

UI/UX Design of Web-Based for Outcome-based Education (OBE) Assessment Information System in Universitas Maritim Raja Ali Haji (UMRAH) Using Prototype Method

*Marisha Pertiwi**, Nolan Efranda, Berta Erwin Slam, Nola Ritha, Martaleli Bettiza

Informatics Engineering, Universitas Maritim Raja Ali Haji, Tanjungpinang

Abstract. Outcome-based Education (OBE) is one of the teaching approaches that influences the learning process starting from curriculum design, learning outcomes, learning methods, and forms of evaluation of learning. Implementation of the OBE curriculum will not run without a student learning outcome assessment system. Universitas Maritim Raja Ali Haji has implemented the OBE education system in 2024 in the Informatics Engineering study program. However, it does not yet have an information system for assessing Graduate Learning Outcomes and Course Learning Outcomes, so the assessment system is still carried out manually. This study aims to build an OBE curriculum Assessment Information System that can be accessed via the website based on performance indicators and assessment rubrics. Thus, it makes it easier for system users to assess student learning outcomes in the OBE curriculum. The UI/UX design of the OBE curriculum assessment information system refers to the OBE manual guidebook. The results of this study are in the form of a website-based information system design developed using the Prototype method. The framework used is MVC from Laravel which can make the process of creating a website more structured and organized so that it is easier to complete work faster. Then, this system uses API authentication tokens for website security. The testing method used in the prototype design uses the User Acceptance Test (UAT) by involving the UMRAH Informatics Engineering Lecturer Discussion Forum Group as users of the information system. The results of UAT test stated that the system design created can help solve problems in designing an OBE assessment information system because all users contributed to the development of the OBE assessment system so that the design of this system can be well received by users of the information system.

1 Introduction

The rapid development of science, technology, and art and the need for workers related to current developments also require educational designs that meet these requirements. In the past seven years, the government has made several changes to improve the standard of education in Indonesia [1-4]. In 2020, the Independent Campus Independent Learning policy was implemented. In its implementation, the MBKM supporting curriculum applies a results-based learning methodology approach known as Outcomes-Based Education. (OBE) [5-8]. This method focuses on achieving student learning outcomes. To achieve the results specified in the OBE learning model, lecturers must first identify learning methods, learning resources, and assessments and formulate them to achieve the results. Based on the 2020 Higher Education Curriculum Development Guidelines, Determination of graduate profiles should have a clear context and be determined based on Graduate Learning Outcomes [3,9]. The implementation of the OBE Curriculum policy in Universitas Maritim Raja Ali, especially in the Informatics Engineering study program, was ratified in 2023 through the Rector. So,

* Corresponding author: marishapertiwi@umrah.ac.id

the entire study program curriculum team began to prepare a new curriculum by implementing output-based learning. (OBE).

This OBE-based Assessment Information System can manage the planning of assessment methods that have been created by a lecturer. Manage assessment data based on the classes owned by lecturer. Conducting student grade processing based on previously designed assessment methods. However, in its implementation, the lecturers in charge of the course had difficulty in measuring the results of the course achievements for each student, this is evident from the level of understanding of the application of outputs in each lecturer's course which is different. The variety of interpretations of student achievement results regarding course learning outcomes, must be carried out appropriately in OBE as assessment of student output regarding the specified course learning outcomes and can also be used as an evaluation if the specified course learning outcomes are by the needs of graduates [10-12].

Currently, the assessment methods applied in the Informatics Engineering study program are not planned in detail. Calculation of students' final grades is also done manually and takes a long time. The Informatics Engineering study program does not yet have an Outcomes-Based Education (OBE) curriculum Assessment Information System that can be access via the website based on performance indicators and assessment rubrics. A system that can manage and document all curriculum activities based on Outcomes-Based Education (OBE) starting from determining graduate learning outcomes to course learning outcomes data in an integrated manner. This will pose a risk of errors in calculating grades. This study aims to build an OBE-based Assessment Information System that can be accessed via the website. This Information System is very important to be used to facilitate lecturers in designing assessment methods that will be used in student learning activities. Facilitate the processing of students' final grades based on the assessment methods that have been created. This system can also support the successful implementation of the OBE curriculum in Informatics Engineering UMRAH, if this information system is implemented it can also help the Informatics Engineering study program obtain International Accreditation [13].

