

UMP INTELLIGENT CHATBOT
Using DIALOGFLOW

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**BACHELOR OF COMPUTER SCIENCE
(COMPUTER SYSTEMS & NETWORKS)
WITH HONOURS**

UNIVERSITY MALAYSIA PAHANG

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UMP INTELLIGENT CHATBOT

Using DIALOGFLOW

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ABSTRAK

Kemajuan teknologi kecerdasan buatan membolehkan Chatbot membantu urusan seharian. Ia memerlukan masa dan kos yang tinggi untuk membayar gaji pekerja dan ketersediaan khidmat pelanggan adalah terhad. Chatbot adalah program automatic yang berinteraksi dengan pelanggan seperti manusia dan tidak memerlukan kos. Untuk membina Chatbot seperti itu, algoritma pembelajaran mesin digunakan untuk mempelajari Bahasa manusia yang terutamanya semasa perbualan tersebut. Pemprosesan Bahasa Tabii (Natural Language) untuk meletakkan kecerdasan buatan di dalam Chatbot yang membolehkan komputer memahami manusia bagaimana mereka bercakap dalam bahasa normal. Bahasa Tabii (Natural Language) adalah cara komputer menganalisis, memahami dan memperoleh makna dari bahasa manusia dengan cara yang pintar dan berguna. Dengan menggunakan pemprosesan Bahasa Tabii (Natural Language), dapat organisasi dan menyusun pengetahuan untuk melakukan tugas seperti ringkasan automatik, terjemahan, pengecaman entiti nama, pengekstrakan hubungan, analisis sentimen, pengucapan dan segmentasi topik. Chatbot menganalisis input teks, memberi tindakbalas dari input teks yang diterima. Maklumbalas yang diberi oleh Chatbot adalah dalam bentuk teks dan suara. Wakil khidmat pelanggan biasa diberikan manual arahan yang mesti mereka teliti, chatbot pintar diberi banyak bilangan log perbualan, dan dari log tersebut, chatbot dapat memahami jenis keperluan soalan dan jenis jawapan. Khidmat pelanggan yang sedia ada menyebabkan kelewatan masa balasan kerana wakil sokongan pelanggan perlu melayan satu pelanggan pada satu masa. Manakala, chatbot dapat melayani pelanggan setiap masa sepanjang hari dan minggu dan tidak dibatasi oleh masa atau lokasi fizikal. Chatbot pintar ini membolehkan pengguna hanya mengemukakan soalan dengan cara yang sama seperti mereka akan mengemukakan dengan manusia. Projek ini bertujuan untuk membangunkan perisian Chatbot yang berupaya untuk menjawab kebanyakan soalan di Universiti Malaysia Pahang (UMP) dengan menggunakan aplikasi DialogFlow yang menggunakan Pemprosesan Bahasa Tabii (Natural Language).

ABSTRACT

Advances in artificial intelligence technology allow Chatbot to help with day-to-day affairs. It takes a lot of time and costs to pay up for the salary of customer service, and the availability of customer support is also limited. A chatbot is an automated program that interacts with customers like a human would and cost little to nothing to engage with. To create such a chatbot, a machine learning algorithm is used to learn the human language that is mainly used during such conversations. Natural language keyword phrases put artificial intelligence in chatbots that allow computers to understand how humans talk in normal language. Natural Language keyword phrases are a way for computers to analyze, understand, and derive meaning from human language smartly and usefully. Utilizing the Natural Language keyword phrases model can organize and structure knowledge to perform tasks such as automatic summarization, translation, named entity recognition, relationship extraction, sentiment analysis, speech recognition, and topic segmentation. The chatbot analyses the text input considers the best response and delivers that back to the user. The chatbot's reply output will be delivered as written text and voice commands. While normal customer service representatives are given manual instructions which they must be thorough with, a customer support chatbot is nourished with many conversation logs, and from those logs, the chatbot can understand what type of questions needs, and what kind of answers. Existing customer service causes a delay in response time because customer support representatives must serve one customer at a time. Whereas chatbots attend to customers at all times of the day and week and are not limited by time or a physical location. A chatbot allows a user to simply ask questions in the same manner that they would address a human. This project aims to develop a chatbot that can answer most questions at University Malaysia Pahang by using the DialogFlow application that uses the Natural Language keyword phrases model in the intent data.

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LIST OF ABBREVIATIONS

NLP	Natural Language Processing
ML	Machine Learning
AI	Artificial Intelligence
HCI	Human-Computer Interaction
HTML	Hypertext Markup Language
CSS	Cascading Style Sheets
JSON	JavaScript Object Notation
MIT	Massachusetts Institute of Technology
GUI	Graphical User Interfaces
HDFC	Housing Development Finance Corporation Limited Bank
SDLC	Software Development Life Cycle
SMTP JS	Simple Mail Transfer Protocol JavaScript
API	Application Programming Interface

CHAPTER 1

1.1 INTRODUCTION

The background of integrating the chatbot system with the University Malaysia Pahang website is presented in this chapter. Apart from that, a problem statement is created depending on the results of the survey. The solution and approach to the problem are then defined to meet the project's objectives and scope.

1.2 BACKGROUND OF THE PROJECT

Over the last two decades, Artificial Intelligence (AI) Chatbots have received attention. AI Chatbots can be defined as machines that interact with humans and solve problems encountered with computer-generated information in the real-world environment. They are simulations that can understand human language, process it, and re-interact with the human while performing certain tasks. Messaging apps are now more widely used on social networks, which is good news for AI Chatbots because they are inspired by such apps. AI Chatbots are typically used in dialogue systems for a variety of purposes such as customer service or information acquisition. AI Chatbots applications use a database of information and pattern matching together with machine learning, natural language processors, and sophisticated Artificial Intelligence (AI) algorithms to search for keywords and generate feedback using common phrases obtained from libraries or stored databases. But how does an AI Chatbot translate human language and how does it understand messages and perform tasks required by users? The answer to his question is thorough the use of Natural language processing (NLP). (Sofie & Annasc, 2018).

AI algorithms enabled Natural Language Processing (NLP), allowing Chatbots to understand and respond to user messages. Natural Language Processing focuses on how technology can interpret and act on human language input in a meaningful way. NLP allows technologies like Alexa to understand what we are saying and how to react to it. Without Natural Language Processing, AI that requires language input is relatively useless. Therefore, NLP plays a very important role when building a Chatbot. (Brandtzaeg & Følstad, 2017).

Customer service representatives require high time and cost to pay employees' salaries and the availability of customer service is limited as well. As we know, machine learning and deep learning are among the technologies undergoing very rapid advancement. However, customer service is still in the old style where customer service representatives should be in place. (Lee & See, 2004). This project aims to develop customer service based Automated Chatbots using Natural Language Processing keywords in the user input.

1.3 PROBLEM STATEMENTS.

With modern technology's advancement, traditional methods are no longer effective. Customer service costs a lot of money right now. When it comes to customer service, a hiring and training process must be followed. New employees must be informed of the ins and outs of the company and its products so that the customer service representative can answer requests accurately. This requires additional time and a high investment of money. Next, existing customer service will not be able to do 24-hour work. With a customer service team, the time available for customers to access support is limited, as most companies are unable to establish 24/7 support staff. If a customer has a problem that is outside of working hours, they should wait. Also, the response time is slow. Existing customer service causes a delay in response time because customer support representatives must serve one customer at a time.

Furthermore, as previously discussed regarding the conflict in customer service, the common challenges that arise on educational websites, such as the University Malaysia Pahang website, are represented in Figure 1.1 below. For this, a survey is used to analyze the problem and identify the UMP website's challenges.

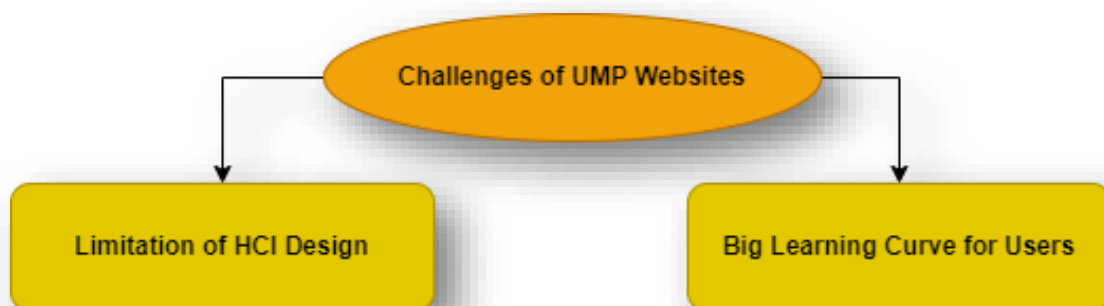


Figure 1.1: Challenges of the UMP website

1.3.1 Limitation of HCI Design

A good and efficient user interface will be manageable and understandable, allowing users to accomplish their goals while remaining satisfied. Human interface design principles are used to create efficient user interfaces.

According to Constantine and Lockwood's (2004)'s Six Principles of User Interface Design, one of the principles on which the UMP website has a constraint is the Simplicity Principle. The simplicity principle states that the design should make extensive procedures simple and provide shortcuts. A search bar for relevant inquiries, for example, would be a helpful shortcut to extensive procedures when surfing the website.

However, the UMP website is an information-based website that students can use to learn more about their faculty. Adding a search box will not improve the website's simplicity because users need to know the search keyword for their goals. As a result, according to a survey conducted to assess student opinion on the usability of the UMP website, 41% of respondents find it difficult to browse.

Nonetheless, the website's constraint of the Simplicity Principle can be solved by implementing a chatbot. The chatbot can help customers with demands that are just not met by search bars, such as offering context and suggestions for "What to Search." As a result, the process has been simplified, and the website's usability has improved.

1.3.2 Big Learning Curve for users

A well-designed user interface should help users save memory. It should be designed such that people can quickly glance through it and figure out where to go instead of having to recall. Nielsen's (2005) 10 usability heuristic is backed up by this impression, which recommends recognition above recall.

The UMP website is designed to emphasize recognition over recall. However, the survey results suggest that there are significant learning curves when students use the website. When they are new to the website, 88 percent of respondents struggle to use it effectively to achieve their goals. As a result, students are dissatisfied and uncomfortable with accessing the website.

It has something to do with the website's massive amount of data. With more than 10 faculties' information on the university website and various programs offered at UMP, it's obvious that content will be difficult to scan. Increasing the learning curve can take time away from UMP students or staff's ability to find answers to their questions.

As a solution to these problems, a chatbot can assist in reducing the UMP website's learning curve. By generating questions for users based on their input, the chatbot enhances recognition over memory and minimizes the time it takes for users to complete their jobs.

In addition, among the problems encountered was answering the same questions from customers. Customer service usually answers the same question repeatedly, causing people to get bored. Existing chatbot software does not yet fully use NLP to answer questions. Among the problems encountered while building this chatbot is the problem of collecting keyword phrases related to common questions in a university. In addition, the problem is to identify the correct artificial intelligence (AI) techniques to use in chatbot development.

1.4 OBJECTIVES OF THE PROJECT.

The objective of this project was to create a chatbot system that can answer any user's question about the UMP website in a single keyword phase. This chatbot web application serves as a proof of concept for improving usability and minimizing learning curves for UMP website users. Given that it is integrated into the UMP website, it responds to any user inquiry. Meanwhile, an administrator dashboard in the DialogFlow framework provides a comprehensive overview of the chatbot system.

The objectives are as follows:

- i. To study chatbot software capable of answering most questions regarding UMP information using natural language keyword phrases.
- ii. To design and develop a UMP intelligent chatbot in Web-based development on the University of Malaysia Pahang environment domains and resources.
- iii. To construct an administrative option for creating, updating, and deleting chatbot questions using the Intents, Entitles, and Knowledge-Based System that helps to support decision-making of keywords in DialogFlow Framework.
- iv. To verify and evaluate the functioning of the Dialogflow Framework designed to construct a convenient HCI design intelligent chatbot system with the UMP website.

1.5 SCOPE OF THE PROJECT.

This UMP Intelligent Chatbot Project was established to address problems with the UMP website by providing an automated customer support chatbot system. As a proof of concept, the UMP website is integrated with this chatbot system using DialogFlow Framework. The targeted users of this chatbot system are UMP students and staff on the Pekan and Gambang campuses. The scope of this study is:

- i. Focused on University Malaysia Pahang environment domains and resources.
- ii. English is the input language used in this Machine Learning Chatbot.
- iii. Intended to answer frequently asked questions from users or customers.

USER SCOPE

UMP Students from all courses on Pekan and Gambang campuses.

- i) UMP Students can ask the chatbot for relevant information or answers relating to the UMP website resources.
- ii) UMP Students can also choose a question to ask when the chatbot's confidence level is between 50% and 80% percent.

UMP Academic and Technical Staff on Pekan and Gambang campuses.

- i. UMP staff or lecturers can use the administration option in DialogFlow Framework to manage the overall chatbot system.
- ii. UMP staff can manage the chatbot's questions with Create, Read, Update, and Delete operations using the Intents, Entities, and Knowledge-Based in DialogFlow framework.

SYSTEM SCOPE

The UMP Intelligent Chatbot is a retrieval-based chatbot that understands users' requests and responds appropriately with keyword phrases. This chatbot system is accessible through the UMP website. This project's intended users will be UMP students and staff. Students and staff can use the chatbot to quickly find their answers. A recommendation feature will also be included in the system. Based on the user's query, queries are offered.

The system scope of this study also includes:

- i. Covered keyword phrases model for a natural language designed in intent data.
- ii. Covered the collection or training data used to train the intents and entities in the keyword phrases model for the chatbot's processing actions.

DEVELOPMENT SCOPE

- i) Using Dialogflow Framework to design and integrate conversational user interfaces bot in UMP intelligent chatbot development that integrated with the UMP website.
- ii) Using Visual Studio Code application to code HTML, CSS, and JavaScript for the UMP intelligent chatbot's website.
- iii) Using the SMTP JS (Simple Mail Transfer Protocol JavaScript) application to configure and push the complaint Data on the website to UMP email Server for fast action.

CONCLUSION

To summarize, the existing UMP website faces huge challenges such as HCI design limitations and a big learning curve. As a result, a UMP Intelligent chatbot system is created to integrate with the website, and it assists in the solution of limitations and the improvement of the learning curve to reduce UMP students' and staff's dissatisfaction with the website.

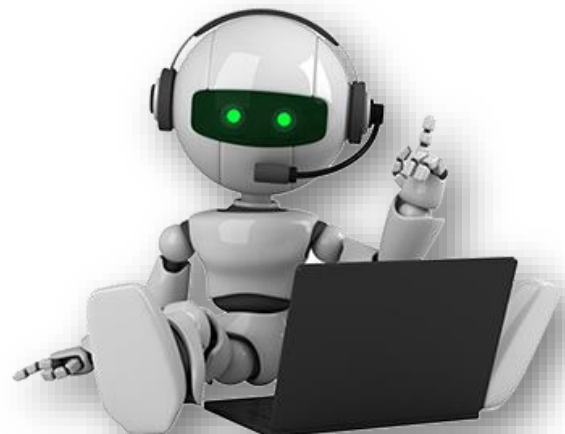
1.6 SIGNIFICANCE OF THE PROJECT

In the wake of this current of modernity, we are subconsciously at the height of a new revolution that will eventually transform every organization, industry, public service, and Education institution around the world. Therefore, companies and institutes should shift to the use of more secure, flexible, and cost-effective AI systems. It is more desirable to serve users using Chatbots in this digital age. Therefore, new systems should be introduced to meet some of today's biggest user service challenges.

One user service representative cannot serve many users. They need a lot of user service agents and must spend a lot of time and money to train them. In this case, the construction cost for the chatbot is very minimal. According to (Juniper Research, 2017), "chatbots will help businesses save more than \$ 8 billion a year by 2022". If a website receives a lot of user service requests, existing user service representatives will not be able to float the high demand in the digital age so chatbots will be able to help with more requests, at a given time. A chatbot can be online 24/7, 365 days a year. No matter where they are in the world, users can chat with chatbots and receive instant feedback. The same questions from the same domain can be processed using appropriate techniques.

For dataset collection problems, the number of dialogs that use text will be increased from time to time to increase the number of datasets. The construction of this chatbot is based on a responsive website that can be accessed by various devices such as mobile phones and tablets.

In conclusion, a chatbot with this artificial intelligence is a system to facilitate customers and users. Heading toward robotics, it looks bright for an AI-powered chatbot. This project will greatly benefit the institute as well as the students. Chatbots can solve problems that customers may face.



1.7 REPORT ORGANIZATION

This report contains five chapters. Chapter 1 explain the overview of the project including the Introduction, Problem Statements, Objective of the project, Scope, and Thesis Organization.

Chapter 2 briefly explains the literature review on existing systems of AI Chatbot for the education field in process of answering the user's questions via keyword phases in form of a text interface based on the University of Malaysia Pahang environment domains.

Chapter 3 explains the methodology used in this project. This project implements the Prototyping model methodology. The stages that are used in this project are Requirement gathering and analysis, Quick design, Implementation, Testing, and Maintenance.

Chapter 4 describes and explains the project's initial implementation, results, and discussion. This chapter highlights all the accomplishments made throughout the initial design and implementation. This chapter also covers the project's strengths and constraints, as well as future improvements.

Chapter 5 summarizes the results obtained from this project. The limitation and constraints of this project as well as future works are discussed in this chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

A literature review is a method of gathering data and information for a project using previous research sources such as books, journals, and the internet. Before beginning the project, it is critical to conduct a literature review on the current system or approach to comprehend the existing methods. This analysis procedure is also significant since it allows the developer to gain a better understanding of the system's workflow and to solve current project challenges to achieve the best results with quality. Additionally, a comparison with the existing system is done to identify flaws and improvements will be made during the project's development. This can be used as a starting point for new proposals to create a more efficient and effective system.

2.2 BACKGROUND OF THE STUDY

A chatbot is a computer program that conducts online chats using text or text-to-speech technology. ELIZA, built by Joseph Weizenbaum at the Massachusetts Institute of Technology, is regarded as the first chatbot in computer science history (MIT). The word 'Chatterbot' was coined in 1994. ELIZA recognizes keywords or phrases as input and generates responses based on those keywords from pre-programmed responses. For example, if a human says, "My mother cooks delicious cuisine." ELIZA will respond to the word "mother" with the open-ended query, "Tell me more about your family." Even though the process is a mechanism, it creates a sense of understanding and contact with real people.

Chatbots are just the natural progression of query testing systems that utilize Natural Language Processing from a technology standpoint. Natural Language Processing is used as an enterprise application to summarize responses to questions in natural language. 2018 (Marco Varone).

2.3 STUDY OF EXISTING SYSTEMS

This research was conducted to discuss existing chatbot applications or initiatives. A thorough market analysis is required for the development of a system because it will allow us to determine the system's strengths and limitations. It can also help us avoid repeating mistakes and be more cautious in our dealings. Although the existing application is taken and used as an example of the study, it is not the same as the application to be built, it does help to some extent in the process of developing future applications by making some key comparisons.

Furthermore, the purpose of this study was to differentiate existing apps in terms of interface display and key functionality, as well as to produce ideas and materials for use in the development of Smart Chatbot systems. The studies were undertaken on existing Chatbot Technology used in the Banking Technology Industry and reviewed chatbots for Human-Computer Interface Design. In addition, there was a comparison of the six existing chatbot applications where Freshchat, Botsify, Wysa, Intercom, Activechat, and Drift bots for the tasks that can be automated and augmented through Artificial Intelligence solutions.

The Graphical User Interface (GUI), platform support, AI and NLP functions, Channel Integrations, the language provided, target audiences, size of the chatbot application, pricing, advantages, and disadvantages of the chatbot application will be the focus of these six comparisons of existing chatbots. This comparison is carried out to guarantee that the chatbot application built into this project is superior to the previous version. This can be used to generate fresh ideas for improving the efficiency and effectiveness of the UMP Intelligent Automated chatbot system.

2.3.1 REVIEW OF CHATBOTS IN THE BANKING TECHNOLOGY INDUSTRY

Most firms and organizations are beginning to see how machine learning and artificial intelligence can help them improve their operations. Artificial intelligence has advanced to the point where more sophisticated chatbots can now be created. Organizations are concentrating on key areas of customer engagement that consume a significant amount of time but can be replaced by a chatbot. Instead of the consumer having to go through a multi-step process, chatbots can comprehend what they need with a single text.

Chatbots are used to automate customer service and save staff time spent on manual, repetitive duties so they can focus on higher-priority tasks. In comparison to a customer care agent, businesses that deal with consumers regularly basis has identified the potential of chatbots as a medium to disseminate more efficient and immediate information to clients regarding concerns and issues (Onufreiv, 2017).

HDFC Bank has partnered with artificial intelligence firm Niki.ai to create a cutting-edge conversational banking chatbot (HDFC Bank, 2017). The chatbot is accessible through the bank's Facebook Messenger account, and users may use it to conduct e-commerce and financial operations.

A chatbot is also included on the HDFC login page to help with online banking. The chatbot was created as a free service; this is one method for improving customer happiness in online banking, allowing banks to build stronger relationships with their consumers. Chatbots will transform and modernize the customer service business, as well as the primary sectors mentioned above, such as banking and healthcare (Newswire, 2017).

Integration of a chatbot is projected to save a lot of money in industries including retail, healthcare, e-commerce, and banking. Chatbots are expected to save \$8 billion per year for enterprises between 2017 and 2020. Most of the savings will come from customer service, since clients may now ask questions about banking via chatbot rather than calling the bank, allowing banks to save on contact Centre labor. According to the survey, chatbot integration in the banking industry would increase from 12 percent to 90 percent by 2022.

In addition, the integration of a chatbot into most online banking services would be beneficial. Bots assist internet banking service companies in building stronger relationships with their clients. Customers can obtain rapid answers to their questions and complete e-commerce and banking transactions all from one bot interaction. Another advantage of having an online banking system with an integrated chatbot is that "87 percent of online banking users prefer to conduct their financial transactions on a single site" (Dauda, et al., 2015).

Customers can connect with an organization in a more personal and quick way with chatbots, allowing them to provide consistent and appropriate customer service at scale (Conversational Business, 2018). Facebook has now published its own Messenger Bots, allowing businesses to create their Chatbots to deliver their services through Messenger.

Facebook is also working on AI approaches for obtaining precise information on users across a variety of categories. The data is utilized as a dataset to help them create and improve their Artificial Intelligence, allowing them to analyze, group, and rate each user post (Rossman et al., 2018).

"When it comes to customer service, 44% of US consumers prefer to communicate with a chatbot over a human" (Wellers et al., 2017). This is seen in other businesses like insurance, recruiting, media, and pharmaceuticals, where chatbots are becoming more common.

2.3.2 REVIEW OF CHATBOTS FOR HUMAN-COMPUTER INTERFACE DESIGN

Chatbots are becoming an essential driving factor in the HCI community, according to (Folstad, et al, 2018). Chatbots are creative ways for people to communicate with digital businesses because they are effective tools for engaging customers. Chatbot technologies are also thought to have a lot of potential as a technology for social good.

Likewise, Brandtzaeg and Folstad (2017) propose that natural language, rather than swiping, scrolling, or button clicks, is the preferred interface for interacting with digital services. This shift is especially noticeable with the recent advancements in chatbots. As the CEO of Facebook, the world's major firms are establishing the trends to help chatbots develop. For example, Facebook CEO Mark Zuckerberg stated that chatbots are the solution to app overload (McMillan, 2018).

Thakkar, et al. (2020) also point out that the need for chatbots on university websites or educational establishments is fast growing. They state that the websites of educational institutions are frequently unmaintained and contain redundant information. As a result, lecturers and students find it difficult to get the information they need. Chatbots are the system to tackle the problem because they can assist users in getting their desired information with a few queries and clicks.

Finally, Brandtzaeg and Flstad (2018) conducted research to determine why individuals are so interested in chatbots. The paper investigates user behavior and interactions with the chatbot. It examines the motivation for the interest. According to the study, the most common motive can be summed up in one word: "productivity." According to studies, chatbots can deliver quick and effective assistance and information (Brandtzaeg and Folstad, 2018).

In a nutshell, AI conversational interfaces and chatbots provide an entirely new universe to be discovered and conquered. The technology created for putting chatbots on the UMP website is a great improvement in the website's HCI. The deployment of a chatbot on the UMP website will assist students and staff find information more quickly and efficiently because a natural language interface is a new revolution in how users engage with data and services.

2.3.3 TYPES OF CHATBOTS

i. Rule-based Bots

This type of bot communicates using pre-programmed rules. To receive an answer, user input must follow certain pre-defined rules. Often, simple buttons are used with such bots. Because no artificial intelligence is used here, a full-fledged discussion with this type of bot is either impossible or extremely limited.

ii. Natural Language Processing (NLP) of AI Bots

Many users are still confused by the concept of artificial intelligence (AI). The goal is to train robots to "think like humans." That encompasses numerous facets, which is why it is such a big notion. We can consider abilities such as logical reasoning, planning, and language comprehension. Understanding languages is extremely useful when working with chatbots. Unlike rule-based bots, these bots process natural language using algorithms (neural networks). This is the root of the word NLP or Natural Language Processing.

NLP chatbots learn languages in the same approach as children do. They can create connections between questions asked in different ways after learning a lot of examples in keyword phases. In this approach, the bot understands the query without being specifically trained for it, and a suitable response can be provided. This is also known as Conversational AI when used in a conversational environment.

2.4 REVIEW OF SIX EXISTING CHATBOT SYSTEMS

In this section, six existing chatbot applications are used in social media and education to conduct online conversations via text or text-to-speech. The bots Freshchat, Botsify, Wysa, Intercom, Activechat, and Drift, which all use a Natural Processing Language (NLP)-based approach, are investigated to gain insights and perspectives on this Project's development.

2.4.1 Application 1 – Freshchat Chatbot

Freshchat is an omnichannel, Artificial Intelligence, self-service chatbot solution for customer service that has solutions for business and small enterprise customers. Freshchat is a product that is meant to be only useful for companies that already use, or plan to use Freshworks for help desks, online sales, marketing automation, and other business systems. This means that Freshchat provides limited options and there are not many functions for the use of this product.

Furthermore, the Freshchat chatbot offers a Natural language processing function to perform State-of-the-art proprietary conversational AI and Machine learning engine in the field of Intent classification, which is to add training data and trains the system for intent recognition and allows the engine to keep context and learn from flow designs. It also offers sentiment analysis to measure business rules and analytics. Furthermore, it allows for the reuse of the same intents across different flows, as well as the automatic generation of new examples for intent training data for Natural Processing Language. (Freshchat, 2021)

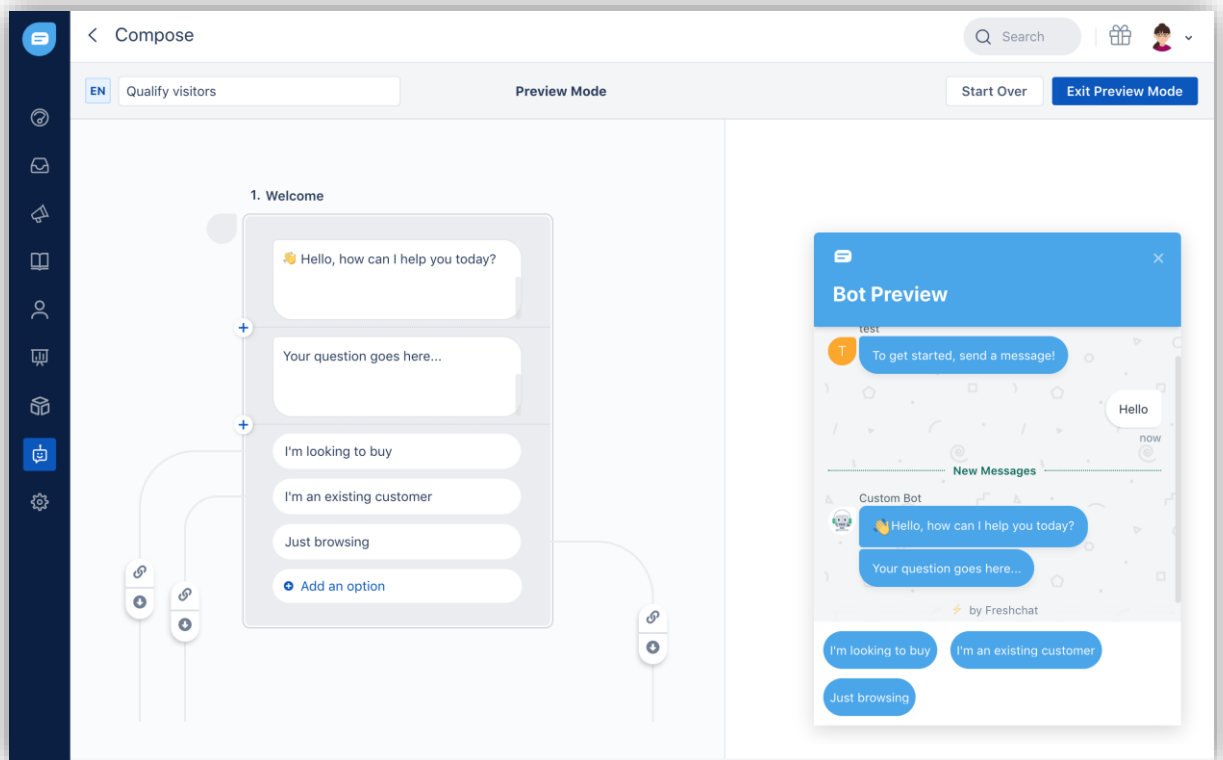


Figure 2.4.1: Freshchat interface

2.4.2 Application 2 – Botsify Chatbot

Botsify is a customer support chatbot platform that requires no coding experience and allows us to build conversation dialogs for Facebook Messenger, web chat, Slack, Shopify, and Alexa Amazon. It provides a faster response rate which attracts customers by automating their chat and sending a speedy response for the real-time assistant.

Furthermore, it provides a higher conversion rate by reducing response time, personalizing the customer experience, and recording analysis to increase conversion rates with a chatbot. In addition, the Omnichannel Chatbot Platform in the Botsify application allows for seamless interaction across our channels, providing customers with a unified experience and realistic personalization of all users. Botsify typically provides 24/7 customer support, assists in the creation of the first chatbot, resolves issues quickly, and enables a stronger relationship with clients. Moreover, Botsify performs as an education chatbot, making it ideal for teachers and institutes to collect student feedback such as through chatbot services. (Botsify Community, 2021)

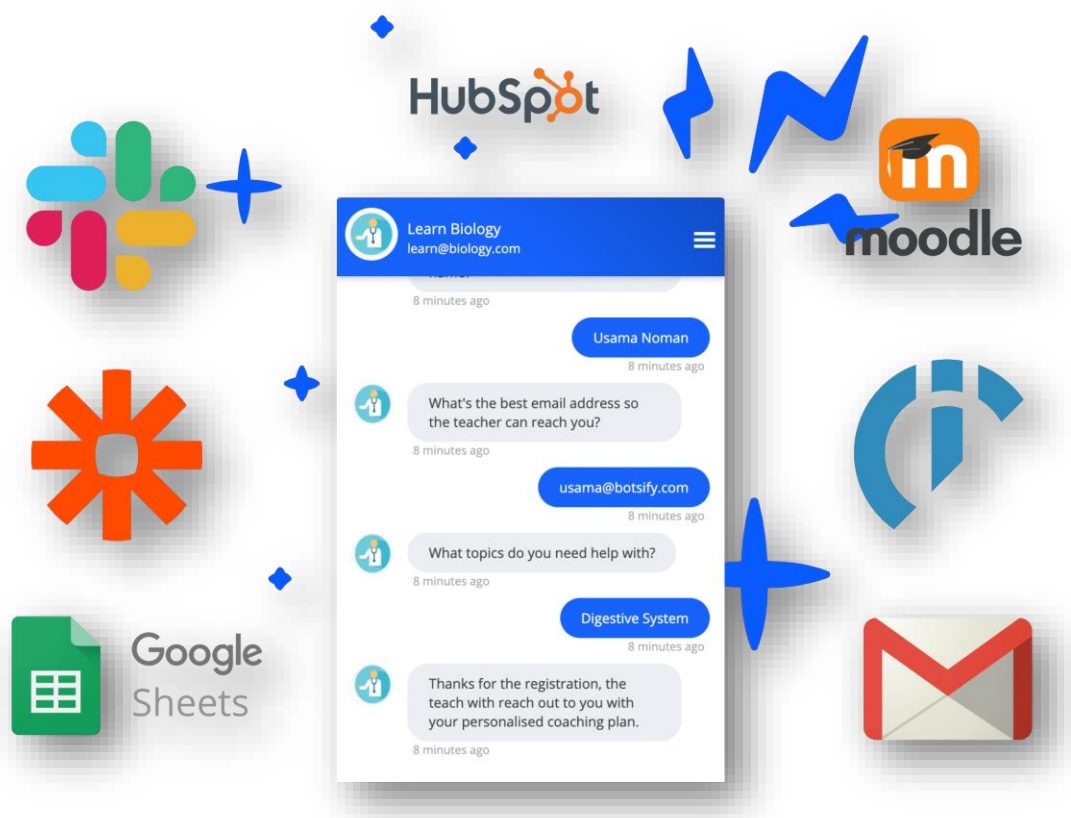


Figure 2.4.2: Botsify interface

2.4.3 Application 3 – Wysa Chatbot

In 2016, Wysa was produced and created by 15 psychologists, designers, and software developers. WYSA is a mobile application that aims to help users with mild symptoms of anxiety and depression through a virtual chatbot that delivers messages. Upon entering the program, users get acquainted with WYSA, a chatbot that will initiate conversations and a brief mood-checking process. WYSA offers a variety of tools to help users overcome sad feelings by interacting with WYSA in the form of chats where WYSA takes them through recommended exercises.

