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***Unit Name : Managing IT Projects***

***Unit Code : SWE30010***

**Project Proposal[[1]](#footnote-0) :** *Intelligent Chatbot*

**Problem Domain:**

Mr. Lei Sing Hong's team faces difficulty accessing and understanding software project documentation quickly. Onboarding new programmers is time-consuming due to the complexity of the existing project data.

**Solution Domain 1:**

The chatbot provides an efficient way for employees to access contextual knowledge quickly. It integrates with existing project management systems to allow real-time tracking of project status, client details, and project documentation. **RAG** is chosen to retrieve relevant information from the project data, ensuring quick access to accurate and up-to-date information. While **BERT** plays a supporting role in understanding the intent behind user queries, **RAG** is the core for document retrieval and generating accurate responses.

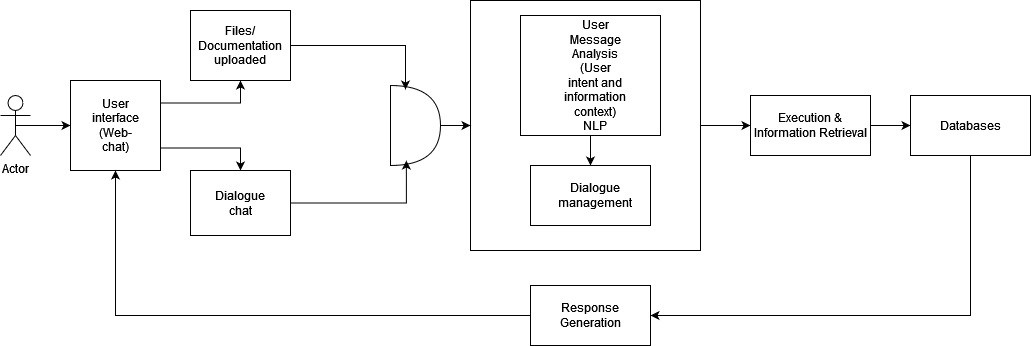
**Solution Domain 2:**

AI-powered chatbot This solution domain focuses on the implementation of an AI-powered designed to help staff and new programmers access essential project information effectively, streamline project management processes and reduce onboarding time. This solution leverages advanced AI technologies, integrates with existing project management tools and Azure SQL, LangChain and Chainlit to create a user-friendly, responsive system.

**The solution**

This solution focuses on developing an AI-powered chatbot to help employees access project information quickly and efficiently. The chatbot will act as a virtual assistant, providing easy access to tasks, deadlines, updates, and documents, which reduces onboarding time and improves productivity. It will use Azure SQL for secure and scalable data storage, ensuring project information is organized and easy to retrieve. Employees can interact with the chatbot using natural language, and it will integrate with existing tools to provide real-time updates. With role-based access controls via Azure Active Directory, the chatbot ensures data security. Over time, it will learn from interactions, improve the responses and make project management more seamless for the entire team.

**High Level Diagram**



*Based on the diagram above shows the architecture diagram of the chatbot. The diagrams show how the interaction between the user and the chatbot should behave. In the diagram, the user can interact with the chatbot via the chat that’s been provided. Any information that the user key-in will then have to go through the user-message analysis process which includes any files uploaded for the chatbot to identify the user’s intent and the context of the information based on the user’s queries after then it will go through dialogue management. The user can’t just uploaded its file without stating its purpose nor reason otherwise the chatbot wouldn’t understand what the user wants. After that, it goes through the execution and information retrieval which there the chatbot will check if there is any information that can fulfil the user’s queries from the databases. From there, the information retrieved will be sent to the response generation which then will be sent and displayed on the chat for the user to review.*