The OBE assessment information system for assessing student learning achievements in the OBE curriculum was created by a study program at another university. The results of the research questionnaire show that the system created can be used well, based on criteria, such as functionality, reliability, usability, and efficiency. Apart from the questionnaire results, based on interviews conducted with the Head of Study Program, the study program secretariat, and the curriculum division, it was stated that the application created can help users in processing OBE curriculum data and has provided information on measuring the results of the OBE curriculum. For this reason, UMRAH Informatics Engineering wants to create the same information system with a light and easy website base to help lecturers in designing OBE curriculum assessment methods and avoid the risk of errors in calculating grades [14-15].

This research was conducted to create a proposal for designing an Outcomes-Based Education (OBE) assessment information system that complies with assessment provisions. Course achievement or graduate learning achievement in the curriculum that has been prepared using the outcome-based learning (OBE) approach in the form of UI/UX design for the outcome-based education (OBE) assessment information system in the Informatics Engineering study program in Universitas Maritim Raja Ali (UMRAH) based on a website using the prototype method.

Thus, it is expected that the results of this information system design, if implemented into a information system, can provide convenience for lecturers in charge of courses in processing final grades and achievements, as well as presenting detailed information on the achievements of each class participant to the study program in an integrated manner as well as evaluation material for development of this system in the future.

2 Methods

2.1 Design

According to Bin Ladjamudin, the design stage aims to design new system that can solve the problems faced by the company, which is obtained by selecting the best alternative system. (Ladjamudin, 2005). Based on this, design is a stage that has a fundamental objective in developing the system. This design stage aims to create a new system that can effectively address several problems faced by the company. This approach is based on the selection of the best system alternative, which will be the basis for a more in-depth design process. Thus, design becomes an important foundation for producing efficient and appropriate solutions, so that companies can optimize their performance in overcoming various challenges faced in their operations. [8].

2.2 Prototype Method

The methodology used in the research is based on the software development life cycle (Software Development Life Cycle) with the information system development method used as the Prototype Method. The prototype method is a basic working example of the software development program. Prototypes are generally designed to be examples used for demonstration purposes or as part of the software development or manufacturing process. In non-technical processes, prototypes are specific models as representatives of certain categories. In design, a prototype is a form that is initially used as a model or standard physical size. Prototypes are created before development or specifically designed for development before scaling. This method is suitable for systems that require many changes to their features. A prototype is created before developing an information system design. A prototype is created before it is developed by a programmer to create an information system [7].

The prototype method begins with collecting client/user needs through a Group Discussion Forum with system users. The users of this information system are Lecturers, Heads of Study Programs, and Informatics Engineering Study Program Curriculum Admins. After the client's needs are collected, the developer creates an initial design or prototype of the information system which will then be re-evaluated together with the system users until it becomes a system that is ready to be used. The results of the information system design will be tested using the User Acceptance Test (UAT) testing technique with information system users via a Discussion Group Forum so that an information system can be created with user requirements and easy to use. The flow of this research method is shown in the Figure. 1.

