WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

DESIGNING AND DEPLOYING AI-POWERED BUSINESS ASSISTANTS WITH IBM WATSON

Dr. TV Ramana[1], Yogesh Kumar Shah[2], Sajat[3], Ankit Raj Jaiswal[4]

[1]Professor Department of CSE FET, Jain (Deemed-to-be University) Bangalore-562112 venkataramana.t@gmail.com
[2]Undergraduate,CSE-SE FET, Jain (Deemed-to-be University) Bangalore-562112 yogeshaaryaveer593@gmail.com
[3]Undergraduate,CSE-SE FET, Jain (Deemed-to-be University) Bangalore-562112 ankitjaiswalofficial05@gmail.com
[4]Undergraduate,CSE-SE FET, Jain (Deemed-to-be University) Bangalore-562112 realsajat@gmail.com

A B S T R A C T:

The brief concerning this project is to leverage the Watson Assistant programme to create a chatbot, or virtual assistant, for websites. The principal aims are to alleviate the burden on staff members who respond to customer queries and improve the overall user experience on the website.

The project comprises many resources for chatbot production as well as a theoretical portion that explores and defines the state of chatbots today. The IBM Watson Assistant tool, which was used to create the chatbot, is then thoroughly explained.

After the tool's illustration, the approach used to design and develop the chatbot is described. The methodology chapter makes comparisons between the individual's development process and how an IBM team would normally produce the product.

Last but not least, the chatbot is tested, and findings are obtained. It has been noted that the chatbot functions as a useful tool for answering often requested questions in its field, which lessens the laborious and repetitive processes involved in answering website inquiries by hand.

Keywords: chatbot, leverage, resources, customer, user experience

Introduction:

Artificial intelligence (AI) technology integration has significantly changed many facets of our everyday life in today's digital environment, most notably how we obtain information and services. The emergence of intelligent conversational agents, or chatbots, that provide customers with round-the-clock, instantaneous, and specific service, and is one noteworthy development.

The idea and implementation of a chatbot—a virtual assistant—that is specially designed for the university website is the main focus of this thesis. By offering a quick and stimulating platform for assistance as well as knowledge retrieval, their primary objective is to further enhance the user experience.

But the project's reach goes beyond just building chat-bots. It includes creating a comprehensive system that emphasizes user participation and synchronizes the chat bot with academic needs. The main goal is to improve user experience by responding to frequently asked questions in a timely and correct manner. This will lessen the need for traditional support channels and free up human resources to work on more complex tasks.
With this project, we hope to further advance the field of virtual assistants by illuminating the subtleties of AI implementation and emphasizing the importance of each functional facet in technical endeavour.

Background and Motivation:

A major change has occurred with the emergence of artificial intelligence (AI) systems, which enable computers to pick up on human language and behaviour. With AI's continued advancement, we are getting closer to a day where people and robots can communicate with each other seamlessly, removing boundaries and promoting natural relationships.

The realisation that virtual assistants have the ability to revolutionise user interaction with information and services is the driving force behind this thesis. Our goal is to improve user experience by creating an intelligent chatbot that offers quick, tailored service. By serving as a liaison between users and the plethora of material on the university website, the chatbot expedites resource access, responds to frequently asked questions, and eventually raises user happiness.

In the final analysis, the project is driven by the exciting potential that arises from the combination of virtual assistants and artificial intelligence. It attempts to take care of substantial problems including strengthening human-machine collaboration, energy efficiency, and university customer service.

Objective:

This project's main goal is to employ IBM Watson Assistant to build a virtual assistant that will enhance users' experience on the university's website. This virtual assistant will serve as a user's own information centre, answering their questions and assisting them in navigating the website's content.

In addition to my internship experience, I was motivated to work on this project because of the growing importance of chatbots in society, especially when OpenAI's ChatGPT became widely known at the end of 2020. I saw a chance to optimise workload management to save energy usage and improve the university's customer service.

Reducing call volume and effort at the university's call centres is another important objective, particularly during peak hours. Routine duties including answering often asked inquiries, giving general information, and pointing users in the direction of pertinent resources will be automated by the virtual assistant. The operating efficiency will be greatly increased by this automation.

Furthermore, by utilising IBM Watson Assistant's capabilities, we will be able to obtain insightful data and analytics. Valuing user interactions will yield important information about user behaviour, preferences, and frequently asked questions. Data-driven decisions based on these insights will improve the content, architecture, and overall user experience of web pages.

Delimitation of research:

The development and integration of a virtual assistant using IBM Watson Assistant can present a number of complex technical issues that need a comprehensive grasp of the Watson Assistant platform and programming language skills.

Time is also a major obstacle because it would take longer to design a chatbot that can handle every component of the webpage and is completely functioning. The project's restricted time availability might limit its potential.

Furthermore, because of its limited scope and depth, the virtual assistant might not be able to cover all needed subject matter or provide thorough assistance for user questions. This constraint may result in a user experience that isn't as fulfilling and functional holes.

Benefits of research:

Availability: One significant benefit that chatbots have over human representatives is that they are available 24/7. While chatbots may provide consumers with immediate support around-the-clock, human agents are constrained by their work hours. This guarantees that clients will always have access to information or help, which will increase client happiness and loyalty.

Understanding Customer Insights: Through human contacts, important details regarding the requirements, preferences, and behaviours of customers may be discovered. Companies are able to customise their goods, services, and marketing tactics by using this data to obtain analytical understanding of their clientele. This comprehension aids companies in establishing stronger connections with their target market and providing consumers with tailored experiences.

