SMART PRICING APP (A-S-A-P) "As Soon As Pay" : REDIFINING BUYING AND SELLING WITH AI-DRIVEN MARKET INSIGHTS AT TRADITIONAL MARKETS

Cherylene Callista Reksohartono[1], Crysantha Monica Lim[2], Jovian Yanto[3], Sharon Selina Yoe[4]
Bina Nusantara University, Kemanggisan, School of Computer Science, 11530, Indonesia
Email: [1]cherylene.reksohartono@binus.ac.id, [2] crysantha.lim@binus.ac ,

[3] jovian.yanto@binus.ac.id ,[4] sharon.yoe@binus.ac.id

Abstract

The surge in the number of online applications has resulted in unintended consequences for traditional merchants who often experience a decline in foot traffic amid intensifying competition. This research addresses the challenges by proposing a solution wherein the presence and allure of our application can aid in the pricing process for sellers, thereby rekindling buyer interest in on-site purchases. The study explores the impact of numerous online applications on dwindling visitor numbers in traditional trading platforms. Investigated factors include platform friction, fierce competition, and market diversification. Through interviews and surveys, the research gathers data on online merchant experiences and user preferences.

The proposed solution involves a strategy incorporating artificial intelligence technology to enhance visibility and user appeal through the development of the A-S-A-P application. This application's key feature is to assist sellers in determining prices during the negotiation process, enabling them to secure fair prices and boost sales percentages. The research will delve into the detailed design plan for the application.The anticipated outcomes of this research are expected to provide valuable insights for application developers in understanding the issues and finding solutions to enhance the appeal of traditional businesses amid the increasingly complex landscape, particularly with the rampant growth of online sales. Focusing on innovative strategies and the implementation of cutting-edge technology, this research aims to support and foster sustainable growth for traditional merchants in the digital era.

Keywords: traditional commerce, online competition, smart application, artificial intelligence, pricing strategy, user appeal, negotiation process, digital era, sustainable growth.

1. INTRODUCTION

In recent years, Indonesia's commercial landscape has undergone a notable transformation, marked by the increasing prominence of online commerce or e-commerce platforms. These platforms have introduced unprecedentedly low pricing strategies, significantly altering the traditional dynamics of offline trade. As a consequence, local merchants have encountered substantial challenges in sustaining their businesses, grappling with the pressure to match the competitive pricing offered online while navigating customer demands for reduced prices.

With the help of Artificial Intelligence (AI), our primary goal is to develop an innovative application. This application will empower merchants by enabling them to accurately determine optimal pricing strategies for their products. Furthermore, it will serve as an invaluable assistant, streamlining negotiation processes and potentially enhancing the profitability of these merchants.

By harnessing AI technology, our initiative aims to create a solution that assists merchants in making informed pricing decisions while optimizing their bargaining power. The proposed application will not only strive to level the playing field for local traders but also contribute to sustaining their businesses in an increasingly competitive market.

2. LITERATURE REVIEW

This research focuses on developing an AI-assisted application incorporating features such as voice recognition and chatbot with text and voice based. In Naman Pundir's 2019 research report, Hidden Markov Model (HMM) technique was employed for speech/voice recognition. This method constructs its model using words and generates outputs that aren't easily specified but possess flexibility, making them challenging to derive directly from available data. Nevertheless, it stands as the most convincing model for speech recognition. HMM aids in voice recognition by understanding and identifying speech patterns through its probabilistic nature based on a pre-trained model. During training, Pundir adjusted parameters in the HMM model with speech patterns. Additionally, Pundir utilized Raspberry Pi to further the development of the assistant robot.

In another study by the USENIX Association in 2018, it was noted that speech recognition systems often utilize end-to-end deep learning. In speech recognition, multiple stages are crucial, such as amplifying, filtering, and extracting acoustic features from audio signals. Mel-Frequency Cepstral Coefficients (MFCC) are commonly used as acoustic features. Extracting these features simplifies the audio signal for further processing. Gaussian Mixture Model (GMM) is employed for detailed analysis of these features, recognizing patterns in audio signals, and performing classification, prediction, or variable estimation. However, GMM has limitations in recognizing patterns within complex or nonlinear data structures. Hence, the recommendation is to use Deep Neural Network-Hidden Markov Model (DNN-HMM), a fusion of two techniques: Deep Neural Network (DNN) and Hidden Markov Model (HMM). DNN operates similarly to MFCC, while HMM models hidden state sequences

based on features generated by DNN. These hidden state sequences represent the patterns to be identified from the audio signal inputted into the model.

Interestingly, in another study by Anusha Bodepudi and others in 2019, it is mentioned that artificial intelligence and machine learning can improve the accuracy and scope of voice recognition, especially in natural language processing (NLP), that can enable voice recognition to handle complex and arbitrary data, such as different accents, dialects, situations, and emotions. A voice recognition system can be made based on cloud computing, which consists of a cloud computing terminal, a decision maker, a communication network, a local speech recognizer, and a voice recognition terminal. This method can overcome the limitations of traditional speech recognition software like the need of powerful hardware and large vocabulary.