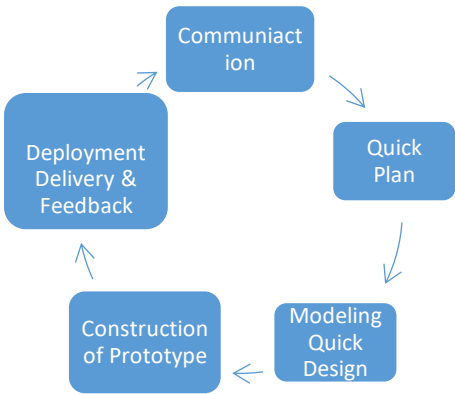


Fig. 1. Stages of prototype method system design

Steps/stages of information system design using the prototype method which consists of 5 stages, such as :

- 1 Communication, at this stage the developer and client meet and determine the general objectives, desired requirements, and overview of the parts that will be needed next.
- 2 Quick Plan, at this stage the design is done quickly and represents all known aspects of the information system, and this design basis for making a prototype.
- 3 Modeling Quick Design, at this stage focuses on the representation of aspects of the information system that can be seen by the customer/user. Quick Design Modeling tends to prototype creation.
- 4 Construction of Prototype, building a framework or prototype design of the information system to be built
- 5 Delivery & Feedback, The prototype that has been created by the developer will be distributed to the user/client for evaluation, then the client will provide feedback that will be used to revise the needs of the information system that will be built.

2.3 UI/UX

In using information systems, understanding the interface displayed is the most basic thing because it is a component that interacts directly with the user. The interface design continues to be optimized through various systems that provide feedback to users, both verbally and non-verbally, such as through speech, text, and so on. This is done so that the designed information system can be better in terms of User Interface (UI) and User Experience [4]. UI (User Interface) and UX (User Experience) are two important aspects of digital product design, especially in software, applications, and websites. User Interface is the visual part of a digital product that is used by users to interact with the system. The main purpose of UI is to provide an attractive, easy-to-understand, and easy-to-use appearance. Meanwhile, User Experience is the overall experience felt by users when interacting with digital products. The main goal of UX is to provide a positive, efficient, and satisfying experience for users[6]. The creation of the UI/UX design for this information system is based on the principles of usability, namely learnability, efficiency, memorability, and satisfaction in the form of a mockup. The principles of usability are:

- 1 Learnability, The system should be easy to learn, so that users can easily start working with the system.
- 2 Efficiency is the speed at which user objectives can be completed accurately and completely.
- 3 Memorability, The system must be easy to remember, so that users who do not use it regularly can operate the system after some time without having to learn it again.
- 4 Satisfaction, refers to how enjoyable it is to use a system

After the design is complete, the next stage is to conduct an evaluation based on the UI/UX usability principles for users of the information system.

2.4 Laravel

The framework or website architecture design used is MVC (model-view controller) from Laravel which can make the process of creating a website more effective, both to be more structured and structured so that it is easier to complete work faster. Laravel is a PHP-based web framework that is open-source and free, created by Taylor Otwell, and is intended for developing web applications that use the MVC pattern. The MVC pattern structure in Laravel is slightly different from the MVC pattern structure in general. In Laravel there is routing that bridges between requests from users and controllers. So the controller does not directly receive the request.

2.5 API

API stands for Application Programming Interface, which is software that allows developers to integrate and allow two different applications to connect simultaneously. The purpose of using API is to share data between different applications and speed up the application development process by providing a separate function. So, developers no longer need to create similar features. The system that sends the request is called the client and the application that sends the response is called the server. An API is an interface that acts as a link between one system and another, or between client and server, to allow feature integration without having to add data manually.

The Web service API method is the most appropriate to use in integrating various databases. This type of website uses the JavaScript Object Notation (JSON) data format. This method makes data exchange between applications lighter. In terms of security, information systems use API authentication tokens to allow users to make API calls. The authentication token checks that the user is a real user and that they have access rights for that API call. For example, when we log into an email server, our email client uses an authentication token to secure access. That way, the web security system and privacy data can be guaranteed. An overview of the system using API is in Figure 2.