Literature review:

In an effort to improve comprehension, it is helpful to define a few terminology that will be crucial to this project before getting into great detail about Chatbots.

Artificial Intelligence (AI) is the first and most general phrase. The goal of this branch of computer science is to create programmes and systems that can carry out activities that usually call for human intellect. Artificial Intelligence (AI) aims to develop models and algorithms that let computers interpret data, learn repeatedly, make decisions, solve issues, and work independently.

A number of AI subfields are especially pertinent to comprehending chatbots and virtual assistants. Natural language processing (NLP), deep learning, and machine learning are a few of them.

As a branch of artificial intelligence, machine learning focuses on creating models and algorithms that let computers learn on their own from given data. It includes a range of methods for building models and forecasts based on patterns seen in the data.

Deep learning is a subfield of machine learning that focuses on multilayer artificial neural networks. These networks gradually analyse input in each layer to extract progressively complicated traits and patterns. They learn data representations with different levels of abstraction. Deep learning is widely used in the analysis of texts, photos, sounds, and other kinds of data. It modifies connections according on the information it receives to improve prediction and decision-making abilities.

Natural language processing (NLP), which makes it easier for computers to communicate with people via language, is another key concept in relation to chatbots. NLP uses machine learning and deep learning to provide computers the ability to understand, analyse, and produce natural language. The ultimate objective is for robots to be able to identify and comprehend spoken, written, and sign language from humans.

Moreover, the phrase "user interface" has significance in the context of chatbot design. It describes the ways and mechanisms by which a user communicates with a computer programme or system. User interfaces shape the user experience by integrating text, speech, and motion interactions with visual components like buttons and displays.

Inferences Drawn from Literature Review:

Specialised bots that are skilled at sustaining conversations and delivering pre-programmed replies are referred to as chatbots, often known as chatterbots or conversational agents. The word "bot" comes from the word "robot," and while the two have many characteristics in common, a bot may exist fully in a virtual environment, but a robot need physical assistance to be developed.

An artificial intelligence (AI) programme designed to have text- or voice-based discussions with people is called a chatbot. It understands and reacts to user inquiries by utilising machine learning algorithms and natural language processing techniques. Among its essential traits are:

1. Conversational Interaction: Designed to mimic real-world human discussions, chatbots may carry out activities, respond to queries, give information, and carry out instructions at the user's request.

2. Natural Language Processing: By using these methods, chatbots are able to comprehend and interpret natural language, determining the intentions of users, gathering pertinent data, and producing well-reasoned replies.

3. Autonomy and Adaptability: Chatbots are able to adjust on their own to ever-changing settings, using their prior encounters and ability to learn to enhance responses and provide users with a precise and accurate experience. Algorithms for automatic learning improve with interaction.

4. Personality: Chatbot behaviour and tone of communication may be customised by developers to meet the needs and tastes of certain users. Chatbots are able to recall facts and context, which allows them to provide more customised and pertinent replies.

5. Platform and Service Integration: Chatbots can communicate with users without requiring them to download extra software. Chatbots are capable of integrating with a wide range of platforms and services, including customer management systems, messaging applications, and websites. They may interact with people on many platforms and access a variety of information sources thanks to this multi-channel strategy.

PROBLEM FORMULATION AND PROPOSED WORK:

My virtual assistant was built using the IBM Watson Assistant framework, which is a component of the IBM Watson artificial intelligence (AI) platform.

IBM Watson is designed to evaluate large datasets, gain knowledge from them, and provide perceptive solutions and insights in a variety of fields and businesses. Text, picture, and video data are among the forms it handles.
This technology, named for IBM's first CEO, Thomas J. Watson, came forth as a result of a research effort called DeepQA at IBM. The principal aim of the project was to create a system that could respond to natural language and understand human inquiries. The system was to analyse large datasets and provide answers that would normally take human researchers many days, weeks, or even months to come up with.

IBM Watson learns by selecting, purifying, and classifying a "corpus" of knowledge in order to remove out-of-date, unimportant, or low-quality material related to the issue area. The cu-ration process improves data processing efficiency. The data next goes through preparation, where information is generated to enable faster processing, sometimes referred to as intake. After that, the model is trained by assigning particular queries to matching responses using machine learning. Rather than giving Watson explicit answers to every query, this training teaches Watson the language patterns and meanings specific to the field. As fresh knowledge is constantly being uploaded, Watson continues to learn through sporadic encounters under the supervision of specialists.

Developers may access IBM Watson's capabilities through APIs by utilizing IBM Watson Cloud, a cloud-based platform. These APIs make Watson scalable and easily accessible by granting access to a range of capabilities including language translation, picture recognition, and natural language comprehension.

System Architecture/model:

A specialised service inside the larger IBM Watson platform is Watson Assistant. It functions as an AI-powered virtual assistant and chatbot that gives companies the ability to create and implement conversational interfaces. Watson Assistant interprets user inputs using natural language understanding (NLU) and responds or takes action accordingly.

Four main algorithms are used by virtual assistants such as Watson Assistant:
- Input Analysis: NLU models parse and segment text into discrete parts, like as sentences, phrases, and words, based on user inputs entered into Watson Assistant. Tokenization helps interpret the structure and meaning of input by giving each word or phrase a unique label or token.
- Language Understanding: Watson Assistant uses natural language processing (NLP) to deduce meaning and purpose from user input. This involves activities such as entity detection, which identifies action-relaying entities inside intents, irrelevance detection, which detects off-topic requests, and intent detection, which understands the general concept underlying user utterances independent of wording. Spelling mistakes are treated with forgiveness thanks to the autocorrection function.

