



Application of the Data Envelopment Analysis Method to the Evaluation Information System of the Study Program at Politeknik Negeri Media Kreatif based on Web App

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Abstract—Assessment of the performance of the Study Program is a routine activity carried out by the College to continuously improve the quality of its services. One form of assessment of the performance of the study program is the accreditation of the institution. Therefore, it is necessary to build a system that is able to perform automatic assessment of the performance of the study program. In performance assessments are often found the variables used are quantitative and / or qualitative. Data Envelopment Analysis (DEA) can be viewed as an aggregation operator for variables of quantitative and qualitative value. This Study Program performance assessment system uses the Data Envelopment Analysis (DEA) method and the software development method used, rad (rapid application development). This system produces an efficiency value of the level of performance of all Study Programs at the Politeknik Negeri Media Kreatif in general and the Graphic Design Study Program (Kampus Medan) in particular, whether it is optimal or not, if not then this system aims to provide material consideration of the value of variables / attributes that need to be reduced or added. The data obtained from these measurements can be used as an analysis of the situation of the next program. The way this application works is designed using the php programming language, and the CodeIgniter framework, on the database server section using MySQL.

Keywords: Sistem Informasi; Web App; RAD; DEA; CodeIgniter

1. INTRODUCTION

The 1945 Constitution mandates (UUD 1945) the Indonesian Government to organize a national education system which is regulated by law, which includes Law No.2/1989 on the National Education System, Law No.20/2003, and Law no. 12/2012 on Higher Education. BAN-PT is a non-structural institution under the Minister of Education and Culture which essentially symbolizes the government's intention and concern in fostering the implementation of higher education, serving the interests of the community, and advancing science and technology to improve people's lives and enrich national culture. One form of assessment of the performance of a study program is the accreditation of the institution. In the accreditation assessment there are seven components that are assessed, which include: vision and mission, leadership and governance, students and graduates, human resources, curriculum and implementation, funds and facilities, and research and service as well as inter-institutional collaboration [2].

In general, all Study Programs at the Creative Media State Polytechnic experienced an increase in the quality of the study program which was linearly related to efficiency and productivity. While in the Graphic Design Study Program (Medan Campus) in performance assessment, it is often found that the variables used are quantitative and/or qualitative. An aggregation operator is needed that can be defined on these variables. Data Envelopment Analysis (DEA) can be viewed as an aggregation operator for variables with quantitative and qualitative values [4].

The department's performance appraisal is a routine activity carried out by the university to continuously improve the quality of its services.

2. RESEARCH METHODOLOGY

2.1 Rapid Application Development

Rapid Application Development (RAD) is an approach to object-oriented system development that includes a development method and software that aims to shorten the time normally required in the traditional system development life cycle between the design and implementation of an information system [7]. The RAD model has 3 stages as follows:

1. *Requirement Planning* (Requirement Plan), the initial stage that brings together the *user* and the *analyst* which aims to identify the purpose of the system and information needs to achieve the goal. With the involvement of both parties, making this initial stage the most important thing.
2. *Design System* (*System Design Process*), at this stage the activity of *users* who are directly involved in determining the achievement of goals. In this process, improvements often occur if there is still a design discrepancy between the *user* and the *analyst*.
3. *Implementation*, this stage is the stage of making a program by developing a program design that has been approved by the *user* and *analyst*. This stage also conducts a trial (*trial error*) of the program before it is applied to an organization.

2.2 Data Envelopment Analysis (DEA)

Data envelopment analysis is a non-parametric method that uses linear programming as a mathematical approach. DEA is a mathematical programming technique that measures the efficiency level of a decision-making unit (UPK) or *decision-making unit* (DMU) relative to similar DMUs when all these units are at or below the efficient *frontier* "curve" [3]. The DEA model can be built through two approaches, namely input-oriented and output-oriented. Input-oriented DEA is a DEA model that minimizes input by assuming constant output. On the other hand, output-oriented DEA is a DEA model that maximizes output by assuming constant inputs [11].