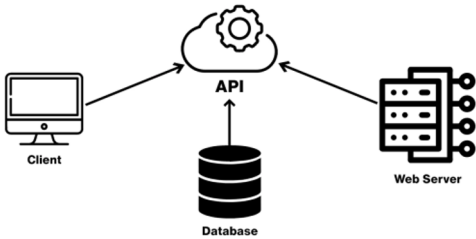


Fig. 2. Application Programming Interface

2.6 User Acceptance Test (UAT)

UAT are testing method that focuses on validating system or application can be accepted by users according to their needs and expectations [2]. By focusing on testing the design of an outcome-based education (OBE) assessment information system to assess the extent to which the system meets user requirements. Considering the importance of a reliable information system in supporting OBE curriculum assessment activities, to test the results of this design, the Discussion Group Forum of Informatics Engineering study program lecturers was conducted as users of the information system. Assessment based on the usability principle of UI/UX, such as learnability, efficiency, memorability, and satisfaction. Several questions are given based on these principles so that the system design runs more effectively and efficiently, so that the system can run well, and help lecturers in shortening the time of the student assessment process in the learning process.

3 Results and Discussion

This research starts with Communication, which is the stage where the system developer and client meet to discuss the system to be designed, Quick Plan and Quick Design Modeling, which is the stage where the developer designs the information system quickly based on the information received by the developer, Construction of Prototype, which is the stage where the UI/UX prototype of the information system is created, and Deployment Delivery & Feedback, which is the stage where the information system design is analyzed to obtain feedback that is by the needs of the user regarding the features and appearance of the OBE assessment information system prototype.

Based on the results of the information system design using the prototype method which consists of 5 stages such as:

Based on the results of the information system design using the prototype method which consists of 5 stages such as:

1. Communication

Communication is the stage where developers and clients meet to discuss the information system that will be created later. At this stage, developers coordinate with users of the information system to collect information about the OBE Curriculum Assessment. From the results of discussions with users of the information system, namely lecturers, heads of study programs, and curriculum administrators in Informatics Engineering, the needs required for system development needs are produced.

2. Quick Plan and Modeling Quick Design

After the communication stage, the developer knows the procedures for the OBE curriculum assessment system in general. The developer designs the system quickly based on the information received by the developer. The system design begins by creating a Use Case, Activity Diagram, and Class Diagram. Use Case Diagram is a diagram that is useful for describing the behavior of actors in the system to be designed. Use Case Diagram explains the relationship between actors and the system to be designed. Use Case Diagrams are useful for explaining the functions of a system and what access is given to actors to use these functions. The actors in this information system consist of Lecturers, the Head of the Study Program, and the Curriculum Admin. Lecturers can analyze the learning design process, design semester learning plans, determine the basis for evaluation assessments, design student assignment plans, and design course contracts. Furthermore, the Curriculum Admin can determine the graduate profile and graduate learning outcomes, course learning outcomes, course design, BoK, and SKS. Then, the Head of the Study Program can manage the course class schedule, assign course lecturers and online course assessments, course assessment reports, and course learning achievement reports. This stage begins with the design of the use case diagram in Figure 3.

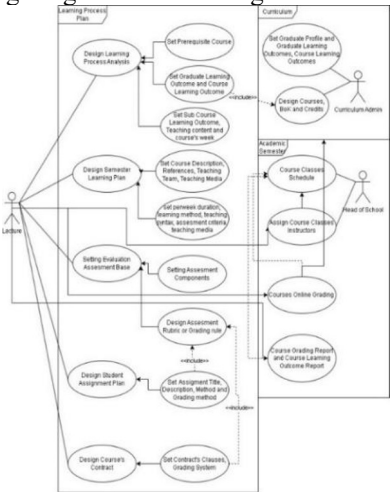


Fig. 3. Use Case Diagram Design

The next Modeling stage is the Activity Diagram is a workflow in running a system. Activity Diagram is also used to describe or collect the display flow of the system. Activity Diagram has components with specific forms that are connected by arrows. The arrows explain the workflow sequentially from the top to the end of the activity in the system. After making a use case diagram, the developer makes an activity diagram for the OBE assessment information system. There are 3 activities, such as curriculum, academic semester, and

course. In the curriculum activity, the process of determining graduate profiles, graduate learning outcomes, determining course learning outcomes, designing courses, BoK, SKS, and semesters, determining course class schedules determining course class instructors, and designing learning process plans, assessments, and reports. Then, in the Academic semester activity, the process of determining the course class schedule and determining the course class instructor is carried out. Furthermore, for the course activity, the process of designing the learning process plan, assessment, and report is carried out. The activity diagram design in the OBE assessment information system is shown in Figure 4.

