Proposal for
Chatbot project

Client:

Mr. Goldy T Wijaya

Team Members:

AUT ID	Name
20108405	Tianyang Li
20108728	Shijie Ma
20108736	Hanpeng Jiang
20108511	Jiacheng Lv

Mentor Name:

Mr. Petteri Kaskenpalo

Date: 31/10/2021

Version 1.2

Table of Contents

Executive Summary

This is a project proposal for developing a chatbot for Jaktent conference and virtual exhibition website. The project cycle is from the end of September this year to the end of May next year. The purpose of the whole project is to develop and explore different chatbots that could be included in the website for Jaktent conference and virtual exhibition. These can guide users to use the website and quickly find the conference and virtual exhibition information relevant to them. The whole project will adopt the software development method of agile development, and use web programming, machine learning, deep learning and other relevant knowledge for project development. The project will deploy and test existing chatbot frameworks and report their suitability based on the team's findings. At the same time, the whole project is divided into five stages, and the overall cost estimate is less than ¥ 200000.

1. Terms of Reference

Jakarta Content Week aims to become a new center for creative content and rights trading in the Asia Pacific region. Publishing products and other intellectual property rights in the cultural and creative sectors focusing on the Asia Pacific region will be displayed and traded. Jaktent is a virtual conference and exhibition website which can provide members from different international content communities around the world with opportunities to meet, share, discuss and trade in the Asia Pacific region.

Jaktent involves different kinds of conferences and exhibitions, including LitBeat, LitBite, LitFest, LitFilm, LitTrade, The Market and Icon. Members of the international content community from all over the world can know the specific information, time, specific precautions of the conference or exhibition they need to participate in through the website. The website can not only provide opportunities for academic and cultural exchanges for people in relevant fields around the world, but also provide a function to organize and inform members to participate in meetings.

Figure 1: Jaktent Website

Mr. Goldy T Wijaya is the project manager for Jaktent who works for FromLabs in Indonesia. He led his team to develop and maintain Jaktent. In the actual operation of the website, they have found the problem that many users are not familiar with Jaktent website now. They are not easy to find some useful things relevant to them

and do not know how to use the website to obtain the specific information and time about the conference or exhibition they participate in. At the same time, it will be very inconvenient if the organizers use email to inform each member of the place and time of the conference or exhibition. The problem mentioned above will cause relevant participants to miss the meeting or exhibition and cannot easily get the useful information, so they think that it is very important to develop a function for Jaktent website that can help people use the website and solve some of their problems when they scan the Jaktent website.

After research, Goldy and his team feel that if they can develop a chatbot for Jaktent website and help people use the website and find the information they need through an online chatbot, it will easily solve the above problems. So the business goal for them is to develop a chatbot for Jaktent website which can help people use the website and find out useful information they need.

2. Rationale for the Project

Chatbot can talk with human beings by learning natural language, which belongs to the category of question and answer system (Wang & Li, 2018). It can not only answer the questions raised by users, but also communicate with users humanely, and remind or arrange users to complete some tasks. Therefore, developing an intelligent chatbot for Jaktent website can well solve the problems that users are not familiar with the website and cannot quickly obtain relevant information about conference or exhibition. When users browse the website, if they don't know how to find and obtain relevant conference or exhibition information, they can ask the chatbot online. Chatbot can provide corresponding answers according to users' questions, so as to solve users' problems and make users have a better experience when browsing the website.

The research of chatbot originated in the 1950s. In terms of technical implementation, chatbot can be divided into retrieval chatbot and generative chatbot. Retrieval chatbot refers to the use of predefined reply library and some heuristic way

to make appropriate replies according to input and context (Wang et al., 2021). In this mode, the content replied by the robot is in a dialogue corpus. When it receives the sentence sequence input by the user, the chat system will search and match in the dialogue corpus, extract the response content and output it. The representative is the chatbot based on decision tree. Generative chatbot means that after receiving user input, it will use other technologies to generate a reply as the output of the chat system. This method does not require a very large and accurate corpus, because it does not rely on the predefined reply database. In contrast to the retrieval chatbot, the generative chatbot does not need a predefined reply library, but can directly learn the corresponding dialogue data, so as to answer complex questions, but the generated replies may have some disadvantages, such as syntax errors or sentences. With the continuous development of artificial intelligence, nowadays, we mainly use the combination of generative and machine learning to develop chatbot, typically using natural language processing technology. There are many mature chatbot frameworks, such as Botonic framework based on Node and React, DeepPavlov framework based on Tensorflow and Keras, Bottender Cross platform chatbot based on JavaScript, etc.

