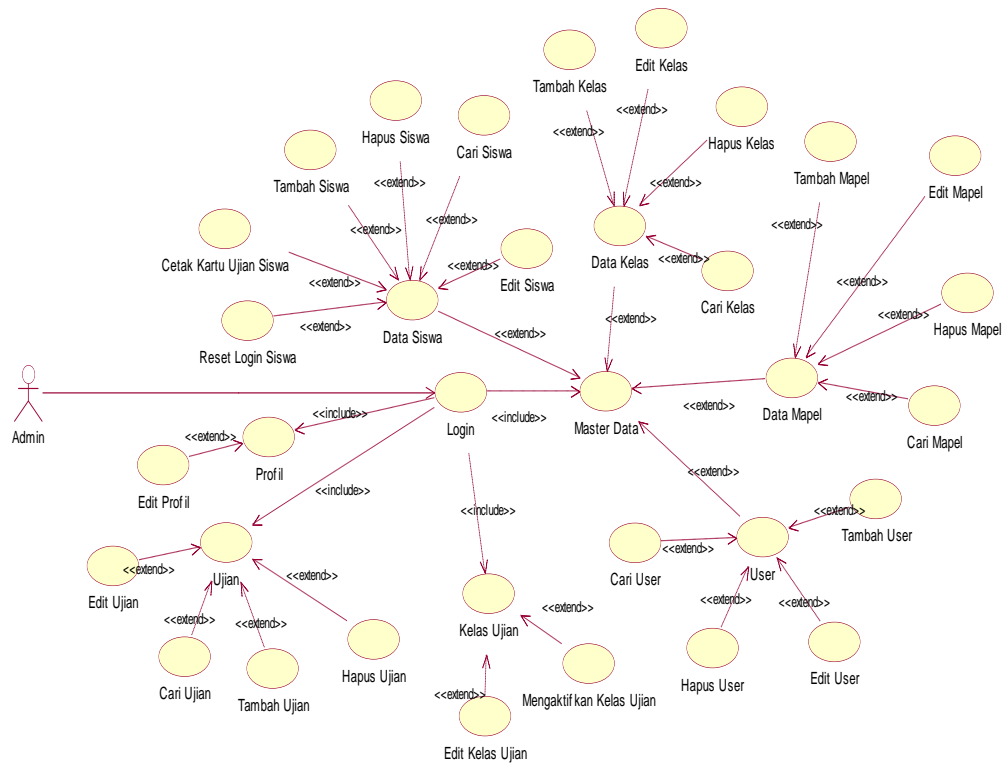


Fig. 3. Using case admin diagram.