**KoST (Knowledge, Skill, Technology) Gap Analysis**

**Knowledge Gap Analysis (Solution 1)**

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| **Team Member Name** | **Gap Analysis** |
| Lorenzo Anak Martin | * Limited understanding and knowledge of RAG architecture and BERT, which are crucial in making intellectual chatbot. * Require a lot of understanding of RAG and BERT theory to be able to understand. * Limited understanding of Retrieval-Augmented Generation (RAG), particularly regarding how it merges information retrieval with generative abilities to produce precise and relevant answers from extensive datasets. |
| Derrick Lu Qing Lee | * Lack of comprehensive knowledge of software documentation standards and effective methods to manage and retrieve project documentation quickly. * Needs a deeper understanding of how BERT and RAG models complement each other to optimize query responses. * Limited knowledge of best practices for project status tracking via automated systems integrated with project management tools. |
| Bazilah Mardhiah Binti Azman | * Limited knowledge about RAG architecture and its underlying algorithms. * Lack understanding of advanced natural language processing (NLP) techniques and their applications in chatbot development. * Need for deeper understanding into existing knowledge base structures and how to effectively integrate them with the chatbot. |
| Nur Nazurah Binti Abdul Rased | * Not familiar with the usage of RAG architecture in the field of natural language processing (NLP). * Research and learning are needed to understand the full potential and benefits of RAG and BERT. * Lack of understanding about the function for each model that could really help in creating a intelligent chatbot. |

**Knowledge Gap Analysis (Solution 2)**

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| **Team Member Name** | **Gap Analysis** |
| Lorenzo Anak Martin | * Limited understanding and knowledge of Natural Language Processing and Conversation AI concepts, which are crucial in making intellectual chatbot. * Lacks familiarity with how NLP models interpret, process, and generate language through methods such as tokenization, stemming, or lemmatization. * Limited experience with Azure, particularly regarding AI services, machine learning, and cloud-based deployment for NLP applications. |
| Derrick Lu Qing Lee | * Requires a better understanding of how NLP models (like BERT) work and how RAG retrieves information contextually from large data sources. * Needs to gain knowledge about integrating AI-driven chatbots with Azure SQL and project management tools effectively. * Limited familiarity with LangChain and its capabilities in handling workflows across different chatbot operations. |
| Bazilah Mardhiah Binti Azman | * Need to increased knowledge of AI technologies and how to use them to create conversational bots is necessary, especially when integrating Chainlit and LangChain. * Lack of understanding of natural language processing (NLP) models, which are crucial for building chatbots that can effectively understand and respond to user queries. * Lack of knowledge in best practices for integrating AI-powered systems with Azure SQL and existing project management tools. |
| Nur Nazurah Binti Abdul Rased | * Only familiar with the surface of AI technologies such as the basic concept and definition. * Requires deep learning about the open-source framework such as LangChain in order to work with it smoothly and with full potential. * Need to fully understand on how to use all the tools and technologies to create a user-friendly system. |

**Skill Gap Analysis (Solution 1)**

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| **Team Member Name** | **Gap Analysis** |
| Lorenzo Anak Martin | * Need to develop skills in machine learning frameworks like **PyTorch** or **TensorFlow** to implement RAG or fine-tune **BERT** models. * Lack of experience in integrating **pre-trained models** like RAG or BERT into applications via APIs. * No hands-on experience with data pre-processing, training, or fine-tuning models for NLP tasks using BERT. |
| Derrick Lu Qing Lee | * Needs to develop better skills in analyzing user queries and mapping them to appropriate project documentation. * Requires training in using tools for project tracking and integrating AI solutions with existing systems. |
| Bazilah Mardhiah Binti Azman | * Need for improve skills in machine learning, specifically in training and refine NLP models. * Limited experience with data handling, including database management Azure SQL and information retrieval techniques. |
| Nur Nazurah Binti Abdul Rased | * Need to achieve and successfully develop skills in machine learning frameworks. * Lack of experience in dealing with RAG and BERT models and requires training and learning to use them accordingly. |