WYSA implements a cheerful penguin character to represent the app's chatbot feature. Anything we send over is completely anonymous, and we will not require a username to get started. We will be asked whether we prefer to work through issues on our own or if a therapist is an affordable option. Following that, we will be directed to a chat feature that can provide us with assistance based on our specific needs. (Wysa Community, 2020)

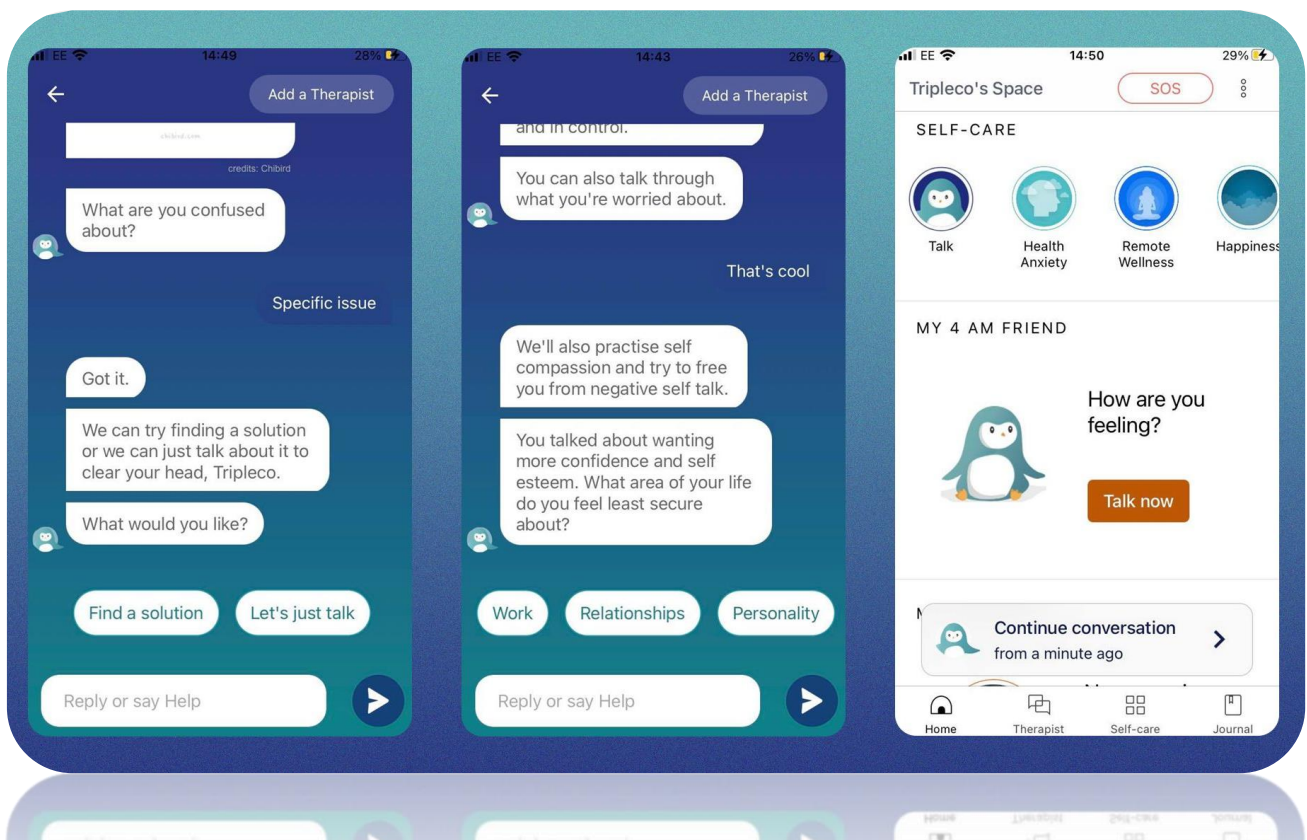


Figure 2.4.3: WYSA interface

2.4.4 Application 4 – Intercom Chatbot

Intercom is live chatbot support and automation platform powered by artificial intelligence (AI) for sales, marketing, product, and support teams. Intercom's chat widget can assist us in identifying and qualifying leads, providing real-time prospect and customer support, and engaging visitors to our website.

Besides, Intercom is a popular product that looks great and was one of the first live chat platforms, but it is far too pricey in 2020. When compared to other live chat platforms that do the same activities, often with added value and functions, Intercom just does not match up when it comes to reaching our company goals or generating as significant a Return on investment (ROI) as the competitors.

Furthermore, Intercom Custom Bots initiate conversations by utilizing targeting and enrichment features, allowing us to engage the leads we desire. Intercom's chatbot builder does not necessitate any coding knowledge. 'Operator' is the name of Intercom's chatbot technology. It drives bots that may be purchased individually to answer typical customer questions and automate basic tasks. (Intercom Chatbot , 2021)

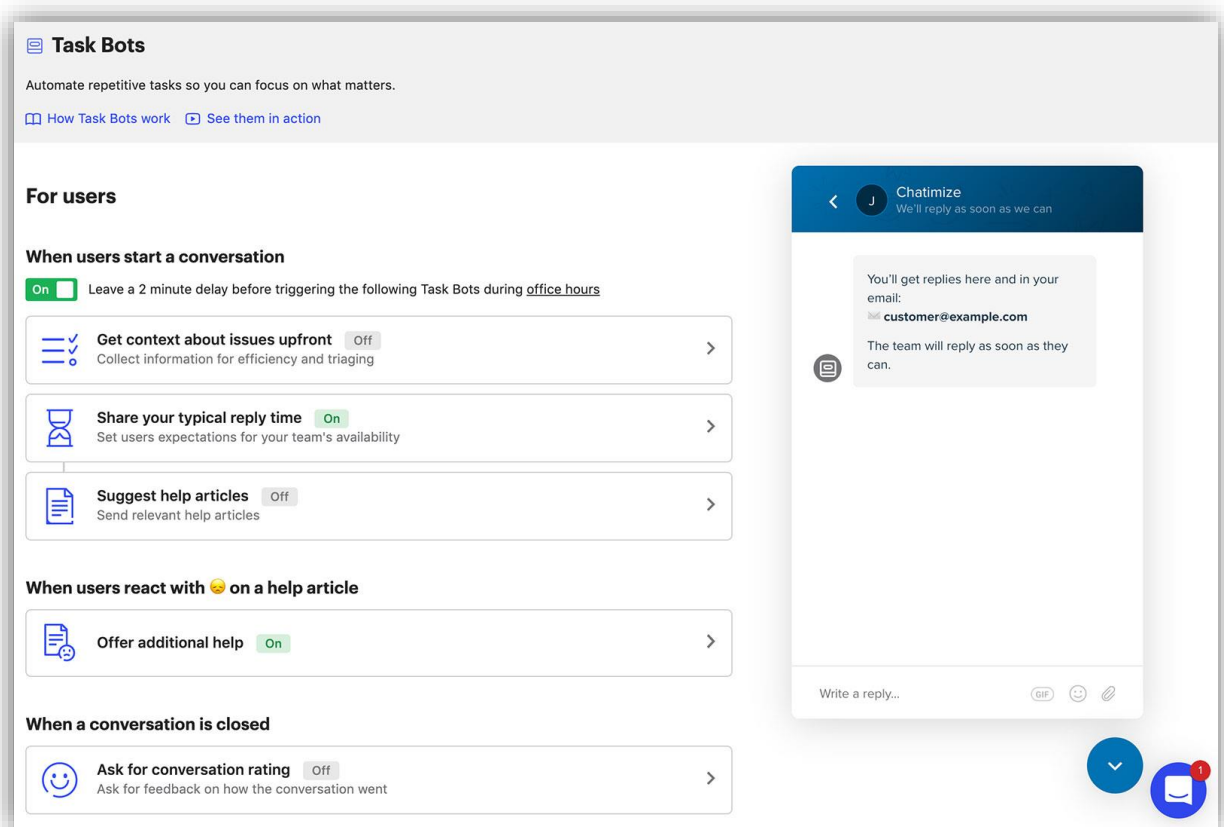


Figure 2.4.4: Intercom interface

2.4.5 Application 5 – Activechat Chatbot

Activechat.ai chatbot is also a live chat tool and a platform for conversational automation. It enables us to improve customer service and sales by utilizing contemporary conversational AI and automating up to 70% of our everyday customer support routine.

We can use Active chat as a multichannel live chat platform that learns our best customer care practices from our human agents as they go about their daily routines, and then we can turn this knowledge into smart natural language automation that can work independently as virtual support agents or suggest AI-generated conversational hints to our human support and marketing teams.

Besides, the Activechat application can assist with are a Live chat engine that can help our agents improve their performance by utilizing smart AI-generated suggestions as quick responses and a Visual natural language chatbot builder platform that is based on our custom framework and closely follows the natural human conversation model (events & contexts). (ActiveChat Smarter Conversation, 2021)

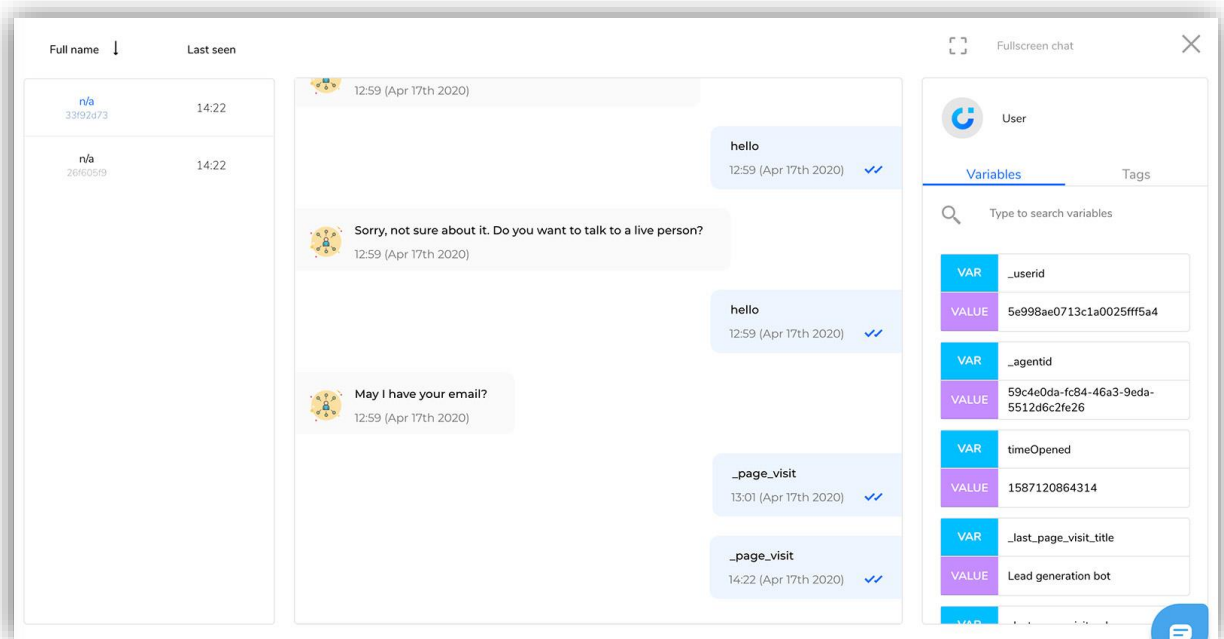


Figure 2.4.5: Active chat interface

2.4.6 Application 6 – Drift Chatbot

Drift is a live chatbot platform that focuses on generating and qualifying leads, scheduling meetings, and offers a robust integration portfolio. Besides, the Drift chatbot has an excellent feature that allows visitors and customers to plan meetings directly with user personnel without the need for a third-party connection such as Calendly. They also have a lead qualification bot that leverages machine learning technologies to replace their SDRs. The trouble is that each of those features comes at far too great a cost.

In addition, the Drift chatbot provides sales and marketing teams with lead generation and productivity solutions to generate and qualify prospects. The chatbot software is designed to assist teams in closing more deals, scheduling sales calls, and providing real-time responses. Drift also includes sales and support capabilities including smart notifications, email playbooks, chat targeting, stored replies, dynamic routing, and contact activity history. Furthermore, Drift's single dashboard provides a comprehensive picture of performance indicators and interactions that influence our business. The dashboard of Drift displays useful information such as the number of meetings scheduled, leads acquired, and conversations initiated. (Drift Custom AI Chatbot, 2022)

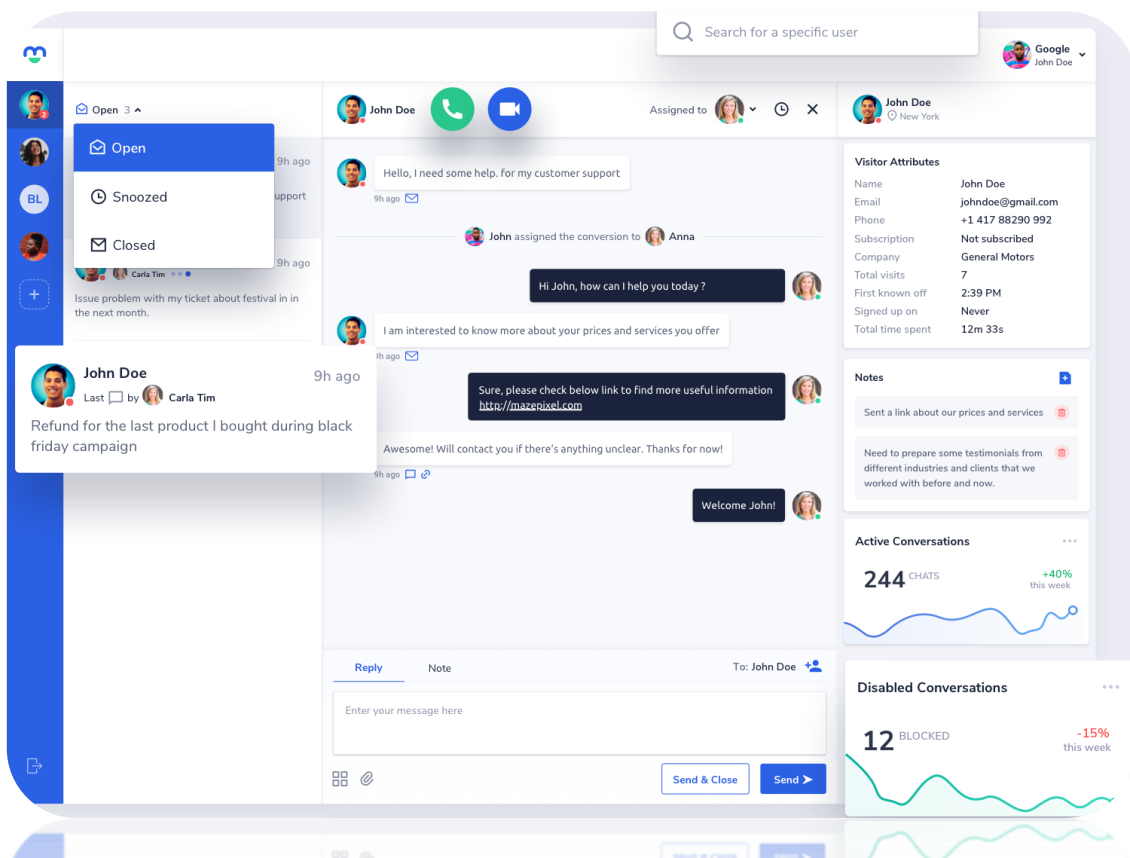


Figure 2.4.6: Drift interface

2.5 COMPARISONS OF SIX EXISTING CHATBOT SYSTEMS

As a result of the literature review, the six chatbots were compared with each other. The diversity of these chatbots can provide the information needed for the construction of these chatbots. The comparisons will focus on the Graphical User Interface (GUI), platform supports, AI and NLP functions, Channel Integrations, the language provided, target audiences, size of the chatbot application, pricing, advantages, and disadvantages of the chatbot application.

- i) Freshchat Chatbot
- ii) Botsify Chatbot
- iii) Wypa Chatbot
- iv) Intercom Chatbot
- v) Activechat Chatbot
- vi) Drift Chatbot

Table 2.5: Comparison of existing chatbot systems

Features	Freshchat Chatbot	Botsify Chatbot	Wypa Chatbot	Intercom Chatbot	Active chat Chatbot	Drift Chatbot
Graphical User Interface (GUI)	The interface is simple, light-hearted, and colorful.	The interface is bright, simple, and well-organized.	The interface is beautiful with a colorful and dark background.	The UI is visually appealing, with a basic user options sidebar.	The UI is vibrant, transparent, and well-organized.	The UI is straightforward, lighthearted, and light color background

Features	Freshchat Chatbot	Botsify Chatbot	Wysa Chatbot	Intercom Chatbot	Active chat Chatbot	Drift Chatbot
Platform Supports	Windows, Android, iOS	Android, iOS	Android, iOS	Windows, Android, iOS	Windows, Android, iOS	Windows, Android, iOS
Algorithms	Machine Learning (AI) and Natural Processing Language (NLP) Algorithms					
Channel Integrations	Websites Messenger WhatsApp Telegram	WhatsApp Telegram Chatbot Platform	SMS WhatsApp Telegram Websites	Websites Email	Websites Facebook Telegram Email	Websites Email
Language Supports	English, Spanish, French	English and Spanish	English	English	English, Spanish, French	English
Target Audiences	Business Customers, Teenagers, Students	Business Customers, Teenagers, Students	Teenagers, Medical Patients	Business Customers, Teenagers, Students	Business Customers, Teenagers, Students	Business Customers, Teenagers, Students
Size of Application	58.20 MB	22.50 MB	70.20 MB	22.00 MB	16.90 MB	20.19 MB
Pricing	\$15/agent/month	5k users for \$49/month	5k users for \$55	from \$39/month	starts from \$49/month	from \$50/month

Features	Freshchat Chatbot	Botsify Chatbot	Wysa Chatbot	Intercom Chatbot	Active chat Chatbot	Drift Chatbot
Advantages	<p>Freshchat is available on WhatsApp for Business, Apple Business Chat, LINE, Facebook Messenger, web chat, and mobile applications.</p> <p>Freshchat can provide instant feedback with intent-based answers by utilizing machine learning automation.</p>	<p>Botsify has chatbot templates for several categories that we can select and create our own. Chatbot templates have been developed for categories such as education, finance, health & beauty, food & restaurants, and travel/transportation.</p> <p>Botsify has basic machine learning capabilities, such as the ability to recognize keywords and trigger a pre-built workflow.</p>	<p>Have a Wysa Chatbot, who is a professional trained to listen, encourage, and support users.</p> <p>All information shared with chatbots is private and confidential.</p>	<p>Intercom's appearance is well-designed and user-friendly, from its chat widget to its UI/UX, which is undoubtedly Intercom's best success.</p> <p>Intercom's tools have been well-crafted, with the end-user experience always in mind.</p>	<p>Active chat integrations have been created for many platforms. Most of the popular tools in our tech stack are likely to have Activechat integration.</p> <p>Furthermore, the Active chat API is powerful and comes with extensive documentation.</p>	<p>Drift offers an intuitive user interface that we and others have found to be simple to use without either specialized technical skills or substantial software user expertise.</p> <p>Drift features a variety of excellent integrations and many of which are built natively on the platform. Some notables are Shopify & HubSpot.</p>

<p>Disadvantages</p>	<p>Failure of use if Freshworks Freshdesk and Fresh sales products are not integrated.</p> <p>Persistent customer errors and problems: Some users have reported a 10-second delay in starting a conversation with a visitor.</p>	<p>Botsify is outdated in terms of software and technology. The NLP used by chatbots is very basic and consistently produces incorrect results.</p> <p>Furthermore, chatbot developers show many obvious error messages due to the lack of chatbot capabilities.</p> <p>Botsify is not a high-powered AI chatbot solution, so advanced response requires consolidation. Only automatic responses are available. If we want to make the</p>	<p>Wysa chatbot has a high cost for using the full version of the application, which is RM119.99 per month.</p>	<p>Intercom has a significantly flawed price plan. It is expensive, and its pricing model is unpredictable and non-flexible.</p> <p>We will be paid for the number of leads and users tracked if we utilize any of the following products: Outbound Messages, Custom Bots, Answer Bots, and Product Tours, in addition</p>	<p>Active chat software lacks many of the chatbot features found in the leading live chat chatbots. Quick replies, buttons, text input, emojis, and email validation are all presented. However, there are no advanced tools, automation is limited, and there is no intelligence. We can create a simple and basic chatbot, but nothing more advanced.</p>	<p>There are no message options for major marketing channels. Drift, unlike other top live chat software solutions, does not support SMS text messaging, Facebook Messenger, WhatsApp, and other networks.</p> <p>The chatbot builder is limited and is only available on the Pro subscription and higher.</p>
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		Botsify chatbots smart, we should use the RASA framework integration.		to high monthly pricing in contrast to competitors.		
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Table 2.5: **Comparison of six existing chatbot systems**

Following some research and data collection, it was discovered that a chatbot is an application that can assist users in a timely and comprehensive manner. This project will create a chatbot integrated into the UMP website that can respond to frequently asked questions by users and receive user complaints about the institution using the SMTP JS Protocol connection from the website form to the UMP Gmail server. As a result, a chatbot with information can assist in most cases that arise. The information that will be built into this chatbot will be internet-based with a website and the chatlog will be ready to train a chatbot from customer service. As a result, the chatbot will be able to answer common user questions.

2.6 SUMMARY OF REVIEW EXISTING SYSTEM

This review of the literature discusses current applications that perform well almost the same function as a customer service-based Smart Chatbot. This research is essential for the system developed later to function properly and meet the needs of users. Finally, this study has provided a clearer picture of how to develop applications that can meet the needs of users.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Chapter 3 will discuss the development process of this UMP intelligent chatbot project. Developing a project needs a good technique to make sure it can be done successfully. The methodology is known as the general analysis procedure that outlines the action in which research is to be undertaken between other things and identifies the technique to be used. These techniques described in the methodology, define the means or modes of data collection, and ways to calculate the specific outcome (Howell, 2013).

3.2 PROTOTYPING MODEL IN PROJECT DESIGN

Based on the research, the Prototyping methodology was chosen to develop this UMP intelligent chatbot project. This methodology was chosen because prototyping is the process of creating an appropriate experience for the UMP Intelligent chatbot's target users, which are students and staff from the Pekan and Gambang campuses. It consists of several stages that assist designers, product owners, or business analysts in identifying key concerns, such as user needs, navigation, information architecture, usability, accessibility, UI, or visual design of the chatbot development with a significant improvement in HCI on the UMP website. Furthermore, the efforts to develop this project were carried out in a precise sequence, with the customer or user feedback on the chatbot system's final goal in mind always.

In addition, the precise reporting system in the Prototyping model also enables easy control and transparency of the project development. Pal (2018) proposed a prototyping process that includes two phases: prototype development and iterative development as mentioned in figure 3.2 below. Each phase will be explored in detail in this chapter.

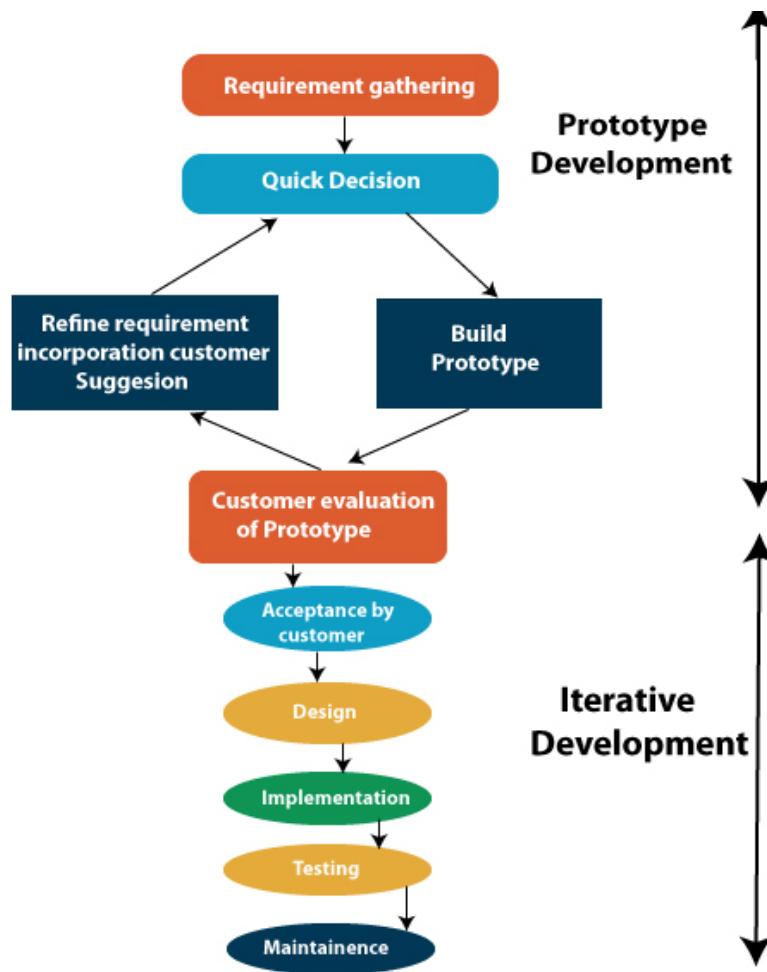


Figure 3.2: Prototyping Methodology

3.2. Phases of Prototyping Development Model

There are five steps to be completed during the prototype development phase. As indicated in figure 3.2 above, these five processes form a cycle to collect consumer feedback and improve the prototype of the UMP Chatbot accordingly until it is approved.

3.2.1 Requirements Gathering and Analysis technique in the Initial Phase.

In the questionnaire, the requirement collecting technique was utilized to collect requirements and problems from stakeholders. Furthermore, Gantt charts have been created to ensure that the system development period is structured and follows a predetermined schedule.

3.2.1.1 Survey Questionnaire

A questionnaire was issued to 50 students to better understand the targeted user's thoughts and requirements. The survey included 50 UMP students, ranging in year of semesters from the first to the fourth year. From year one to year four, the respondents are rather evenly distributed. Each year's respondents are relatively distributed evenly, with Year 3 students contributing the most. In addition, it was discovered that 48 of the respondents used the UMP official website to search for information about FYP, internships, course structure, and respective departments as intended.

There are nine questions in all, divided into two sections: Section 1 is for gathering user feedback, while Section 2 is for gathering system requirements. There are also closed-ended questions, four survey questionnaires, and five multichotomies queries in the question.

3.2.1.2 Data Collection for Requirement Gathering

Students from the UMP Pekan and Gambang campuses were surveyed to gather information and opinions about the current UMP website and the implementation of a chatbot system. Fifty sets of questionnaires were provided to fifty students, and all of them quickly returned their responses. The following is an analysis and summary of the feedback:

1. The student's intended objective when visiting the UMP website.

Question 1: What do you use the UMP website for?

50 responses

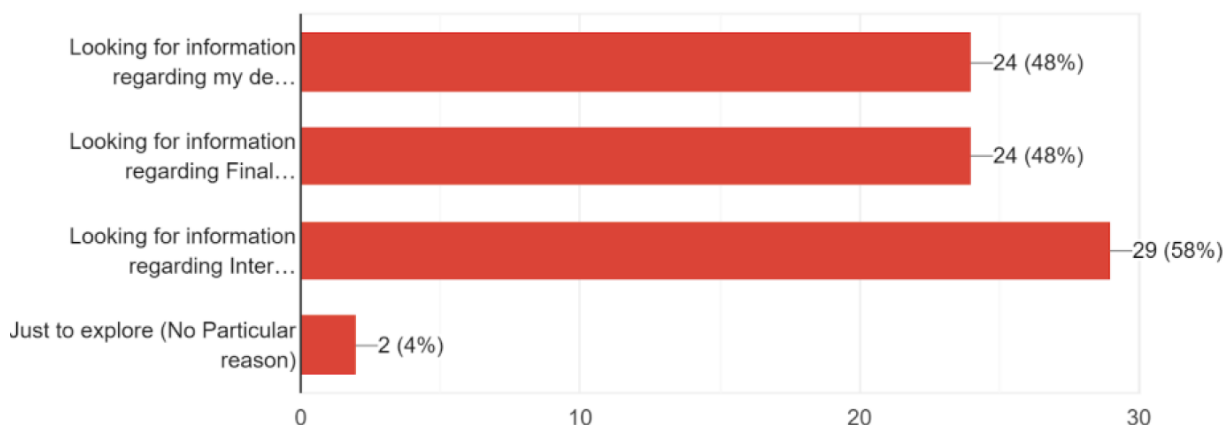


Figure 3.2.1.2.: The students' objective when visiting the UMP website

According to Figure 3.2.1.2, students visit the UMP website for three primary reasons:

- i. Research information about their department.
- ii. Look for information about the Final Year Project (FYP).
- iii. Look for internship-related information.

The findings suggest that most students visit the website to get information about internships, followed by departments and final-year projects. Only two out of fifty UMP Students, on the other hand, used the website for no apparent purpose. In my opinion, the UMP website is an essential resource for UMP students searching for academic material, with over 96 percent of students accessing it for academic purposes.

2. Frequency of student usage of the UMP website

Question 2: **How often do students use the UMP website?**

50 responses

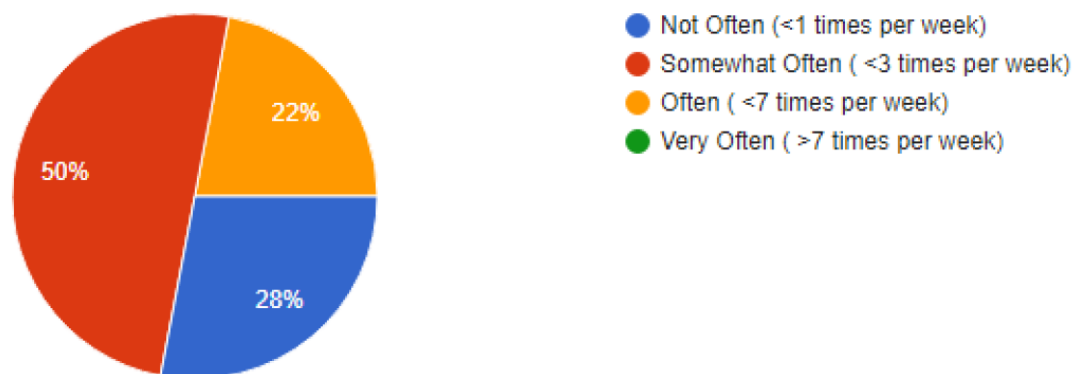


Figure 3.2.1.3.: Usage of the UMP website

According to the survey in Figure 3.2.1.3, students do not frequently use the UMP website, with most students visiting it less than three times a week. Similarly, no student visits the UMP website more than seven times per week. This indicates that the UMP website has an average burden and no consistent visitors. Furthermore, many students who do not frequently visit the website are in Year 1, as they do not want information about internships or final-year projects.

3. Student acknowledgment of difficulties with the UMP website

Question 3: **Do you have trouble using the UMP websites?**

50 responses

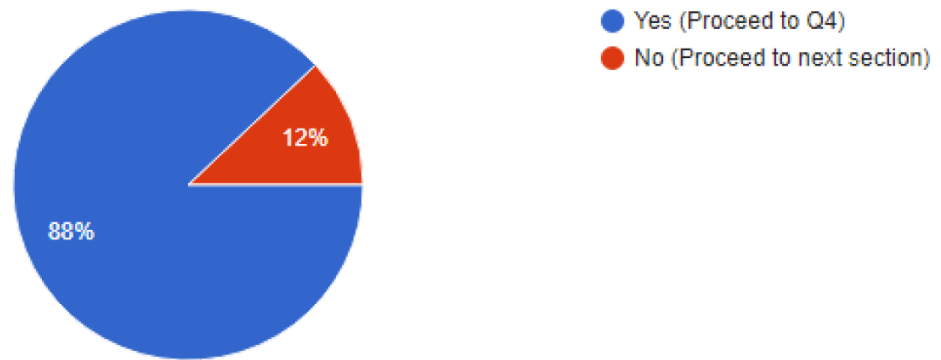


Figure 3.2.1.4: A student's acknowledgment of difficulties with the UMP website

4. Students' difficulties and limitations

Question 4: **What do you find difficult when using the UMP website?**

44 responses

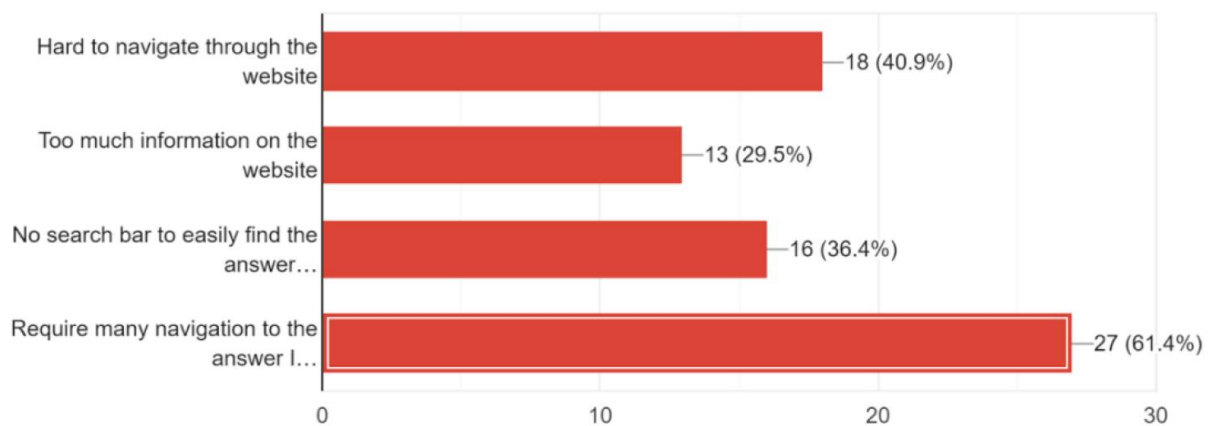


Figure 3.2.1.5: Students' challenges and constraints when accessing the website.

