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Bershca: bringing chatbot into hotel industry in Indonesia

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ABSTRACT

Adopting technology could give competitive advantage and positively impact the hotel's profitability, thus hotels should keep up with the latest hotel technologies. An important part in the hotel services is the customer service. A problem with the human-to-human customer services today is a long time in answering customers query. On the other hand, nowadays customers need easy and effective services. Thus, a chatbot is required to answer consumers' issues automatically which leads to higher customer satisfaction and a growing profit. Because of the need and there is still an absence of chatbot for hotel industry in Indonesia, this study is conducted. The chatbot for hotel industry in Indonesia, named Bershca, has been successfully developed using artificial intelligence markup language (AIML) to construct the knowledge. Google Flutter is used for the system's front-end, while Python is used for the back-end of the system. As a text-preprocessing method, Nazief-Adriani Algorithm is implemented in the system's back-end. The system is evaluated using technology acceptance model (TAM). As a result, 85.7% of the respondents believe that using chatbot would enhance their job performance and 84.33% of the respondents believe that using the technology would be free of effort.

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1. INTRODUCTION

The change in technology is unpredictable. Hotels should keep pace with the advanced hotel technologies which are continuously being introduced [1]. A judiciously executed technology adoption strategy could positively impact the hotel's profitability [2], foster service innovation, and induce competitive advantage [3]. One important aspect of any business services is customer care. The demand for easy and effective service is one of several factors which determine customer service priorities today [4]. On the other hand, human-to-human support services take time to answer customers query. The waiting time increases as the number of clients increases, which results in poor client satisfaction [5].

Higher customer satisfaction and increasing profit obtained when hotels give excellent online customer services. An automated chatbot is a solution to provide an optimal and efficient online customer support. It used to answer customers' questions without explicitly being programmed [6]. The behavior of humans as a conversational partner using a text-based dialogue system simulated through conversational agents [7-9]. Fast with less confusing web and mobile application, a chatbot is easy to install as there is no need to have installation packages [10].

Several researches, such as Reikobot [11], have been conducted in order to develop chatbots which can prove to be realistic or to mimic human communication skills [12]. Some of those chatbot-related researches used artificial intelligence markup language (AIML) as in chatbot for insurance company [13] and NLAST [14]. AIML-based chatbots are the most popular because they are lightweight and easy to configure [15-17]. Using the standard of XML, AIML becomes a language that defines a service in the field of artificial intelligence [18-20].

Performing services for an individual, chatbot handles customer problem reports and replies the same solutions for the same type of problems [6]. This can be seen in chatbot acting as an interface to a list of frequently asked questions (FAQ). For questions that are frequently asked, queries and terminology are relatively predictable and responses have been written [21]. Users can quickly scan a short FAQ list, but it takes less time for a long FAQ list to explored using verbal queries [21].

As the absence of chatbot for hotel industry in Indonesia, the study of AIML-based chatbot for hotel industry using Nazief-Adriani Algorithm was conducted. Nazief-Adriani Algorithm is a stemming algorithm used to eliminates the affixes to the words so they can represent the same meaning even if they have different morphologies [22-24]. It overcomes overstemming problem by using basic words dictionary and the understemming problem by adding rules. Besides that, it can also stem compound words correctly [25]. Google Flutter was used to develop the mobile application, whereas Python was used for the backend of the system. Furthermore, the testing phase of the chatbot application was carried out using the technology acceptance model (TAM).

2. SYSTEM DESIGN

Developing chatbot application for hotel industry needs some phases which should be performed: designing a user interface for the front-end using Google Flutter, developing the back-end of the system using Python, and constructing AIML structure. Figure 1 shows the design of chatbot system. The string message sent by the user is transmitted to the back-end of the system through the Internet and some text pre-processing steps are performed. Afterwards, the text will only contain root words to be matched with the pattern in AIML structure. AIML results in form of database query will be delivered to the hotel database. Response then will be sent to mobile application in JSON format. The text pre-processing consists of four steps below [24]:

1. Case folding
   This technique is used to convert the string message to lowercase letters.
2. Tokenization
   Tokenization is a process to convert the string into a list of words or tokens.
3. Stopwords Removal
   This process is implemented for eliminating common words which are likely to be meaningless or insignificant for information extraction. The result of this step is unique word set which is expected to improve the accuracy of similarity.
4. Stemming
   Stemming process changes the correspondent words in the same root word. For example, "*menjual*", "*terjual*", and "*dijual*" come from a root word "*jual*". Prefix, infix, sufix, and confix or word repetition often contained in some words in Indonesian.