- Response Generation: Watson Assistant uses contextual information and intent detection to determine appropriate replies after understanding user input. Responses might be created dynamically using data from other APIs, or pre-defined, such in the case of typical inquiries.

- Dialogue Management: By preserving dialogue context, Watson Assistant manages the flow of conversations. It chooses when to ask for more details, request clarification, or offer definitive answers.
Personalised interactions, context awareness, and backend system connectivity are just a few of the things that Watson Assistant offers. It facilitates multi-turn talks by recalling prior exchanges to provide pertinent and precise answers.

Clients communicate with the helper through a variety of channels:
- Web chat incorporated on business websites that may connect customers with human support agents for complicated questions.
- Messaging apps on social media, such as WhatsApp, Facebook Messenger, and Slack.
- Text or phone messaging.
- Custom programmes, such as voice-activated robots or smartphone apps.

In order to provide customers with efficient support, the assistant processes their messages and leads them via the proper resolution path.

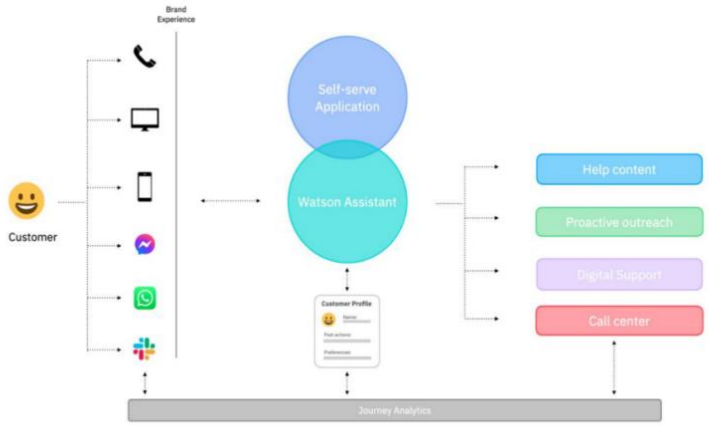


Figure 3.2.1. Watson Assistant channel scheme

Proposed algorithms:

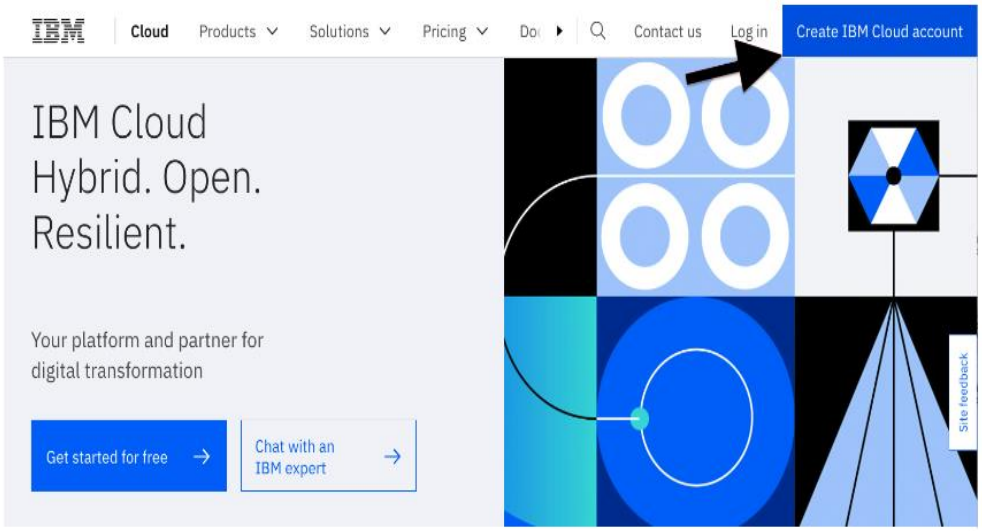
By acting as a customised solution created especially for bot creation and behaviour specification, a chatbot framework greatly minimises the manual labour that is usually involved in creating a chatbot.

A bot development framework often consists of parts like a developer site, bot connectors, bot builder SDK, and bot directory. A testing console is made accessible to make testing easier when the chatbot is built. Bot frameworks, put simply, give developers a complete toolbox that speeds up and improves the effectiveness of creating chatbots.

These would normally be handled in a corporate context by experts who are each knowledgeable in their own subject. Project managers, front-end and back-end developers, consultant analysts, and consultant developers would all be crucial positions for a project this size.

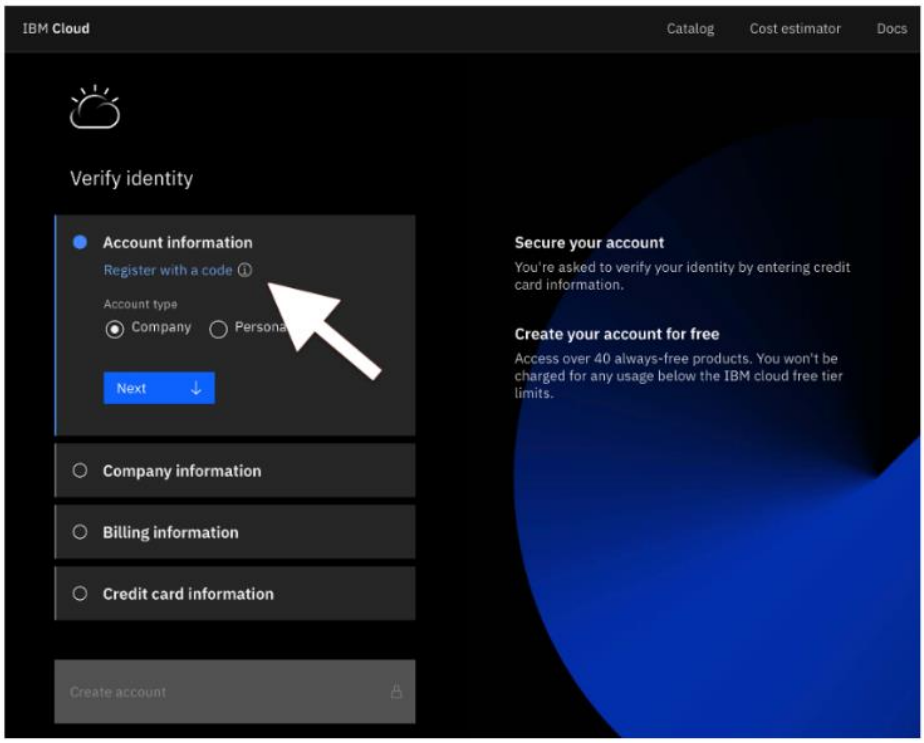
Here are the steps to get started:

