International Journal of Electrical and Computer Engineering (IJECE)
Vol. 12, No. 5, October 2022, pp. 5330~5338
ISSN: 2088-8708, DOI: 10.11591/ijece.v12i5.pp5330-5338

Automated information retrieval and services of graduate school using chatbot system

Meennapa Rukhiran[1], Paniti Netinant[2]
[1]Department of Computer Science, Faculty of Social Technology, Rajamangala University of Technology Tawan-OK, Chanthaburi, Thailand
[2]Department of Information Technology, College of Digital Innovation Technology, Rangsit University, Pathum Thani, Thailand

Article Info

Article history:

Received Jul 16, 2021
Revised Mar 22, 2022
Accepted Apr 15, 2022

Keywords:

Automated system
Chatbot
Electronic document
Information retrieval
System development

ABSTRACT

Automated information retrieval and servicing systems are a priority demand system in today's businesses to ensure instantaneous customer satisfaction. The chatbot system is an incredible technological application that enables communication channels to automatically respond to end-users in real-time and 24 hours a day. By providing effective services for retrieving information and electronic documents continuously and automating the information service system, the coronavirus disease (COVID-19) is challenging to promote graduate school programs, update news, and retrieve student information in this era. This article discusses automated information retrieval and services based on the architecture, components, technology, and experiment of chatbots. The chatbot system's primary functions are to deliver the course and contact information, answer frequency questions, and provide a link menu to apply for our online course platform. We manage the entire functional process of gathering course information and submitting an application for a course online. The final results compare end users' perceptions of chatbot system usage to onsite services to ensure that the chatbot system can be integrated into the university's information system, supporting university-related questions and answers. We may expand our chatbot system's connection to the university's server to provide information services to students in various informative areas for future research.

Corresponding Author:

Paniti Netinant
Department of Information Technology, College of Digital Innovation Technology, Rangsit University
52/347 Muang-Ake Phaholyothin Road Lak-Hok Muang Pathum Thani 12000, Thailand
Email: paniti.n@rsu.ac.th

1. INTRODUCTION

A chatbot is an automatic informal agent of computer system that can virtually communicate to users [1]. User input texts begin the basic operations to ask for information (output). Recently, chatbot systems have been developed that analyze data using natural language processing (NLP) and machine learning. By analyzing users' input, a series of intentions supports information pattern matching, and the chatbot system provides an intent response to the user [2]. The NLP divides into two parts for understanding input and generation output. The NLP engines provide capabilities that summarize the complex construction of a chatbot [3] between humans and computers, providing real-time and 24/7 interaction information services. Kocaleva *et al.* [4] stated the standard architecture of NLP flow processing after gathering user inputs: automatic text recognizer, languages and grammar understanding engine, dialog manager, and final information output. The probability and data-driven models are involved in supporting processing such as optical character recognition, data retrieval, speech recognition, answering and questioning [5], machine translation, and information diagnosing. Ofer *et al*. [6] studied proteins and languages to build NLP algorithms and methods. Many human languages should be concerned, such as uniform punctuation and stop words. The improvement of the better performances of input dialogs, word separation structures such as words, paragraphs, and sentences are critically concerned.

The advantages of a chatbot drive a command-line interface using user interface (UI) controls to respond to users quickly [7] and reduce human service costs [8]. The delivery channels of chatbot systems are developing on web pages, applications, and messaging platforms [1] such as Line, Telegram, Facebook Messenger, and Google Assistant. Khan [9] has represented an architectural view of a chatbot solution. The diagram is divided into sequences of layers: the present layer, which communicates with UI components for end-user performances. The system components are channels, mobile apps, and message platforms. The above layer is the business layer that can access capabilities of the system, such as user access and dialog management. The service layer integrates gathering information and matching it with NLP services, data access services, and external services. The bottom layer is the data layer, which consists of functions and a data lake.