The knowledge structure, obtained from interviewing some hotel staff from different divisions, is depicted on Figure 2. The topics consists of four main subjects:

1. Sales
   On this subject, user can ask about wedding packages and vendors, meeting room with several types of seats, and a reservation with more than 10 rooms.
2. Front office
   This area comprises hotel facilities, room, and transportation. Swimming pool, parking area, health club, and laundry are some topics which users can ask about facilities, while hotel rooms have several properties: early check-in, late check-out, connecting rooms, smoking rooms, up-selling, and room upgrade. Transportation from and to the airport is a topic which user can also ask.
3. Reservation
   This subject consists of questions about room availability check, payment methods, and room cancellation.
4. Food & Beverages
   Questions about breakfast and restaurant can be asked by the user on this subject.

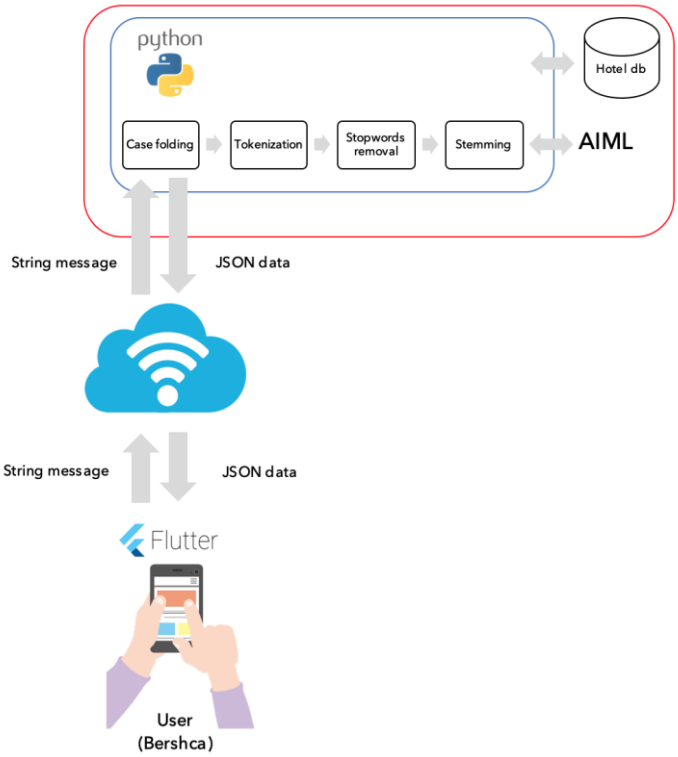

Figure 1. Design of chatbot system

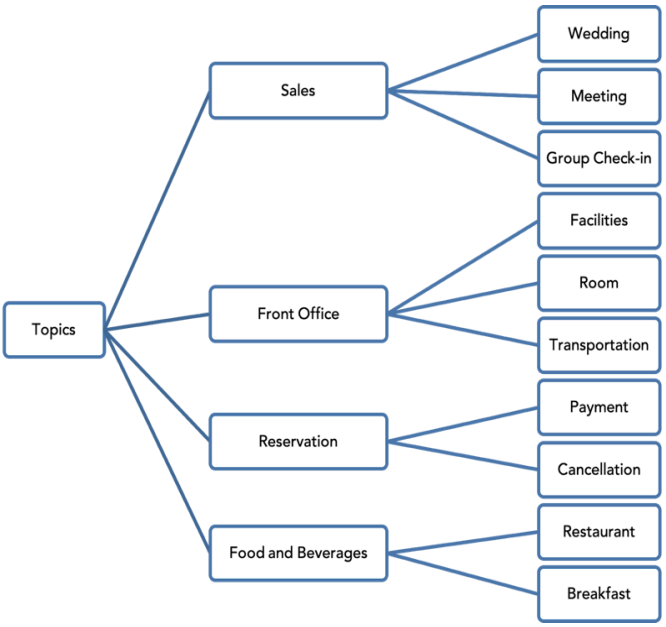

Figure 2. Knowledge structure

3. IMPLEMENTATION

Bershca is developed by using Google Flutter as the front-end application, while the back-end and the knowledge base are created by using Python and the Artificial Intelligence Markup Language (AIML). Shortly after users launch the application, Bershca logo in the splash screen will be displayed as in Figure 3 (a). Later, Berscha will first do the greeting by letting the user ask for the necessary

information as depicted in Figure 3 (c). Suggestions are provided to guide users in asking questions. The description about the development of the chatbot is shown in Figure 3 (b).

