

Implementing Artificial Intelligence Chatbot in Moodle Learning Management System

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ARTICLE INFO

Article history:

Received Dec 30, 2021

Revised Jun 29, 2022

Accepted Jul 22, 2022

Keywords:

Learning Management System,
Web-Based Technology,
E-Learning,
Artificial Intelligent,
Chatbot

Conflict of Interest:

None

Funding:

None

ABSTRACT

Learning Management System (LMS) is a software application or web-based technology that is used to develop, implement, and evaluate a specific learning process. KYP has implemented an e-Learning Management System (e-LMS) using Moodle since early 2021. The main features already implemented in this e-LMS is course details and it should also support the communication process between lecturers and students where currently, the KYP e-LMS lack of. Usually, students will ask the same question to their lecturer in person and cause the lecturer to have to give the same answers repeatedly. This results in a waste of time for both parties in answering and receiving answers. To overcome the problem, there is a need to replace the manual way of getting answers to any kind of academic or course related questions repeatedly. The main objective of the project is to develop an intelligence Chatbot which can help students finding academic related information without the need to ask their instructors or spent more time browsing menus in e-LMS. E-LMS has been developed based on Rational Unified Process (RUP) approach. In this project, the Moodle system is fully implemented by integrating with Kommunicate, one of the Cloud software and Dialog Flow, which is a chatbot plugin system connected with Google Cloud Platform. An AI Chatbot able to interact with students and can provide answer to students' queries instantly despite of the place, date and time zone of the student as well as enhances interaction which provides a feel of support to the students.

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1. Introduction

The e-Learning Management System (e-LMS) is an online platform that connects university education professors and students. A e-Learning Management System (e-LMS) allows for easy sharing of classroom content. It is also an online education platform that allows lecturers and students to communicate and interact (Subramanian et.al., 2014) outside of the classroom, such as through discussion boards or chatbots, which would otherwise take up too much of the time that should be spent in the classroom and during learning. According to Aydin and Tirkes (2010), e-learning technologies able to reduce the learning time with the average of 50 percent. Students in higher education are essentially self in their learning because lecturers typically hand out lecture notes for them to discover on their own, as opposed to the one-way learning approach used in primary and secondary school. Consequently, university students must continually improve their knowledge by seeking information on their respective subjects. In September 2020, Kolej Yayasan Pahang (KYP) has been implementing this e-LMS to their students. The KYP e-LMS was developed by using Moodle software which is located on KYP server. This system was developed to organize the student classrooms. Through this e-LMS, student can access their course module, which is view their course classroom, review their assignments, tutor, test, and their course grading. Students can do their test, tutor and quiz and lecturers also can mark their answers and submitted it through this module.

2. Literature Review

2.1 Moodle Learning Management System

Moodle is an open-source community that was established in 2001 as an outcome of Martin Dougiamas' PhD research project (Momani, A.M., 2010). Moodle, as a web application, has support and development limitations that are not typical. This is because of how Moodle is implemented. A user interacting with Moodle will make more clicks than usual, and Moodle will generate several SQL queries while it develops a page. Moodle is extremely effective at what it does. What it does, though, is somewhat complex. This means that as developers, we must be aware of the architectures in which our improvements will most likely be employed. It also implies that we must be mindful of the performance implications of our coding. Figure 1 below depicts some common Moodle settings in a production environment. Moodle, such as the basic PHP application framework, scales at specific points. The database is the first scalability point, and it is readily relocated to a separate physical server. After that, we may use a load balancer to add more frontend web servers. When using multiple web servers, developer also need shared storage for Moodle data. Session data can be stored in either Moodle data or in the database. The database server is the point where Moodle's scalability is most limited. To scale the database, a faster database server should be brought in to replace the older server. As with web application servers, there is currently no standard mechanism for scaling a single Moodle installation across multiple master database servers (Moore & Churchward, 2010). In this project the Moodle software will be install on UNIX cPanel server platform, by using MySQL as installation database and Google Cloud Platform (GCP) for Dialog Flow. In technical support, admin will be the Helpdesk in this system and English language will be implement for the first test run. Kolej Yayasan Pahang will be the client of this project and costing for this project is free (Table 1).