1. Visit the IBM Cloud website and locate the "Create IBM Cloud account" option in the upper-right corner.

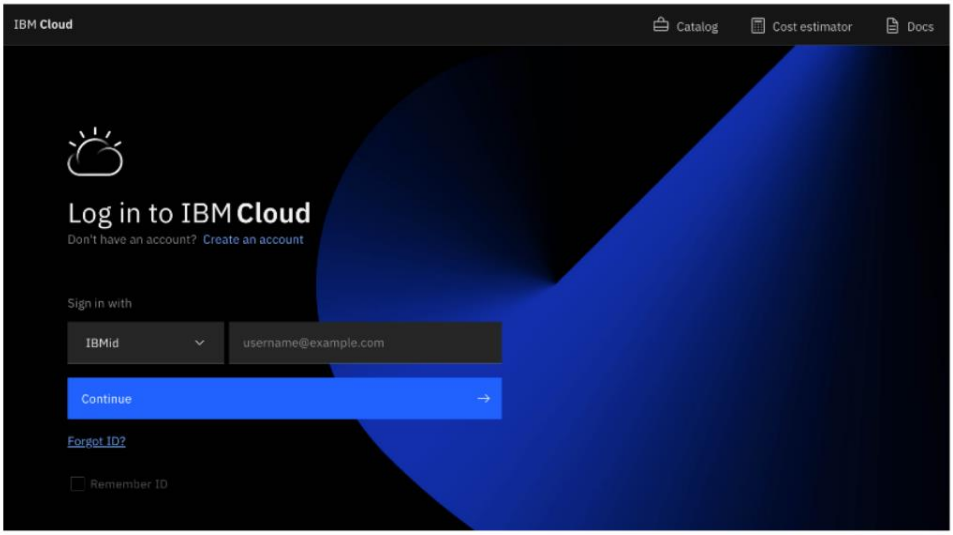


2. Follow the prompts to create a new IBM Cloud account, providing necessary details such as email address, password, country/region, and credit card information.

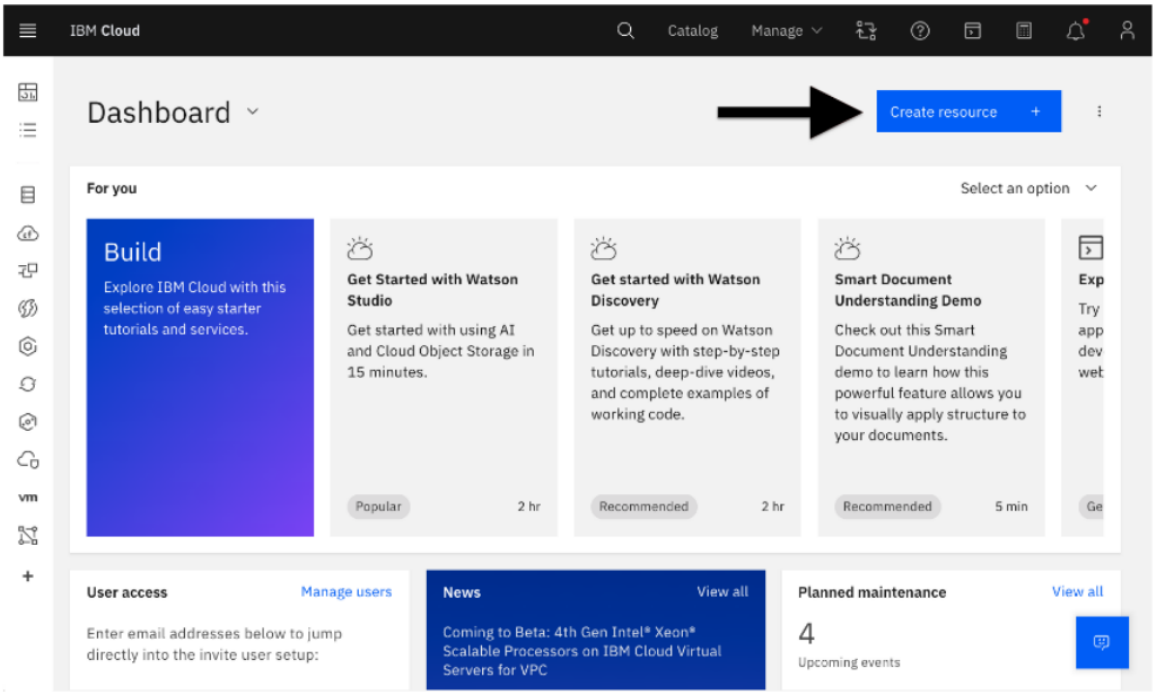
3. If you have a subscription or feature code, register using the provided code.



