

## The Implementation of a Chatbot and Website Interface in Department of Development Economic

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### ABSTRACT

The issue arising from this activity is the need to optimize the existing CMS Joomla-based website to make it more responsive and interactive in line with modern technological developments. The update was carried out using SP Page Builder as the main tool for interface development, while the chatbot was implemented using JavaScript technology with the Levenshtein Distance algorithm to provide automatic information services to users. The result of this practical work includes updates to several key components of the website, including the homepage, which is now equipped with a dynamic banner, a message from the head of the department, highlights of the study program, and a news and announcement section. The faculty and staff pages have been optimized with more comprehensive information, while the gallery page has been redesigned with a responsive grid layout. The chatbot implementation successfully provides automated information services for common academic questions, such as class schedules, KRS (course registration), and scholarships. Overall, these updates have improved the accessibility of information and the user experience in accessing the Department of Development Economics website.

## 1. INTRODUCTION

The website is one of the main tools for providing information to the academic community and the general public, both for academic and administrative purposes. The department of development economics at Malikussaleh University previously had a Joomla-based CMS website that served as the primary information hub. This website has served various needs, such as news publications, academic announcements, and administrative information [1]. The website also plays an important role in supporting communication between lecturers, students, and relevant parties in the learning process and other academic activities.

However, as technology advances and user needs become more dynamic, the interface and its features have started to feel less optimal. The website's design, which is not responsive, causes an uncomfortable display on various devices, especially on mobile devices that are now widely used. Additionally, the website's navigation, which is not intuitive, makes it difficult for visitors to quickly find the information they need. The limitations of interactive features also pose a challenge, particularly in providing a more personalized and efficient user experience.

Given these conditions, the existing website is deemed in need of an update to meet modern standards and provide a better user experience. This update includes the development of a user-friendly responsive design, improvements to the navigation structure to make it more accessible, and the addition of interactive features that can enhance comfort and efficiency in using the website. One of the proposed additional

features is a chatbot, designed to provide easy access to information automatically for users. This chatbot can provide up-to-date information, such as event schedules, academic information, announcements, and other services that can be accessed quickly and easily.

With the presence of this chatbot feature, it is hoped that users can obtain information more quickly and do not need to wait long to get answers to their questions. Additionally, the chatbot can enhance interaction between users and the website, making it more interactive and responsive to user needs. This website update is expected to improve user satisfaction and support various academic and administrative activities in department of development economics at Malikussaleh University.

## 2. CHATBOT

According to Russell and Norvig (2021), a chatbot is a software agent that communicates with users through a conversational interface, either text or voice [2]. In its development, chatbots can be categorized into two main types:

(1) Rule-Based Chatbot: Uses a set of predefined rules to respond to user input.

(2) AI-Based Chatbot: Uses machine learning algorithms to learn conversation patterns and provide more adaptive responses.

To provide effective interaction, chatbots typically use the following combination of technologies:

(1) Natural Language Processing (NLP): To understand, analyze, and generate human language. Examples include keyword parsing, sentiment analysis, or entity extraction.

(2) Keyword Matching Algorithms: Simple logic, such as the use of the Levenshtein Distance algorithm to detect typos and find the most relevant responses.

(3) Data Processing and Dynamic Responses: Utilizing databases or data structures to tailor responses based on the context of the conversation.

### 3. RESEARCH METHODS

#### 3.1 Observation

Data collection is carried out by directly observing the needs of the head of the department regarding the desired features for the chatbot and website interface to align with the vision of the department.

#### 3.2 Analysis

This stage is carried out to understand the needs and issues present on the department of development economics website. The analysis process includes:

- (1) Observing the functions and interface of the current website.
- (2) Gathering opinions from the head of the department regarding the desired features for the chatbot and website interface to align with the department's vision.

#### 3.3 Design System

In this stage, initial design is carried out based on the identified needs:

- (1) Determining the chatbot features, such as providing academic information, class schedules, administrative assistance, and specific information requested by the head of the department, such as guidelines for final projects and scholarships.
- (2) Implementing a keyword matching algorithm with input error tolerance (Levenshtein Distance).

## 4. RESULT AND DISCUSSION

### 4.1 Use Case Diagram

A use case diagram is one of the various types of UML (Unified Modeling Language) diagrams that illustrates the interaction relationships between a system and its actors. A use case can describe the types of interactions between the system's users and the system itself.

The functions of a use case diagram are as follows:

- (1) It is useful for showing the sequential activity process within a system.
- (2) It can depict business processes, even showing the sequence of activities in a process.
- (3) It serves as a bridge between the creators and consumers to describe a system.

The Use Case Diagram illustrates the interaction between actors and the system. On the department of development economics website at Malikussaleh University, there are various actors interacting with the system, such as administrators and users. Below is the use case diagram for the department of development economics website at Malikussaleh University.