According to the Pie Chart in Figure 3.2.1.4, a great majority of students (88%) admit to having difficulties accessing the UMP website. As indicated in Figure 3.2.1.5, the difficulties that students experience can be divided into four categories:

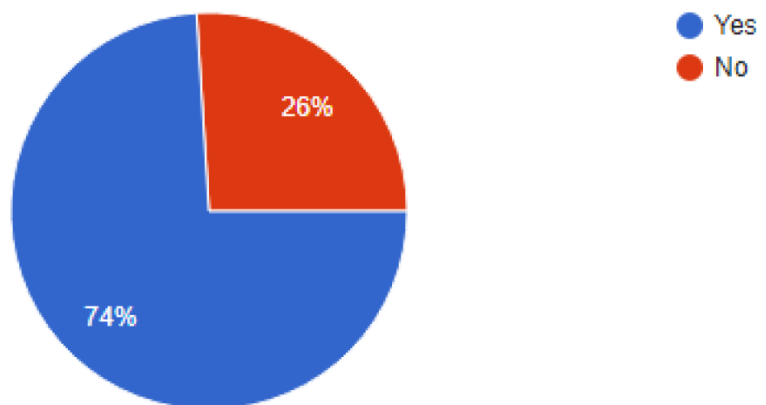
- i. The website is difficult to navigate
- ii. There is too much material on the website
- iii. There is no search box to quickly locate the desired answer.
- iv. Require extensive navigation to the solution

This demonstrates how students have struggled because of the limitations of an information-based website HCI. Even though the fact that the UMP website was designed with good design concepts in mind, any information-based website will always have limits. For example, most students experience the problem that "websites require extensive navigating to their intended answer," which is necessary.

5. Student perspectives on AI Chatbots

Question 5: **Do you use any AI chatbots?**

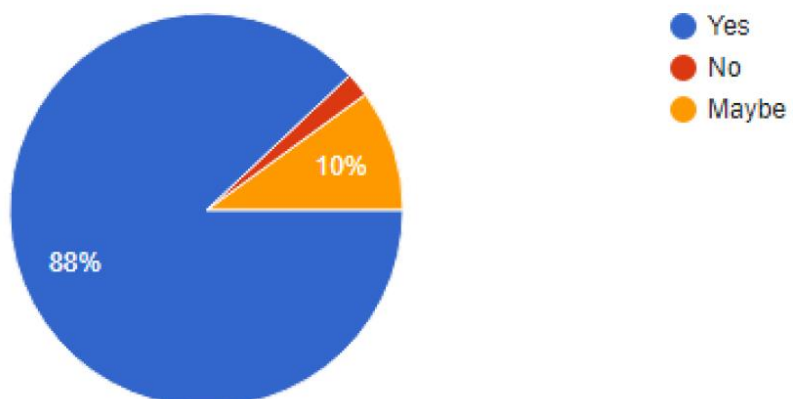
50 responses



Question 6: **Do you think the chatbot will help students find answers more quickly?**

50 responses

Figure 3.2.1.6: Student feedback on the AI Chatbot



Nearly 74% of respondents used AI chatbots like Siri, Alexa, and Google AI Assistant, as seen in Figure 3.2.1.7 above. Most students believe that the chatbot solution on this project will benefit them in finding the desired response more quickly. The chatbot can improve the UMP website's HCI while also enhancing student productivity.

6. Expectations of students from the chatbot

Question 7: **What is the feature that you would like to see in the chatbot system?**

50 responses

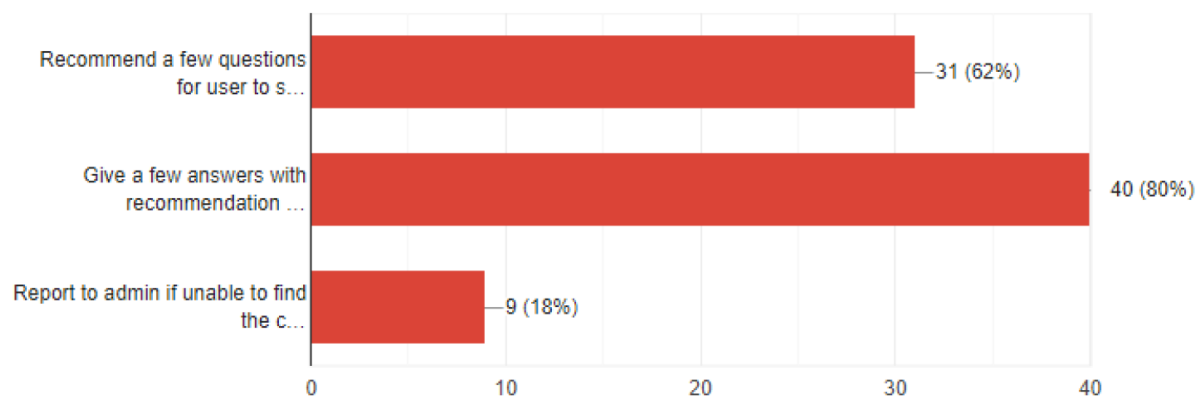


Figure 3.2.1.7: Expectations from the chatbot by students.

According to Figure 3.2.1.7 above, the most requested feature from the chatbot is the ability to provide a few answers with recommendations, which received over 80% of the votes. The expectation is then to "Recommend a few queries for a user to choose" because students may not know what word to write when searching. The recommendation feature, in my opinion, is a basic requirement of a chatbot since it provides users with a sense of power and choice when using the system. It boosts the user's productivity when they use the system.

3.2.1.8 Survey Highlights

According to the Questionnaire survey, 88 percent of fifty respondents considered the UMP website difficult to use. This is due to the HCI limitations that UMP has as an information-based website experience. According to the survey, the most significant drawback is that "the official website requires extensive navigation to the answer the respondents need."

Furthermore, a large majority of 88 percent of respondents believe that chatbots are a legitimate and useful tool for students to find answers; however, 10% are unsure and 2% disagree with chatbot deployment. Similarly, the results suggest that 96 percent of respondents will utilize the chatbot after it is built and that the chatbot should have the following features:

- ✚ The chatbot should provide a few responses with suggestions for easier searching, according to forty percent of respondents. When users type queries about Bus facilities, the chatbot may respond with "The Bus schedule timing from Monday to Sunday with the venue information clearly and straightforward."
- ✚ Thirty-one percent (62%) of respondents agreed that displaying a few questions for users to choose from helped eliminate the problem of not understanding what to search for while using the search bar.
- ✚ If they were unable to identify their desired queries, nine (18%) of the respondents required the option to report.

Table 3.2.1.8: **Survey Highlights**

Survey Questions	Number of respondents (50 TOTAL)		
	Agree	Neutral	Disagree
The UMP website is challenging to navigate.	44	0	6
For students looking for an answer, the chatbot is a practical and effective option.	44	5	1
If the chatbot system is implemented, I will use it.	48	0	2
	Most respondents requested the following functions:		
What features would you like to see in the chatbot system?	<ul style="list-style-type: none"> ❖ If the user is undecided, the chatbot will respond with a few options for them to choose from. ❖ Display a few questions for the user to choose from. 		

3.2.2 Iterative Analysis Phase

The second phase of the approach, iterative analysis in development, will begin once the targeted user agrees to and approves the prototype. In this phase, an iterative approach is used to design the actual implementation of the UMP Intelligent chatbot system integrated with the website. The prototype's code could be reused or removed and discarded. Regardless, the technological risk has been considerably decreased because of the prototype's experiences.

1) First Iteration

The following are some of the initial iteration activities:

- i. Create a model for the UMP intelligent chatbot system.
- ii. Using JSON code deployment, integrate the chatbot model with Intent, Entity, and Knowledge-Based options into the Dialog Flow API.
- iii. Using Web Framework, design and create the chat's front-end user interface.
- iv. Hosting and Source Control the UMP intelligent chatbot that was integrated with a Firebase-hosted UMP website.

2) Second Iteration

Additional administrative activities have been added.

- i. Based on input from the initial iteration, refine the chatbot model.
- ii. Create a Dialogflow API as a backend service for admin-related operations (This is to ensure separation of concern).
- iii. In Dialogflow Framework, design and create the front-end user experience for the DialogFlow Dashboard to customize the Chatbot's responses to the frequently asked questions through keyword phrases.

3) Third Iteration

The actions in the third and final iteration include:

- i. Restructure the chatbot model depending on feedback from the previous iteration.
- ii. Implement the entire Create, Read, Update and Delete feature, which allows administrators to enter response data for frequently asked questions about UMP Information to train the chatbot in the DialogFlow framework.
- iii. Implement the complete Create, Read, Update and Delete feature, which allows administrators to add frequent abbreviations to improve the chatbot's accuracy.

3.2.3 Quick Design Phase-in Iteration Development

The purpose of this phase is to decide on the instructional methods to be used. This phase will also result in the creation of the initial design for the UMP chatbot system. The software and language to be used, as well as the initial and final designs of the UMP chatbot system to be built, must all be decided. These choices are made clear in the software and hardware requirements. The chatbot system and website interfaces are intended to be more user-friendly and simpler to use for new users as shown in the Prototype section

A few software tools and languages that will be used to construct this project are presented in Table 3.10.1 below. Dialogflow Framework is used to design and integrate conversational user interface chatbot, Google Chrome is used to find information, VS Code IDE is used to write Python language, Web Development languages such as HTML, CSS, and JavaScript to build UMP-based information websites, SMTP JS application to push the complaints in the UMP website's complaint form to Gmail server for verification and Firebase is used to host the complete website with the integrated chatbot to the internet for access by any target users with their devices.

DialogFlow Chatbot Architecture Model in Design Phase

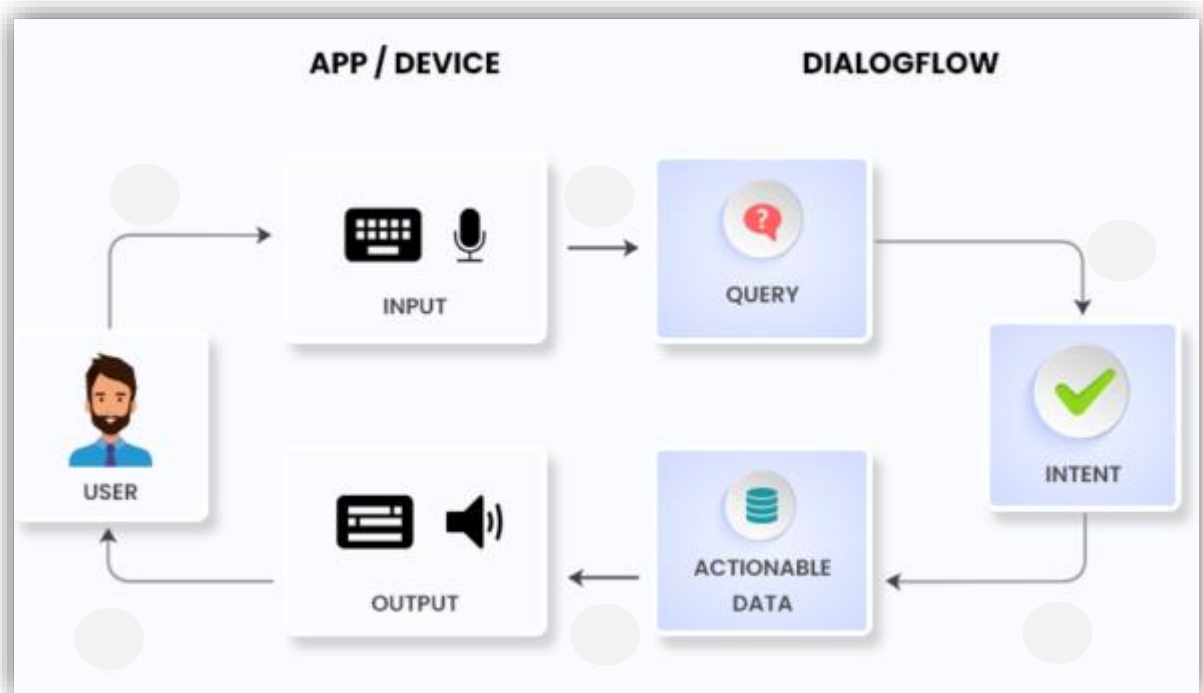


Figure 3.2.3: UMP Intelligent Chatbot Architecture Model in DialogFlow Framework

The UMP intelligent chatbot system is based on DialogFlow Algorithms. Usually, Algorithm design is a procedure or collection of rules that must be followed by a computer during a problem-solving operation. It should be intended to make the development process easier. Furthermore, the algorithm design is intended to demonstrate the application's functioning. As a result, users' comprehension of the Intelligent Chatbot system can be enhanced.

So, in this project, we used two DialogFlow Framework methods to match intents: rule-based grammar matching and Machine Learning (ML) matching. DialogFlow runs both algorithms simultaneously and selects the best result.

When an end-user types or says something, this is referred to as an end-user expression, DialogFlow compares the expression to the training words for each intent to identify the best match. Intent categorization is another term for matching an intent. The factors used to match intent are intent detection confidence, Intent priority, Knowledge connectors, context, and Fallback intents.

3.2.4 Implementation Phase-in Iteration Development

In addition, the implementation phase in this module intends to improve the module materials that have been measured, tested, and implemented, as well as to match the user evaluation and user feedback form that was performed during the requirement gathering.

Additionally, this is also done to identify any errors or updates that need to be made to the chatbot system. As stated in the User Requirement below, the response of the targeted user will be recorded.

3.2.5 Testing Phase-in Iterative Development

In the testing stage, the UMP intelligent chatbot system with the website will be tested. This testing ensures that the chatbot system built will meet the needs of targeted users, such as answering frequently asked questions and receiving user complaints about the UMP website to Gmail server in the initial and customer evaluation of the prototype in the Development.

As a result, a few tests are performed, including an integration and usability test, performance test, and user acceptance test, as listed below, to guarantee that a system's requirements are met by assessing the right output when given input. Its purpose is to ensure that the system complies with the system's functional requirements. If the project's goal was not met, the application needs to revise back, reanalysis the error that occurs, and implement it back.

3.2.6 Maintenance Phase-in Iterative Development

In the final stage, the system will provide support and maintenance for the UMP chatbot system, ensuring that it runs smoothly. If users and students encounter errors, defects, or bugs while using the UMP intelligent chatbot, the main goal of this stage is to fix them. User acceptance testing (UAT) is used to keep track of user reactions when updating the UMP chatbot system.

CONCLUSION

In conclusion, a chatbot with this artificial intelligence is a system to facilitate customers and users. Heading toward robotics, it looks bright for an AI-powered chatbot. This project will greatly benefit the institute as well as the students. Chatbots can solve problems that customers may face.



3.3 WORK BREAKDOWN STRUCTURE (WBS)

Figure 3.3 shows the work-break down structure for this project

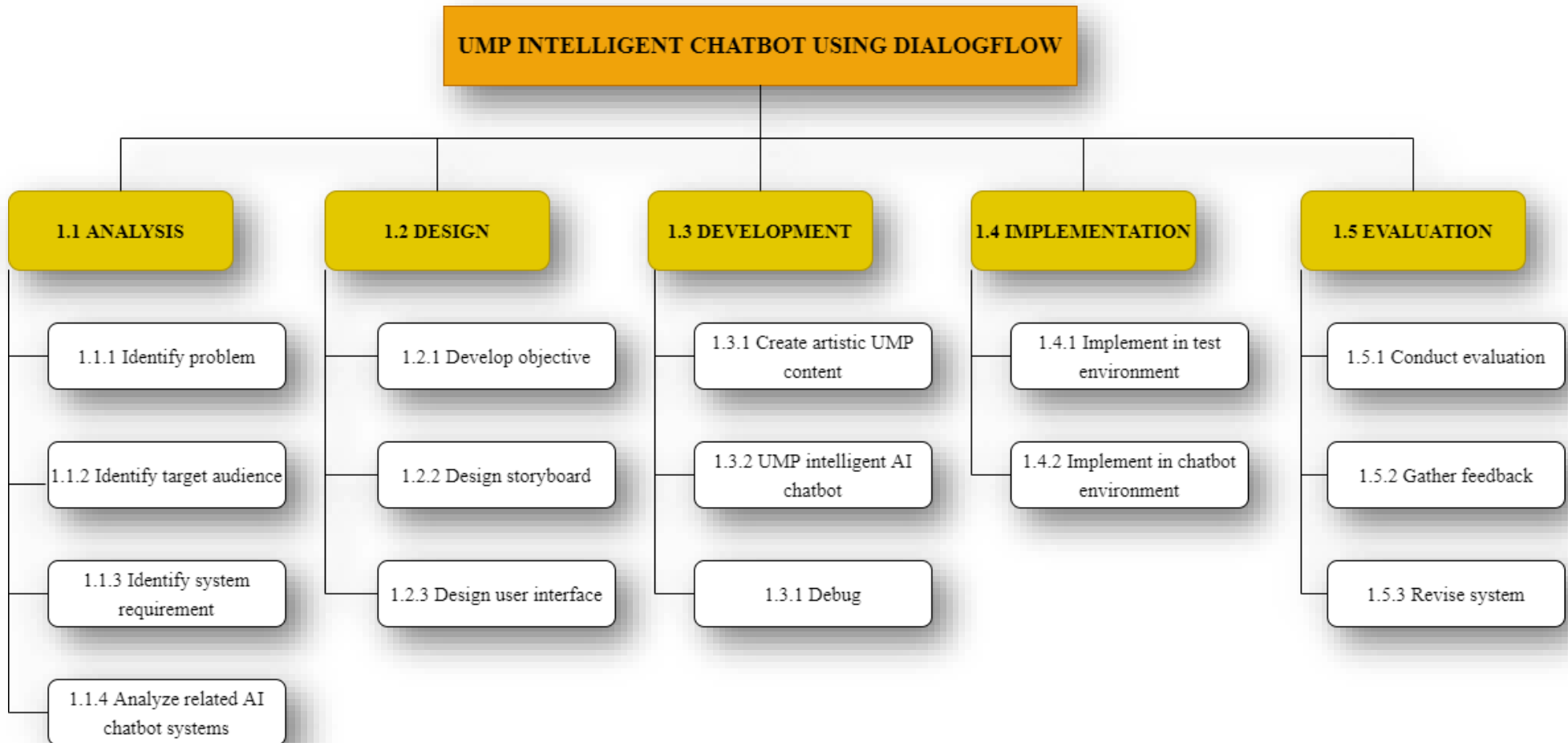


Figure 3.3: Work – Break Down Structures

3.4 PROJECT REQUIREMENTS.

This section will go over the hardware and software requirements specifications. To ensure that the process runs without system faults, requirements and specifications must be fulfilled before applying the method. The requirements specification utilized in the creation of the UMP Intelligent Chatbot system with the website is divided into two parts: functional requirements and non-functional requirements. This section will also go through hardware requirements specifications and software requirements specifications. Following that, the design steps involved in the construction of the Intelligent Chatbot system will be presented so that the system is simple to use and understand. Concerning relations to this, three diagrams will be created, namely the Context Diagram, the Use Case Diagram, and the Activity Diagram, which will be featured in this section. As a result, when creating a system, it is essential to carefully specify the application system requirements. This is done to guarantee that all the suggested functions and features can be built, and work as intended.

This section will also go through the system design specifications that will be used for this project. It is a comprehensive document containing all the information required to construct the system. This system design specification tries to observe and demonstrate how the system operates and interacts with the user. Following that, this chapter also aims to plan the initial framework of the system.

3.4.1 FUNCTIONAL REQUIREMENTS

The goal of the developed system requirements specification is important to ensure that the system structure is well-built. Each system to be designed should function in compliance with the functional requirements given. The function of system components that can be implemented smoothly is determined by functional requirements. A user needs specification is a list of application functions that users can perform. Before the system is constructed, user requirements specifications will be specified in detail.

The following are the functions of the system available in this UMP chatbot system with web:

- 1) Answer frequently asked questions about the university.**
 - The user enters a selection of frequently asked questions.
 - The user sends a message by pressing the “Send” button.
 - The chatbot will answer the question with the correct answer.

- **Provide redirect link to the complaints form when the user enters the Complaint.**
- Consumers enter the keyword to make a complaint in the chatbot.
- The user provides a redirect link to the complaint form to make the complaints.
- The website will collect the information and send it back to the UMP Gmail server to process with the help of SMTP JS push protocol.

2) Display university-related information.

- Users select the university information option.
- The chatbot will display the information requested by the user.
- The chatbot should use natural language designed with the intent to recognize input.

3.4.2 NON -FUNCTIONAL REQUIREMENTS

Non -functional requirements are implemented to support the development of functional requirements. Among the non -functional requirements that have been carefully studied are as follows:

a) Consumption.

The UMP intelligent chatbot system is developed with an easy-to-use user interface. Users will find it easy to understand how to use this chatbot system. The chatbot system is designed to be user-friendly, and all the system’s features are easily available to the targeted UMP users.

b) Efficiency.

The UMP chatbot system should respond to user questions rapidly and in a short amount of time. This is done to avoid unwanted effects on users and, as a result, to keep other systems from being affected.

c) Reliability

The reliability aspect is important in determining how much people trust the application. Reliability is sometimes described as the degree to which a program can be expected to fulfill the desired function with the required accuracy. Users can understand the program as a medium of customer care.

d) **Security**

Ensure that there are no bugs that could interfere with the use of the UMP intelligent chatbot system that is integrated with the UMP website.

- i. The chatbot should be dependable and error-free.
- ii. The chatbot should be rapid and responsive when creating the response.
- iii. The chatbot should be consistent, with few errors or flaws.
- iv. The chatbot should be easy to use and communicate with.
- v. The chatbot should respond to input with accuracy.

3.4.3 CONSTRAINTS AND LIMITATIONS

Among the constraints experienced during the study are as follows:

- This chatbot will only support English.
- Chatbots do not have the precise knowledge to distinguish between good and bad.
- These chatbots are programmed in such a way that they only know what is being taught. They are unable to understand the human context, and this is a huge gap that can lead to customer dissatisfaction.

3.4.4 USER REQUIREMENT

Finally, the least popular feature is reporting to the administrator if we can't locate the proper answer. This, in my opinion, is because the student may find it frustrating to report an inaccurate answer to the administrator every time a mistake is identified. As a result, the student does not think the function is efficient and does not require it.

Additionally, the users of this UMP Intelligent Chatbot system are students or staff at a university. The user requirements specifications available in this system are:

- Users can ask frequently asked questions about the university.
- Users can make a complaint in the Complaint form which will then be sent to the Gmail server for verification.
- Users can view information about the university, courses, and facilities.

3.5 FLOWCHART

The flowchart is used to illustrate the process's workflow of the chatbot system. Figure 3.5 describes the flow of the UMP intelligent Chatbot system from start to finish.

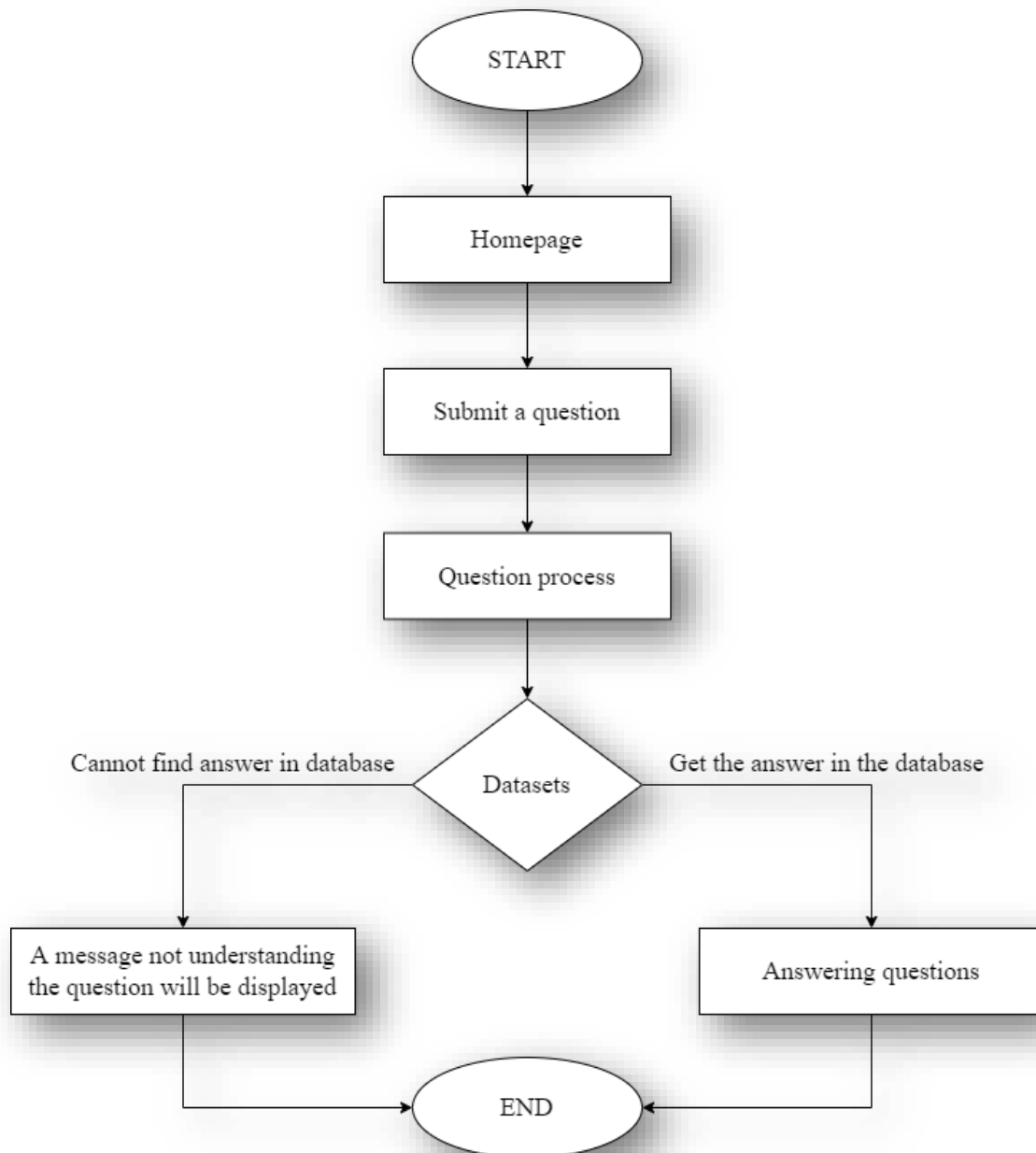


Figure 3.5: UMP Intelligent Chatbot Flowchart

3.6 CONTEXT DIAGRAM

Figure 3.6 is a context diagram that illustrates this system. It describes the boundaries between the system and the data flow. The system consists of an external entity which is the user. The first activity is that the user will enter the Chatbot website and click the Chatbot Icon, and next will type in the questions that need to be asked. The second activity is that the user will enter the complaint keyword in the chatbot to be given a link to the complaint form to file a complaint which will then be sent to the Gmail server for UMP verification. The third activity is, for users, to get information about the university (UMP).

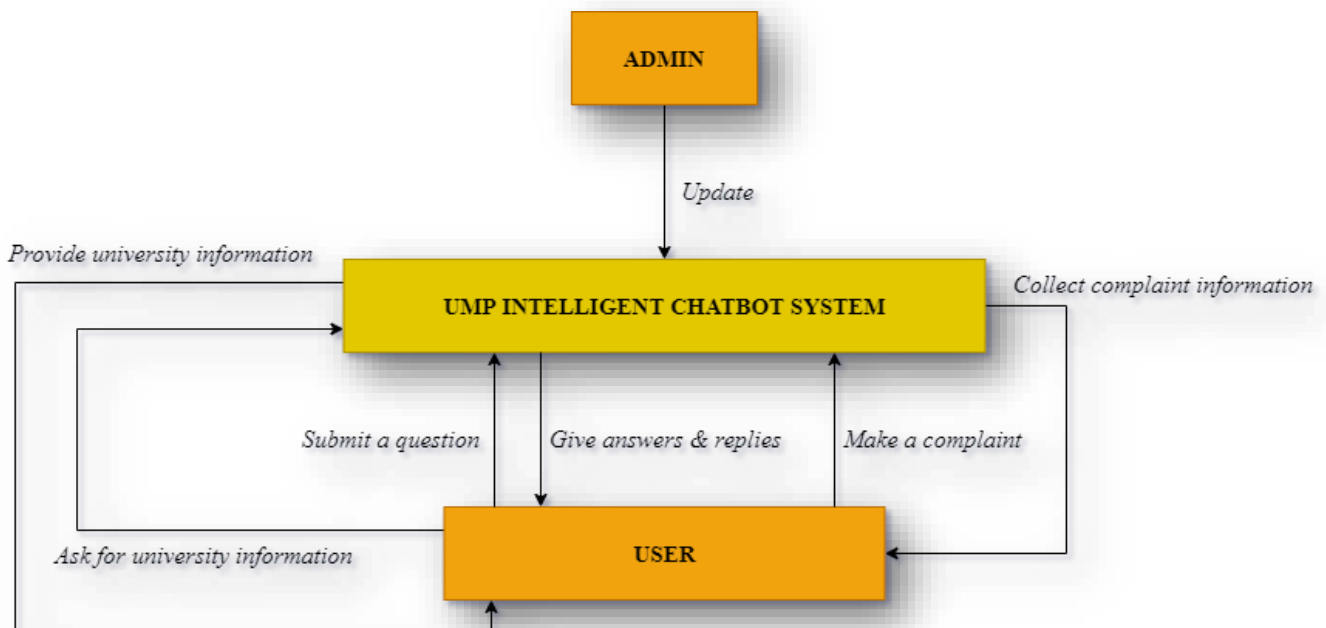


Figure 3.6 UMP Intelligent Chatbot **Context Diagram**

3.7 USE CASE DIAGRAM

A use case diagram is a graphical representation of the interaction between system parts, such as the user and the system. In system analysis, use cases are strategies for identifying, explaining, and organizing system needs. As a result, the use case diagram clearly shows the type of user and the use case. Figure 3.7 depicts Intelligent Chatbot use case images.

The symbols used in Figure 3.7 are shown in Table 3.7.





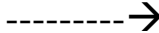
SYNTAX	DETAILS	CONSTRUCT
Use Case	A description of a set of action sequences. Visible interactions between actors and solutions when actors use the system to achieve a goal.	
Actor	Individuals or systems that interact or respond to actions made by another actor	
System boundary	The boundary between the physical system and the actors that interact with the physical system.	
Connection	Participation of actors in use cases	
Inclusive	Inclusive is a dashed line that begins at the base use case and ends with an arrow pointing to another use case. It is very useful when the same use case can be factored in from two different use cases.	<p data-bbox="1066 1554 1294 1585"><< include >></p> 

Table 3.7: Use case activity diagram symbols

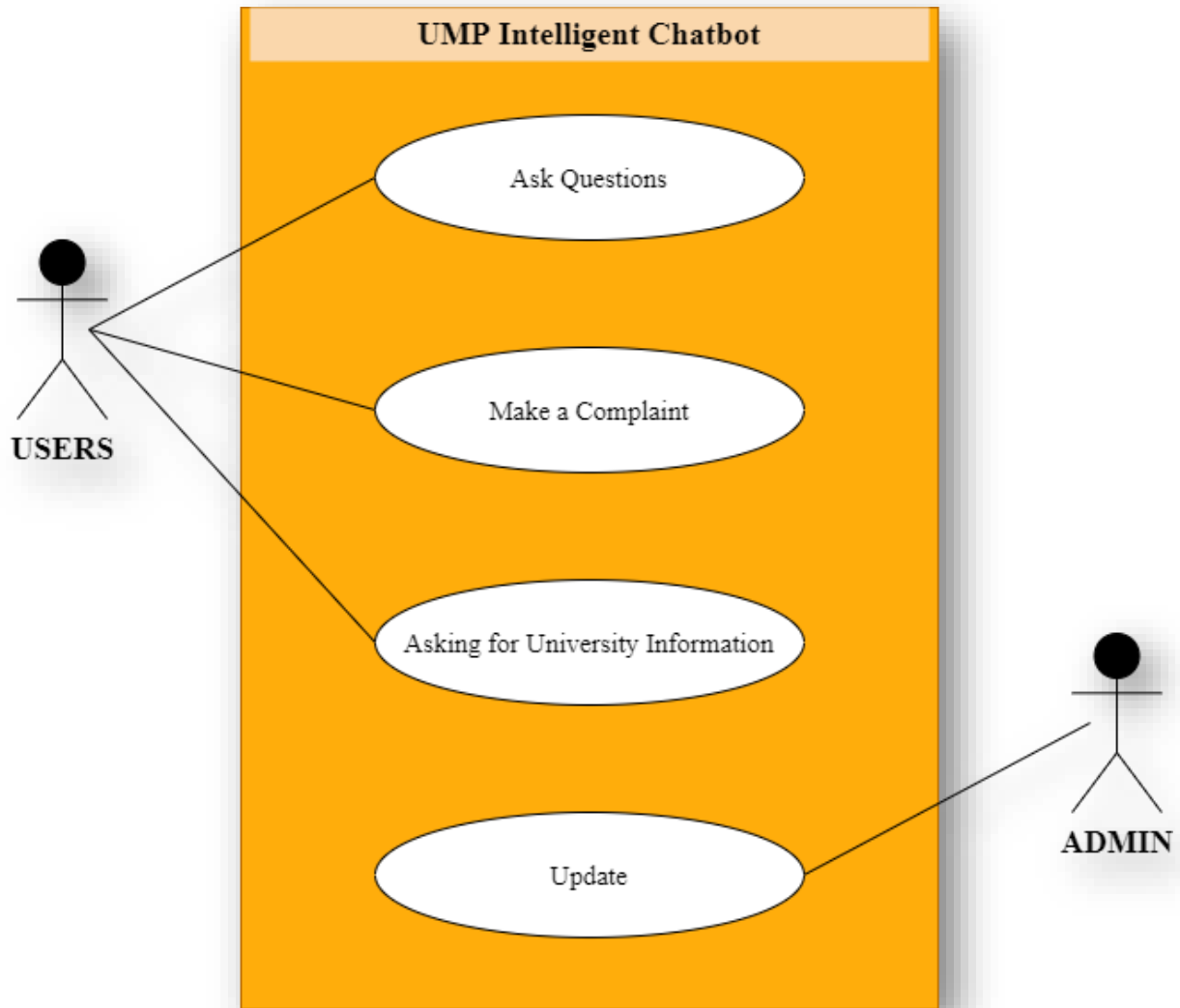


Figure 3.7 UMP Intelligent Chatbot, Use Case Diagram

3.7.1 USE CASE SPECIFICATION

A use case specification is a document used to identify specific details of a use case. In addition, use case specifications also provide a way to identify system functional requirements. Table 3.7.1, Table 3.7.2, and Table 3.7.3 show the use case specifications for the intelligent chatbot.