As explained in the previous section, users can give some questions related to four main subjects. Some questions which can be asked about hotel shuttles to and from airport are represented in Figure 3 (d). Figure 3 (e) shows the wedding package information answered by the chatbot. There are three packages provided for customer: Classic, Romantic, and Royal, along with a detailed description of each package. Several types of room questioned by the user are shown in Figure 3 (f). The description of each type of room is also given by the chatbot. Users will always be able to change the subject from one to another during a chat.

Figure 3. Bershca interface. (a) Splash screen (b) About page (c) Greeting by Bershca (d) Hotel shuttle questions (e) Wedding package questions (f) Hotel room questions

4. RESULTS & DISCUSSION

The chatbot application is evaluated by 100 respondents. As shown in Figure 4, the respondents of the questionnaire consist of students, employee, entrepreneur, and housewife whose age range between 21 and 60 years old. Due to the excitement in new and smart mobile technology, most respondents are on the age group between 21 and 30 years old. According to occupation, most respondents are employees and entrepreneurs who have a lot of business trip.

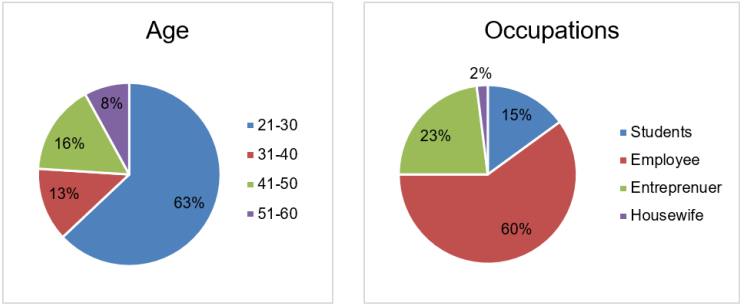

Figure 4. Demographic data of respondents: (a) categorized by age, (b) categorized by occupations

In the testing phase, respondents tried to make the conversation with Bershca about four main subjects covered by the chatbot. They were allowed to use slang words or daily communication in Bahasa with Bershca. After that, the respondents were given a questionnaire using technology acceptance model (TAM). The two aspects which are involved in TAM are perceived usefulness and perceived ease of use [1]. Perceived usefulness is the degree to which a person believes that using technology would enhance his or her job performance, whereas perceived ease of use is the degree to which a person believes that using technology would be free of effort [26].

Table 1 shows the result of chatbot acceptance level using TAM. The percentage for each aspect is as follows: 85.7% for perceived usefulness and 84.3% for perceived ease of use. The result shows that 85.7% of the respondents strongly agree that the chatbot is useful, while 84.3% of the users strongly agree that the application is easy to use. On the other hand, the chatbot flexibility has the lowest percentage amongst 12 factors in the evaluation results. The low flexibility of the application might be caused by the use of slang words which chatbot has not been able to respond properly.

Table 1. TAM evaluation results

Aspect	Factors	Result	Aspect Percentage
Perceived usefulness	Work more quickly	88.2%	85.7%
	Job performance	82.6%	
	Increase productivity	82.2%	
	Effectiveness	85.0%	
	Makes job easier	89.2%	
	Useful	87.0%	
Ease of use	Easy to learn	83.0%	84.3%
	Controllable	86.8%	
	Clear & Understandable	85.8%	
	Flexible	79.4%	
	Easy to become skillful	82.2%	
	Easy to use	88.8%	

5. CONCLUSION

The chatbot application for hotel industry in Indonesia is successfully developed using Google Flutter for the front-end, Python for the back-end, and AIML for the knowledge. As a text-preprocessing method, Nazief-Adriani Algorithm is implemented in the back-end of the system. Users can ask about hotel-related information which is divided into four categories: sales, front office, reservation, and food & beverages. According to TAM evaluation, 85.7% of the respondents believe that using chatbot would enhance their job performance and 84.33% of the respondents agree that using technology would be free of effort.

Nevertheless, there is still a restriction on this chatbot. Standard Indonesian words must be used for an appropriate response. Users may use slang words in Bahasa, but the response may not be proper. To improve the user experience on this application, the chatbot must be elevated to the semantic level. Therefore, ontology can be used so that the chatbot will not only perform pattern matching, but can also understand the meaning of the chat.

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