Therefore, the development of chatbot has a very mature technology. In Jaktent website, it is technically feasible to develop an intelligent chatbot for conferences and virtual exhibitions. The main issue we need to pay attention to is which technique skill is used in the website to develop the chatbot for Jaktent website, so as to solve the existing problems. Because each chatbot technical framework has its own advantages and disadvantages, we need to choose the most intelligent and appropriate chatbot technical framework according to the actual situation of the website. At the same time, whether the UI interface can meet the user experience is also a key issue to be considered.

3. Scope and Objectives

Project Title: Chatbot Project
Date: 26/10/2021 **Prepared by:** Shijie Ma, Tianyang Li

Project Justification:

Jaktent is a virtual conference and exhibition website that provides users from different parts of the world with the opportunity to meet, share, discuss and trade in the Asia-pacific region. As a virtual conference and exhibition website, Jaktent currently lacks a function to guide users to use the website and quickly find the conference and virtual exhibition information relevant to them.

Project Goals:

The goal of the project is to create a chatbot for a virtual conference and exhibition called Jaktent, and use its conference materials and contents as training and examples for such chatbot configuration.

Project Characteristics and Requirements:

1. Provides links to conferences and exhibitions
2. Provide guidance on website services(Account registration etc)
3. Respond accordingly to the context of the user
4. Transfer manual customer service

High-level Requirements:

Functional requirements

1. Be able to identify basic user problems
2. Be able to link to questions
3. Some general problems to guide the solution(Login registration problems etc)
4. Choose the best response based on the user's semantics
5. Transfer manual customer service

Nonfunctional requirements

1. The system can be used by 100 people at the same time, and the page response time is less than 6 seconds
2. The system requires 7*24 hour continuous operation
3. The accuracy of the user's answer should reach more than 90%

Summary of Project Deliverables

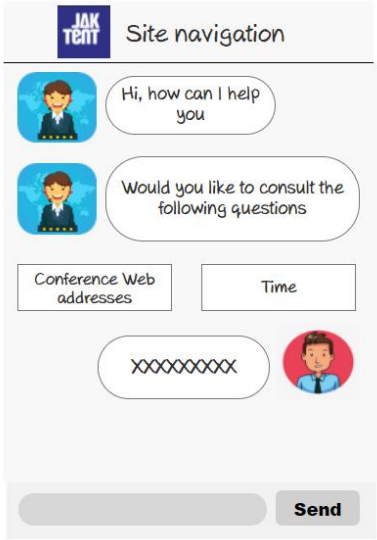
Project management-related deliverables: team contract, scope statement, project

schedule, status reports, final project presentation, final project report, individual reflective report, and any other documents required to manage the project.

Product-related deliverables: project prototype, design documents, software code, hardware, etc.

Envisaged Final Solution:

We plan to learn and test different chatbot technologies, and finally select the most intelligent method. Combined with web front-end technology, we will develop a chatbot that can realize human-computer interaction for Jaktent website. The specific prototype is as follows:



4. Project Method

We think that it is best to use the agile development method to develop our chatbot project. Agile development method takes the evolution of users' needs as the core, and adopts an iterative and step-by-step method for software development. This innovative software development method is based on evolutionary development, flexible response to change and improvement through adaptive planning (DesignRush, 2020).