Table 3.7.1 User Use Case Specifications posed a question

ID	CASE 1
Use Case	Users submit questions
Description	Users will type questions in the Chatbot
Actor	Users
Pre-requisite	The user has entered the website and clicked the icon “Talk to Our Chatbot” to interact with the UMP Intelligent chatbot system.
Mainstream	<ol style="list-style-type: none"> 1. The system will display the homepage. 2. The user types a query message in the website’s chatbot 3. The user sends the message by pressing the "Send" button. 4. Chatbot will reply to the message with the correct answer.
Post-conditions	The chatbot has answered user questions correctly.
Alternative Streams	If the message sent is not understood by Chatbot, the system will display the message “Sorry, I don’t understand the question ”.

Table 3.7.2 Specification of User Complaint Redirect Link Use Cases

ID	CASE 2
Use Case	Users will type “Make complaints”
Description	Users will be provided redirect links to the complaint form on the websites.
Actor	Users
Pre-requisite	The user enters the complaint information on the website.
Mainstream	<ol style="list-style-type: none"> 1. The user will enter the complaint on the complaint form on the UMP website. 2. The user’s complaint will be sent to the Gmail account through the SMTP JS push protocol. 3. UMP staff will collect the information of the complaint and will address it to the relevant staff in the department.

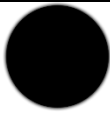

Post-conditions	The complaint has been successfully filed.
Alternative Streams	If the user wants to exit the complaint, the user must type "Cancel or Exit"

Table 3.7.3 Specification of User Use Cases Asking for University Information

ID	CASE 3
Use Case	Users ask for university information
Description	Users will request university information in a message.
Actor	Users
Pre-requisite	The user selects the information option in the chatbot
Mainstream	1. The user types a question 2. Chatbot will display information.
Post-conditions	The correct information has been communicated to the user.
Alternative Streams	If the information is not known to Chatbot, Chatbot will display the message "Sorry, I'm still learning. I don't have the answer for the question at the moment".

3.8 ACTIVITY DIAGRAM

An activity diagram is a diagram that illustrates and describes a flow of activities performed by each entity involved in a system. The activity diagram is also based on a clearer description than the Use Case Diagram and its description. There are several symbols used in producing this activity diagram, here are the symbols used in Table 3.8

No	Symbol	Functions
1	 Start	The symbol that marks the start of the activity
2	 Stop	The symbol that marks the end of the activity


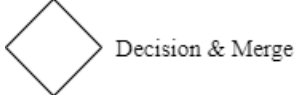
3		Symbols that indicate a process
4		Symbols that require a decision to be made

Table 3.8: Activity Diagram Symbols

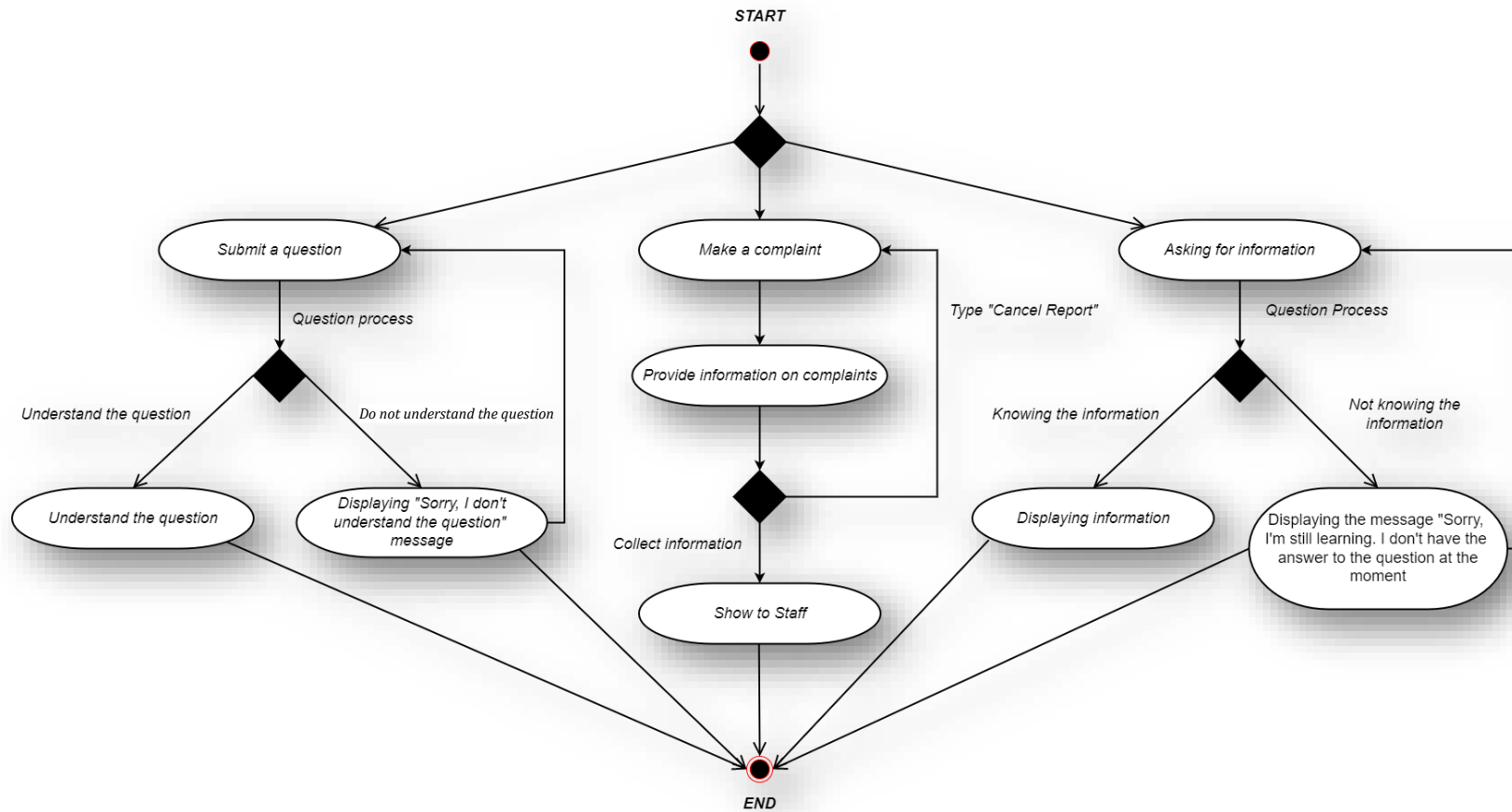
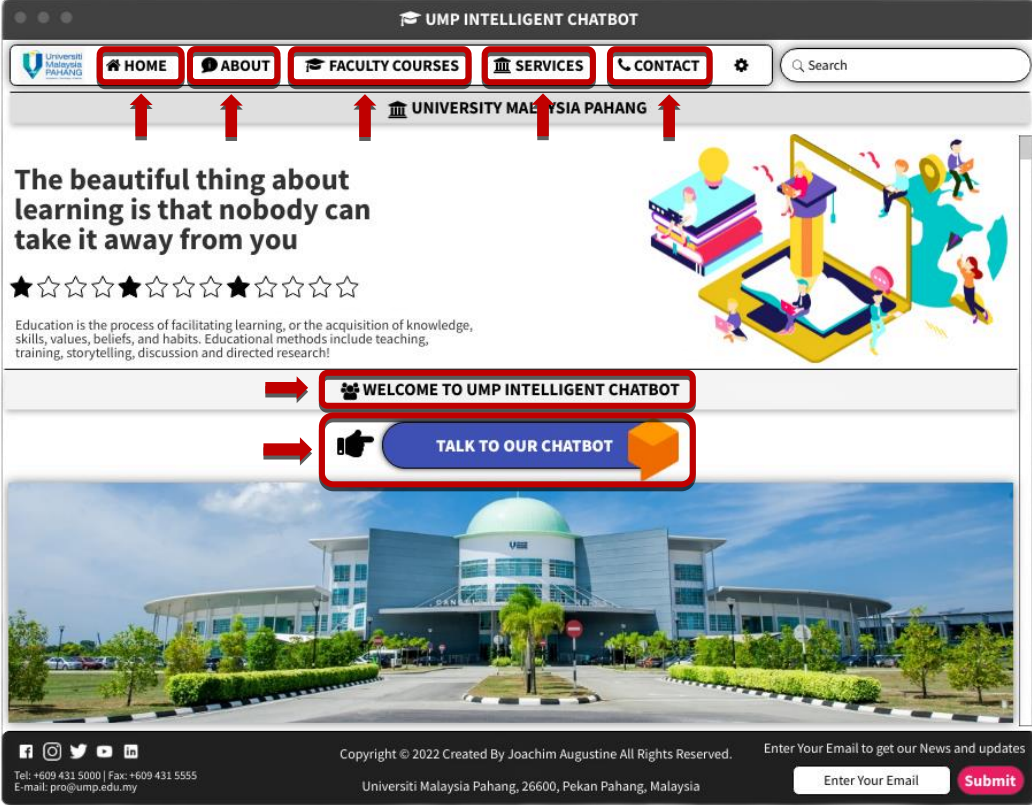


Figure 3.8 UMP intelligent Chatbot Activity Diagram

3.9 STORYBOARD

Home page interface

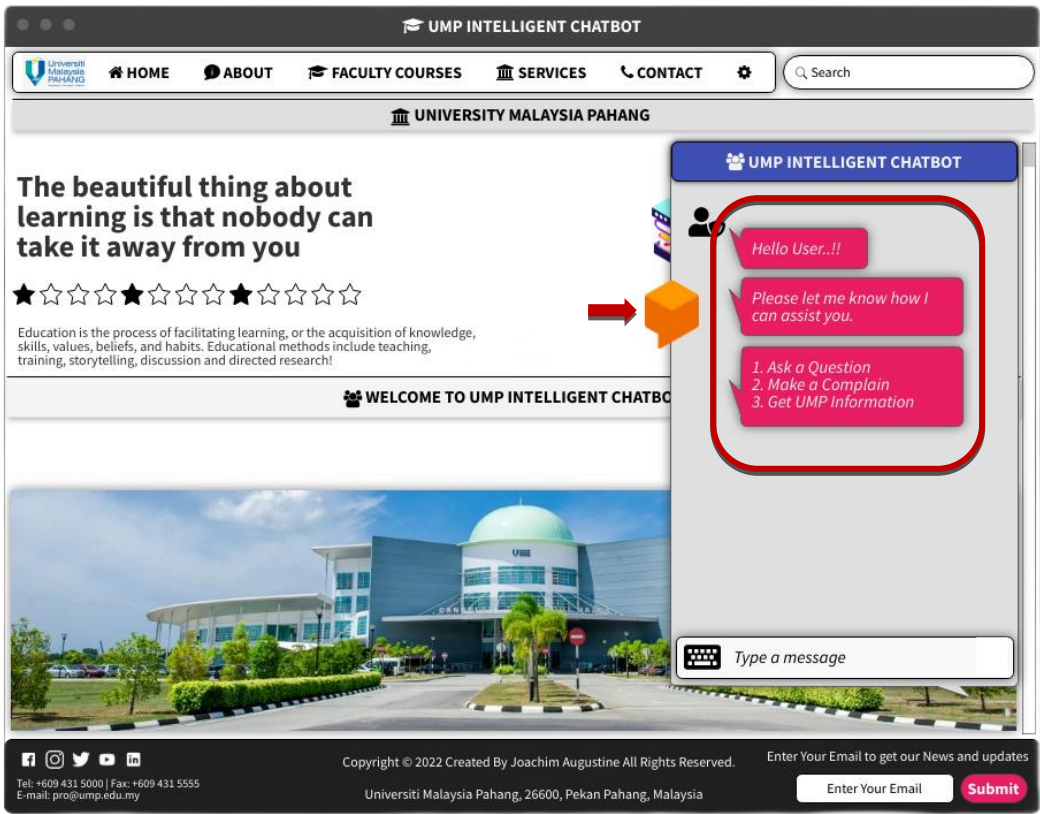
Function	Homepage of UMP Intelligent chatbot website
Layout	01
Screen Layout	
Screen Description	<ol style="list-style-type: none"> 1. On the UMP website, the initial screen layout showcases the homepage of the UMP Intelligent Chatbot system. 2. In the menubar, there are five buttons: Home, About, Faculty Courses, Services, and Contact. When the user selects the Home button, the user is taken to the UMP website's home page. 3. If the user clicks the About button, they will be taken to the University Malaysia Pahang's About page. 4. When a user selects Faculty Courses, a list of all the courses offered by UMP Malaysia is displayed, organized by UMP faculties. 5. If the user selects the Service and Contact button, the user will be directed to the Service and Contact Details page, which has additional information on the Telephone, Fax Number, and Locations.

6. Furthermore, if the user selects the **"TALK TO OUR CHATBOT"** button, the Dialogflow chatbot will appear, allowing users to ask Frequently Asked Questions, provide complaints link, and obtain UMP information using easy text or voice commands. The chatbot application will be closed if the user touches the Orange box symbol button again. 🗨️

Function "TALK TO OUR CHATBOT" features in UMP's Intelligent chatbot

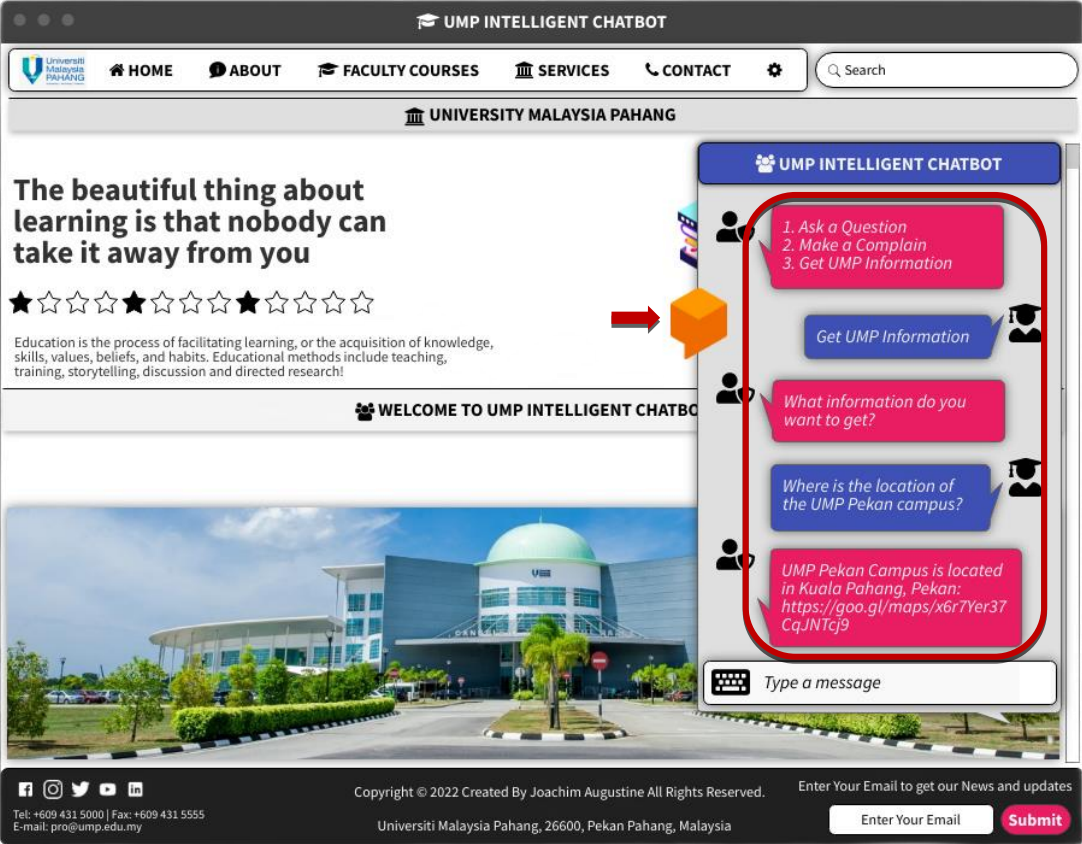
Layout 02

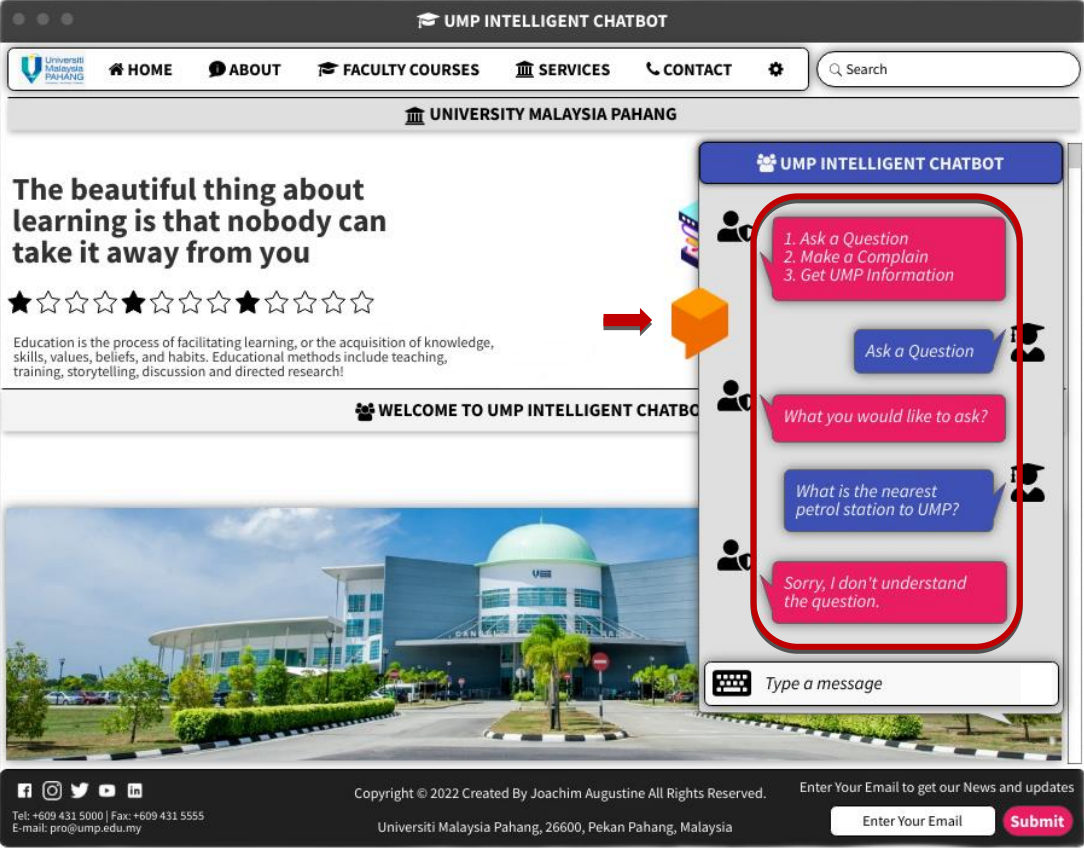
Screen Layout

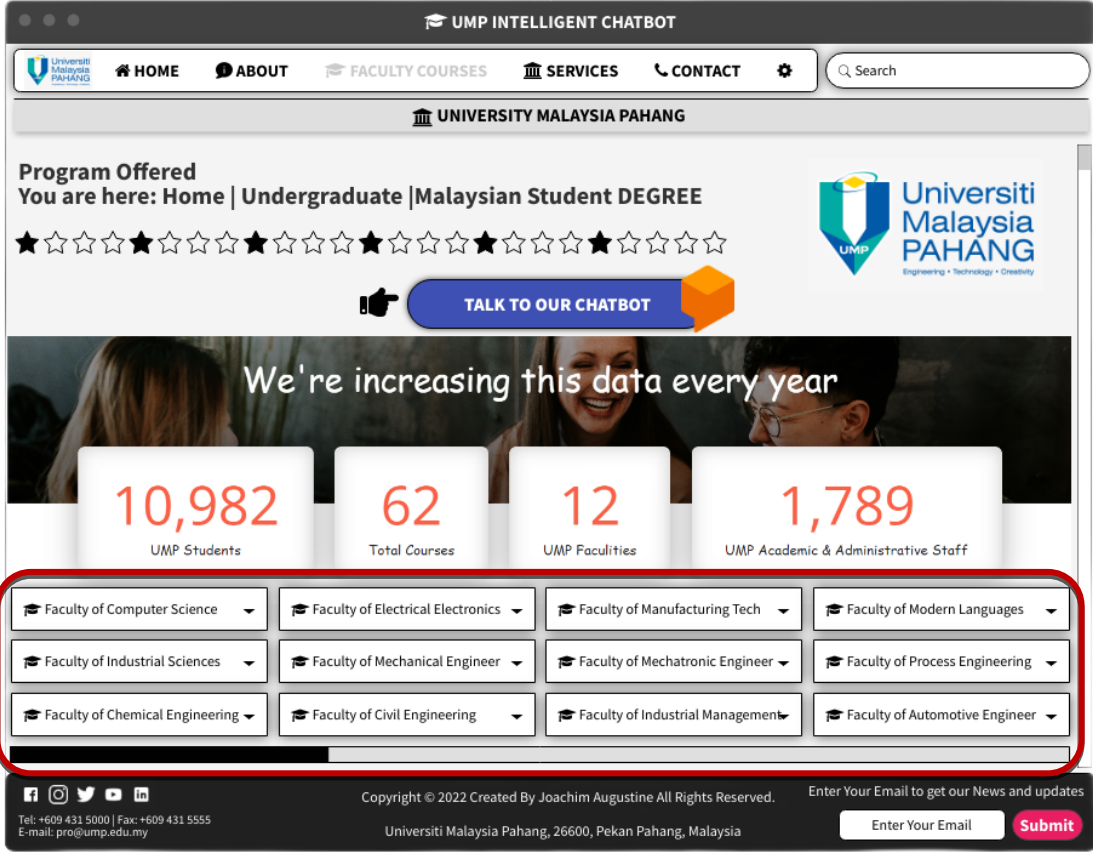


Screen Description

1. When a user selects the **"TALK TO OUR CHATBOT"** button as shown in the previous screen layout 01, the Dialogflow chatbot appears, allowing users to ask Frequently Asked Questions, provide complaint link, and obtain UMP information using easy text or voice searches. The chatbot application will be closed if the user touches the Orange box symbol button again. 🗨️

Function	Question & Response replies if match with the UMP Intelligent chatbot Dataset
Layout	03
Screen Layout	
Screen Description	<ol style="list-style-type: none"> 1. When a user types or speaks into the chatbot's input field for example, "Get UMP information," the chatbot will respond by asking, "What information do you want to get?" 2. If the user asks "Where is the UMP Pekan Campus?", the chatbot will detect the user's queries on the dataset and answer with a link to the Google Maps location, redirecting the user to the UMP location in Google Maps pinpoint.

Function	Response replies if not match with the UMP Intelligent chatbot Dataset
Layout	04
Screen Layout	
Screen Description	<p>1. If a user asks, "What is the nearest petrol station to UMP?" the chatbot will check the dataset for the user's queries, and if the answer was not in the Training machine's dataset, the chatbot will respond, "Sorry, I don't understand the question."</p>

Function	Faculty Courses page of UMP Intelligent chatbot website
Layout	05
Screen Layout	
Screen Description	<ol style="list-style-type: none"> 1. The Faculty Courses page on the UMP website includes all of the different faculties and programs that each faculty offers. 2. If the user selects the "Faculty of Computer Science" dropdown menu, the system will display all of University Malaysia Pahang's computer science courses, along with the prerequisites and course curriculum for each program.

3.10 SOFTWARE AND HARDWARE REQUIREMENTS

Software and Hardware specifications are important components during system development. Therefore, software and hardware are very important to complete the system development and ensure that it functions smoothly and achieves its objectives. The following are the software and hardware specifications required to develop and implement a UMP Intelligent chatbot system with the website.

3.10.1 SOFTWARE REQUIREMENT

Software	Details
DialogFlow	DialogFlow is a natural language comprehension platform used to design and integrate conversational user interfaces into mobile applications, web applications, devices, bots, interactive voice response systems, and related applications.
Google Chrome	Used to find information.
PyCharm IDE	PyCharm is an application used in computer programming, specifically for the Python language.
Visual Studio Code	Use it to code in HTML, CSS, and JavaScript for a UMP website to integrate the chatbot system together
Microsoft Word	This software is used to complete each documentation.
Draw.io	Used to draw the Context Diagram model and WBS structure.
Firebase	Used to host the complete website with the integrated chatbot to the internet for access by any target users with their devices.
SMTP JS	Used to configure and manage the connection of Gmail Server push protocol to stored users' complaints which are entered in the UMP complaint form.
Gmail Account	Used to store information on the complaint for verification.
Mock Flow	Used to design UMP intelligent chatbot user interface prototypes that display to the end-user how the chatbot will appear without having to develop the software or underlying functionality at the initial level.

Table 3.10.1 shows the **software requirements specifications**.

3.10.2 HARDWARE REQUIREMENT

Table 3.10.2 shows the system specifications used to develop the UMP Chatbot system

Type	Details
Storage	1 TB HDD
Processor	Intel® Core i5-6200U CPU @ 2.80GHz
Operational system	Windows 10
Memory (RAM)	4.00GB
System Type	64-bit Operating System, x64-based processor

Table 3.10.2 shows the **hardware requirements specifications**

Table 3.10.2.1: Development of Hardware

System Development	Consumers
<ul style="list-style-type: none"> • OS: Windows 7/8.1/10 (64-bit) • CPU: Intel® Core™ i3-2100, or higher • Memory: 4GB RAM, or more • Storage: Minimum 3GB 	<ul style="list-style-type: none"> • OS: Windows 7/8/8.1/10 • CPU: Intel Pentium 4, or higher • Memory: 4GB RAM, or more • Storage: Minimum 1GB • Internet connection: Yes



3.11 SYSTEM DESIGN SPECIFICATIONS

This system design specification aims to observe and demonstrate how the chatbot operates and interacts with the user. Furthermore, the goal of this section is to create the chatbot system's initial framework.

Architectural design is concerned with the selection of elements as well as the limitations imposed on those elements. For architectural design assistance and to meet specific criteria, the design has always been associated with modulation, thorough interface design, algorithms, procedures, and data type requirements. The design specifications and requirements establish the extent of the system's challenges, expectations, limitations, and final solutions. This involves an analysis of needs, as well as the concept and definition of needs and expectations. Before beginning the design process, we are prone to reach a solution based on the problem's topic rather than knowing the underlying needs of the problem.

Lastly, specifications are essential in the design process. The design of a UMP Intelligent Chatbot system should be identified during development so that the specifications supplied have appropriate and sufficient features. It should always be considered throughout the early stages of design.

3.11.1 DESIGN OF ARCHITECTURE

Architectural design is a term that refers to the process of describing a collection of hardware and software components, as well as interfaces, to provide a framework for the creation of a computer system. The relationship between the specification and design procedures carried out in parallel with other specification activities is also shown through this design. According to the findings, two types of architecture are typically employed in system development. Layered Architecture and Module Hierarchy Charts are two of them.

3.11.2 ARCHITECTURE MODULE

The structure for the architecture to be built is important as a key aspect to starting the construction of this chatbot project. Figure 3.11.2 shows the UMP Intelligent Chatbot, architecture model.

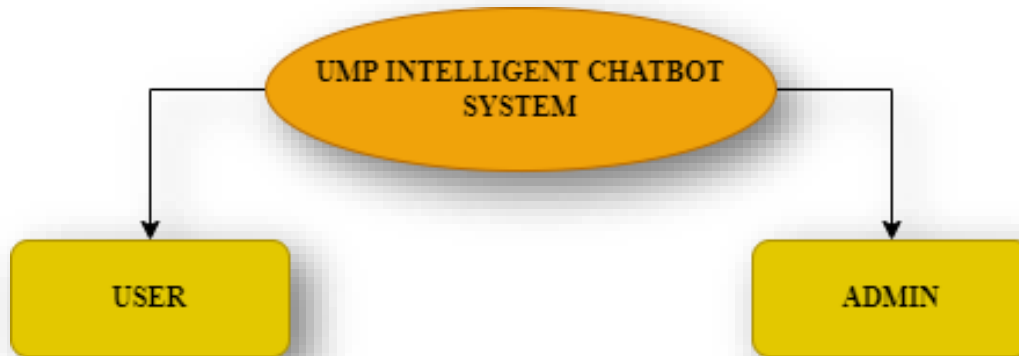


Figure 3.11.2: UMP intelligent Chatbot Architecture Model

3.11.3 MODULE DESIGN

This design uses a hierarchical module chart form to represent the module splitting. The relationships between the modules in this system are explained in this diagram. The following modules are illustrated in Figure 3.11.3.

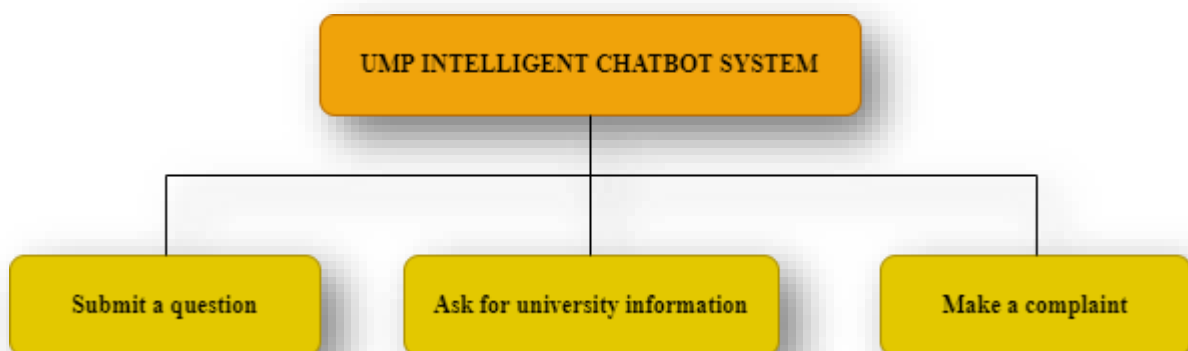


Figure 3.11.3: Hierarchy chart of Smart Chatbot system modules

a) ASK QUESTIONS MODULE

Figure 3.11.4 depicts the Question Submission Module, which requires the user to ask a question to a system chatbot. Users can submit a question by using the "Enter" button or return to the system's main menu by pressing the "Back" button.

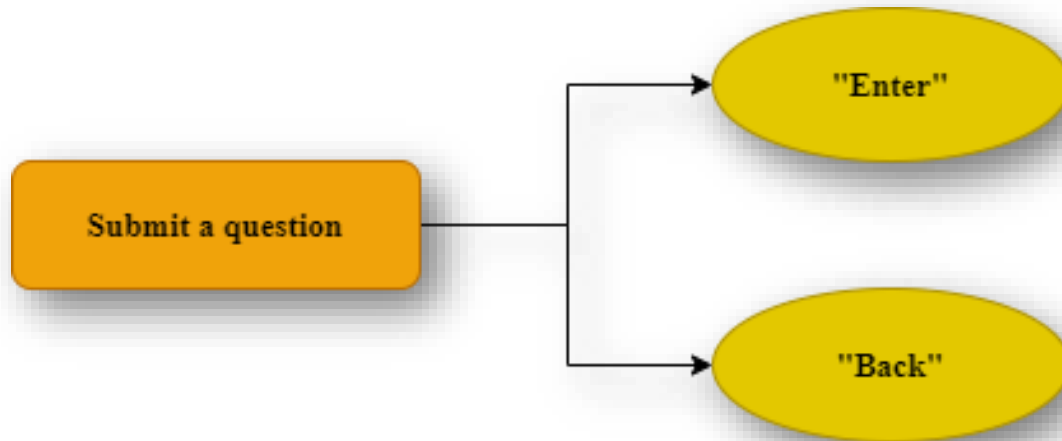


Figure 3.11.4: Questioning Module

b) COMPLAINT MAKING MODULE

This module involves users making a complaint by providing a complaint link on the website to enter complaints with their Username and Email so that website can send the complaints to the Gmail account for verification. Figure 3.11.5 shows the complaint-making module.

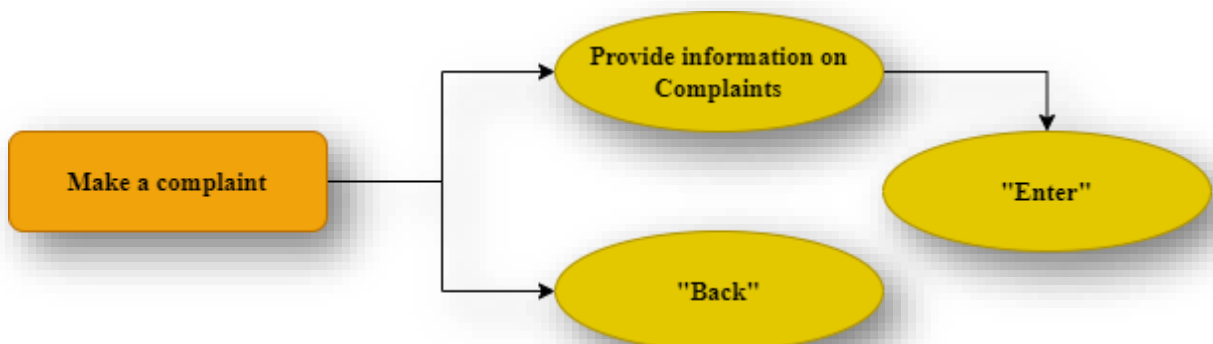


Figure 3.11.5: Complaint Module.