The work steps for the completion of this DEA method include:

1. Identify the dmU or unit to be observed.
2. Identify the inputs and outputs that make up the dmU.
3. Calculate the efficiency of each dmU. The goal is to get the input and output targets needed to achieve optimal performance. The way to calculate the efficiency is to describe it in a mathematical form (linear program), then the simplex method is used to solve the linear program.

The *input-oriented* CRS formula can be seen in table 1 as follows:

Table 1. CRS Formula

Input-Oriented	
$\min \theta - \varepsilon \left(\sum_{i=1}^m s_i^- + \sum_{r=1}^s s_r^+ \right)$	
Subject to:	
$\sum_{j=1}^n \lambda_j x_{ij} + s_i^- = \theta x_{i0}$	$, i = 1, 2, \dots, m;$
$\sum_{j=1}^n \lambda_j y_{rj} - s_r^+ = y_{r0}$	$, r = 1, 2, \dots, s;$
$\lambda_j \geq 0$	$, j = 1, 2, \dots, n.$

Keterangan:
 θ = nilai efisiensi
 ε = angka positif yang kecil
 S_i = slack ke-i
 λ_j = bobot DMU ke-j
 X_{ij} = nilai input ke-ij
 Y_{rj} = nilai output ke-rj
i = jumlah input
r = jumlah output
j = jumlah DMU

3. RESULT AND DISCUSSION

The design of the application carried out is to input computerized study program evaluations, evaluation input processes, evaluation data input and report generation. The design of this process includes context diagrams, system data flow diagrams and data that can explain the flow of data that is processed to produce the desired information. The design of this application can be interpreted as:

1. Preparation for implementation design.
2. Describe the application to be formed, in the form of planning, making sketches.
3. Configure application hardware and software components.

3.1 Application Sitemap

1. Admin

In Figure 1 the Admin Site is a site map of the study program evaluation design to carry out or run this application. This process includes logging in first to enter the application, then entering the main page or home. The admin chooses what standard to add to the list of questions in this application.

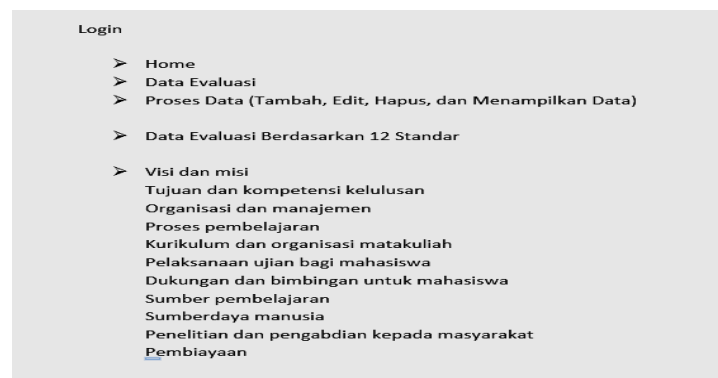


Figure 1. Application Sitemap

2. For Auditors

In Figure 2 the Auditor Site is a site map of the study program evaluation design to carry out or run this application. This process includes logging in first to enter the application, then entering the main page or home. The auditor will fill out the evaluation in accordance with the list of questions that already exist in the standard.