Through the preliminary analysis of the project, we found that we need to develop an intelligent chatbot for Jaktent website before the end of May next year. In the whole process of the project, we need to try different chatbot frameworks which

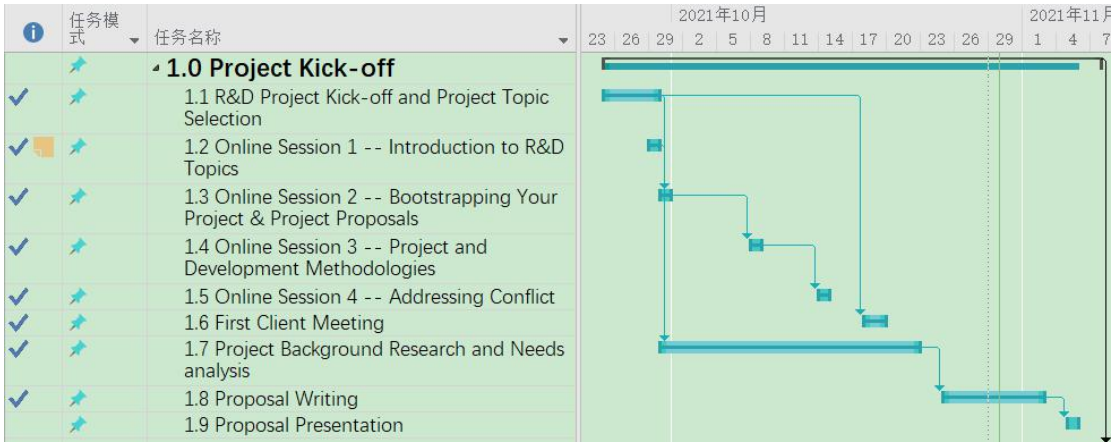
depend on different machine learning technologies and try to design and test different chatbot prototypes according to different frameworks and combined with the conference data of the Jaktent website. Finally we need to choose the best technology to build the chatbot of Jaktent website. Therefore, this project is more like a research experimental project. We need to conduct in-depth research on the application branch of chatbot in the field of artificial intelligence, and finally use the best chatbot technology to develop products and report on the project. At the same time, in the process of project development, client may put forward new ideas according to the progress and have more new requirements to be completed by us.

Therefore, we think the agile development method is more suitable for our chatbot project. It is in line with the gradual research and experimental development mode of the whole project. At the same time, it can adapt to the changing needs of client and it can quickly find out the project loopholes and deviate from the project objectives.

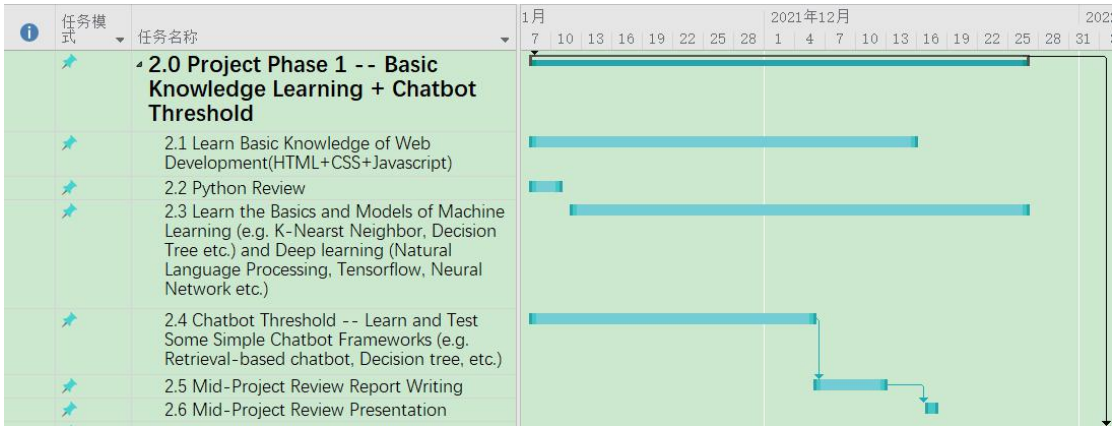
According to the mode of agile development method and our own actual situation, we plan to divide the project into different aspects like requirement analysis, learning of relevant technical knowledge, learning and testing of different chatbot frameworks, comparison and selection of the best technology to deploy and develop Jaktent chatbot, final testing and project release, etc. We need to have group discussions about our project every week and record the learning contents of the week in our work logbook, and summarize the stage and accumulate lessons. At the same time, we need to take time to communicate with our client and mentor, which is necessary for agile development. Considering that there are time conflicts between client and us in daily life, we think that if there is no very serious situation in project development, we only need to report stage work and communicate with client or mentor through email every one or two weeks. If there are major problems or some key milestones, we need to have a client meeting with our client or mentor to discuss our current situation and solve some problems.