3.12 FAQ FOR THE UMP INTELLIGENT CHATBOT

NO	SIMULATED USER UTTERANCE
1	Tell me about UMP
2	Location of UMP Pekan / Gambang Campus
3	What Courses Are Provided at UMP
4	What is the fee for a particular course?
5	What is the number of Faculties at UMP?
6	What are the Entry Level Requirements for Diploma studies?
7	What are the Entry Level Requirements for Degree studies?
8	What are the Entry Level Requirements for master's studies?
9	What are the Entry Level Requirements for Ph.D. studies?
10	What is the course duration for the selected course?
11	What facilities are provided for UMP students?
12	What are the Spots and outdoor activities provided at UMP?
13	What time does the UMP Bus arrive at UMP?
14	What is the latest UMP announcement?
15	What are the UMP Events?
16	What is the address of UMP Pekan?
17	What is the address of UMP Gambang?
18	Bus Schedule.
19	Course Structure with Prerequisite requirements
20	Vertical Credit Transfer Information
21	Course Registration Guidelines
22	Hostel Registration Guidelines
23	Open Registration Guidelines
24	Lecturer information and contact details
25	General Fees for UMP courses
26	Car Rental and Students Grab Service Details
27	Academic Calendar Information

3.13 KEYWORD TRAINING PHASES

Keyword phrases can be classified as a dataset that is trained by the chatbot to observe and recognize different types of queries asked by users for requesting specific details. This dataset is essential for the management of classified information. Data that will be stored must be recognized and understood in advance so that the process of compiling data may be sorted and stored logically.

3.13.1 DICTIONARY OF DATASETS

Figure 3.13.1 shows the design required to build the UMP Intelligent Chatbot.

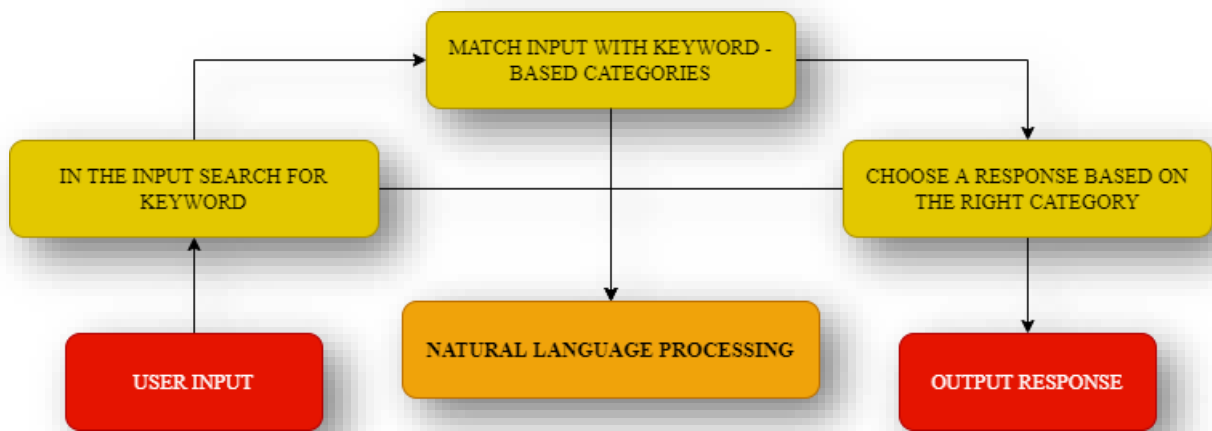
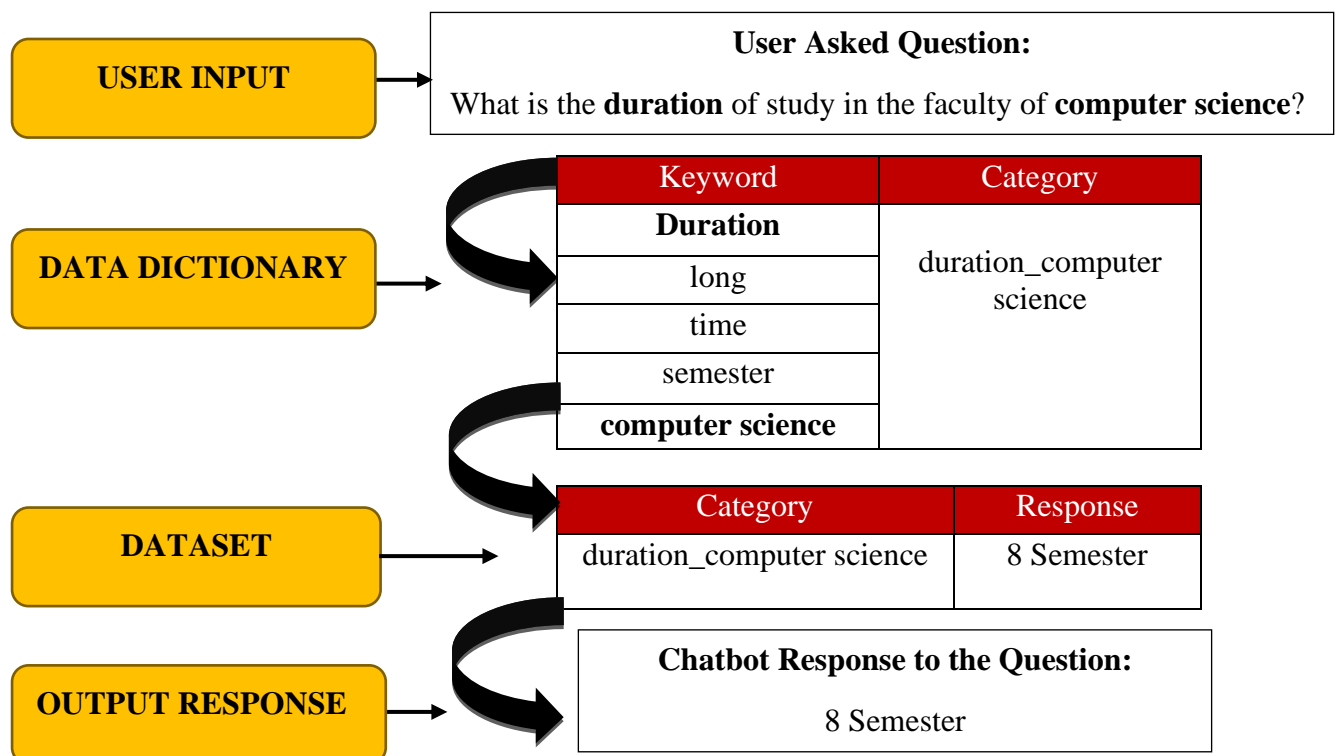


Figure 3.13.1: UMP Intelligent Chatbot Design



3.14 SEQUENCE DIAGRAM

The sequence diagram depicts the relationships between objects in chronological order. It explains the scenario's objects and the messages that must be sent between them for the scenario's function to be performed. The UMP Intelligent Chatbot System is depicted in Figure 3.14 for a sequence diagram. The user asks a question, which is then processed into a dataset, which obtains the answer, and the Chatbot displays the answer to the user.

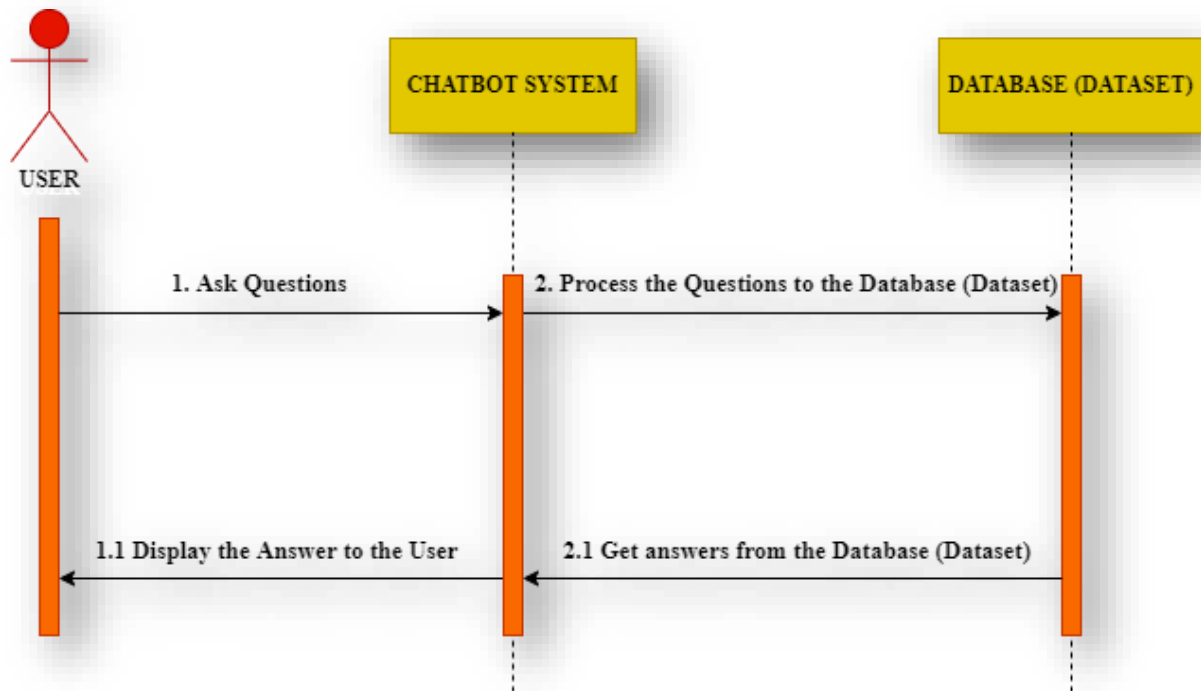


Figure 3.14: UMP Intelligent Chatbot System's Sequence Diagram

3.15 INTERFACE DESIGN

The process of creating an interface for a system or application's users is known as interface design. As a result, the application's basic and user-friendly interface design may assist users in understanding and efficiently using it. The purpose of user interface design is to make application interaction simple and efficient for users. It is important to provide a first overview to the user to verify that the user understands the application that will be created. The initial designs presented for users of the UMP Intelligent Chatbot integrated with the UMP website will be discussed in this phase.

3.15.1 HOMEPAGE OF THE UMP INTELLIGENT CHATBOT’S WEBSITE

Figure 3.15.1 shows the user interface of the UMP website’s homepage.

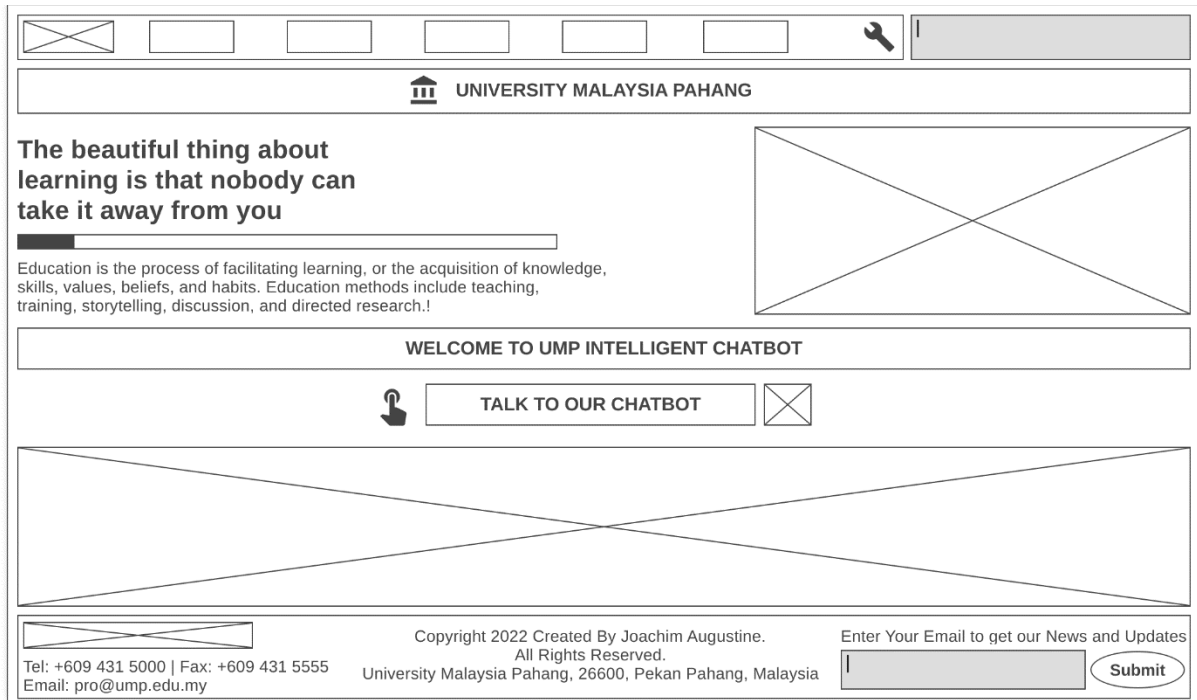


Figure 3.15.1: UMP website’s main screen

3.15.2 “FACULTY COURSE” PAGE OF THE UMP CHATBOT’S WEBSITE

Figure 3.15.2 shows the user interface of the UMP website’s Faculty Course Page

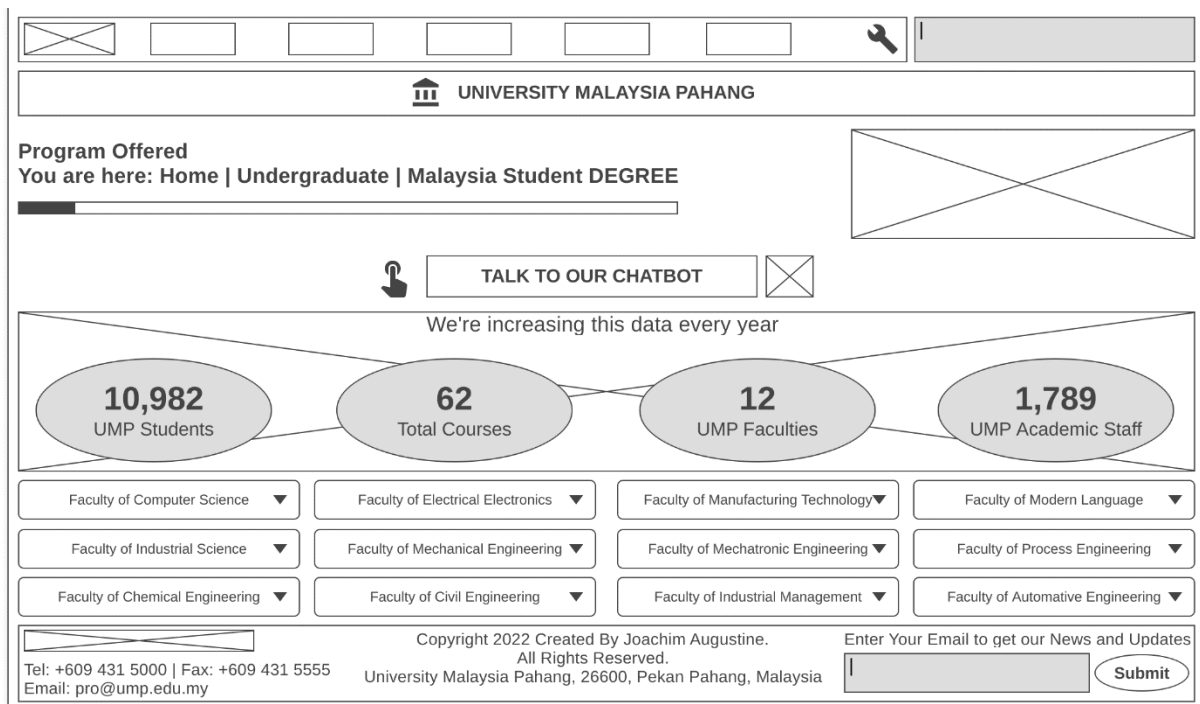


Figure 3.15.2: UMP website’s faculty course screen

3.15.3 CHATBOT APPLICATION ON THE UMP WEBSITE

Figure 3.15.3 shows the chatbot's user interface when a user clicks the "Talk to our chatbot" button on the website and begins to ask the question correctly.

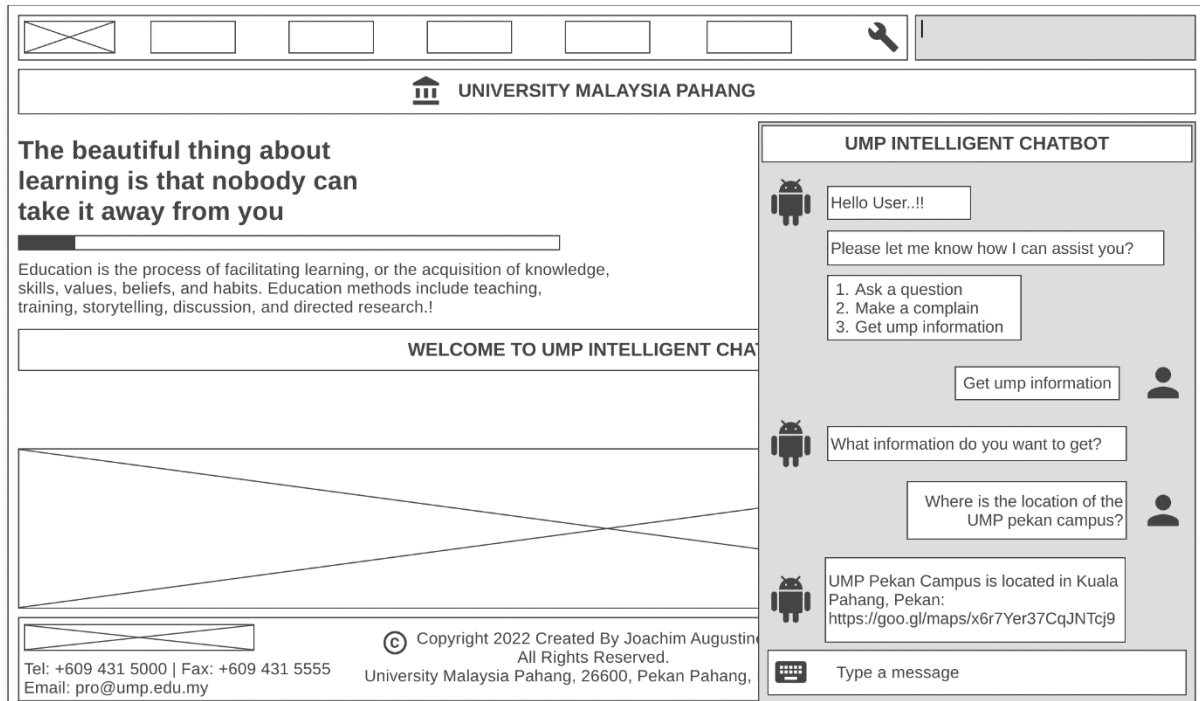


Figure 3.15.3: UMP Intelligent Chatbots chat screen with response to queries

3.16 GRAPHICAL PROTOTYPE DESIGN

The process of creating a prototype design for a system or application's users is known as UX design. As a result, the application's basic and user-friendly prototype design may assist developers to figure out what they're capable of while also allowing them to see their work. Therefore, the developers will have a better idea of which aspects of the original plan are accurate given their resources and time constraints. Moreover, prototyping also allows designers to test the reliability of their current design as well as investigate how trial users perceive and respond to the product.

This phase will discuss the initial prototype designs given for users of the UMP Intelligent Chatbot system that is integrated with the UMP website.

3.16.1 GRAPHICAL (UX) PROTOTYPE OF THE UMP HOMEPAGE

Figure 3.16.1 shows the user experience (UX) of the UMP website’s homepage.

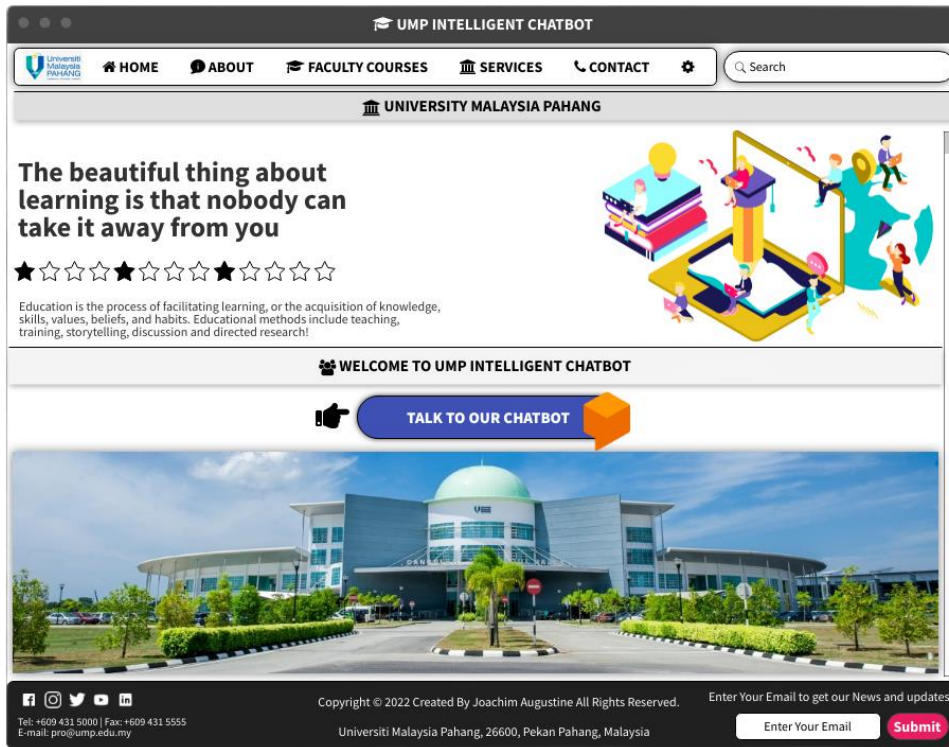
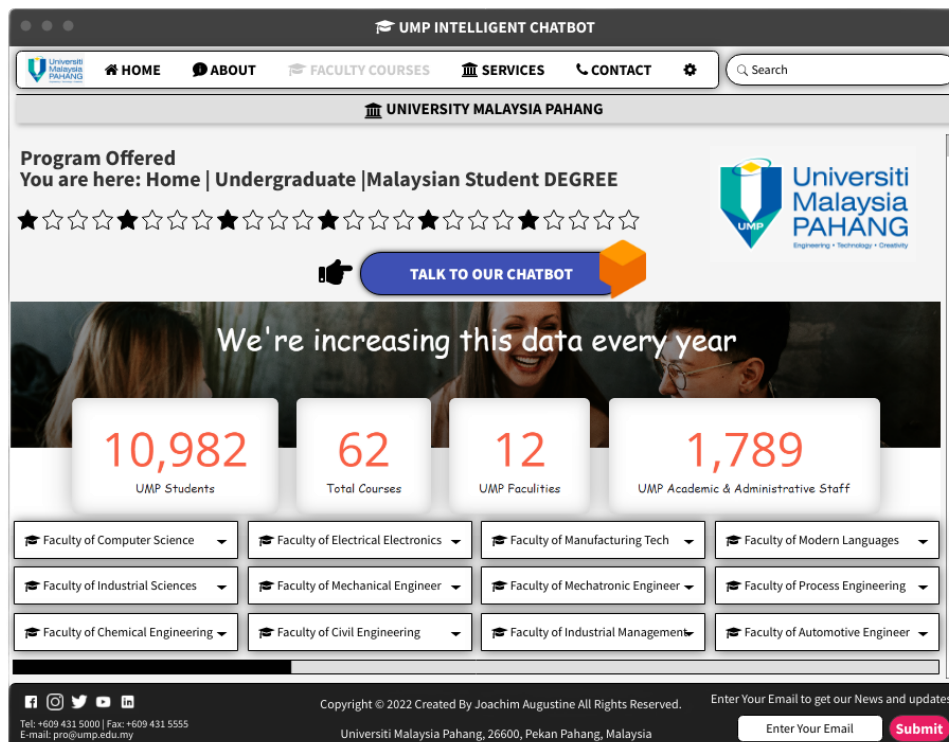


Figure 3.16.1: UMP website’s main screen

3.16.2 “FACULTY COURSE” PAGE OF THE UMP CHATBOT’S WEBSITE

Figure 3.16.2 shows the user interface of the UMP website’s Faculty Course Page



3.16.3 PROTOTYPE OF THE UMP CHATBOTS SCREEN CHAT

Figure 3.16.3 shows the chatbot's user interface when a user clicks the "Talk to our chatbot"

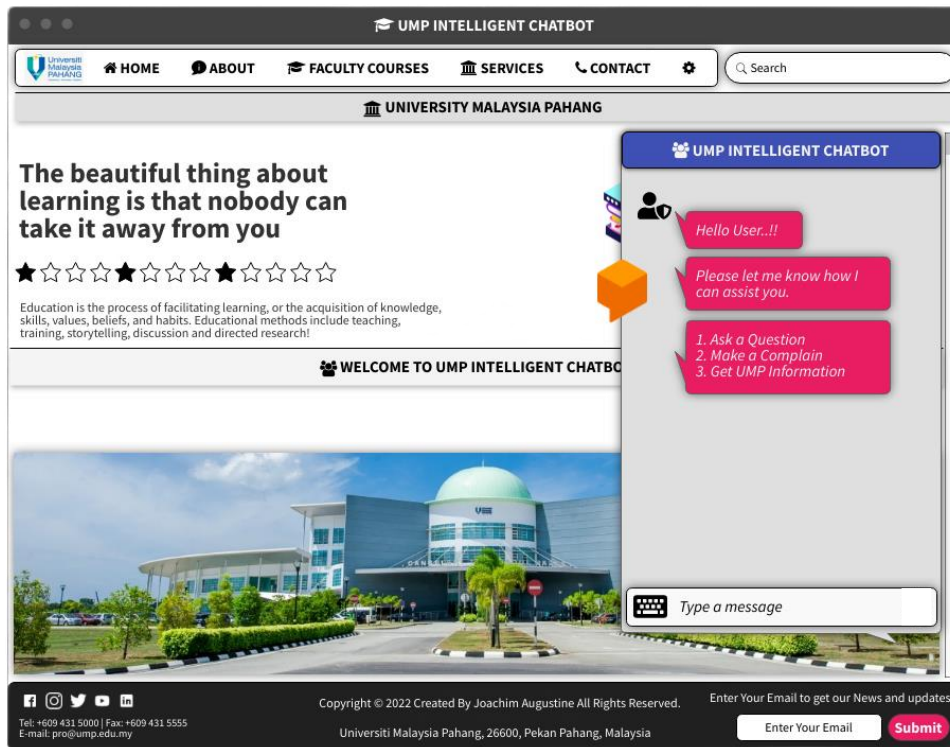
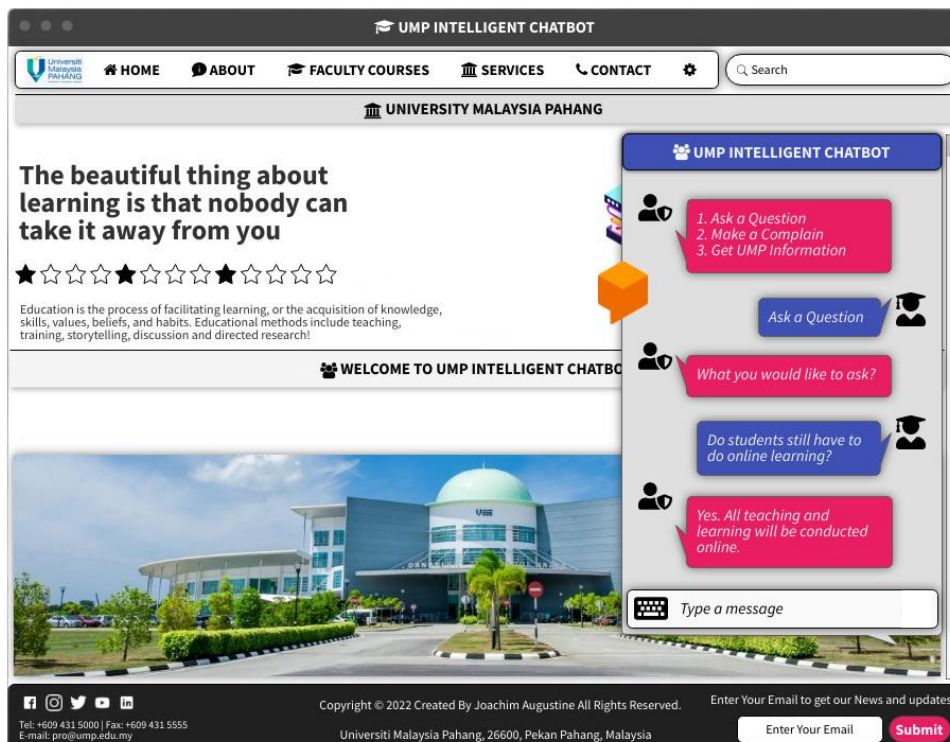


Figure 3.16.3: UMP Intelligent Chatbots Chat Screen

3.16.4 PROTOTYPE OF THE UMP CHATBOT ANSWERING QUESTIONS

Figure 3.16.4 shows the Chatbot answering questions posed by users correctly.



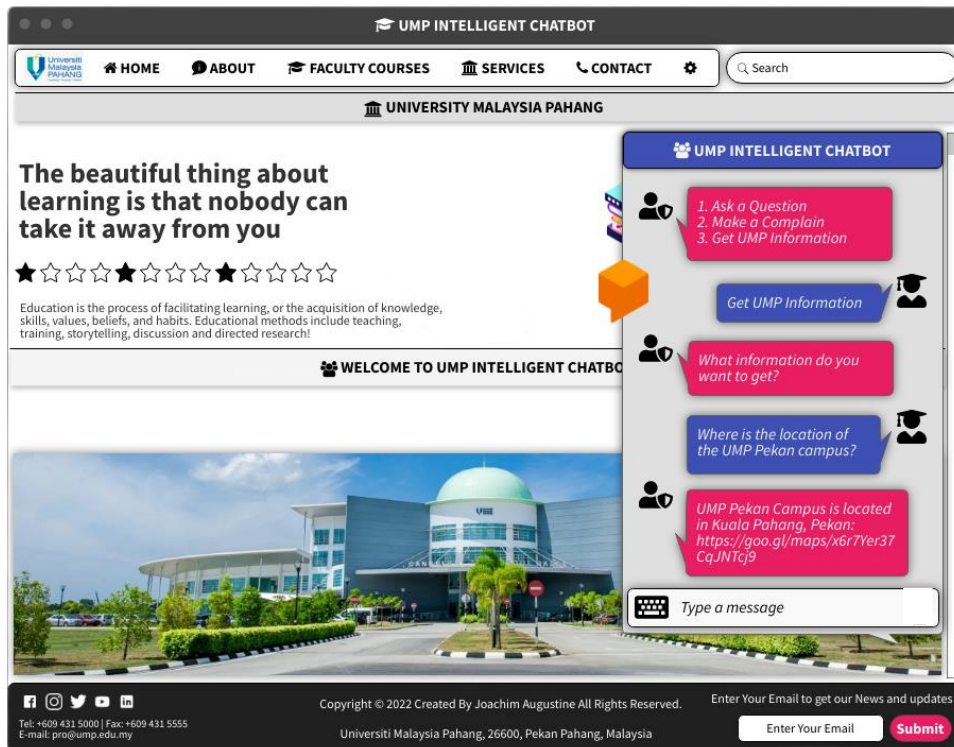


Figure 3.16.4 & 3.16.5: UMP Intelligent Chatbots chat screen with response to queries

3.16.6 PROTOTYPE OF THE CHATBOT QUESTION WAS NOT RESPONDED TO

Figure 3.16.6 shows the UMP Intelligent Chatbot does not get responses to user inquiries since the query is not in the dataset.

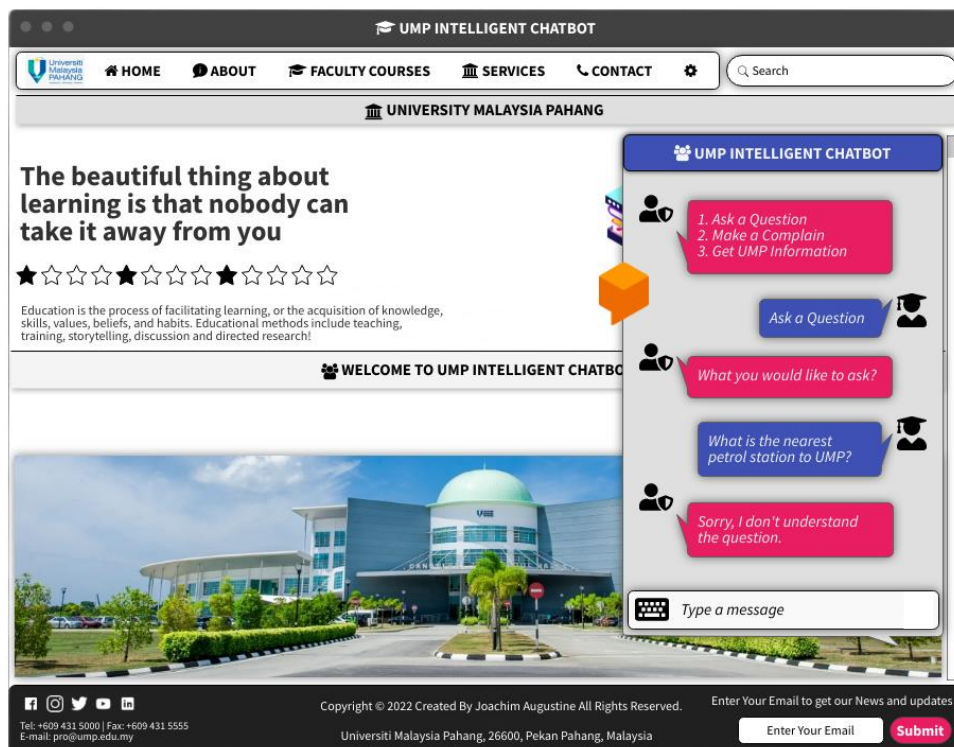


Figure 3.16.6: UMP Intelligent chatbot receives no response to an inquiry.