Examples of chatbot systems are applied in digital platforms, such as frequently answered question (FAQ) [3], business card management [10], healthcare [11], teaching and learning [12]–[14], environmental monitoring [15] approaches. Developing a chatbot may require multipart programming skills [14]. Many complex concerns include unpredictable questions, mapping users' requirements [13], chatbot's repetition, and reaction [1]. A competency of answer and question systems in real-time is standard of chatbot applications from different literatures applied in many areas. Dialog conversational agents use to control the current intents and utilities permitting the conversation [16]. The enhance of human conversational skills can decrease response latency during interviews. An intelligent chatbot should provide a valuable service for application or website access and experience [17]. A library chatbot project was developed to support conversational artificial intelligence [8]. Natural language understanding (NLU) and dialog management are provided to support data training and validation. Business card management [10] is designed for user information's dialog. Users can receive an added contact in many messaging platforms, such as Line and Skype. The mental healthcare system can also use the concept of a chatbot system [11]. The self-care application of stress diagnosing from any employee's face is challenging to detect user emotions. The treatment program includes imagery therapy and emotional stabilization (smile faces) to view the light images to users. The results have found that the chatbot system is helpful for stress reduction. Moreover, the chatbot system can develop against the psychic consequences of pandemics and human emotion [18]. The advanced architecture of an adaptive therapeutic chatbot system is implemented using the TensorFlow framework and Keras API. The limit of data training is the future studies. The virtual assistant for tourist spots represents via the chatterbot expert system [19]. Inputs from a user can respond to the spot information and GPS location. The user acceptance test is collected from participants related to their usage experiences. The online chatbot system can implement supporting the internet of things (IoT) [20]. IoT devices can develop a line server for environmental information retrieval by connecting IoT sensors [15]. Ease of use for automated monitoring systems is a primary investigation of this research.

Additionally, chatbot application tools represent an excellent opportunity for helping human emotion responses [21] and precisely interactive information retrieval [22], [23]. These alternative tools allow us to use a chatbot as a conversational channel to respond to end-users effectively and promptly. Numerous tools are available for creating a chatbot system without professional programming skills, such as DialogFlow, Bot framework, Lex, Azure, and Watson. Google DialogFlow is one of the most popular frameworks for constructing chatbots. Natural language understanding (NLU) platform leverages machine learning capabilities to interface with various messaging apps, including Line, Facebook Messenger, and Telegram. DialogFlow’s features support multi-interactive conversation. Visual flow builder is easy to develop with time reduction and fewer programming skills. By building a DialogFlow and Line application chatbot system, DialogFlow API is an integration system to receive intent requests from Line application called front-end service and detect and send an intent response through DialogFlow services [24]. The capability of chatbot development allows developers to build a simple system without coding and less experience based on programming [25].

With more than 40 million active users in Thailand, the statistical analysis of social media applications has shown that the Line application is the most famous instant messenger application since 2019 [26]. Line application is a free messenger that allows us to communicate with people worldwide, friendlier, easy to use, and emotional stickers can express users' feelings. This research approach focuses on developing a Line chatbot system for graduate school services, such as promoting graduate school programs and electronic services. Due to the widespread distribution of coronavirus disease (COVID-19) [27], the university must immediately close for social interactions. Many policies are pronounced, such as avoiding entering the university, restricting the number of staff in the same area, and work from home. Our research deliberates on the challenge of a closer connection to new students, current students, and alumni [28].

Students can retrieve information through the Line chatbot system directly. The university can offer new programs, course details, and promotions for new students and alumni. Moreover, the current students can get graduate school electronic services such as tracking studying schedules, course enrollment, uploading and downloading documents (certificate and payment), and using virtual private network (VPN).

To advance the integration of a chatbot system for automated information publication in universities, this research aims to design automated information retrieval and services of a graduate school using a chatbot system based on Line and DialogFlow applications and assess the practical usage of the chatbot system based on technology acceptance model (TAM). This study focusses on improving the contribution of course information and news to new students, current students, and alumni. The architecture concerns are founded on significant platform and application development for the Line chatbot system, a component model for graduate school information public relations. Rapid application development facilitates the software life cycle development process in this research. The research outcome can conclude and improve the final development system by evaluating the proposed Line chatbot's performance. The following research questions are identified to achieve the research purposes:

- RQ1: How can a chatbot system design and develop for a graduate school's automated information services and retrieval?
- RQ2: How do users perceive the chatbot system's accomplishments compared to the traditional approach?