Regarding chatbots, our research investigates a study by Yansyah Saputra Wijaya and others focusing on chatbot development based on AIML and Machine Learning. They describe the different AI techniques that can be used to create chatbots, such as rules-based, AIML, chatfuel, chatscript, UIMA, LUIS, and google dialogflow. Therefore, they focus on AIML as the most popular technique. However, there are limitations, such as the lack of reasoning and human-like responses. As a solution, they use selective neural conversational model (or deep semantic similarity model, DSSM), developed by Microsoft. DSSM is a supervised learning method that studies the similarity function between the context of the question and the answer, and selects the most appropriate answer from a predefined set of candidates. Furthermore, the authors use a waterfall model as their research methodology, which consists of five stages: requirement analysis, design, implementation, testing, and operation and maintenance. Based on what they created, they conclude that the chatbot system is able to answer questions posed by prospective students properly and correctly, while the question is available in the chatbot knowledge base, as well as the amount of knowledge base the chatbot has. They suggest that the chatbot system can be improved by adding more features, such as the ability to provide input, voice-based interaction, and self-learning without human assistance. They also recommend that the chatbot system can be applied to other domains and purposes, one of them is e-commerce and marketing.

3. METHODOLOGY

3.1. Related Works

This research is focused on designing an application that facilitates the bargaining process, allowing sellers to find the most optimal price. The application is equipped with three main artificial intelligence features : a chatbot in text and voice formats, as well as voice recognition. Therefore, the objective of this research is to design the basic framework of the application. Subsequently, a survey will be conducted to assess the opinions of the surrounding community, especially potential users, regarding the application.

The research method to be applied is qualitative, where data will be obtained from the results of a survey of general public, especially potential users of this application. The survey will consist of questions related to respondents views on the development of the artificial intelligence application.

Some example survey questions may include :
- How interested are you in the concept of a bargaining application that uses artificial intelligence?
- What are your expectations regarding the use of the chatbot in the application to help bargaining situations?
- What is your opinion of the voice recognition capability in the application to facilitate the interaction process?
- Do you see the benefits of this application in helping find the optimal price in the bargaining process?
- What feature do you find most interesting in our artificial intelligence (AI) application?
- Is there any feature that you personally want or exect in this application?

3.2. Chatbot

Chatbot is a program that is created to do interactions with human, either by text or by voice. The chatbot engages in conversation after receiving messages and requests from users via API. Upon receiving a message, the chatbot processes it and subsequently sends a reply back to the user through the same API. In this application, the chatbot is used to provide accurate information about product prices. It also assists in determining the correct price resulting from negotiations between users and their customers. Through this, the chatbot acts as a knowledgeable intermediary, facilitating a smoother and more informed pricing decision-making process.

3.3. Web API

API or Application Programming Interface is a software intermediary that allows applications to communicate with servers and access the necessary resources. It serves as a communication bridge between two different software, enabling them to exchange data and functionality. In the case of the A-S-A-P application, API can be used to access data from sellers and integrate it with artificial intelligence technology to help determine fair prices. Additionally, API can be used to gather data from user experiences and preferences through surveys and interviews. The A-S-A-P application can use Web API to access seller data and integrate it with artificial intelligence technology to assist in determining fair prices. API can help increase the attractiveness and presence of traditional sellers amidst the growing competition from online sales.

Web API has various uses in the A-S-A-P application, including:

1. **Expanding Application Functionality**: Web API allows A-S-A-P to access external resources, such as seller data and price information, which can expand the application's functionality.
2. **Integrating Applications**: By using Web API, A-S-A-P can connect to external services, such as e-commerce platforms, to integrate functionality and data, such as determining prices during the negotiation process.
3. **Providing Flexibility**: Web API provides flexibility in accessing and using data from various sources, allowing A-S-A-P to optimize the pricing process and enhance the appeal of traditional sellers.

By leveraging Web API, A-S-A-P can become stronger and more comprehensive in supporting traditional sellers in the face of increasing competition from online sales.

https://www.hostinger.co.id/tutorial/api-adalah#1_Mempermudah_Pembuatan_Aplikasi_Fungsional

3.4. Application
3.4.1. Front-end
The user interface in front-end development is managed through three primary components: HTML, CSS, and Javascript. These components are closely intertwined and each serves a distinct purpose. HTML provides the fundamental structure and layout for the front-end. CSS is responsible for styling the visual aspects of the web interface. Meanwhile, Javascript enhances the interface's dynamism and optimizes its functionality, contributing to more dynamic and efficient effects.

3.4.2. Back-end
In the system of A-S-A-P, PHP (PHP: Hypertext Processor), a scripting language integrated into HTML, is utilized to handle the back-end. PHP is widely employed in dynamic websites, therefore it is decided to use this program.

3.5. Feature Requirement
This chatbot management system in this research has several features that are planned :

1. **Dialog Complexity**: The application must be able to manage complex dialogs and have Natural Language Processing (NLP) functionality to analyze the intent of questions, provide accurate answers, and suggest other options.