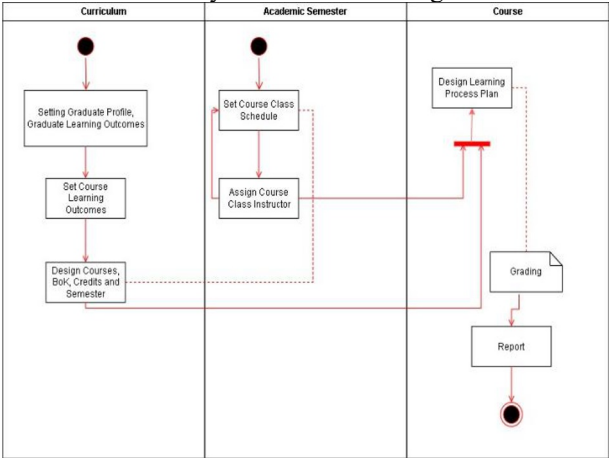


Fig. 4. Activity Diagram Design

Class Diagram describes the structure of a particular system with the method of modeling classes, attributes, and relationships with each other. Class Diagram explains a class, attribute, or object, and the relationship between classes to system. The developer creates a class diagram designed based on the use case diagram that has been designed. In the class diagram design, there are 8 classes, namely Lecturer, Learning Process Plan SemesterLearningDesign, CourseLearningProcessAnalysis, CourseClass, Course, EvaluationAssesmentBase, and CourseClassParticipant which have relationships between their classes. There is a class diagram design for the OBE assessment information system in Figure 5.

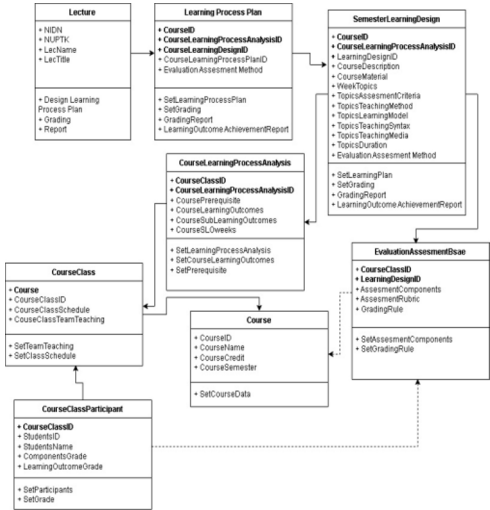


Fig. 5. Class Diagram Design

3. Construction of Prototype

After designing and identifying the general description of the information system to be created, at this stage, the developer creates a UI/UX prototype of the OBE curriculum assessment information system. The results of the prototype are explained as follows:

1. Login Page

Login page is a page of information systems that requires users to enter credentials (usually username and password) to access certain areas or features that require authorization. The login page serves as a security mechanism, ensuring that only registered or authorized users can access the system. Figure 6 shows the prototype of the login page used by information system users to log into the system.