2. METHOD

2.1. Experimental design

Rapid application development (RAD) is a form of software development in experimental design that entails information requirement planning, user information design, construction, and cutover [29]. This research began the software document plan by requirements gathering from university staff. The chatbot's components and system prototypes are proposed during the user design phase. The implementation phase is where the chatbot system is built. Forty current and new students were randomly selected for this quantitative research to evaluate the overall system. Each questionnaire item was scored on a five-point Likert scale ranging from "strongly agree" to "strongly disagree." Additionally, ten respondents were interviewed to elicit their perspectives on chatbot usage. For two weeks prior to the system evaluation, selected graduate students used traditional information and enrollment services while becoming familiar with Line Apps. Both research methods use questionnaires to elicit user feedback on TAM questions: perceived ease of use and perceived usefulness [30]–[32]. Numerous perceived metrics are used to evaluate the chatbot system's performance, including ease of use, text question usage, buttons and links, output accuracy, and rich menu design. The satisfaction levels are compared for traditional services, such as course enrollment, and chatbot system services, such as chatbot achievement. A validation expectation was assumed to have a minimum value of 75%, which is the most useful value for the final acceptance benchmark [33]. Moreover, statistical testing of the chatbot system is examined. Samples were taken independently. The t-test is used to compare the means of two distinct groups (gender and student status). The analysis of variance (ANOVA) test with two variables compares the means of three or more independent groups (age and educational level). The outcomes have an effect on the system's characteristics and usabilities during the cutover phase.

2.2. Information architecture

The information architecture diagram in Figure 1 illustrates the design of automated information retrieval and service systems based on the DialogFlow application. Numerous software applications are configured during this research implementation phase, including the Line application, the Line official account, DialogFlow, a Google Form, and servers. A Line official account must be created to integrate DialogFlow, the primary provider of natural language processing services, via an access token. Each response's information can be determined by the user's intent. Utilizing a training phrase, the DialogFlow matches the user's intent. The training phase section enables the developer of a chatbot to generate similar user input. The system can match similar expressions and respond to the appropriate data. Google Forms is a cloud-based database management system used to retrieve information about courses, academic years, document requirements, and contact information. However, Google Forms requires an authentication token string called Google API. DialogFlow is configured on the university's web servers to support the online student management system via a fulfillment API, enabling login and receiving student information. The Line chatbot system accepts user input and retrieves information via DialogFlow, the university's web servers, and a Google Form integration service connected to the Line official account. End-users become chatbot members by scanning a Line ID or QR code. A chatbot system simulates two-way communication between users. On Line Apps, users can access services by selecting from a rich menu or typing in a question. The system responds to requests for services made by intent detection. The DialogFlow agent then compares a message to parameters associated with training phrases accessible via the Google API. NLP is a critical component of DialogFlow because it enables the recognition of input messages, entities, and intents. When the message's parameters and intent match, actionable data is returned to the users via Line Apps. Additionally, using natural language processing, a set of response dialogs is identified that corresponds to the user's input. The user's input is a keyword to match the message's intent. A single piece of course information can serve multiple purposes. Each intent compares the user's input in the text chat box to the actual data. For instance, a collection of intents for course information includes the terms course, courses, program, enroll, and so on. A collection of doctoral program intents includes doctoral, doctoral program, doctoral degree, and so on. The master program's set of objectives includes the terms master, master program, master degree, and so on. To respond to user requests, the chatbot system uses intent detection. When the user types "course," the dialog displays a course selection menu; when the user types "doctoral program," the dialog displays a doctoral program selection menu.

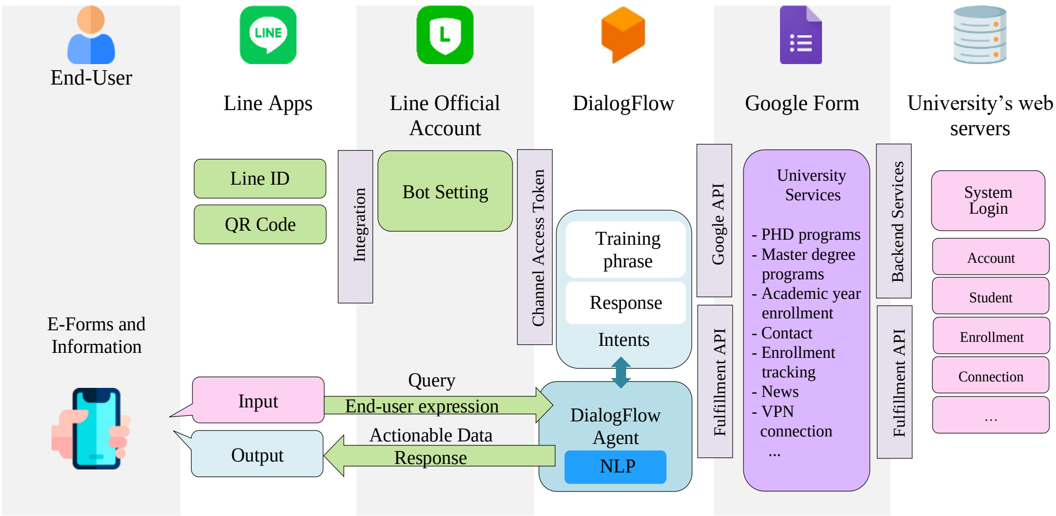

Figure 1. Information architecture design of a chatbot system for information retrieval and services