5. Project Plan

任务模式	任务名称	工期	开始时间	完成时间	前置任务	基线完成时间
	1.0 Project Kick-off	**32 个工作日**	**2021年9月25日**	**2021年11月7日**		**2021年11月7日**
✓	1.1 R&D Project Kick-off and Project Topic Selection	4 个工作日	2021年9月25日	2021年9月29日		2021年9月29日
✓	1.2 Online Session 1 -- Introduction to R&D Topics	1 个工作日	2021年9月29日	2021年9月29日		2021年9月29日
✓	1.3 Online Session 2 -- Bootstrapping Your Project & Project Proposals	1 个工作日	2021年9月30日	2021年9月30日	3	2021年9月29日
✓	1.4 Online Session 3 -- Project and Development Methodologies	1 个工作日	2021年10月8日	2021年10月8日	4	2021年10月8日
✓	1.5 Online Session 4 -- Addressing Conflict	1 个工作日	2021年10月14日	2021年10月14日	5	2021年10月14日
✓	1.6 First Client Meeting	2 个工作日	2021年10月18日	2021年10月19日	2	2021年10月19日
✓	1.7 Project Background Research and Needs analysis	17 个工作日	2021年9月30日	2021年10月22日	2	2021年10月22日
✓	1.8 Proposal Writing	7 个工作日	2021年10月25日	2021年11月2日	8	2021年11月2日
	1.9 Proposal Presentation	1 个工作日	2021年11月5日	2021年11月5日	9	2021年11月5日



任务模式	任务名称	工期	开始时间	完成时间	前置任务	基线完成时间
	2.0 Project Phase 1 -- Basic Knowledge Learning + Chatbot Threshold	**36 个工作日**	**2021年11月8日**	**2021年12月26日**	**1**	**2021年12月26日**
	2.1 Learn Basic Knowledge of Web Development(HTML+CSS+Javascript)	28 个工作日	2021年11月8日	2021年12月15日		2021年12月15日
	2.2 Python Review	3 个工作日	2021年11月8日	2021年11月10日		2021年11月10日
	2.3 Learn the Basics and Models of Machine Learning (e.g. K-Nearst Neighbor, Decision Tree etc.) and Deep learning (Natural Language Processing, Tensorflow, Neural Network etc.)	32 个工作日	2021年11月12日	2021年12月26日		2021年12月26日
	2.4 Chatbot Threshold -- Learn and Test Some Simple Chatbot Frameworks (e.g. Retrieval-based chatbot, Decision tree, etc.)	21 个工作日	2021年11月8日	2021年12月5日		2021年12月5日
	2.5 Mid-Project Review Report Writing	6 个工作日	2021年12月6日	2021年12月12日	15	2021年12月12日
	2.6 Mid-Project Review Presentation	1 个工作日	2021年12月17日	2021年12月17日	16	2021年12月17日