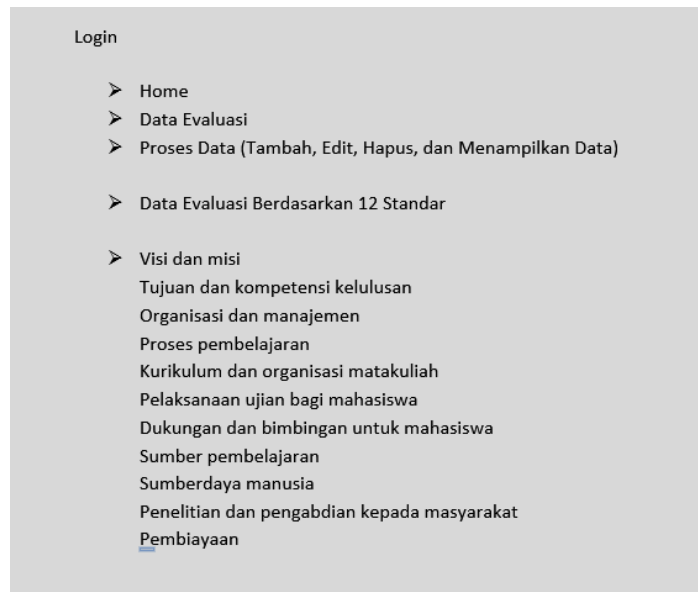


Figure 2. Auditors Sitemap

3. Admin Dashboard

After the admin logs in, it will enter the home page. On the home page is the start page of this application after logging in. On this page there is a menu that has each function

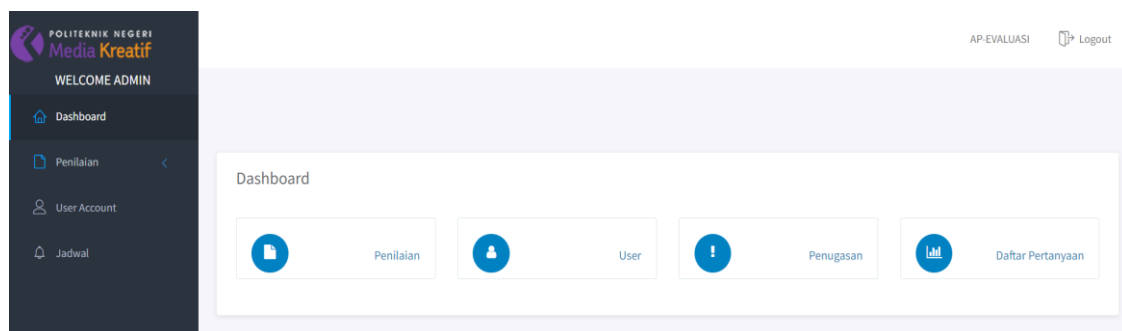


Figure 3. Admin Dashboard

4. Rating Page View

This page displays several important points, such as vision and mission, instruments, perspectives, standards, and a list of questions. This assessment form is used to add questions.

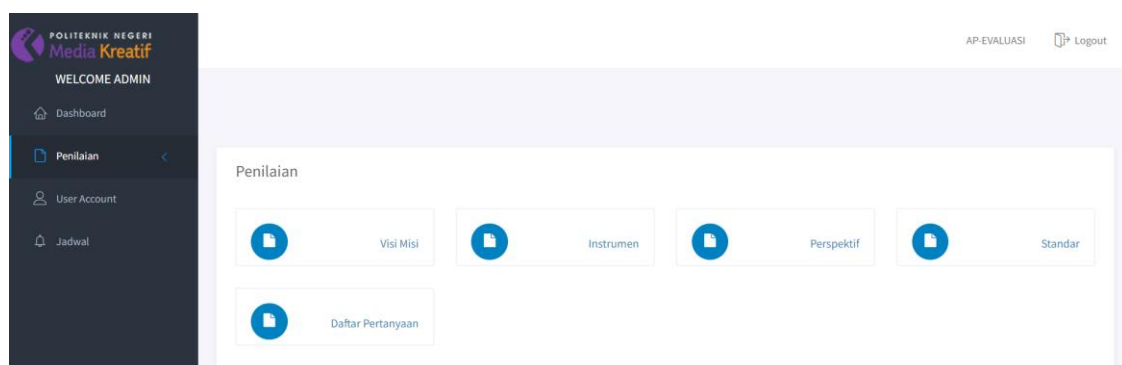


Figure 4. Rating Page Display

5. Standard Page View

On this page displays the standard which is a point on the list of questions to be added.