**Skill Gap Analysis (Solution 2)**

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| **Team Member Name** | **Gap Analysis** |
| Lorenzo Anak Martin | * No skills in deploying NLP models to the cloud using Azure Machine Learning, or integrating cloud-based NLP solutions into web applications. * No familiarity with using APIs to leverage pre-trained NLP models for chatbot integration. |
| Derrick Lu Qing Lee | * Requires hands-on experience with Chainlit to build seamless, interactive chatbot interfaces and automation workflows. * Needs to improve skills in integrating databases such as Azure SQL with chatbots for real-time data retrieval and updates. * Needs experience working with LangChain to build complex chatbot architectures for better project management workflows. |
| Bazilah Mardhiah Binti Azman | * Lack of experience in implementing and fine-tuning advanced AI models for conversation, particularly with LangChain for conversational agents. * Need to develop expertise in integrating Chainlit to create interactive chatbot interfaces and chain workflows for task automation. * Lack of experience in combining AI-powered chatbots with database systems like Azure SQL for real-time data access and retrieval. |
| Nur Nazurah Binti Abdul Rased | * No experience in dealing with advanced AI, especially with the LangChain, Chainlit and not really familiar with the mentioned database which is Azure SQL. * Limited knowledge of the workflow and tools used in this project management. |

**Technology Gap Analysis (Solution 1)**

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| **Team Member Name** | **Gap Analysis** |
| Lorenzo Anak Martin | * Lacks understanding of how RAG conducts document retrieval using tools like Elasticsearch, or dense retrievers, and how it integrates with generative models to produce responses. * No experience working with transformer-based models like BERT for fine-tuning these models to perform specific NLP tasks. |
| Derrick Lu Qing Lee | * Limited exposure to using tools and platforms for automating project management processes through AI-powered solutions. * Needs to explore more advanced techniques for integrating BERT and RAG with project tracking systems. |
| Bazilah Mardhiah Binti Azman | * Lack of familiarity with RAG frameworks and libraries that make retrieval augmented generation models easier to develop. * Need for knowledge of integrating Azure SQL databases with chatbot frameworks for seamless data access and management. * Lack of experience with tools for NLP and machine learning that are essential for building the RAG-powered chatbot. |
| Nur Nazurah Binti Abdul Rased | * Needs to improve understanding of complex data indexing techniques such as using vector search and approximate nearest neighbor algorithms. * No experience in deploying and scaling NLP models that include load balancing and monitoring performance. |

**Technology Gap Analysis (Solution 2)**

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| **Team Member Name** | **Gap Analysis** |
| Lorenzo Anak Martin | * No experience with Azure services like Azure Cognitive Services, Azure ML, or Azure Blob Storage, which are used to store big data and run language models in the cloud. * No experience with the Langchain framework, which helps build applications that link large language models (LLMs) to external knowledge sources like databases and documents, while simplifying retrieval systems and memory management in AI applications. |
| Derrick Lu Qing Lee | * Limited experience working with AI frameworks such as Chainlit and LangChain to develop conversational agents. * Needs to acquire skills in using cloud-based platforms like Azure Cognitive Services or OpenAI APIs to enhance chatbot functionality. * Requires further understanding of connecting AI-driven chatbots with project management tools for streamlined workflow automation. |
| Bazilah Mardhiah Binti Azman | * Limited exposure to advanced AI frameworks and libraries for building conversational agents. * Lack of understanding in using Chainlit to manage complex chatbot workflows and dynamic interactions. * Need to acquire more expertise in cloud-based tools and services for AI-driven projects, such as Azure Cognitive Services or OpenAI APIs for enhancing chatbot functionalities. * Experience with tools for model deployment and integration into the chatbot's web interface is needed. |
| Nur Nazurah Binti Abdul Rased | * Not exposed to Azure SQL database management and cloud integration and more familiar with the other services. * Lack of experience in dealing with advanced AI technology especially the libraries and frameworks such as LangChain that’s used for fine-tuning and RAG for natural language processing tasks. |

1. This document is by no means a “full project proposal”. It has been simplified and customized for the purposes of SWE30010 teaching. The full project proposal includes many other sections which have not been discussed during the first few weeks of SWE30010 teaching. [↑](#footnote-ref-0)