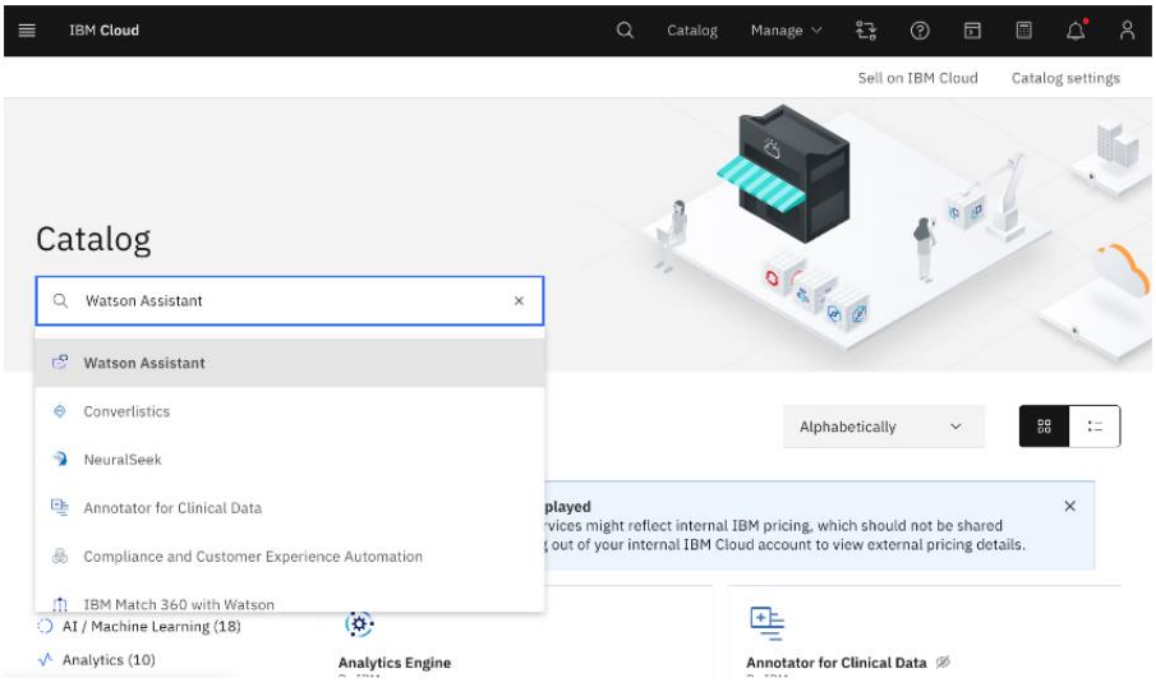
4.After account creation and verification, log in to the IBM Cloud dashboard.



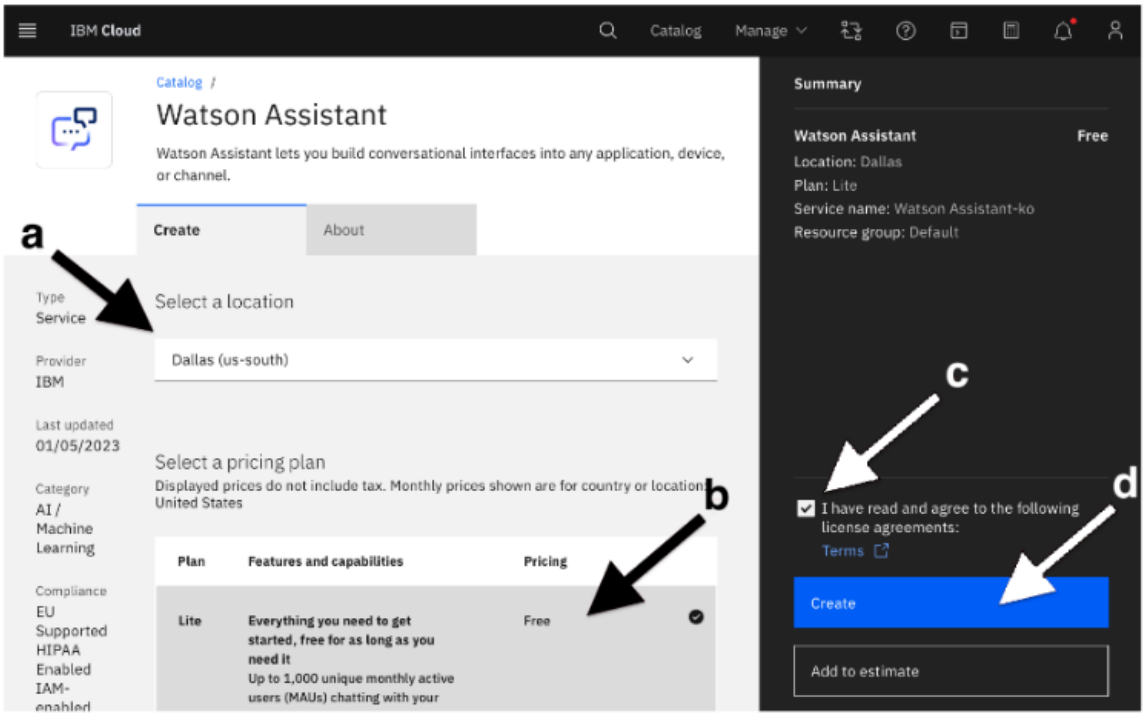
5. Click "Create resource" in the upper-right corner of the dashboard.