3.17 GANTT CHART OF THE PROJECT DEVELOPMENT

Activities / Week	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15
PLANNING PHASE															
Project Registration															
Interviews															
Questionnaire															
Research															
ANALYSIS PHASE															
Identify User Problem															
Information and Data Gathering															
Software & Hardware Selection															
Analysis of system flow															
DESIGN PHASE															
Proposed Design															
Data Design															
Design a proof of the initial concept															
Validation															
Documentation															
Presentation															

Table 3.17: Gantt Chart of the Project Development

3.18 IMPLEMENTATION

This chatbot will be implemented to target users of this project that have been specified in an earlier phase in the prototyping model (Analysis phase). This will implement for the UMP students and staff in the Pekan and Gambang campuses who studied in undergraduate and postgraduate courses. It will involve 10 students from that university to test the application.

Additionally, this is also done to identify any errors or updates that need to be made to the chatbot system. As stated in the User Requirement above, the response of the targeted user will be recorded.

3.19 TESTING

User Acceptance Test (UAT) Forms are used to determine whether the chatbot is fully tested or not. Figure 3.13 shows the evaluation form for students who are testing this chatbot system. Evaluation Forms are used to observe user feedback. Any improvement or change in the application is based on the feedback and measures of the effectiveness of this application.

CONCLUSION

In conclusion, this section emphasizes the specification of system requirements for a system to be developed. This is because the study that has been done in this chapter must be implemented clearly and in detail to avoid any unwanted problems from happening in the future. Functional and non-functional requirements are described to achieve the objectives of system development. In addition, the use of hardware and software must also be appropriate and able to improve the performance of the system to be developed. The system model description can be translated and displayed through Context Diagrams, Use Case Diagrams, and Activity Diagrams. These three diagrams can help users to understand the concept and operation of the UMP Intelligent Chatbot system with the website

In addition, this section has also discussed the system architecture as well as the modules available in this system. Furthermore, this section has explained the UMP Intelligent chatbot's User interface (UI) and Initial Prototype (UX) with the UMP website to provide the user with the initial overview concept and to ensure that the user knows the application that will be developed. As such, through this document, a better-quality system that meets the needs of users can be produced. Each diagram helps to better understand the system to be developed.

3.20 EVALUATION FOR STUDENTS

Following the study, each student was asked to rate six short and simple questions. As the participants were UMP students, a smiley face-based was used as it is fun and easy to complete. For the survey, the experimenter read the question, and the participant ticks the appropriate column.


























No	Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	The UMP chatbot's personality was realistic and engaging.	 Strongly Disagree	 Disagree	 Neutral	 Agree	 Strongly Agree
2	The UMP chatbot seemed too robotic.	 Strongly Disagree	 Disagree	 Neutral	 Agree	 Strongly Agree
3	The UMP chatbot system was welcoming during the initial setup.	 Strongly Disagree	 Disagree	 Neutral	 Agree	 Strongly Agree
4	The UMP chatbot seemed very unfriendly.	 Strongly Disagree	 Disagree	 Neutral	 Agree	 Strongly Agree
5	The UMP chatbot explained its scope and purpose well.	 Strongly Disagree	 Disagree	 Neutral	 Agree	 Strongly Agree

Table 3.20 Evaluation of students.

CHAPTER 4

IMPLEMENTATION, RESULT, AND DISCUSSION

4.1 INTRODUCTION

The development, implementation, and testing plan processes will be discussed in this chapter. Artificial intelligence and natural language keyword phrases designed in intent data algorithms will be used in web development integration, with DialogFlow Framework, VS Code editor, and SMTP JS being used to create this UMP Intelligent Chatbot system combined with the UMP website and Gmail server.

This chapter also tries to fulfill the needs of potential users, such as UMP students and staff, as well as concepts that were intended in previous phases. Implemented planning can improve the achievement of early-stage goals and objectives. Following that, the interface and functioning system will be truly tested. This system testing procedure is essential for detecting system flaws and ensuring that it functions effectively.

4.2 IMPLEMENTATION PROCESS

PROCESS OF DEVELOPMENT WITH SELECTED TECHNOLOGIES

Dialogflow is a natural language understanding platform that makes designing and integrating conversational user interfaces into mobile apps, web apps, gadgets, and bots simple. A Dialogflow agent is an agent that manages end-user dialogues. It's a natural language understanding module that picks up on the highlights of human speech.

During a chat, Dialogflow converts end-user text or speech into structured data that the program can interpret. These Dialogflow agents were created to handle the specific types of talks that this system requires.

i) **“Intent”**

Many meanings will be determined for each agent, and "Intent" will be able to integrate and handle the discussion completely. Dialogflow matches an end-user expression with the exact keyword in the agent when the end-user writes or says something, which is known as an end-user expression. "Intent Classification" is another term for matching keywords.

The term "intent" refers to the following:

- a) **"Training phrases"** - These are hypothetical queries that users might ask. Dialogflow will match "Intent" when an end-user expression matches one of these phrases.
- b) **"Action"** - When "Intent" matches, Dialogflow associates "Action" with the system, and we can use "Action" to initiate certain features in the Chatbot system actions.
- c) **"Parameters"**- When "Intent" is met, Dialogflow returns the value taken from the end-user as a parameter. Each parameter has an "Entity Type" that controls how the data is extracted in detail. Parameters are a type of structured data that can be utilized to quickly execute logic or generate replies.
- d) **"Responses"** - There are a variety of ways to respond to the end-user, including text, speech, and visual responses. The text will be used to respond in this chatbot system. This can be used to respond to the end user, ask for more information about the UMP courses and facilities from the end user, or just conclude the interaction.

The fundamental process for "Intent" matching and user responses is shown in Figure 3.17.1:

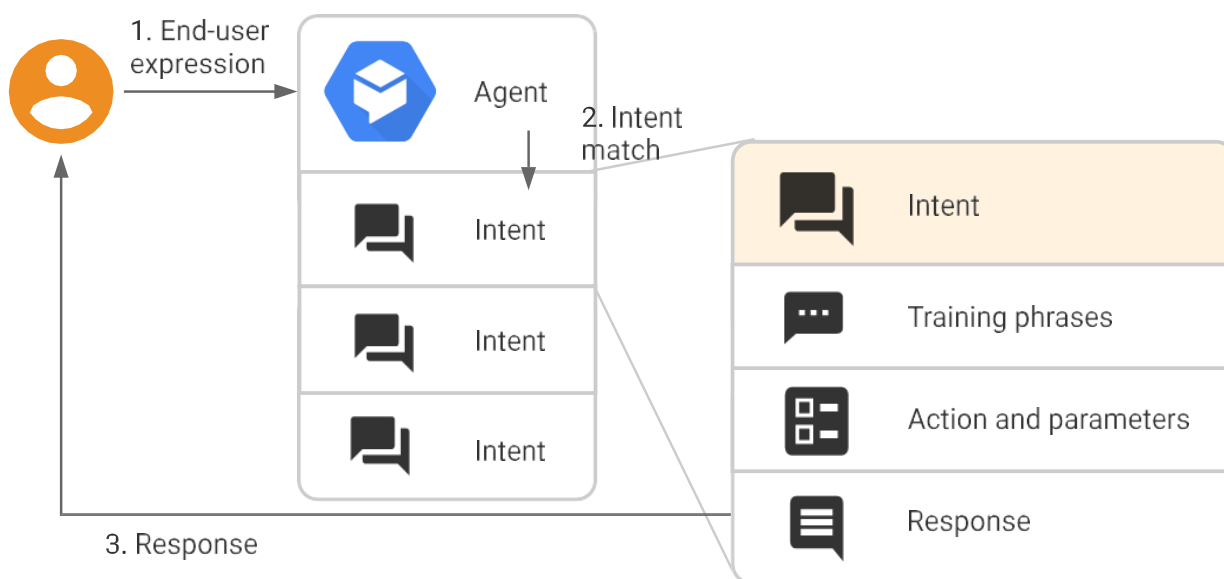


Figure 3.17.1: **Matching Process for "Intent"**

To match "Intent," Dialogflow includes two algorithms: "rule-based grammar matching" and "Machine Learning matching." Dialogflow compares the results of both methods and chooses the best one. It estimates the possible match with the detection confidence "Intent," also known as the confidence score when looking for a suitable "Intent" (confidence score). These numbers range from 0.0 (does not match) to 1.0 (fully match). There are three possible outcomes after "Intent" is computed with a confidence score:

- a) It is returned as a match if the highest "Intent" score has a confidence score greater than or equal to the Machine Learning Classification Threshold setting.
- b) "Fallback Intent" will be matched if no "Intent" fulfills the criteria.
- c) "Intent" will not be matched if no "Intent" satisfies the threshold and no "Fallback Intent" is defined.

ii) “Entity”

Each "Intent Parameter" has an "Entity Type" that controls how data from the end-user is extracted in detail. There are numerous "Entity Entries" for each sort of entity. Each entity entry contains a set of words or phrases that are thought to be interchangeable. The method of "Define Synonyms" is utilized in this project since it is a realistic method that is appropriate for a Chatbot's commonly asked inquiries. Several entity settings alter how entity matching and data extraction are carried out. The following entities are provided as entity options:

- a) "**Define Synonyms**": Each entry includes a reference value as well as a list of synonyms. If the user's input contains synonyms, the relevant reference values are retrieved to match and are utilized to resolve the values of the relevant parameters.
- b) "**Regex entities**": Some entities require patterns from specific phrases to match. For instance, identification card numbers, license plates, and so on. We can supply a "regular expression" for matching with "Regex entities."
- c) "**Fuzzy Matching**": "Fuzzy matching" will locate a match even if the user mispronounces the word or enters a word break from the entity. Word order in values or synonyms is not an issue when "Fuzzy matching" is enabled.

- d) **"Automated expansion"**: When enabled, the agent can recognize values that have not been given precisely. For agents to generate entity types, many samples of entity values must be provided during the "training phases." Otherwise, "Automated expansion" may not perform as planned.

4.2.1 CODE SEGMENTATION

```
{
  "id": "0de3ffb6-f9a7-4d62-8e80-f6ea06a26b20",
  "name": "Default Welcome Intent",
  "auto": true,
  "contexts": [],
  "responses": [
    {
      "resetContexts": false,
      "action": "input.welcome",
      "affectedContexts": [],
      "parameters": [],
      "messages": [
        {
          "type": "0",
          "title": "",
          "textToSpeech": "",
          "lang": "en",
          "speech": [
            "Hello! Welcome to the UMP Intelligent Chatbot!\nYou may ask questions on the\nfollowing topics:\n\n1. UMP History\n2. About Campus\n3. Location\n4. Objective\n5. Mission\n6. Vision\n7. Administrative Staff\n8. Faculty Deans\n9. Directors\n10. Faculties\n11. Admission\n12. Admission Guide\n13. Diploma Programs\n14. Degree Programs\n15. Master Programs\n16. General Requirements\n17. Fees\n18. Scholarship\n19. Facilities\n20. Bus Schedule\n21. Vacancy\n22. Events\n23. Activities\n24. Contact\n25. Others\n26. Sitemap"
          ],
          "condition": ""
        }
      ],
      "speech": []
    }
  ],
  "priority": 500000,
  "webhookUsed": false,
  "webhookForSlotFilling": false,
  "fallbackIntent": false,
  "events": [
    {
```

```

    "name": "WELCOME"
  }
],
"conditionalResponses": [],
"condition": "",
"conditionalFollowupEvents": []
}

```

Figure 4.2.1: JSON code for "Welcome Intent"

Figure 4.2.1 shows the code segment for the "Welcome Intent" section. The purpose of this "Welcome Intent" is to start a conversation with the user

```

{
  "id": "266cff04-1111-4cfe-bd5a-ea276d9e78a4",
  "name": "Default Fallback Intent",
  "auto": true,
  "contexts": [],
  "responses": [
    {
      "resetContexts": false,
      "action": "input.unknown",
      "affectedContexts": [],
      "parameters": [],
      "messages": [
        {
          "type": "0",
          "title": "",
          "textToSpeech": "",
          "lang": "en",
          "speech": [
            "I didn\u0027t get that. Can you say it again?",
            "I missed what you said. What was that?",
            "Sorry, could you say that again?",
            "Sorry, can you say that again?",
            "Can you say that again?",
            "Sorry, I didn\u0027t get that. Can you rephrase?",
            "Sorry, what was that?",
            "One more time?",
            "What was that?",
            "Say that one more time?",
            "I didn\u0027t get that. Can you repeat?",
            "I missed that, say that again?"
          ]
        }
      ],
      "condition": ""
    }
  ]
}

```

```

    }
  ],
  "speech": []
}
],
"priority": 500000,
"webhookUsed": false,
"webhookForSlotFilling": false,
"fallbackIntent": true,
"events": [],
"conditionalResponses": [],
"condition": "",
"conditionalFollowupEvents": []
}

```

Figure 4.2.2: JSON code for "Fallback Intent"

Figure 4.2.2 shows the code segment for "Fallback Intent". The purpose of this code is for when the text from the user is not understood by the Chatbot, it will activate this "Fallback Intent" and give a response like "Sorry, can you say that again?".

```

{
  "id": "61a64889-700b-4f14-8fa2-690dfb596840",
  "name": "thankyou",
  "auto": true,
  "contexts": [],
  "responses": [
    {
      "resetContexts": false,
      "action": "",
      "affectedContexts": [],
      "parameters": [
        {
          "id": "e626901f-08db-4938-a29e-691d17f8516d",
          "name": "thankyou",
          "required": false,
          "dataType": "@thankyou",
          "value": "$thankyou",
          "defaultValue": "",
          "payload": {
            "richContent": [
              [
                {
                  "type": "image",

```

```

    "rawUrl":
"https://news.ump.edu.my/sites/default/files/styles/large/public/articles/AZR_8581-
UMP.jpg?itok\u003dxfsgXCU1",
    "accessibilityText": "Dialogflow across platforms"
  },
  {
    "type": "info",
    "title": "You\u0027re Welcome",
    "subtitle": "UMP Intelligent Chatbot",
    "actionLink": "https://ump-intelligent-chatbot.web.app/index.html"
  },
  "textToSpeech": "",
  "lang": "en",
  "condition": ""
},
{
  "type": "4",
  "title": "",
  "payload": {
    "richContent": [
      [
        {
          "text": "Contact Us",
          "link": "https://ump-intelligent-chatbot.web.app/contact.html",
          "event": {
            "parameters": {},
            "name": ""
          },
          "type": "button",
          "icon": {
            "type": "chevron_right",
            "color": "#FF9800"
          }
        }
      ],
      "textToSpeech": "",
      "lang": "en",
      "condition": ""
    ],
    "priority": 500000,
    "webhookUsed": false,
  }
}

```

Figure 4.2.3: JSON code for "Thank you Intent"

Figure 4.2.3 shows the code segment for the "Thank you Intent" section. The purpose of this "Thank you Intent" is to end a conversation with the user.

4.2.4 CODE SEGMENTATION IN SMTP JS AND ELASTIC EMAIL API

The Gmail server is configured to handle email transfers in real time for the UMP complaint verification department, and when users fill out the "Complaint Form," their complaints are automatically routed back there. The **"sendMail"** function of the Elastic Mail API and SMTP JS (Simple Mail Transfer Protocol JavaScript) are used to do this.

```
function sendMail() {
  var params = {
    name: document.getElementById("name").value,
    email: document.getElementById("email").value,
    message: document.getElementById("message").value,
  };

  const serviceID = "service_y1j2uu8";
  const templateID = "template_ge3xvjd";

  emailjs.send(serviceID, templateID, params)
    .then(res=>{
      document.getElementById("name").value = "";
      document.getElementById("email").value = "";
      document.getElementById("message").value = "";
      console.log(res);
      alert("Your message sent successfully!!")
    })
    .catch(err=>console.log(err));
}
```

Script on complaint form page to connect **"sendMail"** functionality with the API.

```
<div class="form-group">
  <h5 for="message">Message</h5>
  <textarea class="form-control" id="message" rows="3"></textarea>
</div>
<center><button class="btn btn-primary"
onclick="sendMail()">Submit</button></center>
```

As a result, the complaint is received by the UMP complaint verification department though Gmail Server, UMP will process it and take the necessary steps to address any problems or difficulties that the users have raised.

4.3 SYSTEM INTERFACE CONSTRUCTION

The system interface is the medium of interaction between the user and the system. Therefore, a user-friendly interface is very important to ensure that users can use the system easily and effectively.

i) Home Interface

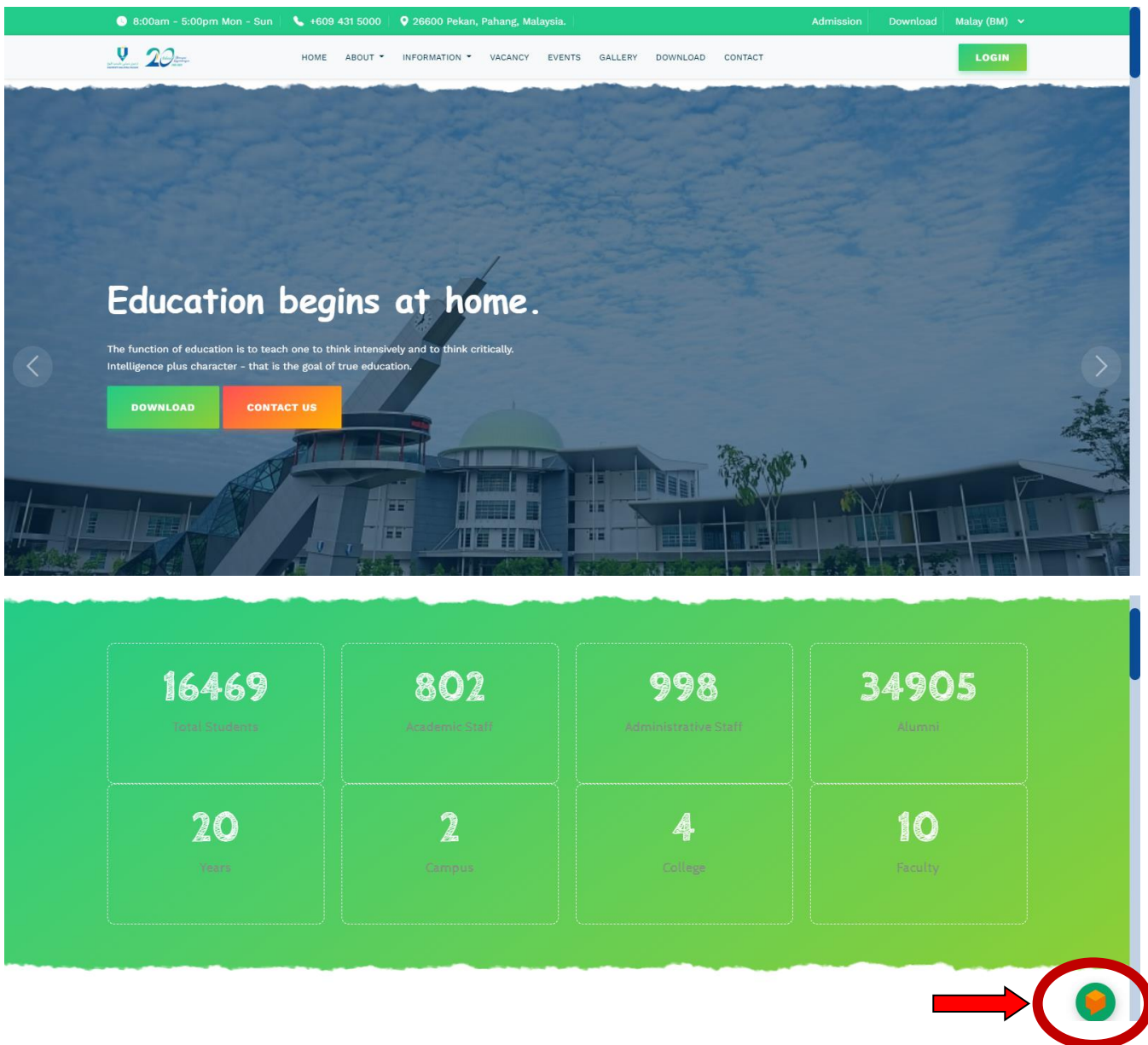


Figure 4.3.1 Main page interface

This developed web system contains the home page interface which is the first interface when users enter this UMP intelligent Chatbot website. Figure 4.3 shows the interface of the home page of the UMP intelligent Chatbot website which automatically triggers the chatbot application when the website is loaded on the browser successfully.

ii) "Welcome Intent" Interface from UMP intelligent chatbot

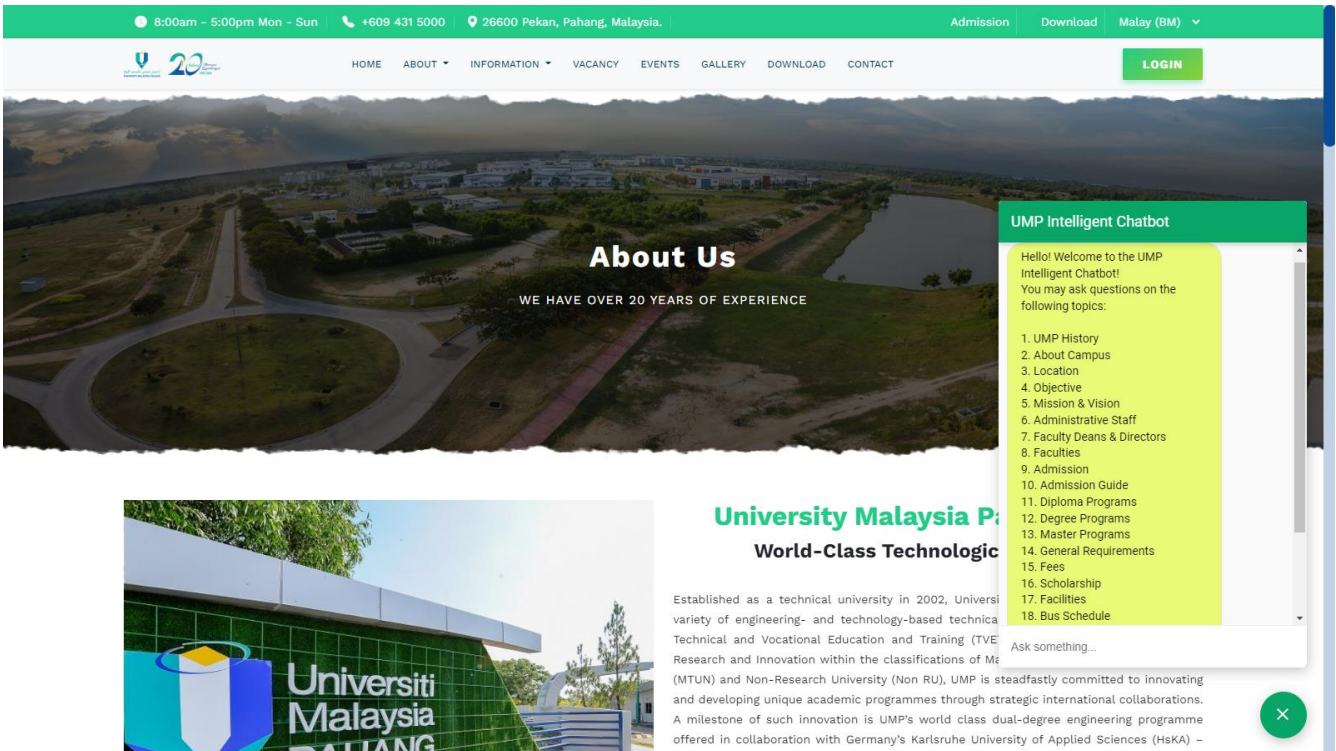


Figure 4.3.2 "Welcome Intent" interface

Figure 4.3.2 shows the "Welcome message" interface from the chatbot after the user starts the conversation. The UMP intelligent chatbot will ask questions where it gives the user the option to ask for relevant information.

iii) "Fallback Intent" Interface

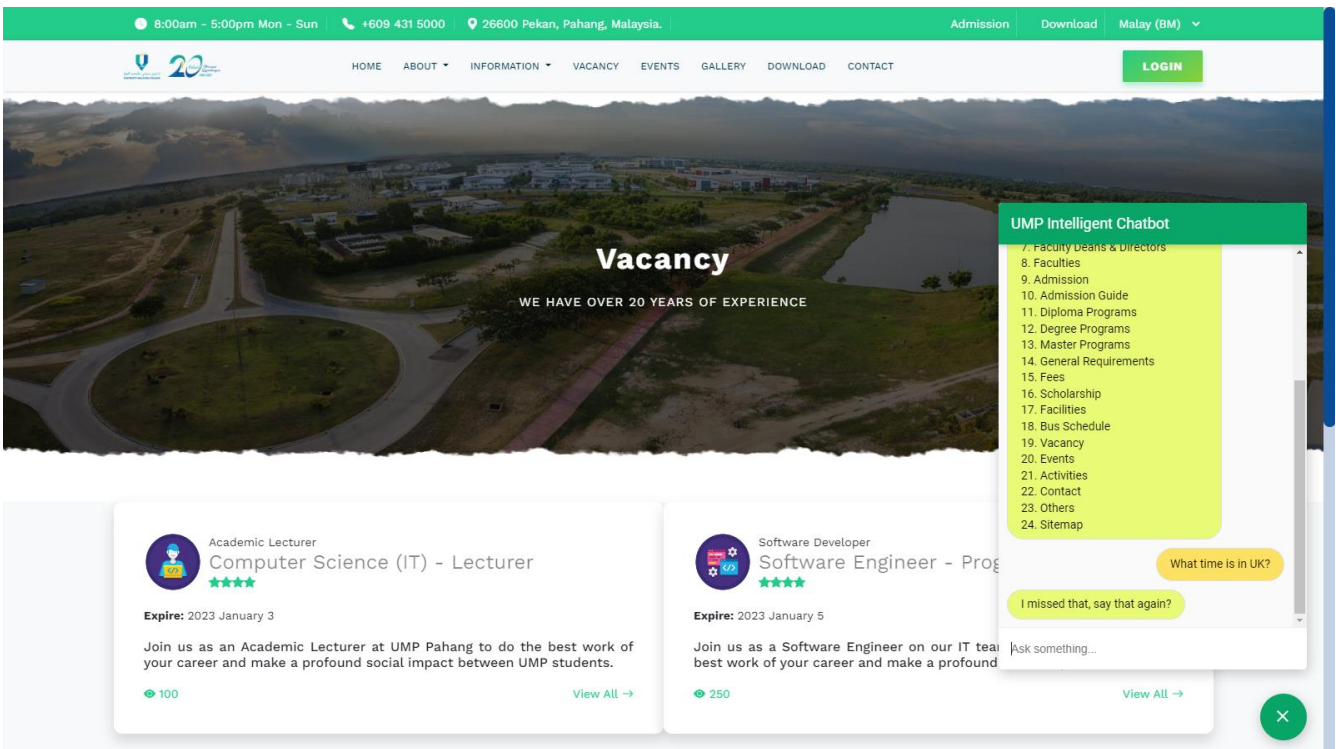


Figure 4.3.3 "Fallback Intent" interface

Figure 4.3.3 above shows when users ask questions outside the scope of this Chatbot. It will automatically match the "Fallback Intent" and answer the question with the correct answer as in Figure 4.3.3.

iv) UMP Intelligent Chatbot Response interface

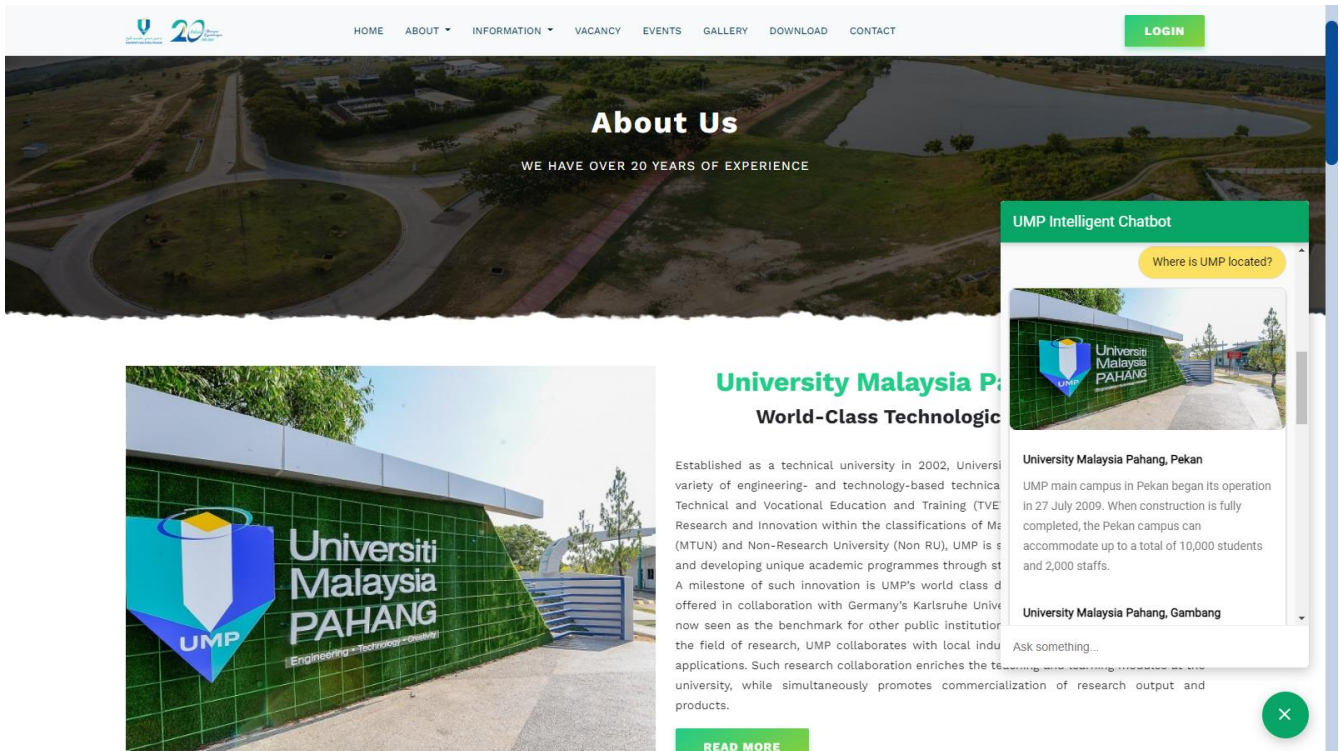


Figure 4.3.4 UMP Intelligent Chatbot response interface (Location – Intent)

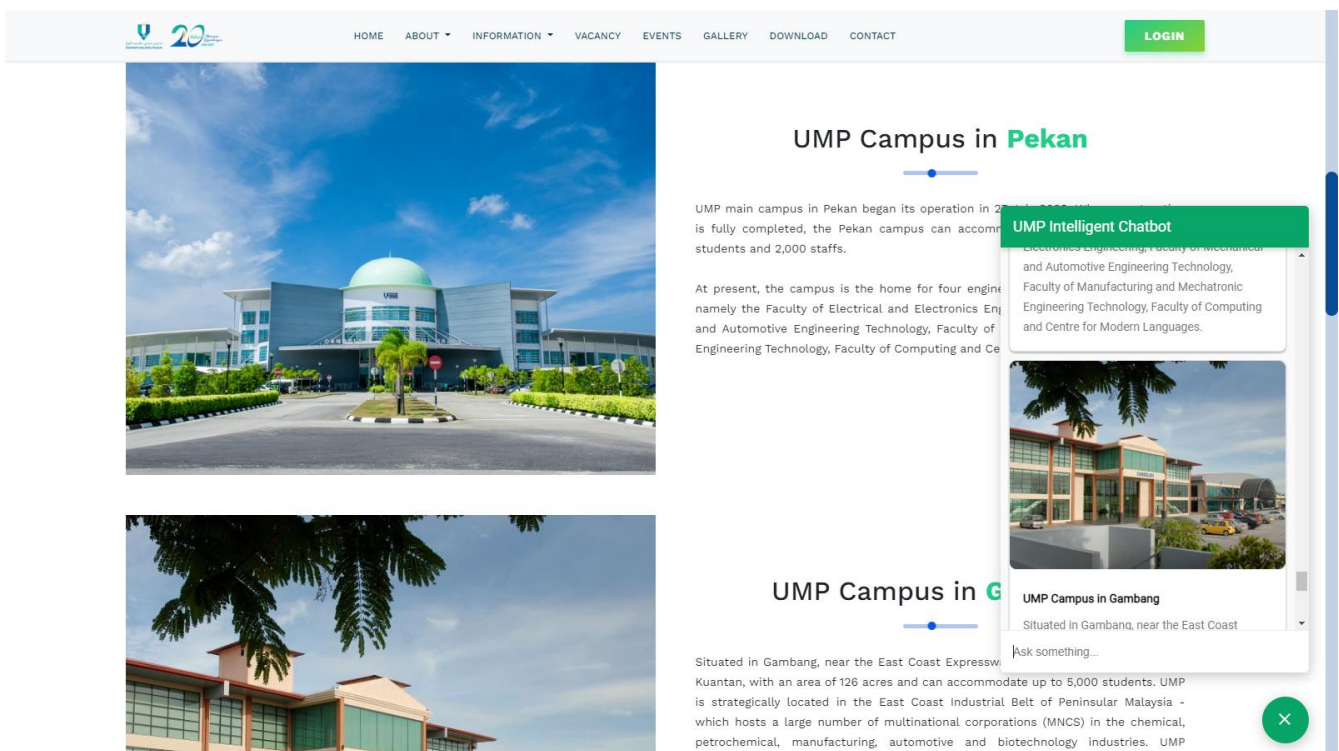


Figure 4.3.5 UMP Intelligent Chatbot response interface (**Administrative Deans – Intent**)