2. **Flexible Data Connection**: The application should be able to connect to external resources flexibly, such as seller data and price information, to expand the application's functionality.
3. **Button Set**: Used to create and edit button arrays that can be used in Action Sets. This feature can create a button layout, give a caption and its value to the button.
4. **Action Set**: Used to create and edit Action Sets which can later be called by Command in reply to chatbot users. Actions supported here are photos, videos, audio, documents, locations, contacts, buttons, and messages. These buttons are called from the button set that was created before.
5. **Command**: Used to set the reply that will be given to users based on keywords that have been determined. The replies given are from action sets that were created before.
6. **Direct Message**: Provides the administrator for answers directly to users whose messages do not contain predetermined keywords.
7. **Broadcast**: Used to create broadcast messages to all chatbot users who have used this chatbot.
8. **Settings**: Used to change settings on the chatbot.
9. **Analytics**: This feature is used to display chatbot usage statistics.

By fulfilling the above feature requirements, the A-S-A-P application will be able to provide comprehensive support for traditional sellers in the face of increasing competition from online sales.

2.6. Use Case Diagram

The Chatbot planned in this research has two types of users. The Chatbot Administrator can manage the chatbot by creating and editing button sets, action sets, and commands. They can also provide direct messages to users and create broadcast messages. The administrator can change the chatbot's settings and view analytics. The Chatbot Users can make conversations with the chatbot and get replies from it. The chatbot can access external resources, such as seller data and price information, to expand its functionality. It can also provide complex dialogues and use Natural Language Processing (NLP) to analyze the intent of questions and provide accurate answers. The chatbot can also suggest other options to the users.
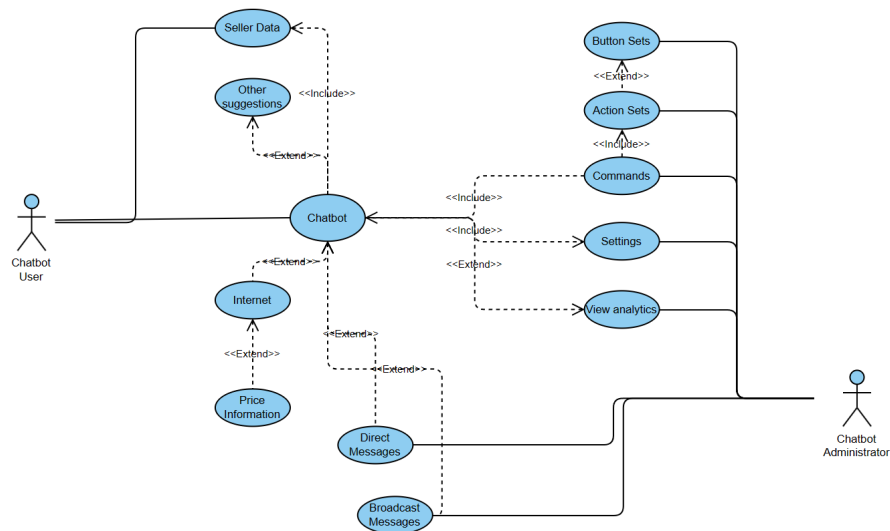
After we make the usecase from the Chatbot administration and user, this one is the system architecture that are planned for the chatbot that based with voice and text. The A-S-A-P application operates through a dual-mode system, accommodating both text and voice inputs. In the text mode, user input is transmitted to the middleware API for processing, while in the voice mode, the input is first converted into text before being sent to the middleware API.

The middleware serves as the crucial link between AIML scripts and the Android app. Upon receiving user input, the middleware engages a pattern matching algorithm that scans AIML scripts. The process involves two primary phases: normalization of the input and the creation of an input path for each sentence.

In the normalization process, the input undergoes standardization for uniformity. Following this, input paths are generated for individual sentences. The pattern matching behavior involves a comprehensive analysis to identify the most extensive matching pattern by comparing words in a step-by-step manner. This is facilitated through a Graph master set comprising files and directories, with nodes representing sets of patterns and branches representing the initial words of these patterns.

Once a matching pattern is identified, the middleware encodes the corresponding template into JSON format and transmits the response to the