任务模式	任务名称	工期	开始时间	完成时间	前置任务	基线完成时间
	3.0 Project Phase 2 -- Different Chatbot Framework Testing and Experimental Prototype Development	**35 个工作日**	**2022年1月4日**	**2022年2月20日**	**11**	**2022年2月20日**
	3.1 In-depth Research on Chatbot -- Learn Some Complex and Advanced Chatbot Frameworks (e.g. Natural language process, Generative-based chatbot, etc.)	25 个工作日	2022年1月4日	2022年2月6日		2022年2月6日
	3.2 Framework Testing and Prototype Development	31 个工作日	2022年1月10日	2022年2月20日		2022年2月20日
	4.0 Project Phase 3 -- Jaktent Conference Website Chatbot Design and Development	**32 个工作日**	**2022年2月21日**	**2022年4月5日**	**18**	**2022年4月5日**
	5.0 Project Phase 4 -- Project Test and Final Presentation	**40 个工作日**	**2022年4月6日**	**2022年5月31日**	**21**	**2022年5月31日**
	5.1 Program Testing and Improvement	22 个工作日	2022年4月5日	2022年5月4日		2022年5月4日
	5.2 Final Poster and Portfolio Preparation	13 个工作日	2022年5月5日	2022年5月22日	23	2022年5月22日
	5.3 Final Presentation	1 个工作日	2022年5月25日	2022年5月25日	24	2022年5月25日
	5.4 Individual Reflective Report Writing	4 个工作日	2022年5月26日	2022年5月31日	25	2022年5月31日

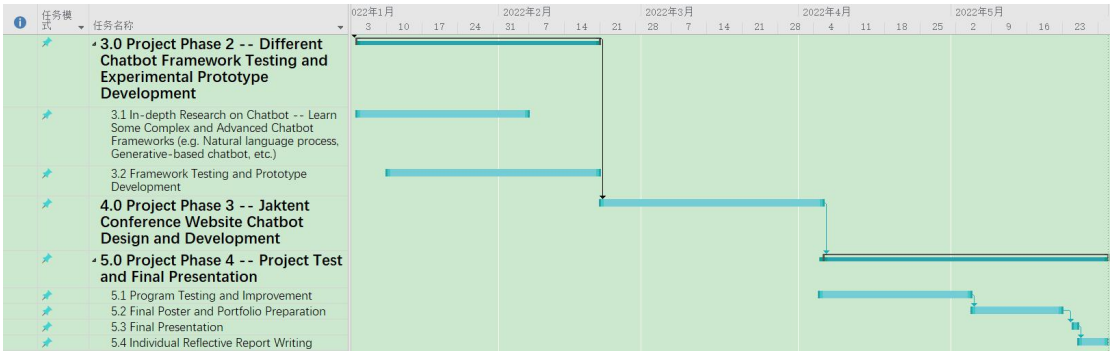


Figure 2: Ghatt Chart for the Plan of Chatbot Project

Figure 2 shows our preliminary plan for the whole chatbot project from the end of September this year to the end of May next year. According to the background research and requirement analysis of the whole project and the project development methodology we selected, we divided the whole project into five phases (1 phase of project kick-off + 4 phases of the project development):

①Project Kick-off (2021.9.29 -- 2021.11.7)

At this stage, we mainly do some preliminary work about our project. After selecting the project topic, we first study the project background, roughly understand the research direction, concept and computer technical skills of chatbot project by reading some literature related to chatbot. Besides, we need to understand the project requirements through meetings with our client. After all these done, we will write the project proposal. The milestone of this stage is to complete the project proposal and give a project proposal presentation in early November.

②Project Phase 1: Basic Knowledge Learning + Chatbot Threshold (2021.11.8 -- 2021.12.26)

After the project proposal presentation, we will start our long project development stage. The first stage of our project is from the end of the project proposal presentation to around Christmas (the end of December). One of the reasons for our division is that two members of our group have Chinese postgraduate entrance examination at the end of December. Therefore, during this period of time, they have to spend a lot of time preparing for the postgraduate entrance examination. At the same time, considering that we still have many technical deficiencies, for example, we need to enhance our web programming ability and better understand some knowledge of machine learning and deep learning, so we need to spend more than a month to improve our abilities in these two aspects. In addition, we will have a mid-project review report around mid December.