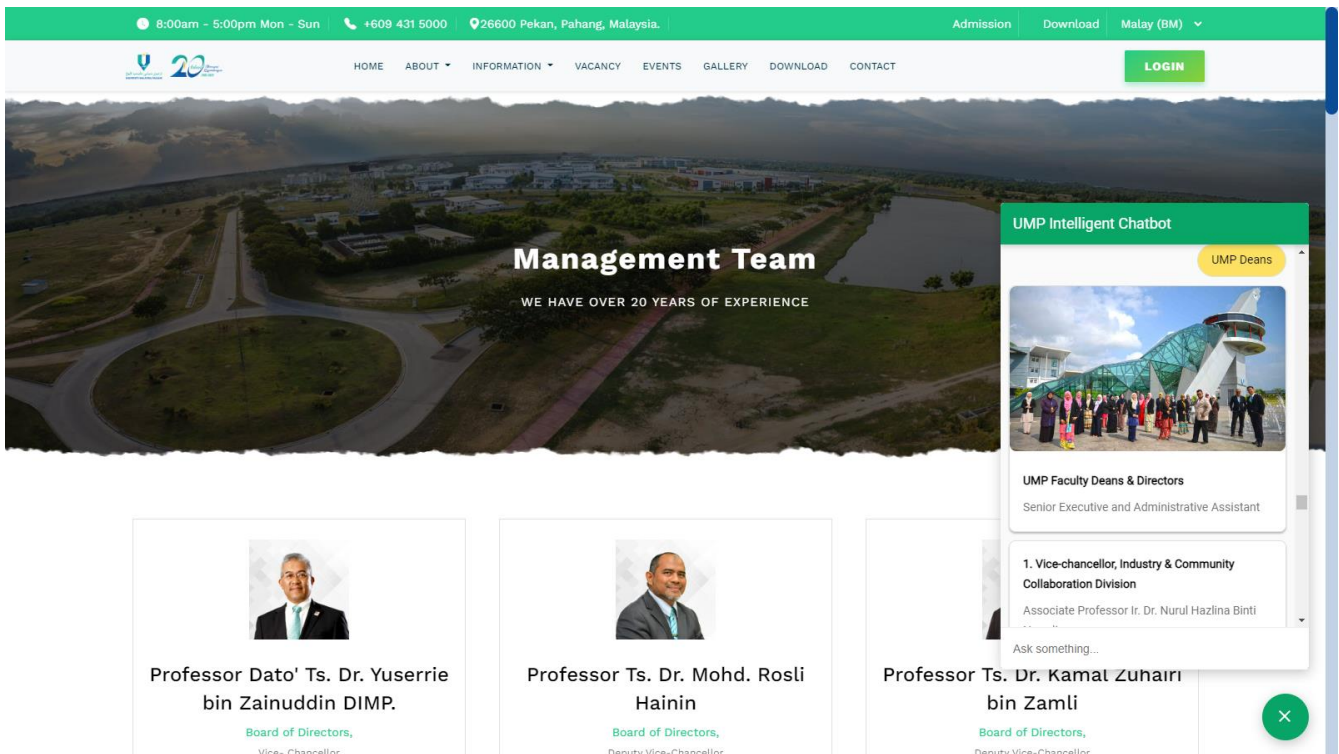


Figure 4.3.6 UMP Intelligent Chatbot response interface (**UMP Staffs – Intent**)

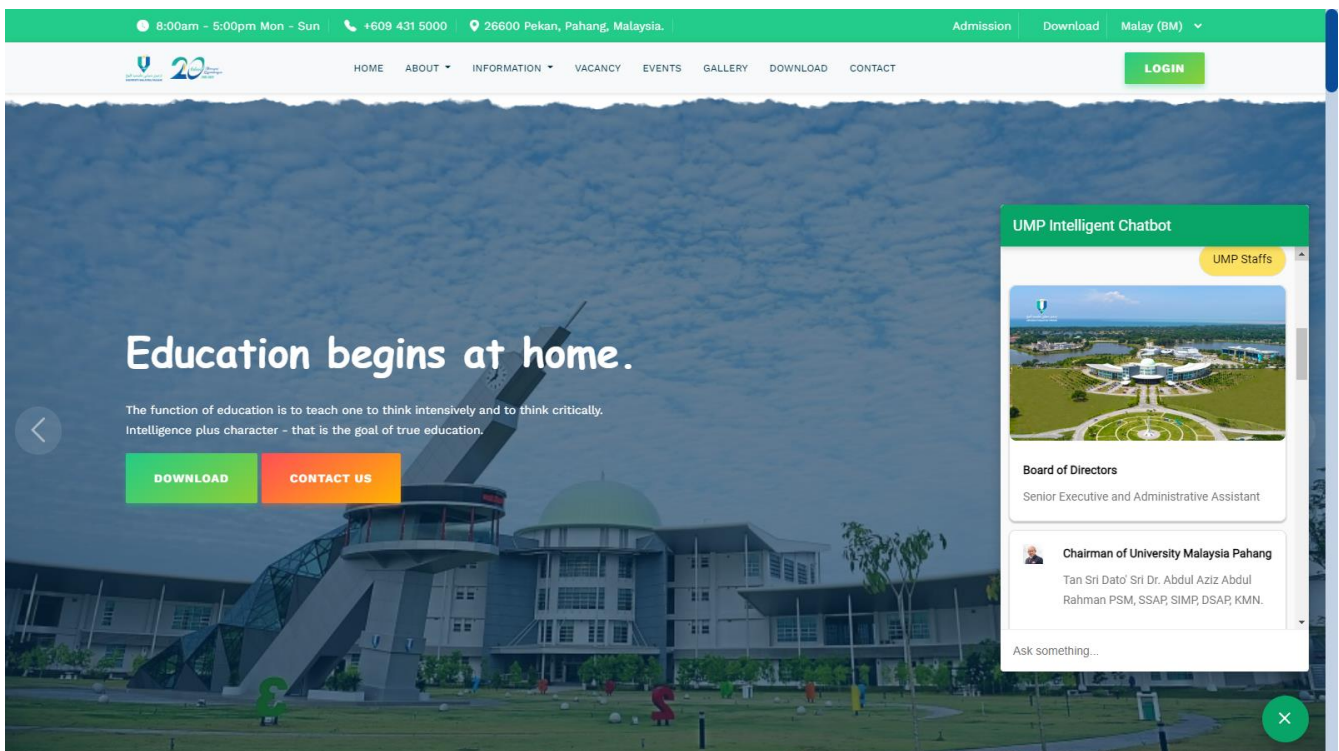


Figure 4.3.7 UMP Intelligent Chatbot response interface (**Objective – Intent**)

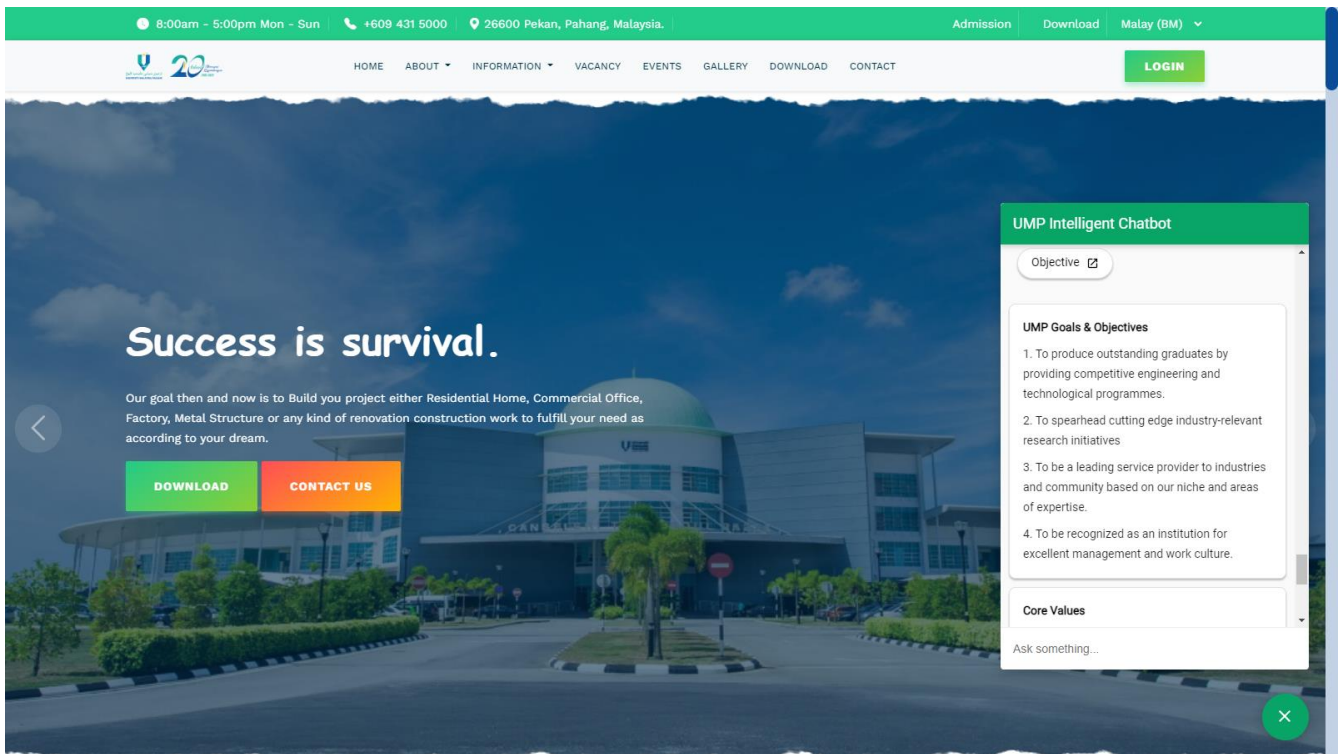


Figure 4.3.8 UMP Intelligent Chatbot response interface (**Mission Vision – Intent**)

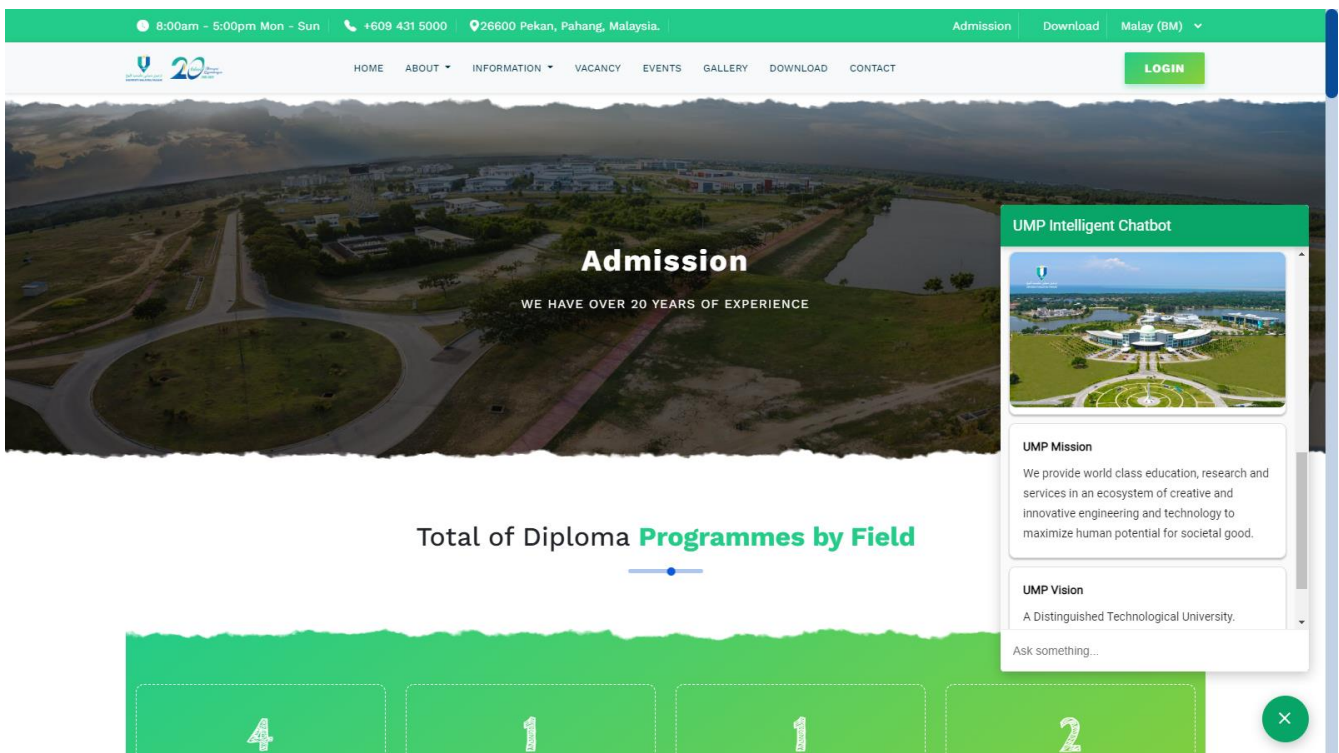


Figure 4.3.9 UMP Intelligent Chatbot response interface (**Bus Schedule – Intent**)

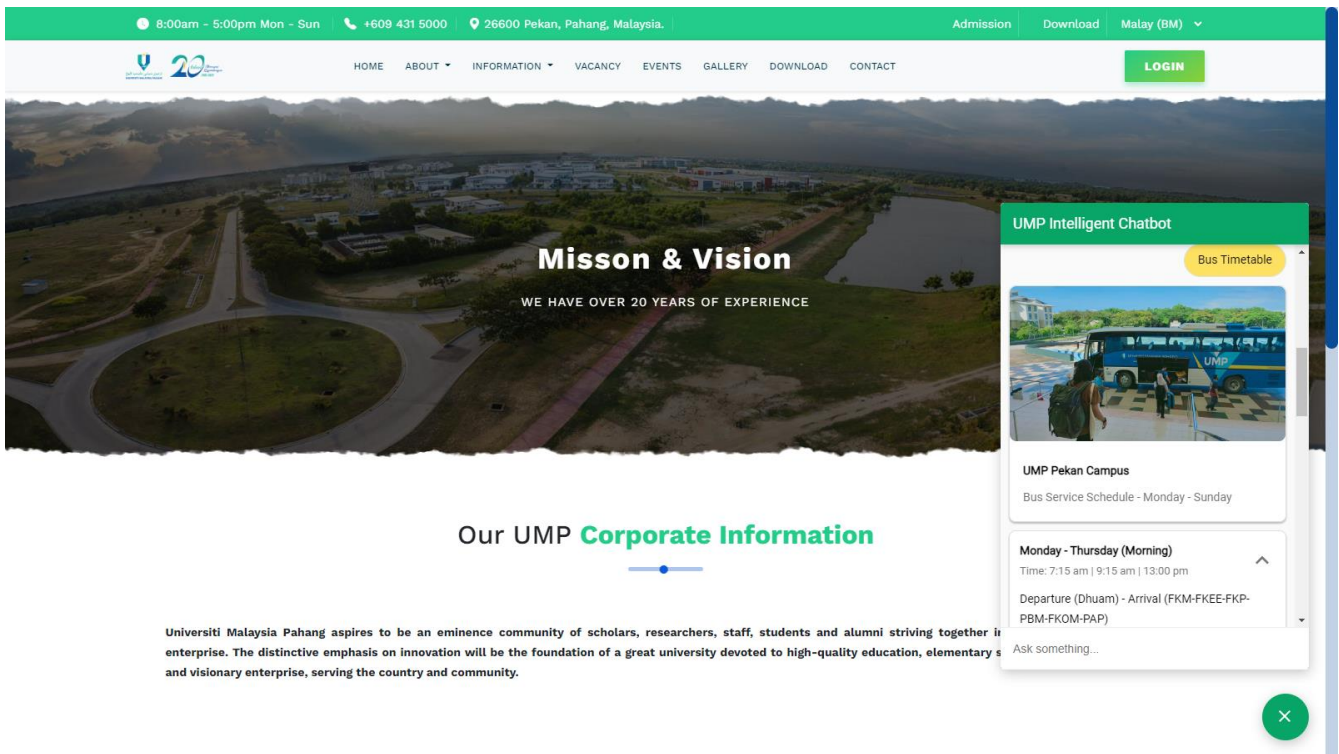


Figure 4.3.10 UMP Intelligent Chatbot response interface (**Activities– Intent**)

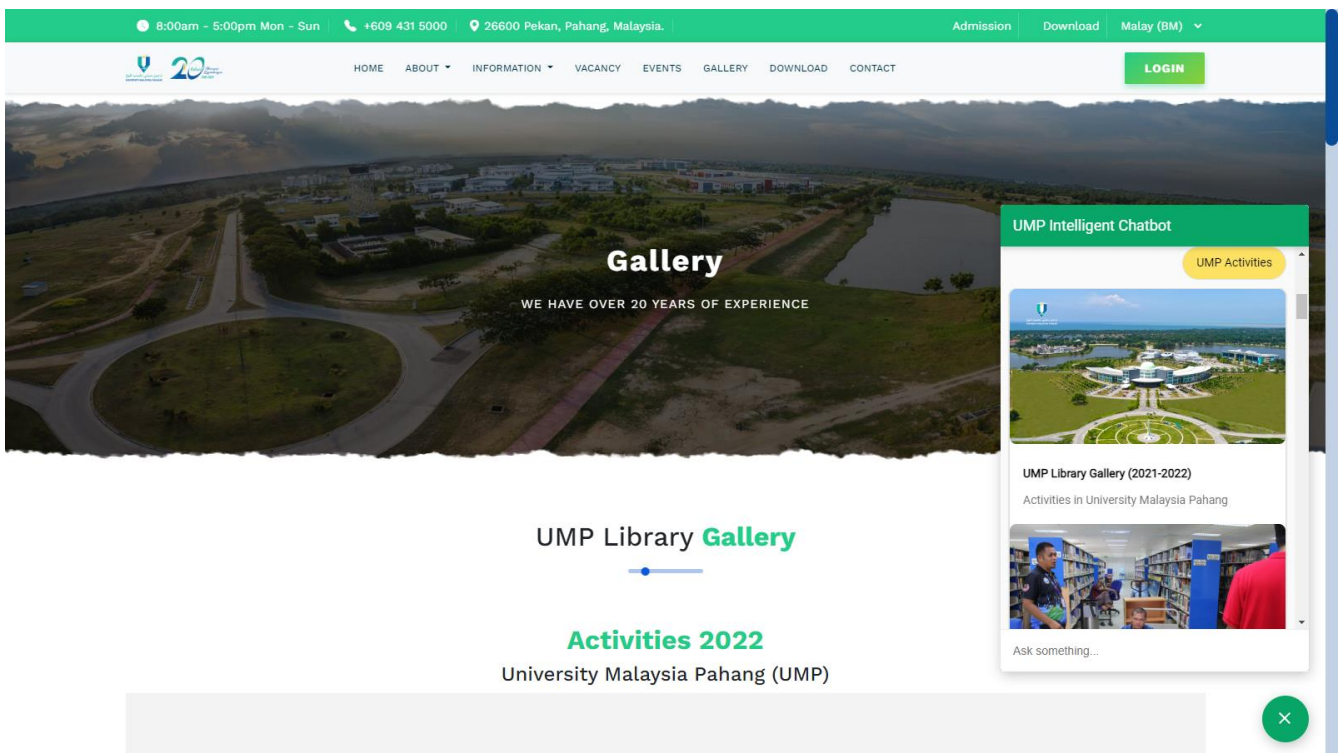


Figure 4.3.11 UMP Intelligent Chatbot response interface (Faculties– Intent)

UMP Intelligent Chatbot

Faculties

Number of Faculties in UMP
There are 10 faculties in UMP in total.

Do you want to know the list of faculties?
Yes | No

Send Feedback

Email address
Email address
Subject
Enter Subject
Message
Write Message

General Information
WE HAVE OVER 20 YEARS OF EXPERIENCE

UMP Tuition Fees 2022 (Diploma)
UMP Tuition Fees 2022 (Bachelor's Degree)

UMP Undergraduate Programs Fees 2022

Program name	Duration	Per Sem Fees	Total Fees
B. Eng (Hons) Automotive Engineering – (collaboration program with HsKA, Germany)	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Civil Engineering	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Electrical Engineering (Electronics)	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Electrical Engineering (Electronics)	4 Years	RM 9220	RM 67,655

Figure 4.3.12 UMP Intelligent Chatbot response interface (Follow-Up (Yes) – Intent)

UMP Intelligent Chatbot

Yes

- Faculty of Computing**
College of Computing and Applied Sciences
- Centre for Mathematical Sciences**
College of Computing and Applied Sciences
- Faculty of Industrial Sciences and Technology**
College of Computing and Applied Sciences
- Faculty of Industrial Management**

Send Feedback

Email address
Email address
Subject
Enter Subject
Message
Write Message

General Information
WE HAVE OVER 20 YEARS OF EXPERIENCE

UMP Tuition Fees 2022 (Diploma)
UMP Tuition Fees 2022 (Bachelor's Degree)

UMP Undergraduate Programs Fees 2022

Program name	Duration	Per Sem Fees	Total Fees
B. Eng (Hons) Automotive Engineering – (collaboration program with HsKA, Germany)	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Civil Engineering	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Electrical Engineering (Electronics)	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Electrical Engineering (Electronics)	4 Years	RM 9220	RM 67,655

Figure 4.3.13 UMP Intelligent Chatbot response interface (Faculty of Computing – Intent)

The screenshot shows the UMP website with a chatbot interface. The chatbot has responded to the user's intent by listing various faculties. The user's input is visible in the chat history, and the chatbot's response is displayed in a green box.

UMP Intelligent Chatbot

- Engineering Technology
- Faculty of Engineering Technology
- Faculty of Industrial Sciences and Technology
- Faculty of Electrical and Electronic Engineering Technology
- Faculty of Chemical and Process Engineering Technology
- Faculty of Manufacturing and Mechatronic Engineering Technology
- Faculty of Civil Engineering Technology
- Faculty of Industrial Management

Send Feedback

Email address:

Subject:

Message:

Write Message

UMP Undergraduate Programs Fees 2022

Program name	Duration	Per Sem Fees	Total Fees
B. Eng (Hons) Automotive Engineering – (collaboration program with HsKA, Germany)	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Civil Engineering	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Electrical Engineering (Electronics)	4 Years	RM 9220	RM 67,655
B.Eng (Hons.) Electrical Engineering (Electronics)	4 Years	RM 9220	RM 67,655

Figure 4.3.14 UMP Intelligent Chatbot response interface (Computing courses – Intent)

The screenshot shows the UMP website with a chatbot interface. The chatbot has responded to the user's intent by listing various computing courses. The user's input is visible in the chat history, and the chatbot's response is displayed in a green box.

UMP Intelligent Chatbot

- Bachelor of Computer Science (Computer Systems & Networking) with Honours
Faculty of Computing
- Bachelor of Computer Science (Software Engineering) with Honours
Faculty of Computing
- Bachelor of Computer Science (Graphics & Multimedia Technology) with Honours
Faculty of Computing
- Diploma in Computer Science
Faculty of Computing

Send Feedback

Email address:

Subject:

Message:

Write Message

UMP Tuition Fees 2022 (Guidelines in Malay Language)

Soalan Lazim

Figure 4.3.15 UMP Intelligent Chatbot response interface (Course – Intent)

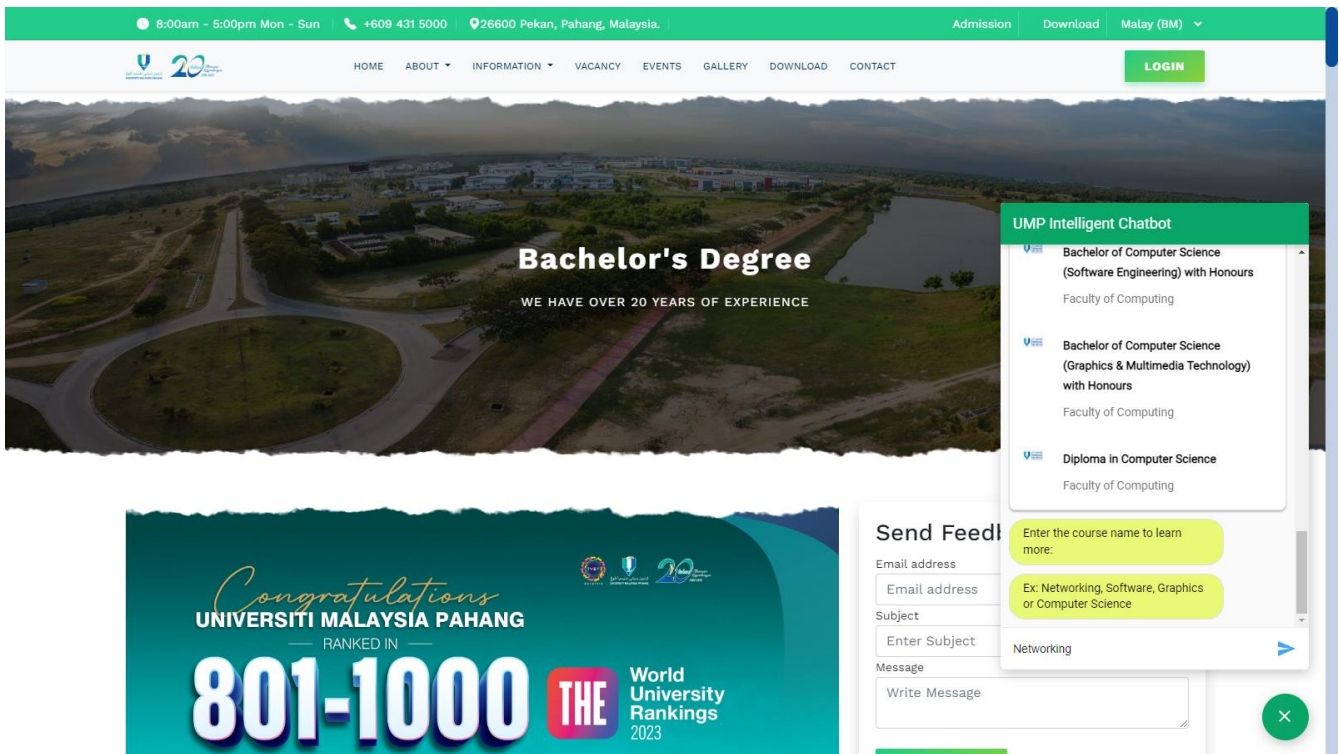


Figure 4.3.16 UMP Intelligent Chatbot response interface (Networking – Intent)



Figure 4.3.17 UMP Intelligent Chatbot response interface (Networking Follow-Up – Intent)

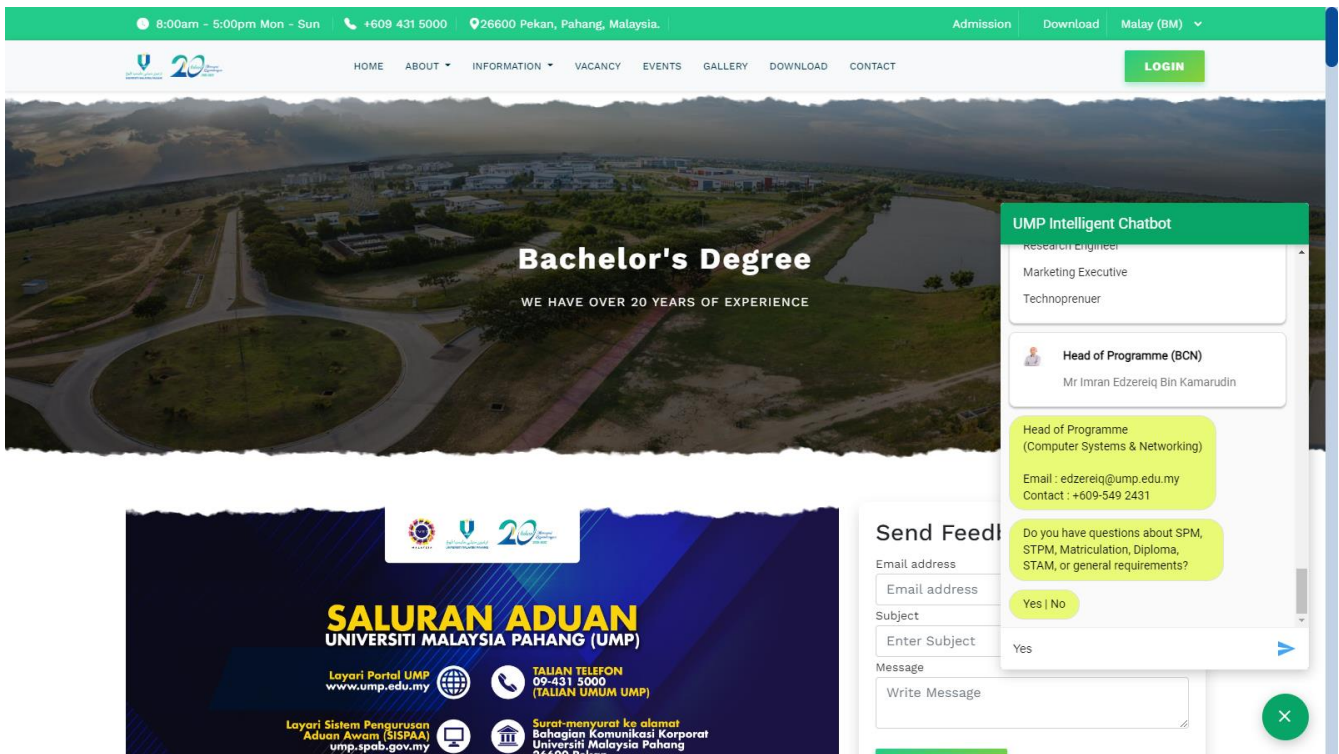


Figure 4.3.18 UMP Intelligent Chatbot response interface (Course Requirement – Intent)

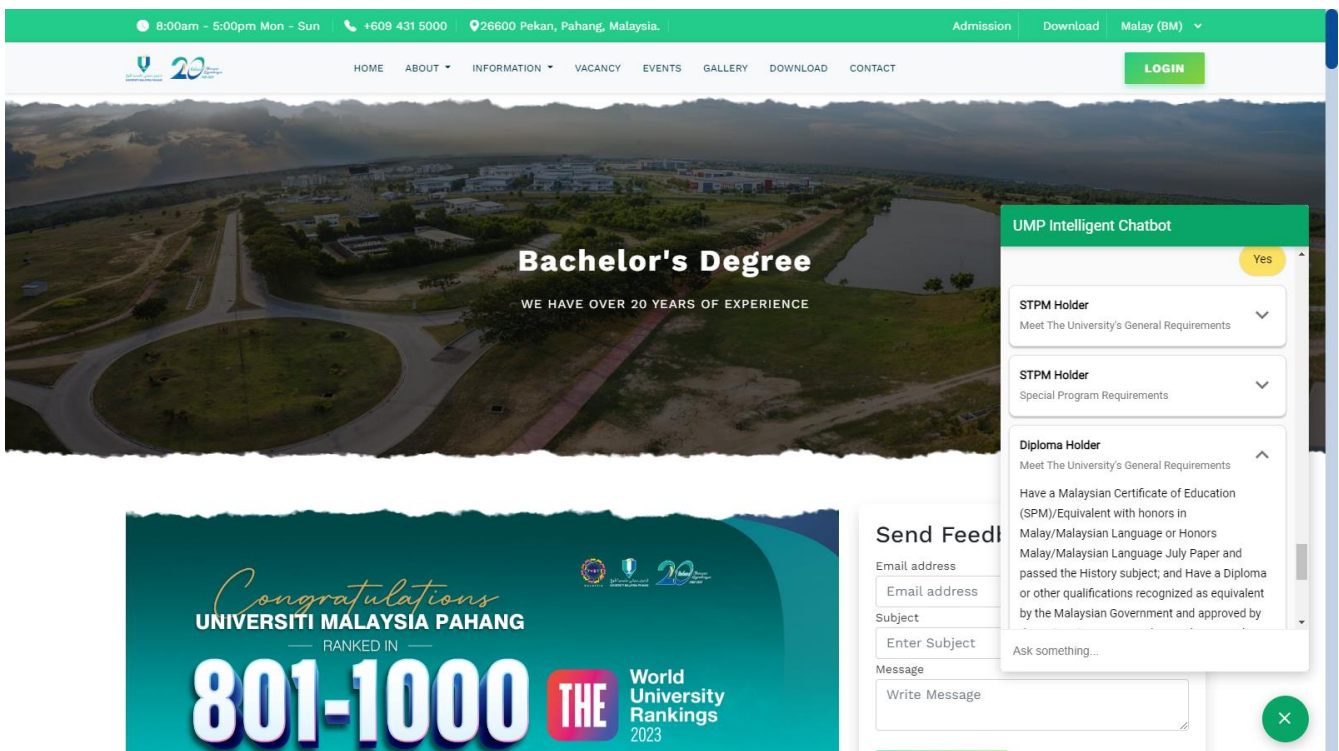


Figure 4.3.19 UMP Intelligent Chatbot response interface (Sitemap – Intent)

Download
WE HAVE OVER 20 YEARS OF EXPERIENCE

No	Title	Published Date	Published By
1	Undergraduate Admission Guide (Local)	2022-11-12	Admin
2	Undergraduate List of Programmes	2022-11-12	Admin
3	Undergraduate Admission Guide (International)	2022-11-12	Admin
3	E-Book Undergraduate Course Information	2022-11-12	Admin
3	Postgraduate Programmes	2022-11-12	Admin
4	Postgraduate Programmes	2022-11-12	Admin

UMP Intelligent Chatbot

- Mission & Vision
- Director's Message
- Management Team
- Admission
- Diploma Program
- Degree Program
- General Info
- Scholarship
- Vacancy
- University Events
- Gallery
- Download Guide
- Contact

Send Feedback

Email address

Enter Subject

Write Message

Figure 4.3.20 UMP Intelligent Chatbot response interface (Menu – Intent)

Events
WE HAVE OVER 20 YEARS OF EXPERIENCE

UMP Intelligent Chatbot

Menu

Universiti Malaysia PAHANG

CALL FOR PAPER

IEEE SYMPOSIUM ON COMPUTERS & INFORMATICS (ISCI 2022)

The IEEE Malaysia Industrial Electronics & Industrial Applications Joint Chapter is proud to announce the IEEE Symposium on Computers & Informatics (ISCI 2022), which will be held as a **Hybrid Conference**: both in person and online, so you can choose how to experience the event on 12 - 13 of November 2022.