Android app. Upon receipt, the app decodes the JSON and delivers the response to the user.
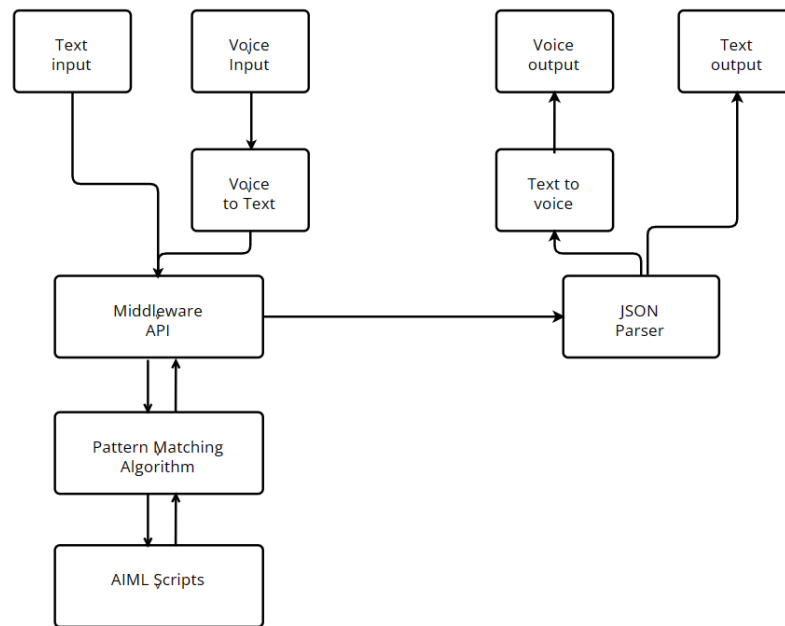
2.7.. Implementation Chatbox
2.7.1. Textbased Chatbox

In the A-S-A-P approach, the initial step involves capturing text input from the user within the Android application. Users are encouraged to input questions to the chatbot, and the entered value is read from the text edit element. Subsequently, this value is sent to the hosted webAPI interface. The server's response is received in JSON format and needs to be parsed to extract the bot's response.

If the bot's response is empty, the response is considered as an error string and displayed to the user. This process is repeated for the ongoing conversation with the chatbot. The details can be outlined as follows:

1. Read user input when the send button is clicked.
2. Send user input to the hosted webAPI server using HttpUrlConnection. Since it involves an internet connection, this method is called in the AsyncTask of the Android system to run in the background of the application.
3. Wait until receiving the reply from the server. The onPostExecute method of AsyncTask will receive the response

formatted in JSON. Then, send it to the JSON parser to extract the bot's response.

4. After extracting the bot's response, display it to the user by appending it to the text view.
5. Repeat the process for the next user input.

This way, the A-S-A-P application enables efficient interaction with users, sending their questions to the server, and accurately displaying the chatbot's response on the user interface.
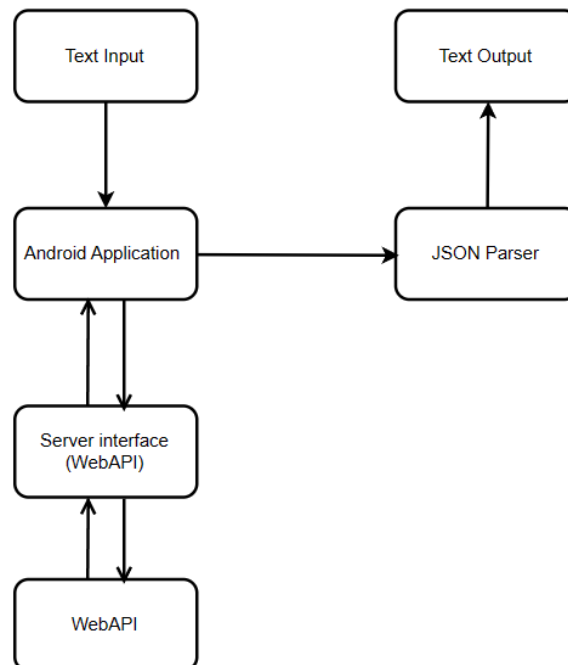

2.7.2. Voicebased Chatbox

This approach begins by capturing voice input from the user when the application starts. Users will be prompted to provide voice input upon the application's launch. Subsequently, the voice input needs to be converted into text because the selected server with webAPI only understands text values. After the conversion from voice to text is complete, the value is sent to the server to obtain a response. As previously discussed, the server provides responses in JSON

format, requiring parsing to extract the bot's response. Given that the input taken is in the form of voice, the application delivers voice output as a response. The bot's reply is converted into voice and played through the phone's speakers. This process is repeated for the ongoing conversation with the chatbot.

The detailed steps explain the implementation of the aforementioned tasks:
1. Encourage the user to provide voice input during the onCreate method and record the user's voice until the end speech event.
2. Convert the voice into text using the Android Google Speech Recognizer API. After obtaining the conversion result, send the data to the server.
3. Use HttpUrlConnection in the AsyncTask to request a reply from the server.
4. Receive the reply in JSON format and parse it to extract the bot's response.
5. Since the chatbot's response is voice-based, convert it to voice using the Android Text-to-Speech API.
6. After the voice playback is complete, prompt the user again for new voice input and repeat the steps.