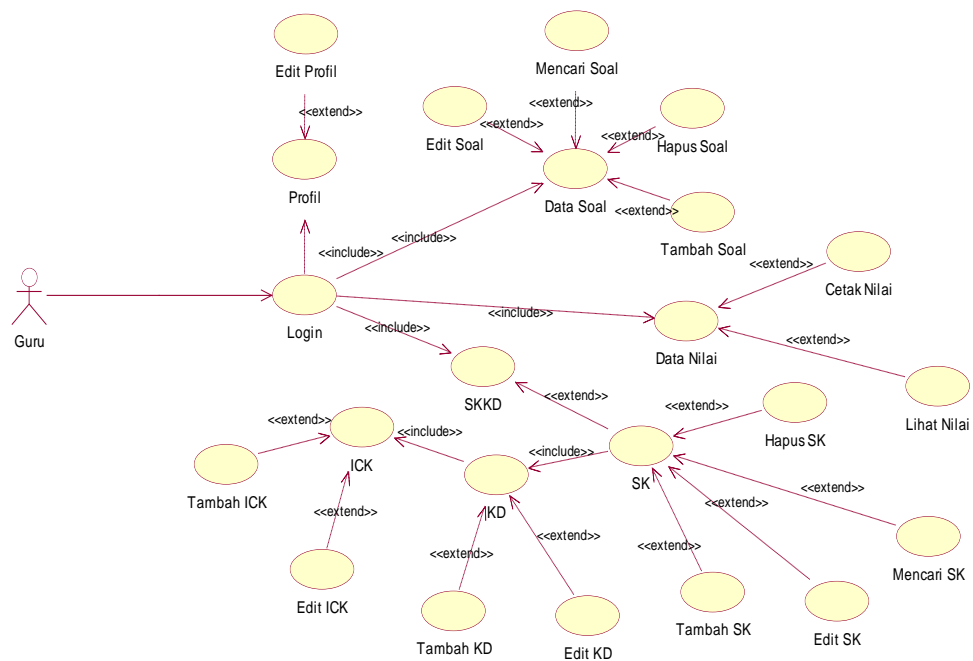


Fig. 4. Using case diagram teachers.

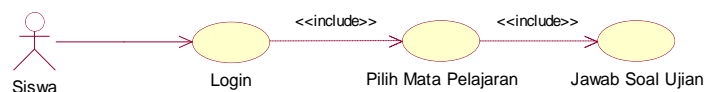


Fig. 5. Using case diagram students.

The following is a description of the implementation based on modeling data objects.

B. Competency Standards

1) *Adding competency standards*: The process of adding competency standards begins with the user entering the SK form and inputting SK data according to the existing form. Input data is changed into objects and objects will be sent to the model with the insert function and then will be forwarded to the database to be saved into standard table competency.

2) *Changing competency standards*: The process of changing the competency standard begins with the user entering the competency standard list and selecting which competency standard data will be changed. After selecting the SK data to be changed, the system will display the SK form. The user changes the SK data according to the available form. The data that is changed from the form is changed again in the object and object will be sent to the model with the update function, then it will be forwarded to the database to be stored in the standard competency table.

3) *Removing competency standards*: The process of removing competency standards begins with the user entering the competency standard list and selecting which competency standard data will be deleted. After selecting the SK data to be deleted, the system will take parameters from the data to be deleted and then forwarded to the controller. The parameters sent to the controller are converted to objects. The object will then be sent to the model with the delete function then it will be forwarded to the database to delete the data according to the parameters.

4) *Look for competency standards*: The process of looking for competency standards begins with the user entering the competency standards list and entering keywords to find competency standard data. The SK form will send SK data according to the keywords to the control as parameters. These parameters are changed into objects which are then passed to the model with function search. The competency model will send the keyword SK data that has been input by the user to look for in the SK table in the database.

C. Basic Competencies

1) *Adding basic competence*: The process of adding basic competencies begins with the user entering form of KD and entering data according to the existing form. Input data is changed into objects and objects that will be sent to the model with the insert function and then will be forwarded to the database to be stored in the basic_competence table.

2) *Changing basic competencies*: The process of changing basic competencies first with the user enters the list of basic

competencies and selects which basic competency data will be changed. After selecting the data that will be changed, the system will display form KD. The user changes the data according to the available form. Data that is changed from the form is changed again into objects and objects that will be sent to the model with the update function, then it will be forwarded to the database to be stored in the competency-base table.

3) *Removing basic competencies*: The process of removing basic competencies begins with the user entering the list of basic competencies and choosing which basic competency data to delete. After selecting the KD data to be deleted, the system will take the parameters of the data to be deleted and then forwarded to the controller. The parameters sent to the controller are converted to objects. The object will then be sent to the model with the delete function and then it will be forwarded to the database to delete the data according to the parameters.

4) *Finding basic competencies*: The process of looking for basic competencies begins with the user entering the list of basic competencies and entering keywords to find competency standard data. Form KD will send data according to keywords to the controller as parameters. These parameters are changed into objects which are then passed to the model with function search. The basic competency model will send data keywords KD that have been input by the user to look for in the table KD in the database.