Send Feedback

Email address

Subject

Enter Subject

Message

Write Message

Figure 4.3.21 UMP Intelligent Chatbot response interface (Thank You – Intent)

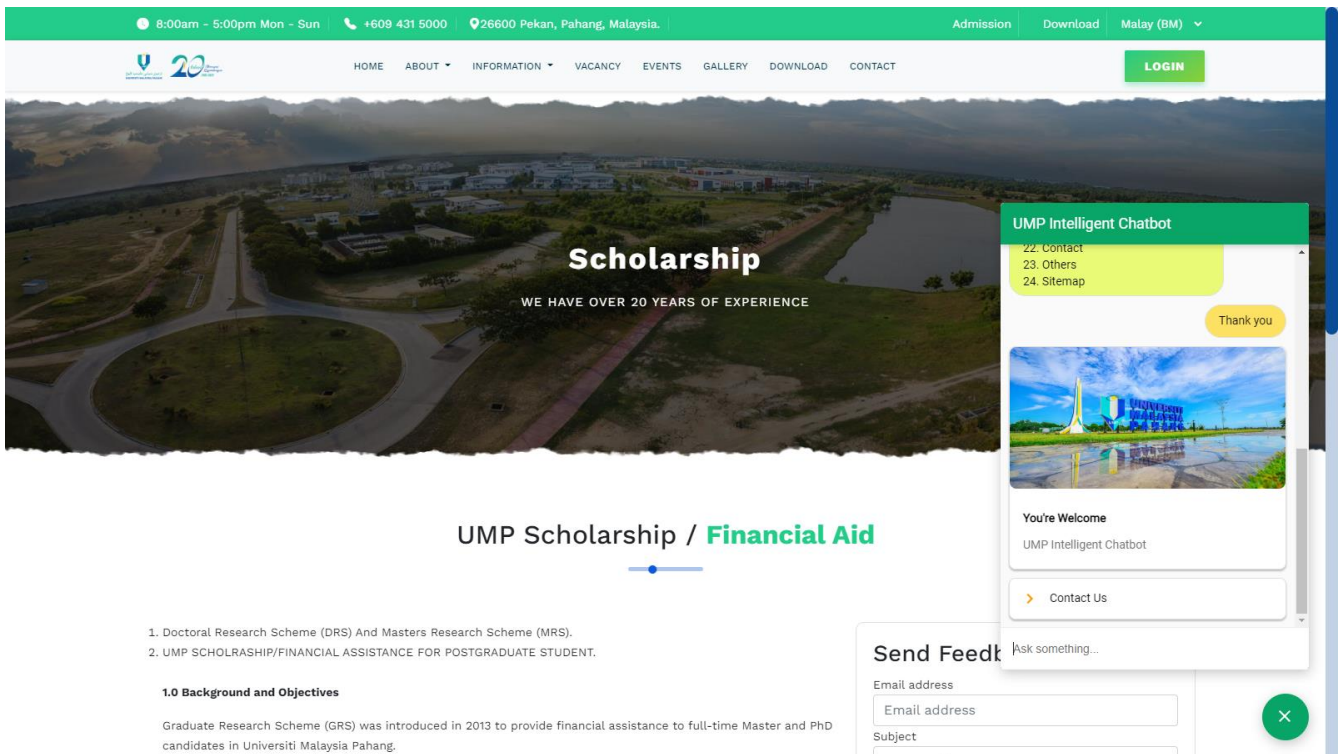
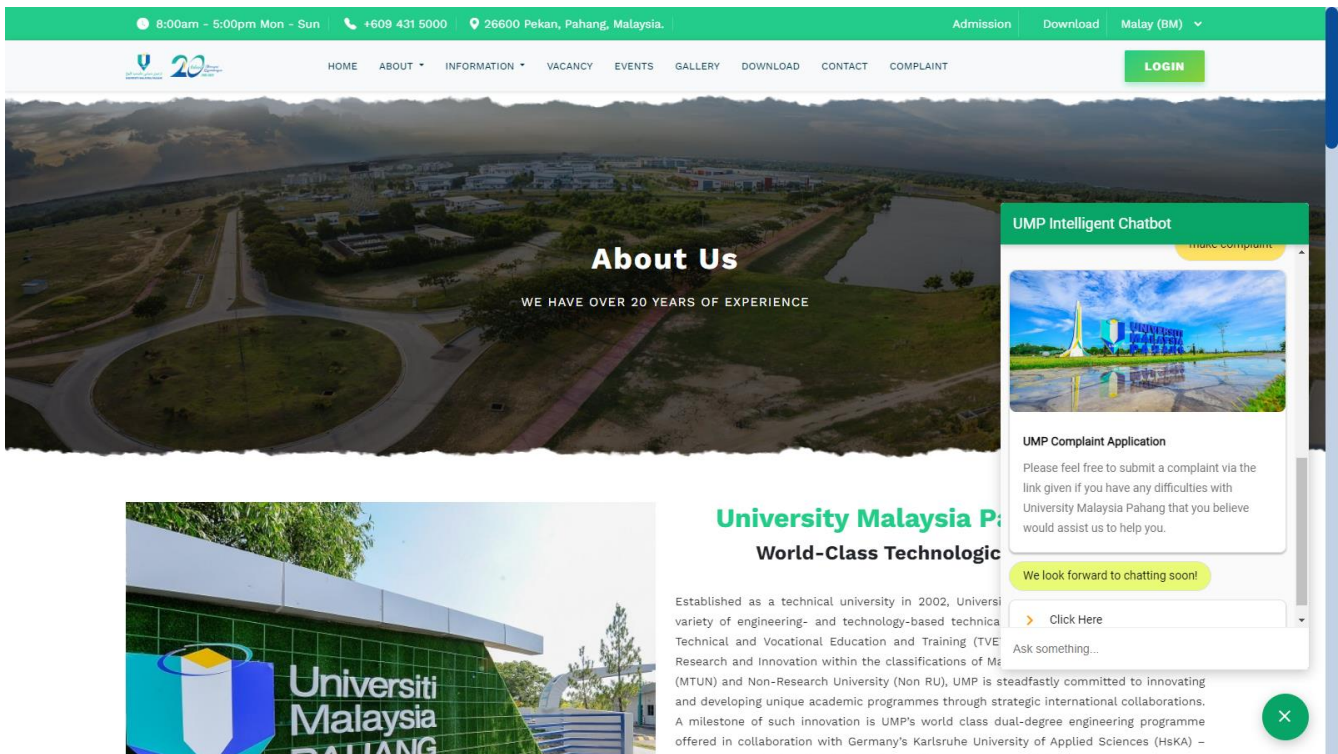


Figure 4.3.4 – 4.3.21. shows the UMP Intelligent Chatbot answering the user's question correctly. This happens by using the built-in "Intent". The Chatbot will match the question with "Intent" and give the response trained in this Chatbot System.

4.3.3 MAKE A COMPLAINT MODULE

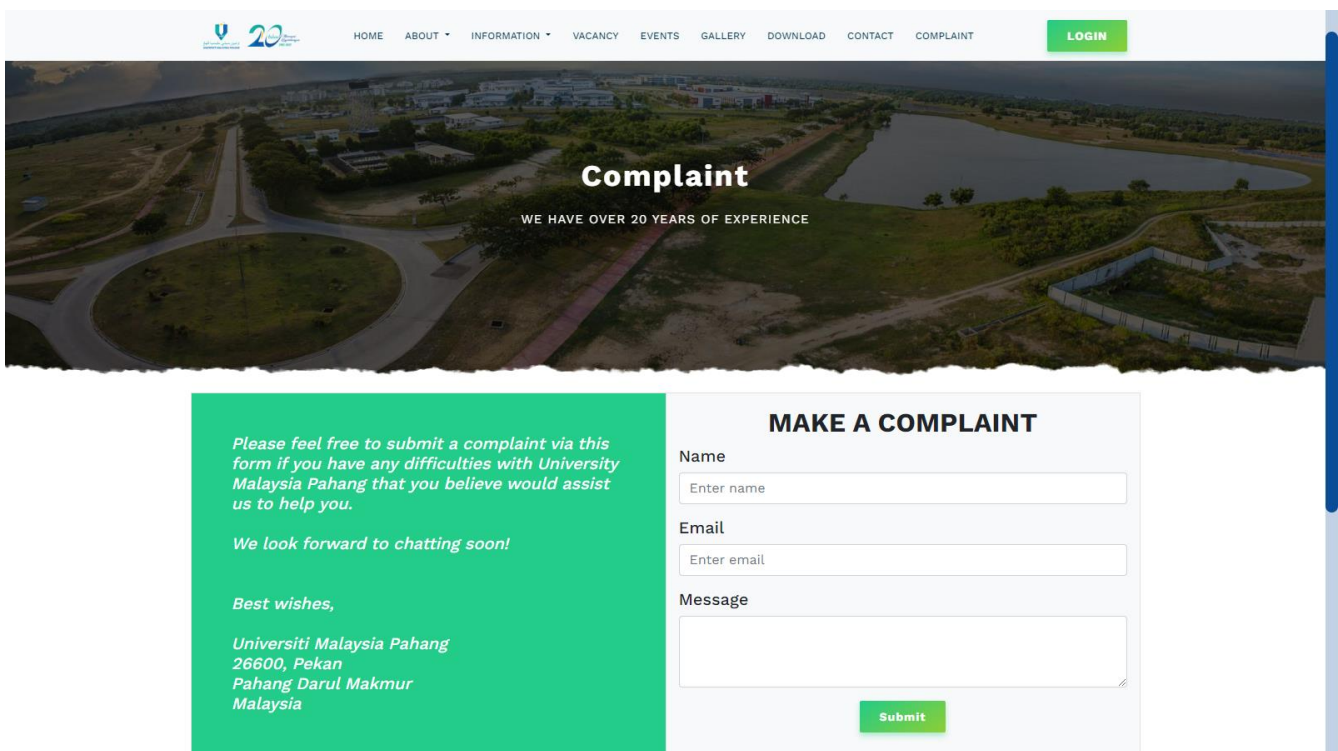
This module prompts users to automatically respond the results as shown below when they type "Make complaint" or a single word such as "problems," "issues," or anything else that is a synonym for the complaint in the chatbot.

Figure 4.3.3.1 UMP Intelligent Chatbot response interface (Make Complaint – Intent)



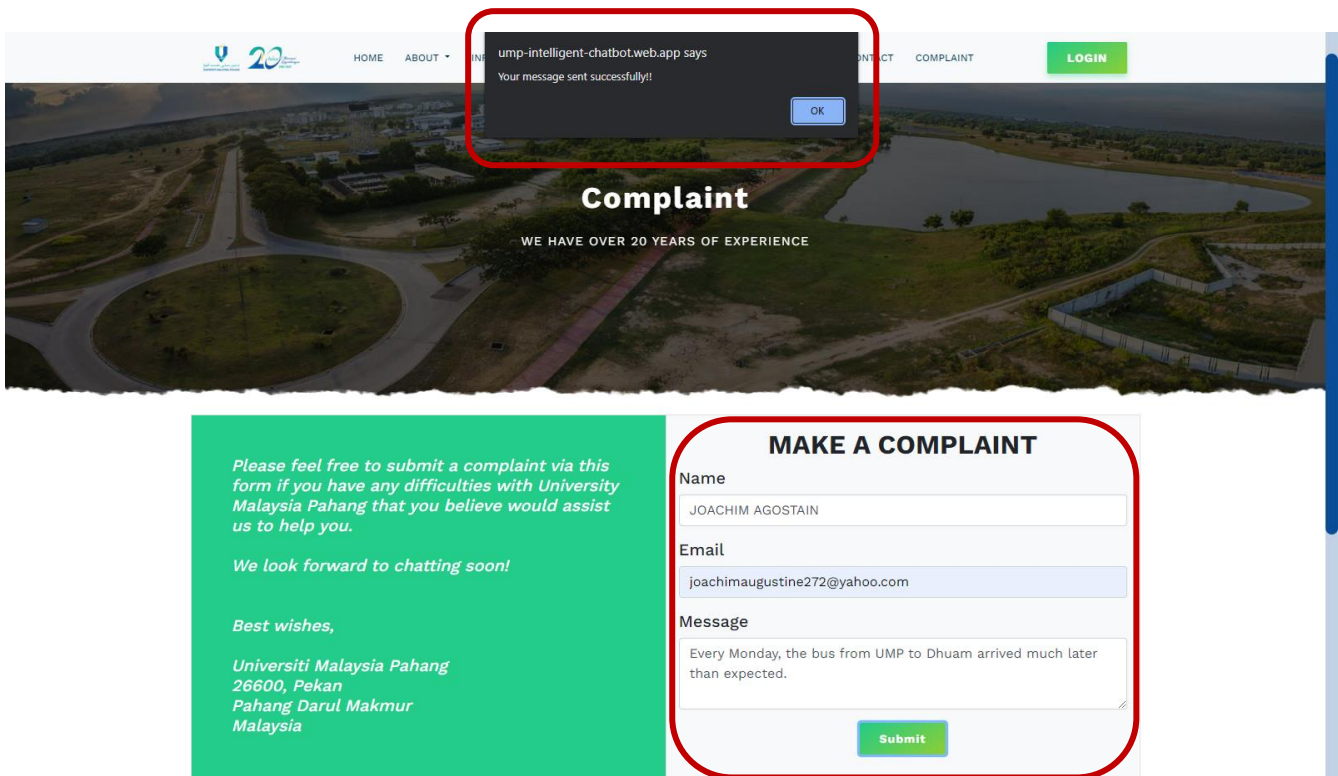
When users enter “complaint” in the chatbot, the response "UMP Complaint Application" clearance is automatically given, along with a link that directs the user to the UMP website's complaint form from where they can submit their problems for review on the UMP Gmail Server.

Figure 4.3.3.2 UMP website’s Complaint form interface (Make a Complaint Form)



Once users click the “Click Here” button as shown in Figure 4.3.3.1 above, they will be redirected to this complaint page where they can submit their complaints in the Complaint form with their full name, email address, and message as shown in Figure 4.3.3.2 above.

Figure 4.3.3.3 UMP website’s Complaint form interface (**Enter Complaint Information**)

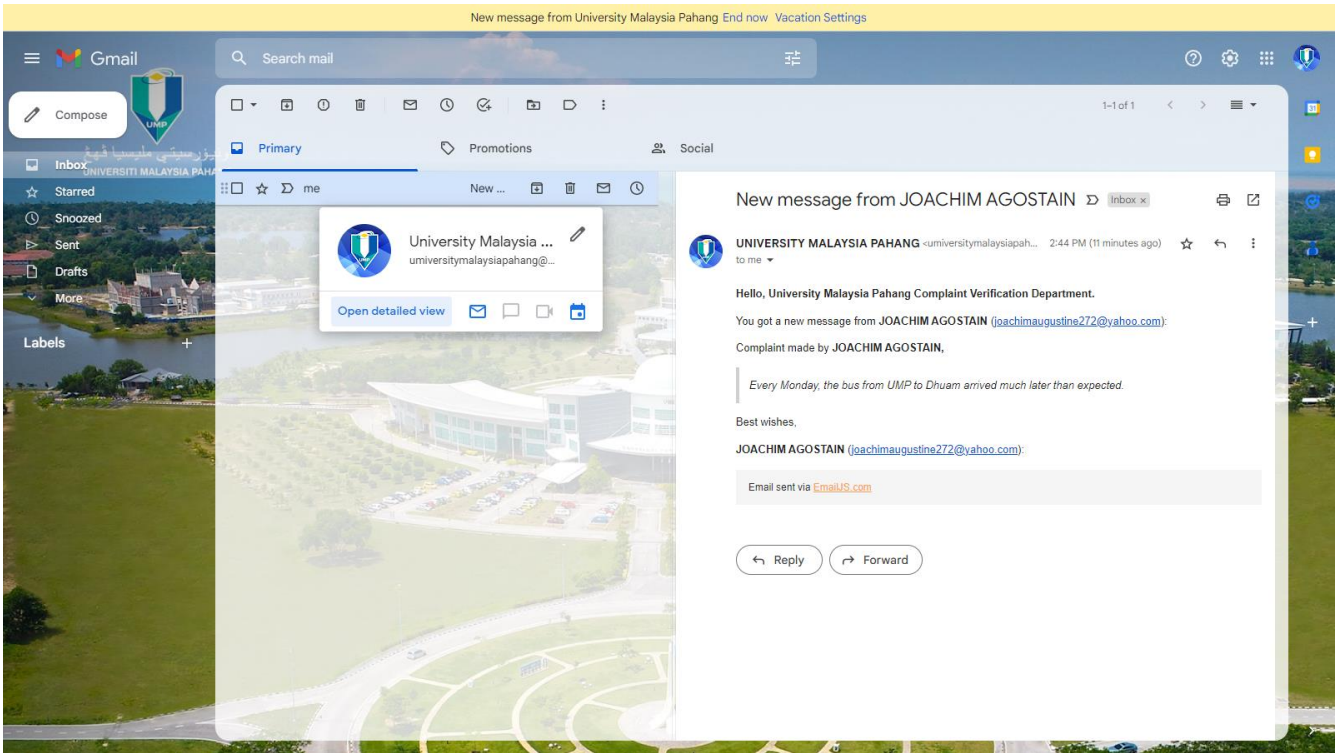


So, once the user key in all the information including their Full Name, Email, and Complaint in the form, and clicks the “Submit Button”, the pop-up notification will be displayed to users that the response has been successfully sent to the UMP for verification and fast action as shown in the Figure 4.3.3.3 above.

4.3.4 COMPLAINTS STORED IN GMAIL SERVER

When users fill out the "Complaint Form," their complaints are automatically sent back to the Gmail server, which is set up to handle email transfers in real time for the UMP complaint verification department. This is done with the help of SMTP JS (Simple Mail Transfer Protocol JavaScript) and the Elastic Mail API.

Figure 4.3.4.1: Complaint Information was received by the UMP Gmail Server with the help of SMTP JS and Elastic API Protocols.



As a result, as indicated in Figure 4.3.4.1 below, as soon as the complaint is received by the UMP complaint verification department through Gmail Server, UMP will process it and take the necessary steps to address any problems or difficulties that the users have raised.

NATURAL LANGUAGE DESIGNED IN INTENT DATA

The keyword phrases model for a natural language is designed in intents and entities data used to train the chatbot's processing actions.

Default Welcome Intent

Intents	Chatbot’s processing action
Long time no see	Welcome Intent
Hello hi	Welcome Intent
howdy	Welcome Intent
Hey there	Welcome Intent
greetings	Welcome Intent
hey	Welcome Intent

How many facilities in UMP intent

Intents	Chatbot's processing action
UMP Faculty	UMP Faculty Details
Faculty	UMP Faculty Details
How many facilities?	UMP Faculty Details
Many faculties	UMP Faculty Details
Number of faculties in UMP	UMP Faculty Details

UMP location intents

Intents	Chatbot's processing action
Location	UMP location Details
Where is the UMP located?	UMP location Details
Where is UMP located?	UMP location Details
Location of university	UMP location Details
UMP area	UMP location Details

Faculty Dean intents

Intents	Chatbot's processing action
Who is the faculty dean?	University Deans Details
Dean	University Deans Details
Dean UMP	University Deans Details
Ump faculty deans	University Deans Details
Deans name	University Deans Details

UMP lecturer intents

Intents	Chatbot's processing action
professor	UMP Lecturer Details
advisor	UMP Lecturer Details
academic	UMP Lecturer Details
Ump lecturer	UMP Lecturer Details

UMP Degree course intents

Intents	Chatbot's processing action
What are the degree courses in ump?	UMP Degree Course Details
Degree courses	UMP Degree Course Details
What are the degree courses provided by the ump	UMP Degree Course Details
Degree programs	UMP Degree Course Details

Faculty of Computing course intents

Intents	Chatbot's processing action
computing	Computer Science Details
Computer science courses	Computer Science Details
What are the courses offered by faculty of computing?	Computer Science Details
Faculty of Computing	Computer Science Details

UMP facilities intents

Intents	Chatbot's processing action
Best feature of ump	UMP Facilities
Ump facility	UMP Facilities
Student facility	UMP Facilities
Why ump	UMP Facilities

4.4 TESTING

Once the implementation process is complete, the system testing process for this UMP Intelligent chatbot will be carried out. It is to ensure that this system is error-free and able to meet the needs of users. In addition, this testing phase is also to ensure that this chatbot can achieve the objectives of this project study. Every function in this chatbot will be tested to make sure it works properly. This UMP Intelligent Chatbot testing uses functional testing methods. Functional testing is a testing technique with real users to ensure that each function can work properly. Testing is carried out with a test plan. The testing phase of this system is divided into two parts, namely testing based on research objectives and functional testing.

4.5 PLANNING FOR IMPLEMENTATION & TESTING (UAT)

The colour scheme and general concept for the web application's appearance would be decided in collaboration with the targeted user of the UMP Intelligent chatbot system while considering the functionality that must be included during the design phase. Wireframes and mock-ups would be built initially, and then HTML, CSS, JavaScript, Bootstrap, Material, and front-end frameworks would be utilized to design the web application's UI.

4.5.1 TESTING OBJECTIVES

The testing goal for this system is to confirm that it can meet the project study's objectives. Furthermore, testing is carried out to ensure that the system's flow is uninterrupted and free of mistakes. Throughout the development phase, system testing is performed to ensure that all components of the system work properly.

4.5.2 INITIAL PLAN FOR TESTING

A test plan is a document that outlines a software or hardware product's objectives, target markets, and methods. To carry out the testing, we need a testing strategy.

I) Test Object

The object to be tested is a UMP Intelligent Chatbot using the Dialog Flow framework with a complaint form module.

II) Testing based on the Objectives of the Study.

The system will be tested based on the stated objectives of the study. This is to ensure that the system can achieve the objectives of this project.

III) Functional Testing

Functional testing is performed to ensure that each function of the system can function properly without the existence of errors.

The functions that will be tested are as follows:

- a. Chatbot homepage function
- b. "Welcome Intent" Function
- c. "Fallback Intent" function
- d. Chatbot response function for questions

4.5.3 INITIAL TESTING PLAN BASED ON THE OBJECTIVES OF THE STUDY

The following table shows the study objectives determined by the project proposal and the actual results achieved at the testing phase of the UMP Intelligent Chatbot with the web project.

Research objective	Actual Results
Develop chatbot software that can answer most questions.	By utilizing the Dialogflow agent, which manages end-user communications. It's a natural language understanding module that can recognize the human language. These Dialogflow agents were created to handle the specific sorts of conversation that this system requires. This Chatbot can respond to frequently requested queries that are related to the study's objectives.
To identify and modify the dataset to make it more environment-friendly.	The dataset in this project has been updated from time to time, and commonly requested questions have been included to ensure that the chatbot runs smoothly and can answer more questions given by users.
For chatbot development, the Dialogflow program is used.	It is possible to integrate and manage the discussion entirely using the Dialogflow Agent. Dialogflow matches an end-user expression with the best keyword in the agent when the end-user writes or says anything, which is known as an end-user expression. As a result, the study's stated goals were met.

Table 4.5.3: Testing planning based on objective

4.5.4 TESTING PROCEDURES

A testing procedure is a set of steps taken by the tester to assess if the system is free of mistakes or whether it is working properly. This technique will outline the elements that were examined during the UMP Intelligent Chatbot system's testing process.

Test Procedure ID	TEST01
Objective	Implement the TEST01 test case according to the procedure
Procedural steps	<ol style="list-style-type: none"> 1. Type a UMP website link on the web browser 2. The main page of the UMP website will load and be visible. 3. The chatbot will immediately activate after the page has properly loaded. 4. Enter the Chatbot conversation that shows the Chatbot question option.
End of procedure	Press the Exit (X) button and exit the Chatbot website.

Table 4.5.4: **Testing Procedures Entering the Chatbot website**

Test Procedure ID	TEST02
Objective	Implement the TEST02 test case according to the procedure
Procedural steps	<ol style="list-style-type: none"> 1. The user has entered the Chatbot website 2. The Chatbot interface is displayed 3. The user types "Hi, Hello" and so on in the "Ask Something" field to start a conversation 4. The chatbot will display one message from "Welcome Intent"
End of procedure	Press the Exit (X) button and exit the website Chatbot

Table 4.5.5: **Testing Procedures for the "Welcome Intent" function**

Test Procedure ID	TEST03
Objective	Implement the TEST03 test case according to the procedure
Procedural steps	<ol style="list-style-type: none"> 1. The user has entered the Chatbot website 2. The Chatbot interface is displayed 3. Users type messages that are beyond Chatbot's expertise such as "Where is the nearest Petrol Station?" 4. The chatbot will display one message from "Fallback Intent"
End of procedure	Press the Exit (X) button and exit the website Chatbot

Table 4.5.6 “Fallback Intent” Function Testing Procedure

Test Procedure ID	TEST04
Objective	Implement the TEST04 test case according to the procedure
Procedural steps	<ol style="list-style-type: none"> 1. The user has entered the Chatbot website 2. The Chatbot interface is displayed 3. Users type frequently asked questions related to UMP 4. The Chatbot will respond to users with the right answer.
End of procedure	Press the Exit (X) button and exit the website Chatbot

Table 4.5.7: Chatbot response function testing procedure

Test Procedure ID	TEST04
Objective	Implement the TEST04 test case according to the procedure
Procedural steps	<ol style="list-style-type: none"> 1. The user has entered the “complaint” keyword phrases in the chatbot. 2. A description and redirect link to the UMP website complaint form are shown alongside the chatbot interface. 3. Users reach the complaint form page by clicking the “Click Here” button, typing their complaint, and submitting it to the UMP Gmail Server. 4. The form then will be sent to UMP Gmail Server for verification and fast action using the SMTP JS protocol.
End of procedure	Press the Exit (X) button and exit the website Chatbot

Table 4.5.8: Chatbot response function redirect link to complaint form page website

4.6 TEST RESULTS

Table 4.6 shows the test results. The testing is done using the "peer evaluation" method which is also studied at UMP using the UMP Intelligent Chatbot's link. This testing is done by UMP students manually at their respective places via laptop or mobile phone. According to this table, it can be said that the tests performed on the functions in this UMP Intelligent Chatbot system with the website are passed.

Test Case ID	Types of Testing	Tool	Pass/Fail
TEST01	Functional	Manual	Pass
TEST02	Functional	Manual	Pass
TEST03	Functional	Manual	Pass
TEST04	Functional	Manual	Pass

Table 4.6 **Test Results**

CONCLUSION

In conclusion, all system testing plans have been described in this section. The process involved in this section is system testing using a test plan. In addition, this section aims to achieve the objectives, and meet the needs of users as well as the design that has been planned in previous phases. The testing phase is the phase that requires testing to be carried out which aims to test so that the system is free from the existence of errors.

CHAPTER 5

CONCLUSION

5.1 INTRODUCTION

The goal of integrating the UMP Intelligent Chatbot with the UMP website is to provide real-time replies to most asked questions about UMP courses, faculty, and facilities without requiring human involvement. The aim is achieved with the help of a DialogFlow agent that uses natural language keyword phrases designed in intent data. Furthermore, the discovered constraints will be examined, as well as suggestions for future system improvements. This is due to the priority placed on improvement suggestions to correct issues and increase the capabilities of future apps.

5.2 RESEARCH CONSTRAINT

During the development of the UMP Intelligent Chatbot system with the UMP website, several constraints and issues were discovered. The first limitation arises while attempting to collect data to create a dataset for this chatbot. This is because the chatbot will not be able to respond to all the user's inquiries. The system is also only available over the internet. Users with mobile phones will be directed to the Google Chrome app, where they will then input the URL for the UMP Chatbot's website. Users will be increasingly interested in utilizing Chatbot programs, such as those obtained from the "Play Store" or "App Store," because of this annoyance.

5.3 RECOMMENDATIONS FOR FUTURE IMPROVEMENTS

The UMP Chatbot System is a simpler version. As a result, adjustments are required from time to time to fulfill the targeted user's needs and expectations. Suggestions for resolving issues with this system include frequently updating the dataset so that this Chatbot can respond to a variety of inquiries from users. The next step is to create apps for smartphones that run on the Android & iOS operating systems. As a result, more people are using the UMP Chatbot system.

5.4 CONCLUSION

Overall, this chapter has gone through the challenges of designing a UMP Intelligent Chatbot system with the website in greater depth. The next step is to outline enhancement suggestions so that they may be applied in the future and a better version of UMP Chatbot can be created. Furthermore, several additional inputs have been acquired because of this effort. At the same time, all previous information has greatly aided in the development of this project within the allotted time limit. As a result, one of the areas that should be stressed to ensure a smooth implementation of the project to construct the UMP Chatbot web system is time management.

REFERENCES

- 1) Active Chat Smarter Conversation. (30 May 2021). Retrieved from Active Chat: <https://activechat.ai/>
- 2) Botsify Community, C. (30 May 2021). Build Conversational Flows. Retrieved from Botsify Chatbot: <https://botsify.com/>
- 3) Drift Custom AI Chatbot. (26 January 2022). Retrieved from DRIFT: <https://www.drift.com/platform/custom-chatbots/>
- 4) Fresh chat, B. (26 January 2021). A Fresh chat Chatbot Platform for Pros. Retrieved from Flow.AI: <https://flow.ai/features>
- 5) Intercom Chatbot. (15 September 2021). Retrieved from AI Community: <https://www.intercom.com/>
- 6) WYSA Community, C. (25 December 2020). AI chatbot that makes you feel heard. Retrieved from WYSA Chatbot: <https://www.wysa.io/meet-wysa>
- 7) "Chatbot", en.wikipedia.org, 2010. [Online]. Retrieved from: <https://en.wikipedia.org/wiki/Chatbot>
- 8) "Chatbot: What is Chatbot? Why are Chatbots Important? -", Expertsystem.com, 2018. [Online]. Retrieved from: <https://www.expertsystem.com/chatbot/>.
- 9) Daniel Palani (30th August 2017) Emotionless chatbots are taking over customer service. Retrieved from <https://theconversation.com/emotionless-chatbots-are-taking-over-customer-service-and-its-bad-news-for-consumers-82962>
- 10) UTAR AI (31st August 2018) An Introduction to Chatbot. Retrieved from <https://chatbotslife.com/an-introduction-to-chatbots-8ca7d7ad2eb2>
- 11) Kapil Yadav (7th December 2017) An overview of Chatbot. Retrieved from <https://chatbotslife.com/an-overview-of-chatbot-a539b5fc55d3>
- 12) Botsify Review. Retrieved from: <https://www.chatbots.org/botsify#section3>
- 13) J Cahn - University of Pennsylvania School of Engineering (2017) http://www.academia.edu/download/57035006/CHATBOT_thesis_final.pdf
- 14) Keshvar Enza. Chatbot AD (Activity Diagram (UML)). [Online]. Retrieved from <https://creately.com/diagram/example/j7rv9u1i1/Chatbot%20AD>
- 15) Kwame Aforo-Addo. (2017, February 21) Examples of Chatbot functions. [Online]. Retrieved from <https://cxcentral.com.au/advanced-technology/chatbot-functions/>
- 16) Shreya Bose. Functional Testing: A Detailed Guide. [Online]. Retrieved from <https://www.browserstack.com/guide/functional-testing>

- 17) Fresh chat, B. (26 January 2021). A Fresh chat Chatbot Platform for Pros. Retrieved from Flow.AI: <https://flow.ai/features>
- 18) Intercom Chatbot. (15 September 2021). Retrieved from AI Community: <https://www.intercom.com/>
- 19) WYSA Community, C. (25 December 2020). AI chatbot that makes you feel heard. Retrieved from WYSA Chatbot: <https://www.wysa.io/meet-wysa>
- 20) "Chatbot", en.wikipedia.org, 2010. [Online]. Retrieved from: <https://en.wikipedia.org/wiki/Chatbot>
- 21) Jérôme Simonetti. (2020, April 28). How to Design a Perfect Use Case for Your Chatbot. [Online]. Retrieved from <https://cai.tools.sap/blog/how-to-design-perfect-use-case-for-your-chatbot/>
- 22) Alex DeBacker. (2017, May 18) A Simple Chatbot Flowchart. [Online]. Retrieved from <https://blog.ubisend.com/optimise-chatbots/simple-chatbot-flowchart>
- 23) Mila Lesra. [Online]. Retrieved from <https://onix-systems.com/blog/how-to-design-a-chatbot-creating-a-conversational-interface>
- 24) Cobus Grayling. (June 23). [Online]. Retrieved from <https://cobusgreyling.medium.com/general-chatbot-architecture-design-development-overview-58e145398608>
- 25) Mostafa Gazar. The 3 main components of a DialogFlow agent. [Online]. Retrieved from <https://hackernoon.com/the-3-main-components-of-a-dialogflow-agent-e5cfff1a186>
- 26) Google Cloud. [Online]. Retrieved from <https://cloud.google.com/architecture/building-and-deploying-chatbot-dialogflow>
- 27) Maruti Tecla's. [Online]. Retrieved from <https://marutitech.com/build-a-chatbot-using-dialogflow/>
- 28) What is Functional Testing? Types & Examples (Complete Tutorial). [Online]. Retrieved from <https://www.guru99.com/functional-testing.html>
- 29) Shreya Bose. Functional Testing: A Detailed Guide. [Online]. Retrieved from <https://www.browserstack.com/guide/functional-testing>