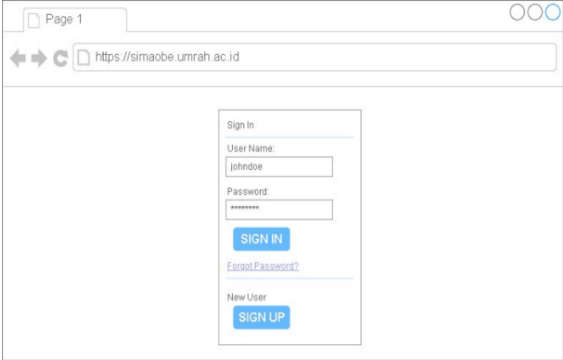


Fig. 6. Login Page Prototype Design

2. Home Page

The Home Page is the main page of the information system that is usually first accessed by users. This page functions as a gateway to various parts or other features of the system. Figure 7 is a prototype of the home page used by information system users to access features on the system

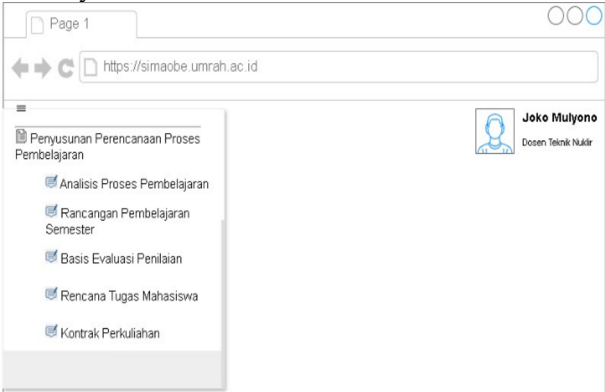


Fig. 7. Home Page Prototype Design

3. Semester Learning Plan Page

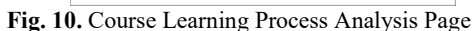
The Semester Learning Plan page is a page for accessing semester learning plans by course lecturers. The prototype results of the semester learning plan page are shown in Figure 8.



The Semester Learning Plan page is a page for accessing semester learning plans by course lecturers, as shown in Figure 9.



Course Learning Process Analysis Page is used by lecturers to analyze the learning process in the courses taught. On this page, lecturers can input course outcomes and sub-course outcome and Lecturers can fill in learning materials according to the meeting. as shown in Figure 10.



6. Semester Learning Plan Filling Page

Lecturers can input semester learning plans on this page, which consist of learning models, outcomes indicators and assessment criteria. as shown in Figure 11.

Mg	SubCPMK	Indikator Pencapaian	Model Pembelajaran/Sintaks	Kriteria Penilaian
1	(SubCPMK0411) Mampu menjabarkan pengertian Struktur Data, ADT dan Analisa Kompleksitas	■ Mampu mengidentifikasi peranan struktur data ■ Mampu mendeskripsikan ADT ■ Mampu mengidentifikasi		
2				
3	(SubCPMK0121) Mampu bekerjasama dalam kelompok			

Fig. 11. Semester Learning Plan Filling Page

4. Deployment Delivery & Feedback

After the initial design results or prototype of the OBE Assessment Information System are made, an analysis is carried out on the design of the information system to be made to obtain feedback from users about the features and appearance of the prototype information system. This activity is carried out with a Discussion Group Forum with users of the information system. The prototype of the OBE Assessment Information System is given to prospective users and to be shown and given a questionnaire and users provide feedback on the design of the information system. The results of the questionnaire and feedback on the OBE assessment information system through the Discussion Group Forum are presented in Table 1 and Table 2.

Table 1. Questionnaire Questions on Design

UI/UX Principles	Question	Answer
Learnability	Is the OBE Assessment Information System Prototype easy to learn so that there are no difficulties when operating the information system?	Easy
Efficiency	Is the OBE assessment information system prototype easy to use?	Easy
Memorability	Are the features used in the prototype OBE assessment system easy to remember and operate?	Easy
Satisfaction	Are you satisfied with the prototype of the OBE assessment information system?	Satisfied

Table 2. User Feedback on Design

Component	User Feedback	Conclusion
Login Page	The design is appropriate	Accepted
Home Page	The design is appropriate	Accepted
Semester Learning Plan Page	The design is appropriate	Accepted
Semester Learning Design Page	The design is appropriate	Accepted
Course Learning Process Analysis Page	The design is appropriate	Accepted
Semester Learning Plan Filling Page	The design is appropriate	Accepted