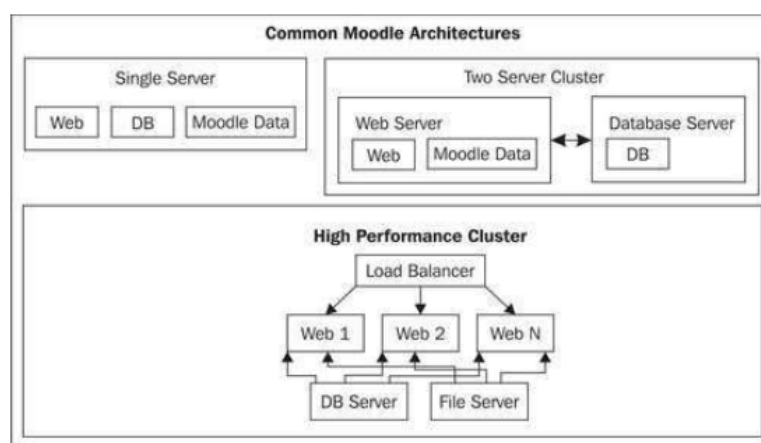


Figure 1. Common Moodle Architecture (Moore & Churchward, 2010)

Based on Figure 1., there are three common Moodle architecture which is Single Server, Two Server Cluster and High-Performance Cluster. Two Server Cluster has been adapted for this project due to the architecture suitability. Two Server Cluster was separated into two-parts, Web Server which covers the Moodle Server and Database Server will cover the installation of Moodle and implementation of Google Cloud Platform for Dialog Flow.

Table 1. Moodle Technical Specification

Hardware/Software	
Client browser required :	All major web browsers work fine.
Database required :	1. MySQL – Installation, 2. Google Cloud Platform (GCP) – Dialog Flow
UNIX server :	UNIX cPanel Server
Windows server :	-
Technical Support	
Help desk :	Students can access context sensitive help for any tool. The system includes online tutorials which may help students learn how to use the system
Languages	English (Malaysia)
Pricing/Licensing	
Company profile :	Kolej Yayasan Pahang, Kampus Indera Mahkota.
Cost :	Free
Open source :	OSI-approved licenses.

2.2 Dialogflow and Kommunicate Integration

Dialog Flow is the main tools that were used in this project. It is a Natural Language Understanding platform that makes it easy to design and integrate a conversational user interface into your mobile app, web application, device, bot, interactive voice response system, and so on. Using Dialog Flow, you can provide new and engaging ways for users to interact with your product (Google Cloud, n.d.). Dialog Flow will integrate Google Chatbot with the Moodle platform to provide online information to students seeking clarifications around their course curriculum. The proposed integration is for a university to aid/assist in information triage and provide a speedy response (real time) to questions and queries on interest. The area of focus is on student needs and addresses the academic, enrollment, student life questions and clarifications.

Kommunicate's purpose is to support your startup long-lasting client relationships that generate growth. Developer can manage client discussions, design, and integrate chatbots, website chat, support agents, team conversations, and customer happiness features all in one place with Kommunicate. There was 4 major works that must be done to integrate the chatbot by using Cloud platform. Table 2 shows the Cloud workflow. Dialog Flow is the most important platform in this system implementation, which the chatbot training platform. Dialog Flow ES was integrated with Kommunicate platform. Chatbot training has divided into two main phases which is Training Phrases and Responses. For this project, developer has implemented the Intent and Entities method in this project.