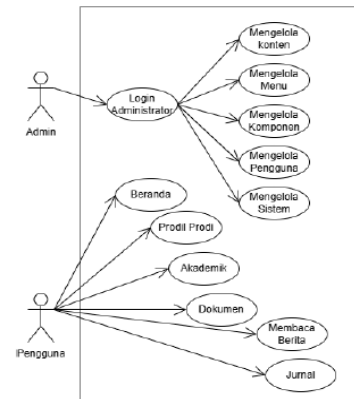


Figure 1. Use Case Diagram

### 4.2 Entity Relationship Diagram

An Entity-Relationship Diagram (ERD) is a visual representation used to model the data required in an information system, including elements such as entities, attributes, and relationships between entities. This diagram serves to illustrate the logical structure of a database, which forms the foundation for designing an information system [3].

The ERD (Entity-Relationship Diagram) is used to model the data structure used in system development. This diagram shows the entities in the system, their attributes, and the relationships between entities. In this system, the entities and relationships involved are as follows:

- (1) Admin: An entity responsible for managing articles, categories, and media in the system.
- (2) Article: An entity that represents the content or information displayed on the website. Articles have relationships with Admin (created by) and Category (categorized under).
- (3) Category: An entity used to group articles based on a specific theme or topic.
- (4) Media: An entity that stores files or images related to articles uploaded by Admin.

The relationships between the entities are shown as follows:

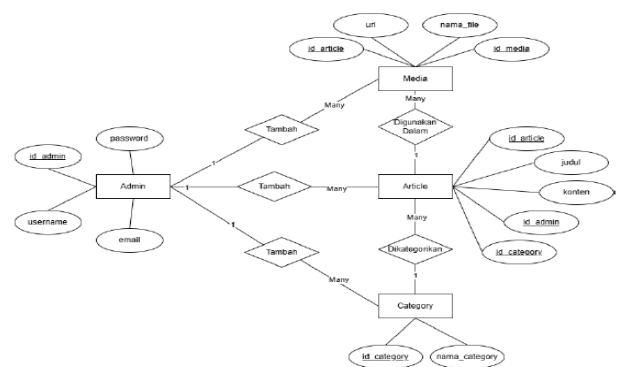


Figure 2. Entity Relationship Diagram

### 4.3 Implementation of Chatbot

In this section, the implementation of the chatbot is explained. The chatbot is designed to help answer various frequently asked questions from students, such as class schedules, KRS filling procedures, scholarship information, and other related topics. This chatbot utilizes JavaScript with a keyword-based approach combined with an error tolerance algorithm for input (typos) through the use of Levenshtein Distance calculations. Below is the analysis and discussion related to the chatbot implementation based on the provided code:

- (1) Response Data Structure:
- Array responses: This array contains objects, each of which has two main properties:
    - keywords: An array of keywords that will be used to match the user's questions.
    - response: The reply message that will be given if a matching keyword is found in the user's input.
  - By using this array, the chatbot can map relevant questions to the appropriate responses.
- (2) Keyword Matching:
- To match keywords with user input, this algorithm uses Levenshtein Distance to measure how similar two words or strings are. Levenshtein Distance is a metric that measures the number of operations (insertions, deletions, or substitutions of characters) required to transform one string into another.
  - The Levenshtein Distance function calculates the distance between two strings and returns a numerical value. This value is used to determine how "close" the user's input is to the keywords in the responses array.
  - Typo Tolerance: Typo tolerance is determined by a threshold set to a value of 6. This means that if the Levenshtein distance between the user's input and a keyword is greater than 6, no match will be found. This allows the chatbot to still provide a response even if there are small typos.
- (3) getResponse Function:
- his function is responsible for processing the user's input and matching it with keywords in the responses array. If a sufficiently close match (within the typo tolerance) is found, the chatbot will provide the appropriate response.
  - The process is as follows:
    - Convert all characters of the input to lowercase to avoid capitalization differences. The entire user input is transformed to lowercase before processing.
    - Check each keyword in the responses array against the user's input using Levenshtein distance to calculate the difference between the two.
    - The system selects the keyword with the smallest Levenshtein distance as the best match, with typo tolerance for small errors.
    - If no match is found, the chatbot will provide a default response: "Sorry, I don't understand your question."

considered crucial for improving user comfort, such as visual design, navigation, and responsiveness. Below are some of the website interface updates:

#### 4.4.1 Homepage

This page is the main page of the department of Development Economics at Malikussaleh University, designed to provide comprehensive information about the department. This main page serves as a gateway for users to access various important information related to the department, for students, lecturers, and the general public.

This main display includes various elements aimed at presenting information clearly and systematically, including a welcome message from the Head of the department (Kaprodi) that provides an overview of the program's vision, mission, and objectives. Additionally, this page also provides information regarding the number of teaching staff, consisting of highly qualified lecturers who are ready to support academic activities. Furthermore, information about the number of alumni who have graduated from this program is also displayed, offering an overview of the program's success in producing quality graduates.