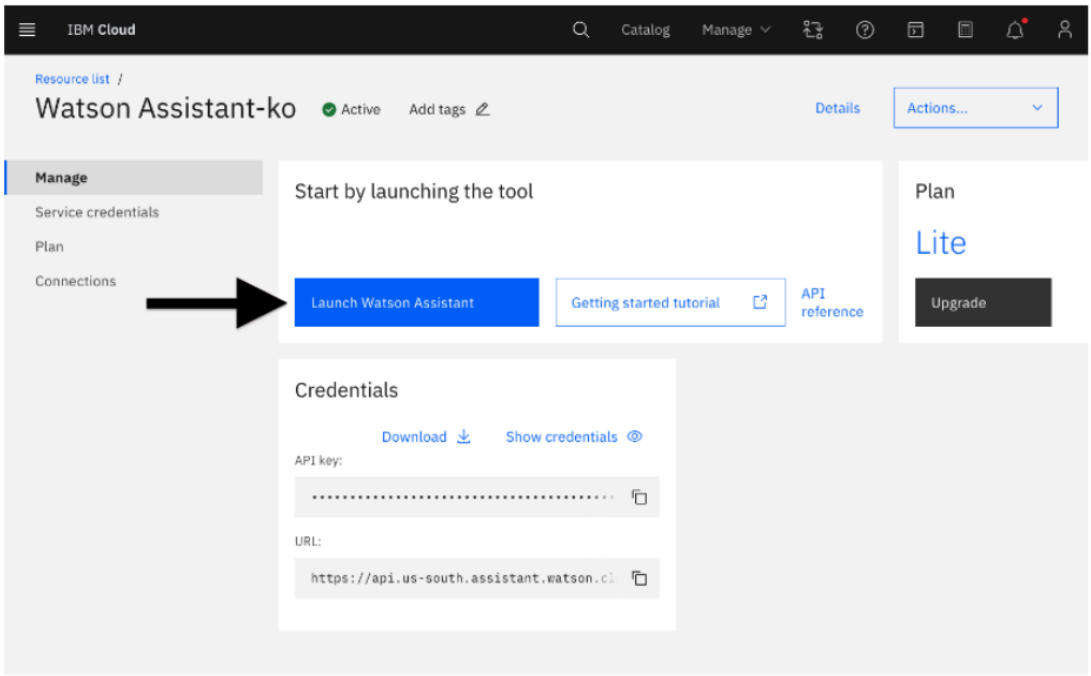
6. In the IBM Cloud Catalog section, search for "Watson Assistant" and select it from the results.



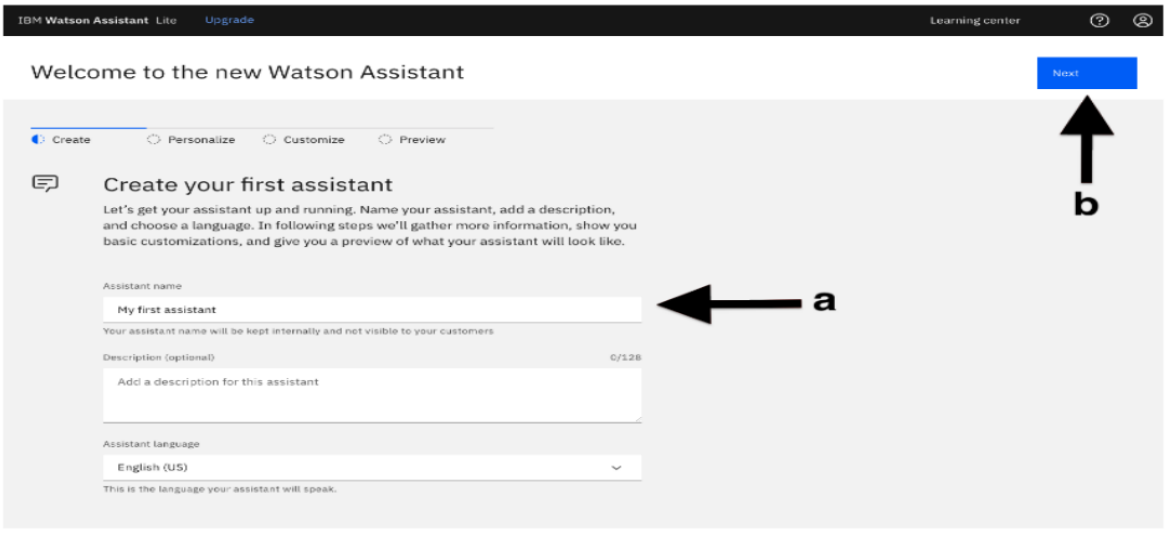
Choose a location, pricing plan, and agree to the license agreements. Then, click "Create."