Table 2. Cloud Workflow

Platform	Workflow
Kommunicate	<ul style="list-style-type: none"> Integrate within Moodle and Dialog Flow. Chatbot Training by using Dialog Flow baseline.
Dialog Flow	<ul style="list-style-type: none"> Chatbot Integration & Training Baseline Update training to Moodle through Kommunicate platform.
Google Cloud Platform	<ul style="list-style-type: none"> Provide JSON File Provide API key Database storage
Moodle	<ul style="list-style-type: none"> Receives chatbot updates from Dialog Flow through Kommunicate. Response based on training.

3. Method

The Rational Unified Process (RUP) approach was employed in this project since the phases and disciplines are appropriate for the development of this project. Rational Unified Process (RUP) is an agile software development methodology that organizes a project's or software development's life cycle into four phases; inception, elaboration, construction, and transition (Shiklo, 2019). Figure 2 shows the RUP iterative lifecycle.

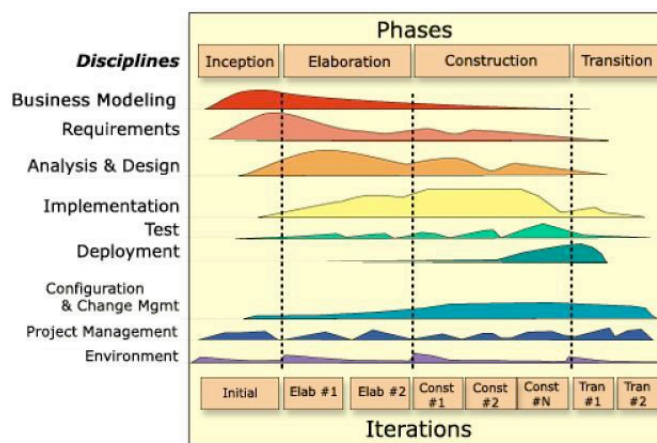


Figure 2. RUP iterative lifecycle (Anwar, 2014)

3.1 RUP Phases

3.3.1 Inception phase

In the Inception phase, the focus is on the project launch. The Unified Modeling Language (UML) was used as the modelling language while Microsoft Visio was used as the design method to develop the UML diagrams. The UML diagrams can be modified based on the new needs to the iterative process. The project's system architecture was also specified, and at the end of this phase, the project's status is known whether to proceed

with the project or not. The outputs of this phase are the defined objectives and scopes of the project, a clear requirement of the project, the initial sketching of use cases and domain models of KYP LMS which were only 10% completed and the selection of technology to be used in application development.

3.3.2 Elaboration phase

This phase focuses on the project's major technical risks. The results of this phase are the system and user requirements of KYP LMS, the complete use cases of KYP LMS which were almost 60% completed including the sequence and activity diagrams, almost 45% of the module plugin has been implemented, a complete sketching of use cases and domain models of KYP LMS and a Gantt chart was developed for project planning purpose.

3.3.3 Construction phase

The Construction phase will focus on the system design's complete development and implementation. This phase builds on the Elaboration phase by putting the working system into a real-world setting. An executable system has been generated and deployed in Moodle. The module was implemented and debugged. At this phase, a beta version of the system was ready to be evaluated and advanced to the next phase at the end of this phase. The results of this phase are KYP LMS requirements and design is completed, the project's goal and objectives were achieved, the AI Chatbot module was tested in real Moodle platform, the User Acceptance Test (UAT) was done and the project report and documentation were also prepared.

3.3.4 Transition phase

The Transition phase was focused on satisfying the needs of the end user. As a proposed result, user feedback is critical for system evaluation to address any concerns that may occur, such as usability and security. The module is ready to be released to students at the end of this phase. The results of this phase are all bugs have been fixed, a complete user manual prepared for students and lecturers and the KYP e-LMS AI Chatbot was implemented in Moodle application.

4. Results and Discussion

This part discusses the implementation and testing of AI Chatbot system which is a Cloud integration application that provides information regarding the academic issues. Implementation and testing are vital phases within the overall process of the system development. This project has been implemented and tested in Kolej Yayasan Pahang server.