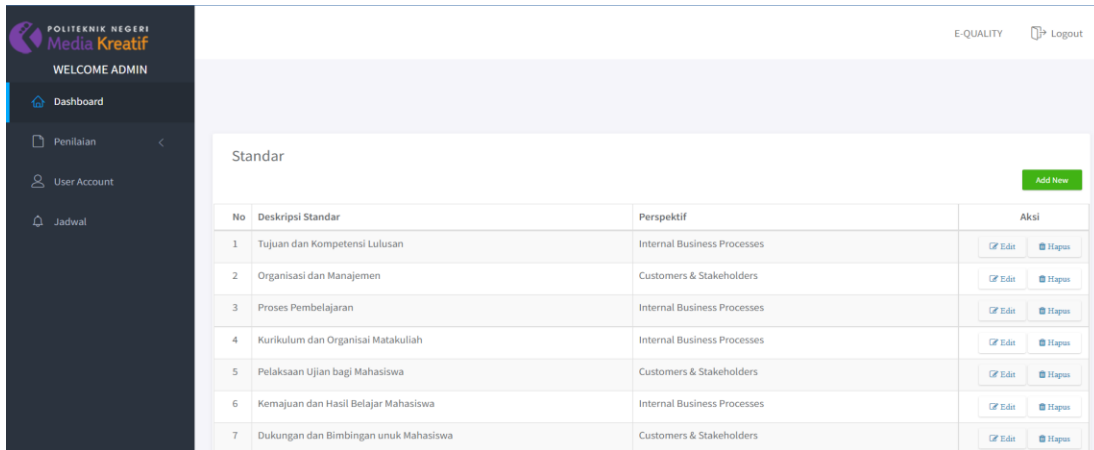


Figure 5. Standard page view

6. Question Page View

This page is a page to add a list of questions and the number of questions that have been added. On this page add a list of questions by inputting instruments, standards, that already exist in the *combobox*. Then add questions and answers to each *textbox*.

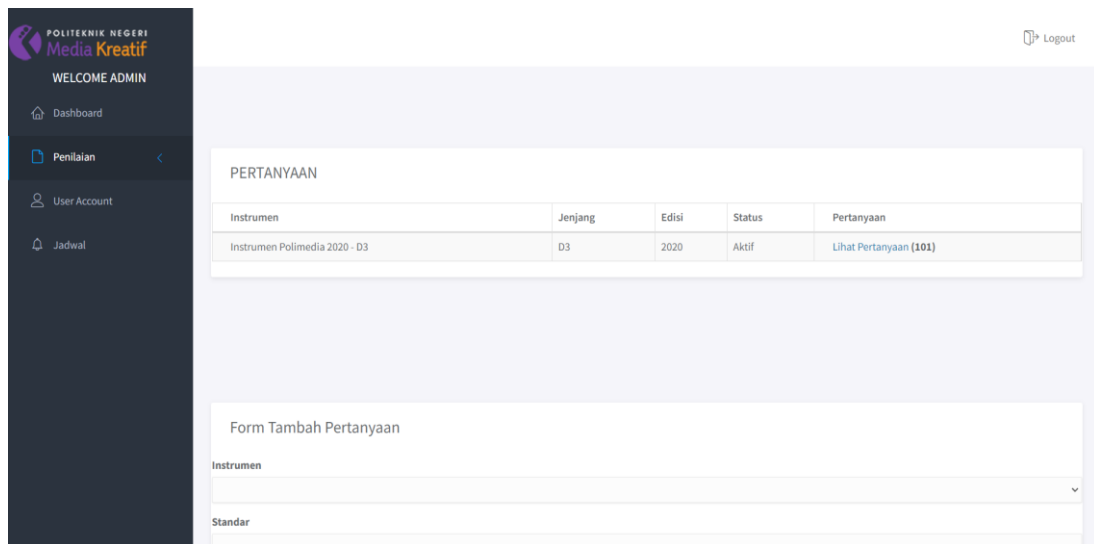


Figure 6. Question Page View

4. CONCLUSION

From the results of research that has been done, the authors can conclude the evaluation question data generated is based on 12 standards and in the evaluation assessment, the auditor inputs question data. The question input data is then converted into a PDF. And the other for suggestions from this research that the authors have done, the authors can draw conclusions are the design of this application, it can overcome the problems faced when evaluating the study program and the author hopes that this application can be useful or can be developed into an information system.

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