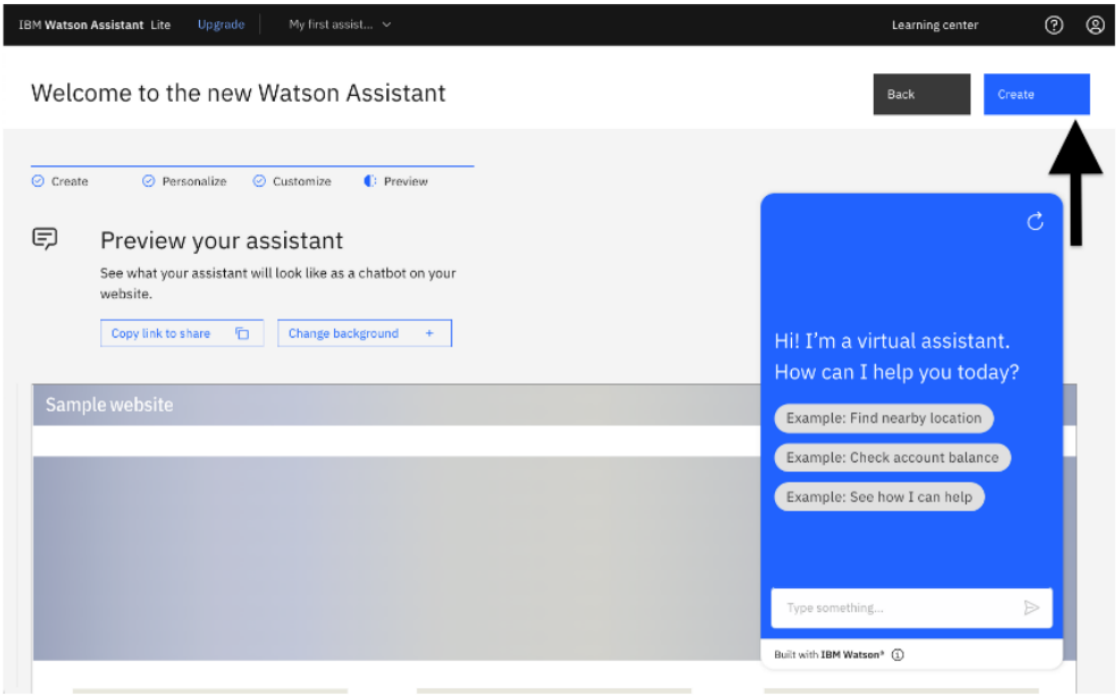
8. Wait for the instance to be created and then click "Launch Watson Assistant" to access the user interface.



9. Begin using Watson Assistant by creating your first assistant, providing an internal nickname, and answering customization questions. Click "Create" to finalize the setup.



10. On the Personalize your assistant tab, answer each question to the best of your ability. Anything that you enter can be changed later, so don't worry about anything being permanent. On the final screen, click Create.



Proposed work and implementation:

Hardware design and implementation

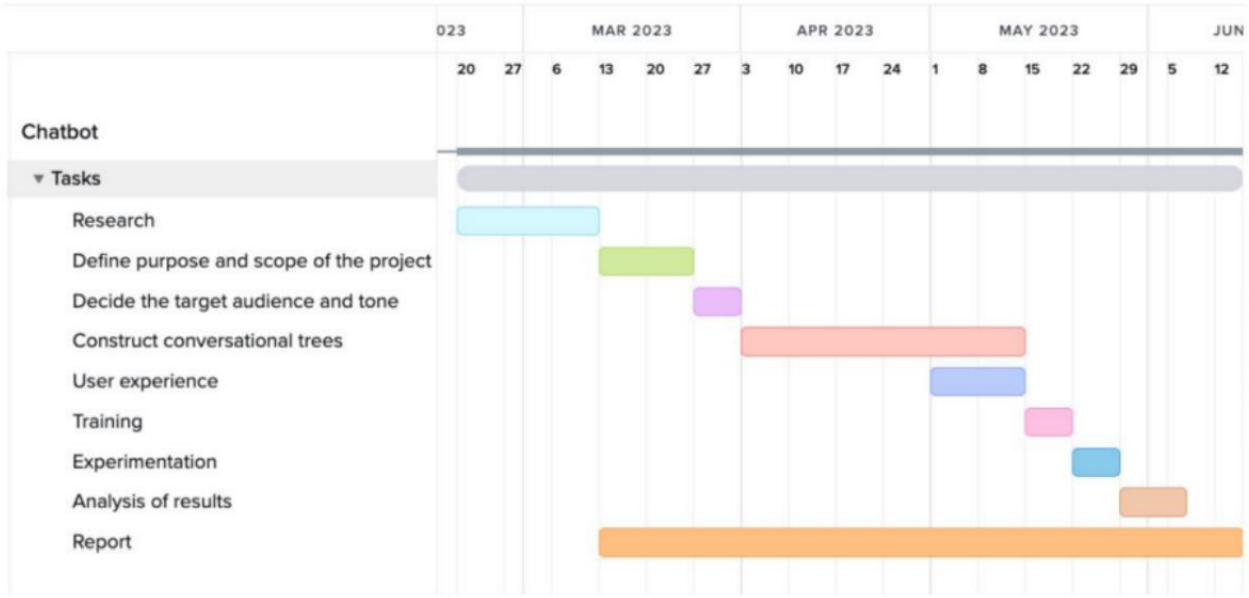


Figure 6.1. Gantt diagram

Table 4.7.2 Calculation of material costs

Material	Quantity Cost (€/ quantity)		Useful life	Total cost (€)
Laptop	1unit	1219	4 years	152
Microsoft 365	6 months	5,6		34
IBM Watson Assistant Lite	1	0	Unlimited	0

Software algorithm:

A chatbot framework is a customised solution that is specially designed for the purpose of developing and expressing bot behaviours. This leads to a significant decrease in the tedious manual activities that are often involved in the process of building a chatbot.

A typical bot development framework consists of a developer site, bot connectors, bot builder SDK, and bot directory. To expedite the testing process, a testing console is implemented after the development phase. Essentially, these frameworks give developers an advanced toolbox that maximises chatbot efficiency and accelerates chatbot development.

These tasks are usually delegated to experts in their fields by specialised professionals working in a corporate setting. Important positions for a large-scale project would include project manager, front-end, back-end, consultant analyst, and consultant developer.