This way, the A-S-A-P application facilitates seamless interaction with users, utilizing voice input and output for effective communication with the chatbot.
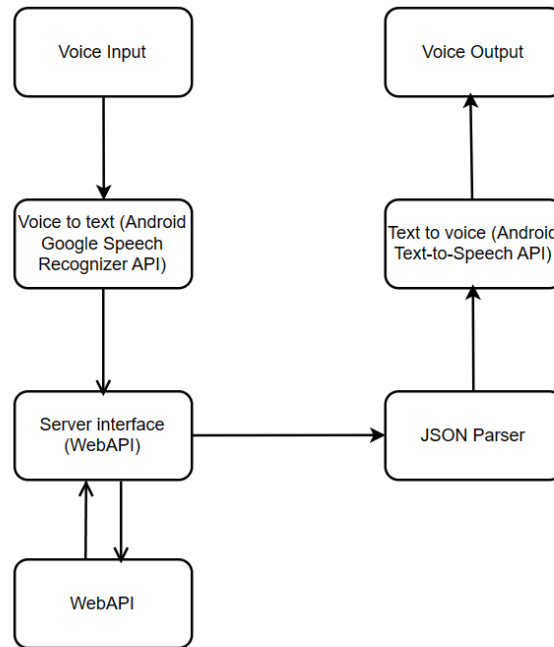
2.8. Voice Recognition
2.8.1. Design
During the design stage, the optimal preparation of processes, data, process flow, and data relationships is undertaken to meet the needs in accordance with the results of the needs analysis. The interface design is crafted to be as attractive as possible to pique users' interest. The chosen design is environmentally friendly, ensuring it is easily accessible and understandable by users.

The aforementioned steps are incorporated into the voice recognition process of A-S-A-P, outlined in the flowchart as follows:
1. **Start**: The process begins, indicating the initiation of the A-S-A-P application flow.
2. **Command to Activate A-S-A-P**: A specific command is given to activate the A-S-A-P application.
3. **Command Validation**: If the command is valid, the process proceeds to execute the A-S-A-P application initialization.

4. **Voice/conversation Validation**: If a sound or a conversation is heard, then application will continue to listen. If there isn't anything heard, application will closes itself and user has to reactivate the application.
5. **Listening UI Voice to Text and Listening Conversation**: The UI for voice-to-text is launched, and the system listens the user's conversation.
6. **Microcontroller Reads Conversation**: The microcontroller reads the input conversation that was received
7. **Microcontroller Calculates from Bargain Process**: The microcontroller calculates the final price based on the conversation heard.
8. **Price calculation reveal:** Application shows the result of the calculation.
9. **Agreement between seller and customer:** If both sides agree with the calculated price, then finish. If there is a disagreement, then microcontroller will re-calculate a more suitable price.
10. **Finish**: The end of the A-S-A-P application operation.
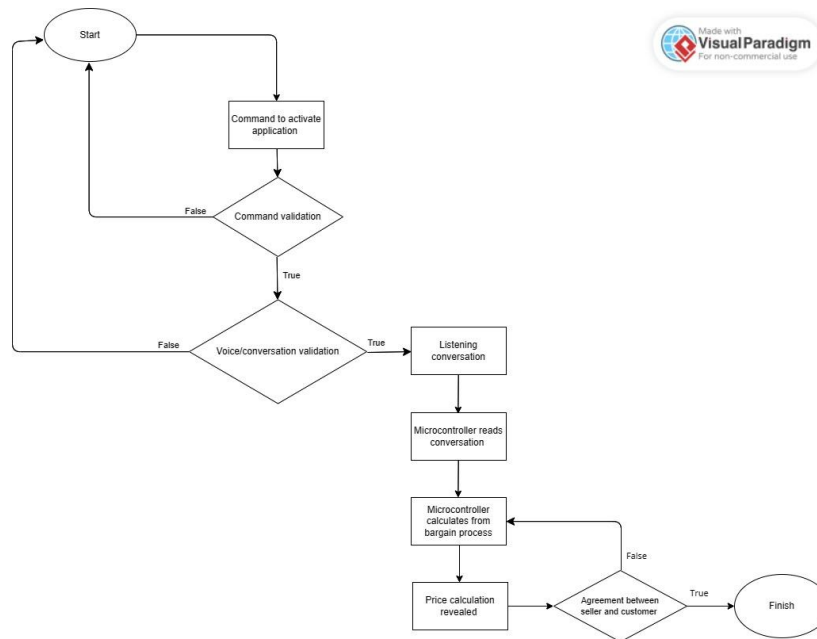
This design approach aims to optimally prepare processes, integrate data effectively, and present an interface that is both attractive and easily accessible to users. The design is specifically tailored to create an environmentally friendly and user-friendly interface, providing an engaging and efficient user experience.

2.8.2. Implementation

In this implementation phase, the development process of the A-S-A-P application proceeds with the actual writing of program code. The designed interface is translated into a computer-readable language to ensure its functionality aligns with the intended design.

After the completion of code writing, the system undergoes testing using the Blackbox Testing Method. This method evaluates the functionality and output of the software based on established standards, ensuring that the application performs well. The testing phase is crucial for identifying system errors that may require correction.