The project's interface is shown in Figure 3. Figure.3(a) shows the main view of the KYP Bot. Students can view their previous conversations on the chatbot. Student can start their new conversation by click 'Start Conversation' button. Figure.3(b) shows the example view of the KYP Bot once students click 'Start Conversation' button. In this project, student can ask based on Intent and Entity that was trained by developer. on Figure.3(c), shows the example of process that student can download direct their academic calendar by click the link that provide by chatbot.

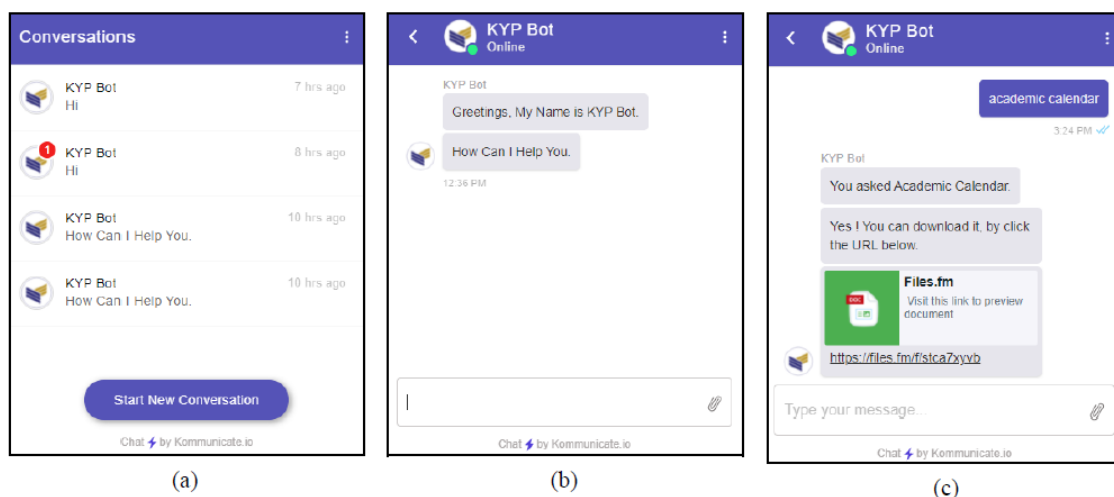


Figure 3. Interface of KYP Bot

Figure.3(a), The chatbot will gives the responses based on the user input, but as a starting the chatbot will greet the user before starts the conversation. The example of training is shown as below:

- *Human* : Greetings (Hello, Hi, Good Morning, Good Afternoon, Good Evening)
- *Robot* : Similarly, chatbots respond to everything that is related to the relevant patterns and chatbots will know the correct answer. Algorithms will assist in taking it to the next level based on Intent and Entity.

Figure.3(b), Student can ask based on Intent and Entity that was trained by developer, the questions are related to 'Download Academic Calendar', 'Outstanding Balance Info', 'Direct access link to student portal', 'Course Details' and 'Mid Semester Break and Final Exam date'.

5. Conclusion

LMS platform have been widely used nowadays since most of student are start their studies in online platform. There were many LMS platform that used in this world depends on the University/College implementation. Hence, new features are being developed every day and uploaded onto LMS platform. Student can communicate with the chatbot to get their studies needs at any time, and anywhere if the student has their Internet connection and have their student ID to access their dashboard. This chapter also discusses the result and achievement of the project objective and suggested plan for project implementation. All processes and activities that have been planned for the construction of KYP AI Chatbot have been completed. The architecture of the project was identified, objectives and scope were defined, literature related to the project was studied, methodology for analysis and development of the system was specified and discussed and, implementation and testing of the system has also been conducted. Finally, KYP AI Chatbot will be a communication tools for all students which the chatbot was trained with full of academic information.

Acknowledgements

We would like to thank to Information Technology Unit of Kolej Yayasan Pahang, for providing the information and server configuration to prepare for this system.

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