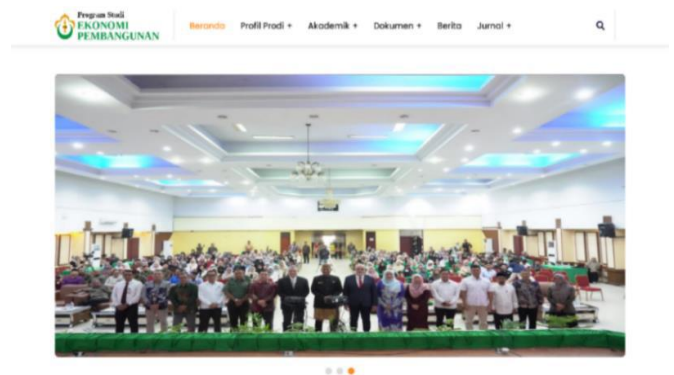


Figure 4. Homepage

#### 4.4.2 Lecturers and Staff Page

This page is the user profile page designed to display personal information of the teaching and educational staff in the development economics department at Malikussaleh University. This profile page has a uniform layout and can be accessed by all types of users, including admins, lecturers, and students. With a consistent format, this page facilitates the management and access to relevant and important information for each user.

At the top, there is a list of teaching staff complete with their names, titles, positions, and areas of expertise. The bottom section of the page contains information about the educational staff, including administrative staff and other managers. The design of this page is created to present the information neatly and clearly, providing an optimal navigation experience for users.

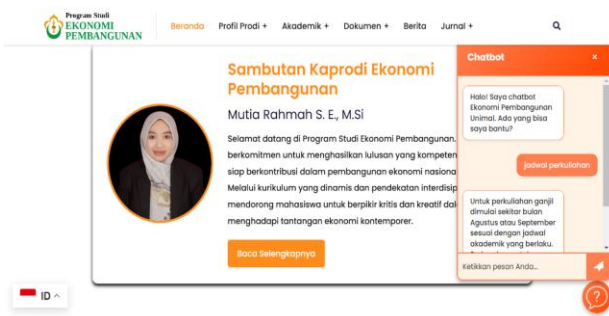


Figure 3. Chatbot Display

### 4.4 Interface Update

The interface update aims to enhance the user experience and ensure that the system's design remains relevant and in line with the needs and preferences of the users. This update is made with the goal of making the interface more accessible, intuitive, and enjoyable to use. In this context, the changes to the website interface focus on several key aspects that are

## Tenaga Pengajar



Figure 5. Lecturers and Staff Page

### 4.4.3 Gallery Page

The display of this page is the gallery page of the Development Economics Department. This page serves to showcase various visual documentation of activities related to the study program, such as student activities, achievements, and other events.

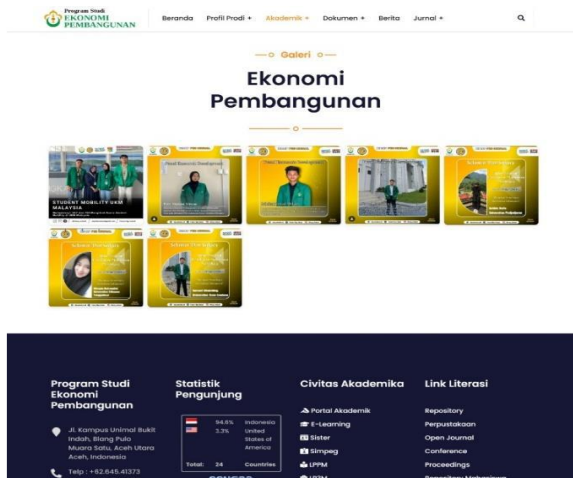


Figure 6. Gallery Page

### 4.4.4 News Page

This page is the news page of the Development Economics Department at Malikussaleh University, designed to display various up-to-date information about activities, achievements, and important announcements related to the department. This page serves as the main communication channel to ensure that all information regarding academic activities, research, and relevant events can be easily accessed by users.

Overall, this news page serves as an important source of information for the entire academic community of the Development Economics Department, with the aim of ensuring that the information shared is always up-to-date, well-organized, and easily accessible to anyone who needs it.



Figure 7. News Page

## 5. CONCLUSION

(1) Interface and Functionality Updates: a) SP Page Builder as a page development tool enables a responsive and modern design. b) The homepage has been redesigned to serve as an information hub with features such as a navigation header, banner, welcome message from the head of the department, program highlights, latest news, and announcements.

(2) Enhancement of the Lecturer and Gallery Pages: a) Information about lecturers and staff is now more comprehensive, including additional photos, NIP (Employee Identification Number), positions, expertise, and academic links. b) The gallery page adopts a dynamic grid and lightbox feature for easier access to documentation.

(3) Chatbot Innovation: a) The chatbot, based on JavaScript technology with the Levenshtein Distance algorithm, is able to quickly and efficiently answer questions related to schedules, KRS (Study Plan Cards), scholarships, and other academic information. b) The intuitive chatbot design and its strategic position enhance the user experience without disrupting the main navigation.

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