D. Indicators of achievement competence

1) *Adding Indicator*: The process of adding an indicator begins with the user entering the indicator and inputting indicator data according to the form. Input data is changed into objects and objects that will be sent to the model with the insert function and then will be forwarded to the database to be stored in the indicator table.

2) *Changing indicator*: The process of changing the indicator begins with the user entering the indicator list and selecting which indicator will be changed. After selecting the indicator data to be changed, the system will display the indicator. The user changes the indicator data according to the available form. Data that is changed from the form is changed again into objects and objects that will be sent to the model with the update function, then it will be forwarded to the database to be stored in the indicator table.

3) *Removing indicators*: The process of deleting an indicator begins with the user entering the indicator list and selecting which indicator data to delete. After selecting the indicator data to be deleted, the system will take the parameters of the data to be deleted and then forwarded to the

controller. The parameters sent to the controller are converted to objects. The object will then be sent to the model with the delete function and then it will be forwarded to the database to delete the data according to the parameters.

4) *Finding indicators*: The process of searching the indicator begins with the user entering the indicator list and entering the keyword to find indicator data. The indicator form will send indicator data according to the keyword to the controller as a parameter. These parameters are changed into objects which are then passed to the model with function search. The indicator model will send the keyword indicator data that has been entered by the user to look for in the indicator table in the database.

E. Question

1) *Adding indicator*: The process of adding questions is begun with the user entering the question form and entering the question data according to the existing form. Input data is changed into objects and objects that will be sent to the model with the insert function and then will be forwarded to the database to be stored in the question table.

2) *Changing question*: The process of changing the default is done so that the user enters the question list and selects which questions to change. After selecting the data that will be changed, the system will display the question form. The user changes the question data according to the available form. The data that is changed from the form is changed again into the object and the object will be sent to the model with the update function, then it will be forwarded to the database to be stored in the question table.

3) *Removing problem*: The process of deleting the default is that the user enters the question list and selects which data to delete. After selecting the data the question will be deleted, the system will take the parameters from the data to be deleted and then forwarded to the controller. The parameters sent to the controller are converted to objects. The object will then be sent to the model with the delete function and then it will be forwarded to the database to delete the data according to the parameters.

4) *Finding questions*: The process of searching questions is begun with the user entering the question list and entering the keyword to find the question data. The form question will send the question data according to the keyword to the controller as a parameter. These parameters are changed into objects which are then passed to the model with function search. The problem model will send the data keyword questions that have been entered by the user to look for in the question table in the database.

5) *Selecting questions according to indicator*: The process of selecting a question begins with the user selecting the question that will be displayed to the student page by checking the available questions. The options are sent based on parameters that are on the indicator. The parameter is sent to the controller which is then converted into an object. The

object is sent to the model with the function `getDataById` and passed to the `problem_test` table to activate the problem status based on the choices in the database.

V. TESTING AND SUBSTITUTION

Each program underwent personal testing to ensure that the program that we have created can be free of errors (bug), although it does not rule out the possibility of a few bugs or not 100% bug free, but testing can at least minimize errors. At this stage, the researcher used a testing method with a black-box testing approach. Black box testing, which is an approach to test whether every function in the program can run correctly. The following are some of the processes carried out by researchers in this test, namely:

- Incorrect functions, both input and output.
- Interface error.
- Error in data structure or database access.

Online references will be linked to their original source, only if possible. To enable this linking extra care should be taken when preparing reference lists.

VI. CONCLUSION

Based on the results of research and testing applications that have been made and discussions, it can be concluded, among others:

- Able to make it easier for teachers to input questions online, view and print student test scores, and manage exam schedules.
- Students do not need to wait long in the assessment process because grades can be printed by subject teachers after the exam has finished.
- The questions displayed will be scrambled by the system.
- There is an automatic timer facility so that if the test time has been given out, the system will immediately give a notification to the user if the exam has been completed and will automatically access the student's main page.

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