Results and discusssion:

The time needed for bot creation was significantly decreased by implementing a chatbot framework. Instead of beginning from scratch, developers might focus on customising bot behaviours and speed up the development process by using pre-built components like the bot builder SDK and connectors.

The use of chatbot frameworks resulted in an improved user experience on the website or platform of the organisation. Higher user satisfaction and engagement resulted from the chatbots' ability to respond to user inquiries quickly and relevantly.

The business saved money on operational and customer support costs by automating repetitive operations and using fewer human agents. The chatbot frameworks enhanced overall efficiency and resource allocation. The scalability and adaptability of chatbot frameworks is one of their main advantages. The chatbots are readily expandable and updated to handle additional capabilities or adjust to changing consumer demands as the company's needs change. The chatbot solution's long-term sustainability and relevance are guaranteed by its scalability. Integration features with backend systems, including databases, APIs, and CRM platforms, are frequently provided by chatbot frameworks. Through this connectivity, chatbots may carry out complicated activities, respond with personalisation, and access real-time data, all of which increase their usefulness and efficacy.

All things considered, using chatbot frameworks offers a plethora of chances to enhance client satisfaction, cut expenses, and boost operational effectiveness. Nonetheless, rigorous preparation, ongoing oversight, and commitment to moral principles are necessary for an effective and long-lasting chatbot implementation.

Conclusion and future scope:

In conclusion, the main objectives of this project—which were to improve user happiness on the university website by developing a virtual assistant using IBM Watson Assistant—were successfully accomplished. In spite of being a proof of concept with a narrow scope, the virtual assistant was able to respond to customer inquiries, provide tailored support, and help users navigate the online content.

Overall, the project's outcomes improve the user experience on the university website, boost operational effectiveness, and enable data-driven insights to be used for well-informed decision-making with an eye towards ongoing improvement.

The chatbot has to incorporate a translator if it wants to increase its language skills. The first step in this process is to identify the language used in the user's inquiry, which is then translated into the language the programme has been taught in. Watson can then decipher the query and find the appropriate response tree.

A straightforward translation and display method is inadequate as answers may contain multimedia information in several languages. Rather, the responses need to be kept in a database with unique content and codes for every language. The relevant response is obtained from the database upon identification of a language.

Alternatives like Google Translate or ChatGPT can be taken into consideration to achieve this feature. These substitutes make it easier to translate and have multilingual capability, which is necessary for the chatbot to have improved language capabilities.

REFERENCES:

1. Kalilulah, S.I., Vidhya, V., Srinivasan, P.K., Vijayalakshmi, V. and Singh, K.A., 2020. The Database Standards And Procedures For IBM Cloud Computing. Database, 29(8), pp.1655-1660.
2. McIntyre, J., 2012. IBM SmartCloud: Becoming a Cloud Service Provider. IBM Redbooks.
3. Almutairi, A.A. and El Rahman, S.A., 2016, May. The impact of IBM cloud solutions on students in Saudi Arabia. In 2016 Fourth International Japan-Egypt Conference on Electronics, Communications and Computers (JEC-ECC) (pp. 115-118). IEEE.
4. Majumder, S., Bhattacharjee, A. and Kozhaya, J.N., 2024. Enhancing AI Governance in Financial Industry through IBM watsonx. governance. Authorea Preprints.
5. BĂLĂNESCU, R.E., 2023. Advancing NATO’s quality assurance education by implementing the ‘learn-watch-ask’training model. Bulletin of" Carol I" National Defence University (EN), 12(04), pp.124-143.
6. Kienzler, R., Khan, R., Nilmeier, J., Nesic, I. and Haddad, I., 2023. CLAIMED--the open source framework for building coarse-grained operators for accelerated discovery in science. arXiv preprint arXiv:2307.06824.
7. Balanescu, E.R., 2023. ADVANCING NATO'S QUALITY ASSURANCE EDUCATION BY IMPLEMENTING THE'LEARN-WATCH-ASK'TRAINING MODEL. Joint Force Development-Allied Command Transformation.
8. Nayak, N., SELECTED PROBLEMS OF INDUSTRY DATABASES AND INFORMATION INFRASTRUCTURE SECURITY.
9. Giaramita, H., 2024. AI Assistance in the Drug Development Process: Reaching for a Regulatory Framework. Seton Hall Law Review, 54(4), p.7.
10. Hoque, A., Srivatsa, M., Yang, C.C. and Ganti, R., 2024. TP-Aware Dequantization. arXiv preprint arXiv:2402.04925.
11. Watson, X., D'Souza, J., Cooper, D. and Markham, R., 2022. Artificial intelligence in cardiology: fundamentals and applications. Internal Medicine Journal, 52(6), pp.912-920.
12. Baughman, A., Hammer, S., Agarwal, R., Akay, G., Morales, E., Johnson, T., Karlinsky, L. and Feris, R., 2024. Large Scale Generative AI Text Applied to Sports and Music. arXiv preprint arXiv:2402.15514.
13. de Souza, C., Neto, J.B., de Souza, A., Gotto, T. and Monteiro, E., 2023. Lessons from Building CodeBuddy: A Contextualized AI Coding Assistant. arXiv preprint arXiv:2311.18450.
14. Gonzalez, G.E., Moran, D.A.S., Houde, S., He, J., Ross, S.I., Muller, M., Kunde, S. and Weisz, J.D., 2024, March. Collaborative Canvas: A Tool for Exploring LLM Use in Group Ideation Tasks. In ACM International Conference on Intelligent User Interfaces.