To use the A-S-A-P application, a reliable internet connection on the mobile device is essential for proper functionality. The application operates by listening to instructions that have been implemented within it and executing them. To initiate interaction with the application, follow these steps:

1. Users provide instructions, such as saying "ASAP," to open the application.
2. After detecting the instruction, the application enters a listening mode to receive the next set of words in the form of voice.
3. After listening a word or two, the application will initiate the bargaining process using voice technology and provide responses according to the implemented chatbot logic.
4. In the end of the bargaining process, application will calculate the right price based on the conversation heard and based on the market trend research and so on.

These steps ensure that the A-S-A-P application not only responds to voice commands to open the application but also actively engages in the bargaining process with the user, presenting responses using voice technology.

4. RESULT AND DISCUSSION
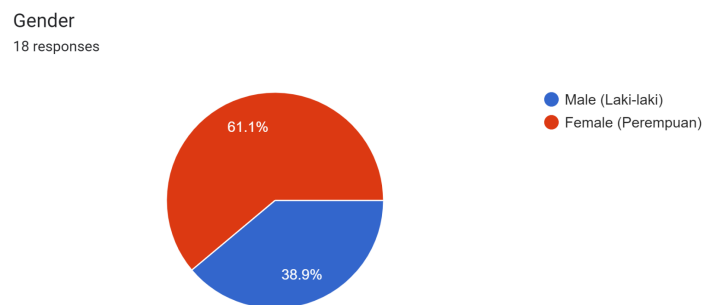
Figure 1 : Gender

Based on the diagram above, it shows that 61.1% are females and 38.9% are males. From the data obtained, we can offer this product to women who might be more interested.

Age
18 responses

- < 19
- 19 - 30
- 30 - 45
- 45 <
- 59 th
- 57
- 51
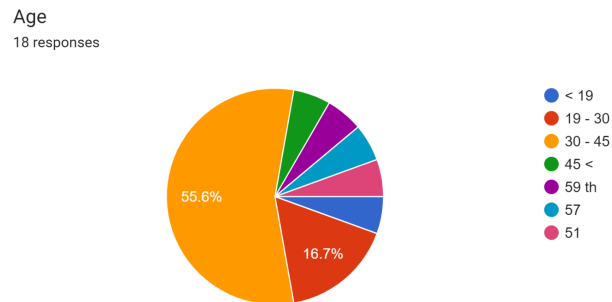
Figure 2 : Age
Based on the above diagram, it shows that 55.6% are individuals aged between 30-45, 16.7% are individuals aged 19-30, and 5.6% fall below 19 and above 45. From the data observed, the target market that can be concluded is individuals aged between 19-45, who may be active individuals seeking effectiveness and efficiency   in   their   lives.

Residence
18 responses
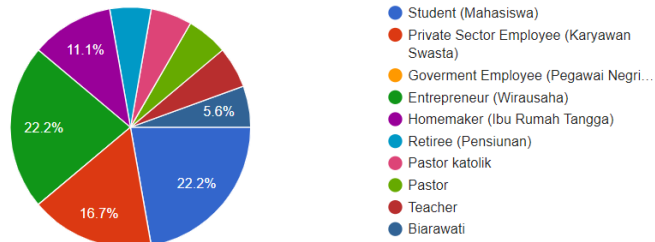

- Jabodetabek
- Outsite Jabodetabek
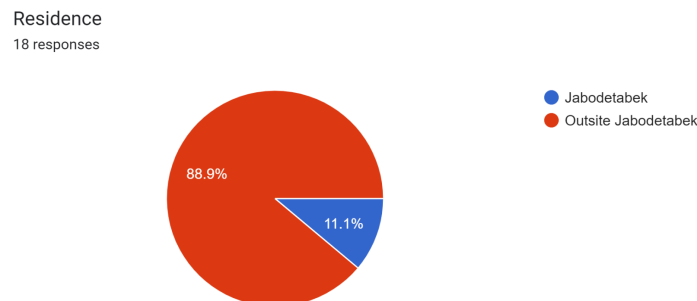
Figure 3 : Gender
Based on the above diagram, it shows that 88.9% are people outside Jabodetabek (Greater Jakarta area), and 11.1% are from Jabodetabek. From this survey, it can be concluded that people interested in this application are predominantly from outside Jabodetabek. Life outside Jabodetabek may have different needs and possibly faces tougher competition due to lower selling prices.

Occupation

18 responses

- Student (Mahasiswa)
- Private Sector Employee (Karyawan Swasta)
- Goverment Employee (Pegawai Negri...
- Entrepreneur (Wirausaha)
- Homemaker (Ibu Rumah Tangga)
- Retiree (Pensiunan)
- Pastor katolik
- Pastor
- Teacher
- Biarawati

Figure 4: Occupation

Based on the occupations of the respondents, 22.2% are students and entrepreneurs, 16.7% are private employees, 11.1% are housewives and pastors, and 5.6% are government employees, retirees, and teachers. From the above diagram results, it can be concluded that our target market could be directed towards students, entrepreneurs, private employees, and housewives who engage in negotiations more frequently compared to other occupations.

How interested are you in the concept of a bargaining application that uses artificial intelligence? Seberapa tertarik Anda dengan ko...ar-menawar yang menggunakan kecerdasan buatan?