To sum up, at this stage, our main task is to improve the basic knowledge and skills related to the project, mainly including: (1) learning some web programming skills (HTML + CSS + JavaScript). (2) Consolidate Python programming. (3)in-depth learning of machine learning and deep learning, especially focusing on learning Tensorflow 2.0, which is a very key technology in our later development. Considering that in the second stage of the project, we need to spend much more time developing some chatbot prototypes and select the best framework and technology to develop chatbot for Jaktent website, so at this stage, we need to start learning some existing chatbot frameworks. However, we still have many deficiencies in some technical skills. Therefore, at this stage, we mainly learn some simple chatbot frameworks (such as retrieval-based chatbot, decision tree, etc) and do some simple tests.

The milestone of this stage is to basically master the relevant computer technology related to the development of chatbot, and show our learning results through some case study. We know that learning computer technology is a long-term process, which requires us to continue in-depth learning throughout the whole project development cycle. So at the end of this phase, we can master and test some simple chatbot frameworks. More complex chatbot frameworks, such as chatbots based on natural language processing and generative-mode, need to be further studied in the next stage. In our mid project review presentation, we mainly need to show our basic

knowledge learning results. We can show some case study and design results, for example, solving relatively simple problems related to the technology we have learned, which can prove that we have basically mastered a certain computer technology. At the same time, we can summarize the chatbot frameworks we have learned at this stage and show some simple relevant testing results, which is a very key step before entering the next stage.

③Project Phase 2 -- Different Chatbot Framework Testing and Experimental Prototype Development (2022.1.4 -- 2022.2.20)

At this stage, we have basically mastered the technologies needed for the development of chatbot project and we have preliminarily mastered and been able to test some simple chatbot frameworks. At the same time, this stage includes our winter vacation. Each member has a lot of time to spend on project research. Therefore, we think this stage is a very core stage in the whole project process. On the basis of the previous stage, we need to further study some more complex and advanced chatbot frameworks. At the same time, we can obtain some relevant datasets related to Jaktent conference website from our client, and our main task is to learn and test different chatbot frameworks with the datasets of the Jaktent conference website. We can also try to integrate the new technologies we have learned into the existing chatbot framework. We need to develop several chatbot prototypes at this stage and test their performance. The key milestone of this stage is to select the best chatbot model after we design several chatbot prototypes before the next stage and in the next stage, we need to use it in the development of Jaktent conference website.

④Project Phase 3 -- Jaktent Conference Website Chatbot Design and Development (2022.2.21 -- 2021.4.5)

At this stage, our main task is to use the selected chatbot model to develop a chatbot for Jaktent conference website, including some certain front-end development. In the actual development of the website, considering some possible issues, we also need to update the model according to the actual situation of the website. Therefore, we plan to give a total of one and a half months to develop the chatbot for Jaktent conference website. The key milestone is to complete the development of chatbot on

Jaktent conference website at the end of this stage.

⑤Project Phase 4 -- Project Test and Final Presentation (2022.4.6 -- 2022.5.31)

This is the last stage of the whole project. We plan to test our chatbot for Jaktent conference website at this stage, fix the bugs and further improve its performance. We should also prepare our final poster, portfolio, individual reflective report and final project presentation. At the end of this stage, we should completely show the finished chatbot to our client, and finally hand in all the required assessment documents.

Finally

The whole project development includes five stages in total. We think this division is in line with the project development method of agile development. We can constantly communicate with our client and mentor during the development process and update our plan regularly. At the same time, there are corresponding milestones at the end of each phase, which can make the phases closely linked. When the project proposal is completed, the first phase of the whole project has been basically completed. In the existing project plan, we focus on the activity division of the second phase before Christmas. During the work process, we will also modify it according to the actual situation, and formulate the specific activities before the beginning of each phase.

6. Skills Analysis

Through the background analysis of the chatbot project, we think that to complete the whole project, we need to master Java, JavaScript, Python and some basic knowledge and framework of machine learning and deep learning (most importantly, Tensorflow 2.0). At the same time, we also need to understand the concept and principle of chatbot.