4 Conclusion

The results of the initial prototype of the information system, it was given to information system users using questionnaire testing tools and direct feedback using discussion group forums. The results of the questionnaire show that the application created can be used well based on the criteria, namely learnability, efficiency, memorability, and satisfaction. Apart from the questionnaire results, based on the discussion group forum that was conducted with Lecturers, Head of Study Programs, and Curriculum Admin, it was stated that the information system created can help users in processing OBE curriculum data and has provided information on measuring the results of the OBE curriculum. The participation of information system users, namely Lecturers, Heads of Study Programs, and Informatics Engineering Curriculum Admins in the development of an OBE-based curriculum assessment information system by providing input makes the results of the information system design easier to adjust to the needs of the Informatics Engineering Study Program in implementing the OBE curriculum assessment system. The use of the prototype method in this study can make it easier for developers to design a system so that it can produce an optimal system that is easy to adjust to needs and overcome problems related to OBE-based curriculum assessment so that efficiency is created in work. Thus, the UI/UX design in this system can be well received by system users, The difficulty faced in this study is that the system is limited to the website only. This assessment information system is designed with a lightweight and easy-to-use website base with the hope that users will find it easy to operate this information system is created with the aim that the OBE curriculum assessment process can run more effectively and efficiently and help lecturers in shortening the time for the student assessment process in the learning process. The results of the graduate learning outcomes obtained from the OBE Assessment System will be information that can be used by the curriculum field of the UMRAH Informatics Engineering study program to revise the curriculum, but the graduate learning outcomes is currently incomplete because it has only been running this year so that improvements to the new curriculum can only be made after the courses in the OBE curriculum have been completed by students or 4 years have passed. Suggestions that can be used as a reference in developing the system in the future are that the OBE assessment system can be expanded in scope by adding teaching and learning process management features and the information system can be integrated with other information systems that already exist in the Informatics Engineering study program and is expected to be use in other study programs in Universitas Maritim Raja Ali Haji.

Reference

1. K. Fadil, A. Amran, and N. I. Alfaien, *J. Gov. Integrity* **7**, 406 (2023).
2. F. Fitriastuti, A. E. Putri, A. K. Sunardi, and R. A. Hidayat, *Int. J. Educ. Technol.* **5**, 123 (2024).
3. F. X. A. P. Jampur, and D. J. Santjojo, *J. Public Adm. Policy* **14**, 256 (2022).
4. Y. Z. Z. Manik, *Proc. Islamic Educ. Conf.*, **25** (2022)
5. U. Nuraini, *J. Law Soc.* **3**, 98 (2023).
6. B. Thoyyib, and D. H. Zulfikar, *J. Inf. Technol. Innov.* **1**, 87 (2023).
7. M. A. Wicaksono, C. Rudianto, and P. F. Tanaem, *J. Digit. Gov.* **7**, 215 (2021).
8. I. Yunianto, and M. M. Mutoffar, *J. Cult. Stud.* **1**, 132 (2019).
9. R. Salim, and Z. Harahap, *J. Legal Stud.* **3**, 50 (2021).
10. A. F. Pratama, and T. Wardhana, *J. Artif. Intell. Gov.* **2**, 145 (2022).
11. A. Wahyudi, and D. S. Permana, *J. Public Sect. Manag.* **6**, 180 (2023).
12. L. Hidayati, and T. Sucipto, *Int. J. Educ. Admin.* **4**, 290 (2020).
13. A. Kurniawan, *J. Leadership Organ. Stud.* **5**, 340 (2022).
14. M. Fathurrahman, and I. M. Putra, *J. Islamic Econ. Dev.* **3**, 160 (2024).
15. S. Arifin, and P. W. Nugroho, *J. Law Technol.* **7**, 400 (2023).