18 responses
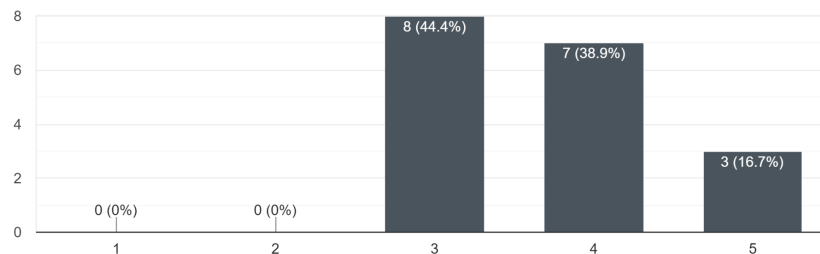
Figure 5: Ketertarikan dalam Aplikasi yang menggunakan AI

Based on the survey, 44.4% chose option 3, indicating that they are neutral or in the middle. Furthermore, 38.9% selected option 4, signifying that they are quite interested in the offered AI application. Finally, 16.7% of respondents chose option 5, indicating that they are very interested. No one selected options 1 and 2, suggesting that there is no lack of interest in the AI application. It cannot be denied that we are in an era where artificial intelligence is needed everywhere. Therefore, the results show that people, at the very least, choose option 3 as their preference because it is improbable that in our lives, we would not use artificial intelligence.

What are your expectations regarding the use of the chatbot in the application to help bargaining situations? Apa harapan Anda terkait penggunaan...sama sekali dalam konteks situasi tawar-menawar.

18 responses
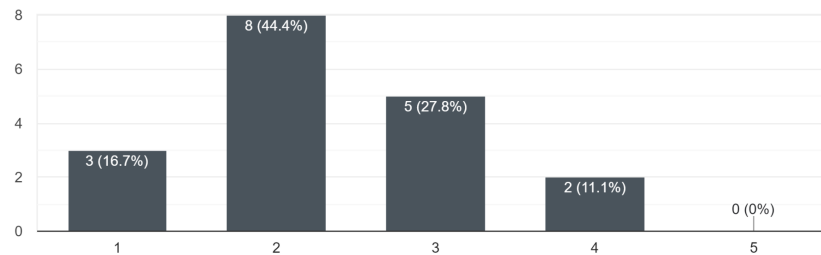
Figure 6: Chatbot
Based on the survey, 44.4% stated that chatbot could play a crucial role in negotiation communication. Additionally, 27.8% believed that chatbot would provide ordinary or nothing special in terms of contribution. Furthermore, 16.7% mentioned that chatbot could deliver significant results in negotiations, while 11.1% expressed doubts about its significant assistance. No one stated that chatbot would not be helpful or deliver insignificant results. From these results, it can be concluded that many people see the value in chatbot and believe it can enhance outcomes, but there are still some who have reservations. With this feedback, we can improve the usability of the chatbot feature to better satisfy users.

What is your opinion of the voice recognition capability in the application to facilitate the interaction process? Apa pendapat Anda tentang kemampuan ...mbah banyak nilai pada pengalaman pengguna.

18 responses
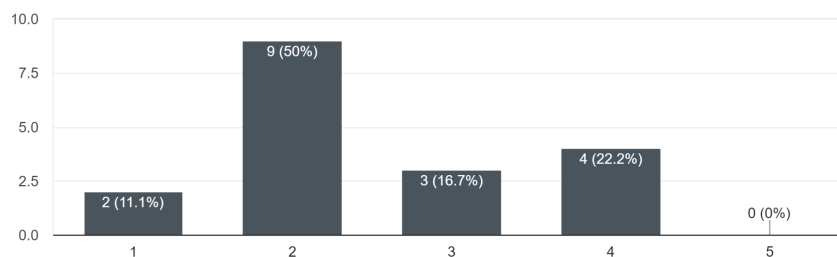

Figure 6: Voice Recognition
Based on the survey, 50% stated that voice recognition could play a crucial role in making negotiations more interactive, friendly, and engaging. Meanwhile, 22.2% believed that voice recognition would contribute less effectively and have limitations. Additionally, 16.7% expressed that voice recognition would provide ordinary or nothing special in terms of contribution, and 11.1% mentioned that

voice recognition would significantly enhance the negotiation process, making it more effective and efficient, resulting in meaningful outcomes.

The results regarding voice recognition are similar to those for chatbot, indicating that these features are perceived as valuable for making processes more efficient and effective. However, there still seems to be some skepticism about whether they can truly assist and deliver significant results. We will pay close attention to these features and consistently update them to ensure they are reliable and maximally beneficial for users.