Team Member	Master Skills
Tianyang Li (Major: Computer Science and Technology)	C, Java, Python, Basic data structure, Artificial intelligence, especially in the field of natural language processing (e.g.

	Recommendation system), use Tensorflow to deal with simple deep learning problems
Shijie Ma(Major: Computer Science and Technology)	C, Java, Python, Basic Data Structure, Deep Learning
Hanpeng Jiang(Major: Computer Science and Technology)	C, Java, Python, Basic Data Structure, Machine Learning (Tried to use machine learning to deal with some financial problems before)
Jiacheng Lv(Major: Computer Science and Technology)	C, Java, Python

Table 1: Members mastered technical skills

Table 1 lists the computer knowledge and technology mastered by our team members. Compared with the skills required by the project, we find that our team members generally lack web programming skills, which is a very important skill to be improved in the next stage. At the same time, our team members have a certain learning of artificial intelligence, machine learning and deep learning. However, to successfully develop the project, we need to further understand the knowledge of machine learning and deep learning, especially natural language processing and Tensorflow. Our skill improvement is mainly arranged in the second stage of the project. We will spend some time to improve our abilities in these aspects before the formal project development.

7. Cost Estimate

According to our analysis, we don't need to spend too much money on hardware and software to complete this chatbot project. The main expenditure is on the working hours and salaries of developers, client and mentor. Suppose that each team member needs to spend 300 hours on project development, so four team members spend 1200 hours in total, with ¥ 100 per hour, and mentor and client spend 50 hours on project

guidance, with ¥ 300 per hour. The test requires 10% of the sum of hardware and software, and the budget is estimated as shown in Table 2 below:

	Hours	Cost/Hours	Subtotals	WBS Level Totals
WBS Items				
1. Project Management				**￥150,000**
1.1 Project Client	50	￥300	￥15,000	
1.2 Project Team Members	1200	￥100	￥120,000	
1.3 Project Mentor	50	￥300	￥15,000	
2. Hardware			￥10,000	**￥10,000**
3. Software (Purchase software license)			￥10,000	**￥10,000**
4. Testing (10% of total hardware and software costs)			￥2,000	**￥2,000**
Total project cost estimate				**￥172,000**

Table 2: Cost Estimate for Chatbot Project

Appendix

Auckland University of Technology

Bachelor of Computer & Information Sciences

Research & Development Project

Disclaimer:

client should note the general basis upon which the Auckland University of Technology undertakes its student projects on behalf of external sponsors:

While all due care and diligence will be expected to be taken by the students, (acting in software development, research or other IT professional capacities), and the Auckland University of Technology, and student efforts will be supervised by experienced AUT lecturers, it must be recognised that these projects are undertaken in the course of student instruction. There is therefore no guarantee that students will succeed in their efforts.

This inherently means that the client assumes a degree of risk. This is part of an arrangement, which is intended to be of mutual benefit. On completion of the project it is hoped that the client will receive a professionally documented and soundly constructed working software application, some part thereof, or other appropriate set of IT artefacts, while the students are exposed to live external environments and problems, in a realistic project and customer context.

In consequence of the above, the students, acting in their assigned professional capacities and the Auckland University of Technology, disclaim responsibility and offer no warranty in respect of the "technology solution" or services delivered, (e.g. a "software application" and its associated documentation),both in relation to their use and results from their use.

Reference

[1] Wang, Y., Li, B. (2018). Research progress of chat robot system. *Computer applications and software, 35*(12), 7-12+95

[2] Wang, Y., Guan, J. & Zhang, T. (2021). Review on classification and evaluation criteria of chatbot. *Software engineering, 24*(02), 2-8

[3] DesignRush. (2020, August 26). *7 Leading Software Development Methodologies And How To Choose The One That's Right For You*. https://www.designrush.com/trends/software-development-methodologies

[4] Botonic simple example: https://botonic.io/docs/getting-started/

[5] DeepPavlov example: https://demo.deeppavlov.ai/#/en/odqa

[6] Botender example: https://bottender.js.org/