Do you see the benefits of this application in helping find the optimal price in the bargaining process?   Apakah Anda melihat manfaat dari apli...ungkin tidak memberikan bantuan yang signifikan.
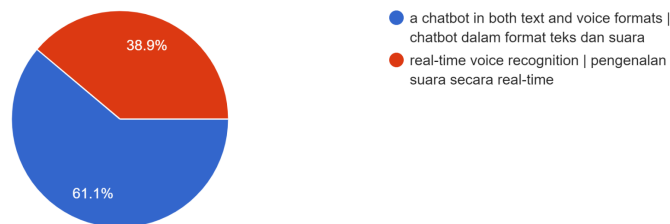18 responses
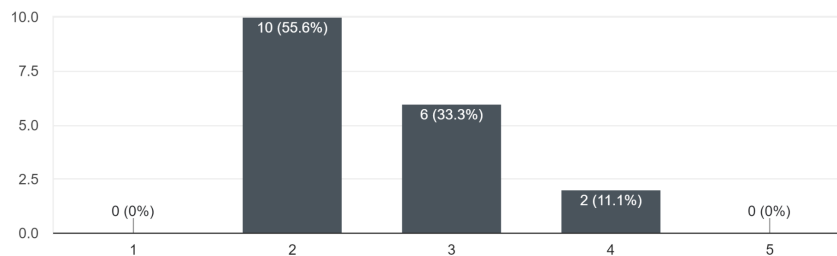
Figure 7: Benefit and Optimalization
Based on the survey, 55.6% stated that the application would be very helpful in finding the right prices. Meanwhile, 33.3% said the application is average, and 11.1% expressed doubts about its effectiveness. No one mentioned that the application would be highly effective or efficient, nor the opposite. From the results above, we can conclude that the application provides substantial benefits and can optimize both buying and selling processes. However, there are still some individuals who have doubts about its effectiveness and optimization. Experiencing the features firsthand with a proper understanding might help alleviate these doubts, and we will continue to offer increasingly appealing benefits.

What feature do you find most interesting in our artificial intelligence (AI) application?   Apa fitur yang menurut Anda paling menarik dari aplikasi kecerdasan buatan (AI) kami?
18 responses

● a chatbot in both text and voice formats | chatbot dalam format teks dan suara
● real-time voice recognition | pengenalan suara secara real-time

Figure 8: Feature
Based on the survey, 61.1% chose the chatbot as the more appealing feature for the application, while 38.9% preferred voice recognition. With the above preferences, we will prioritize accelerating updates for the chatbot feature first, as it is more frequently utilized compared to voice recognition, without neglecting other   features.

Is there any feature that you personally want or expect in this application? (if there isn't any, you can just fill: "its already good enough")   Apakah ada fi... tidak ada, Anda bisa mengisi: "sudah cukup baik")
18 responses
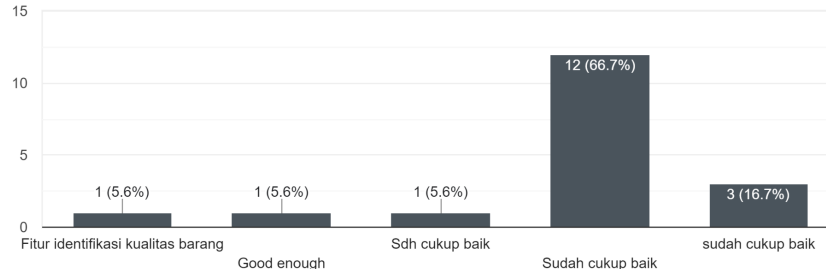
Figure 8: Expectation of the feature
Based on the survey, 94.4% feel that the offered application is already quite good, while 5.6% believe that the identification feature for the quality of goods needs improvement. As mentioned in the survey, we will try to conduct further research on the identification feature for goods to determine whether the quality of the photographed items meets standards and is satisfactory. This will ensure that buyers are not disappointed with the offered or recommended prices.

5. CONCLUSION

A new application like ours, which requires significant capital for development and a considerable amount of time, greatly needs advice and judgment from a

survey of laypeople who may or may not understand our product. Through such a survey, we can identify what makes users hesitant, what appeals to them, and what they expect when using the application we offer, among other insights. After conducting this research, we understand that our application is quite appealing to people, especially those who are students, entrepreneurs, and employees. Additionally, we realize that there are areas that need improvement, and additional features should be added to make the users feel it is more worth it. In conclusion, our application can help users find a middle ground in buying and selling, making their lives more effective and efficient.

REFERENCE
Pundir, N. (2019). Voice Recognition(AI): Voice Assistant Robot. Vol 06.
USENIX Association. (2018). CommanderSong: A Systematic Approach for Practical Adversarial Voice Recognition.
Bodepudi, A et al. (2019). Voice Recognition Systems in the Cloud Networks: Has It Reached Its Full Potential? Link : https://doi.org/10.18034/ajase.v8i1.12
Wijaya, Y. S. (2020). Chatbot Designing Information Service for New Student Registration Based on AIML and Machine Learning.
A., Faradilla. (2023). Apa Itu Api? Pengertian, Cara Kerja, Dan Manfaat API. Hostinger Tutorial. Link: https://www.hostinger.co.id/tutorial/api-adalah#1_Mempermudah_Pembuatan_Aplikasi_Fungsional