2.3. Rich menu prototype component

The system has been designed by a rich menu prototype providing on the welcome Line chatbot system. The Line Apps contains a rich menu allowing users to access via the menu selection. Figure 2 shows the Line chatbot components of the rich menu. There are six components:

- Course online component: the component responds to a command by clicking. The service connects to a graduated online application system. Users can apply for a course online and fill in the information after they may gather course information from the chatbot system.
- RSU website entry component: the component provides the link to the university website.
- Course information component: the component is connected to the DialogFlow agent using a dialog menu to display course information. After users click on the menu, the system displays the popup dialog menu of course information programs (doctoral programs, master degree programs, and short courses). The system shows course names of available programs in the semester. After the program is selected, the course details, including the course name, admission period, documentation requirements, an announcement of candidates, program structure, program fee, and contact number, display.
- FAQ component: the component shows the frequent questions about the graduate school, such as program fee, English test, location, and map. The intent of user inputs is detected and matched a response message to the user.
- Contact component: the component displays a sequence of contact information. For instance, a user types a word (contact) on a text chat box, then the service responses display a popup QR code and contact numbers of officers.
- Student system component: the component responds to user login via the university's web servers. Many students' services are available, such as uploading and downloading documents, tracking student's status, and course enrollment.

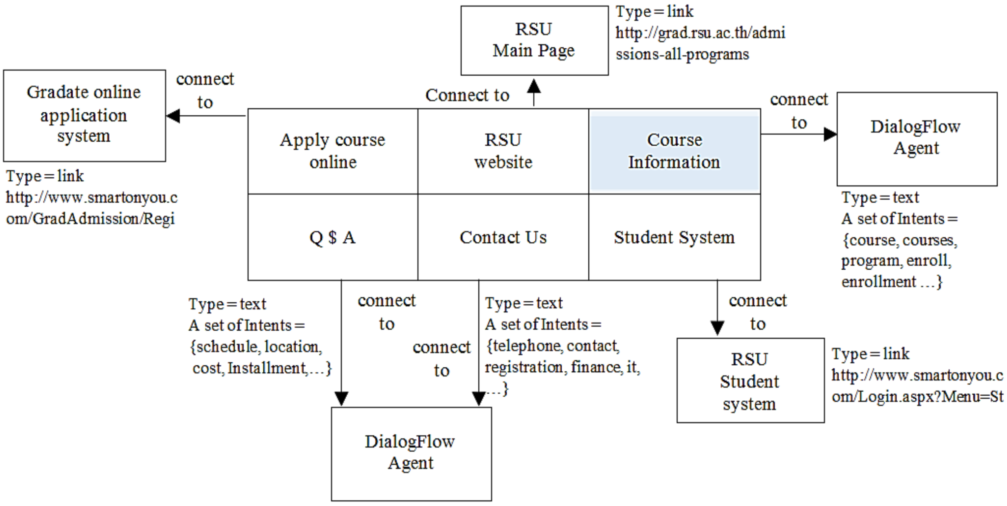

Figure 2. Chatbot' components of graduate school services

2.4. User interface responses and programming language

The DialogFlow Agent retrieves data from Google sheets and training phrases via a Google Webhook. The training phrases are composed of user expressions that correspond to the initial user's input. A fulfillment service is defined as a data response that is similar to the Line interface's data response for retrieving information from a user. The fulfillment service is configured to use a Javascript object notation (JSON)-based programming structure for its user interface. JSON is the preferred data format and interface format. Figure 3 illustrates two sample JSON programming packages for course dialog and doctoral program dialog. Users can type a search keyword and select from a chatbot menu using JSON packages programmed for multiple intents. The JSON package via DialogFlow is limited to programming with strings and numbers. Thus, HyperText markup language (HTML) code colors can create more friendly, responsive interfaces for chatbots, such as image background colors.

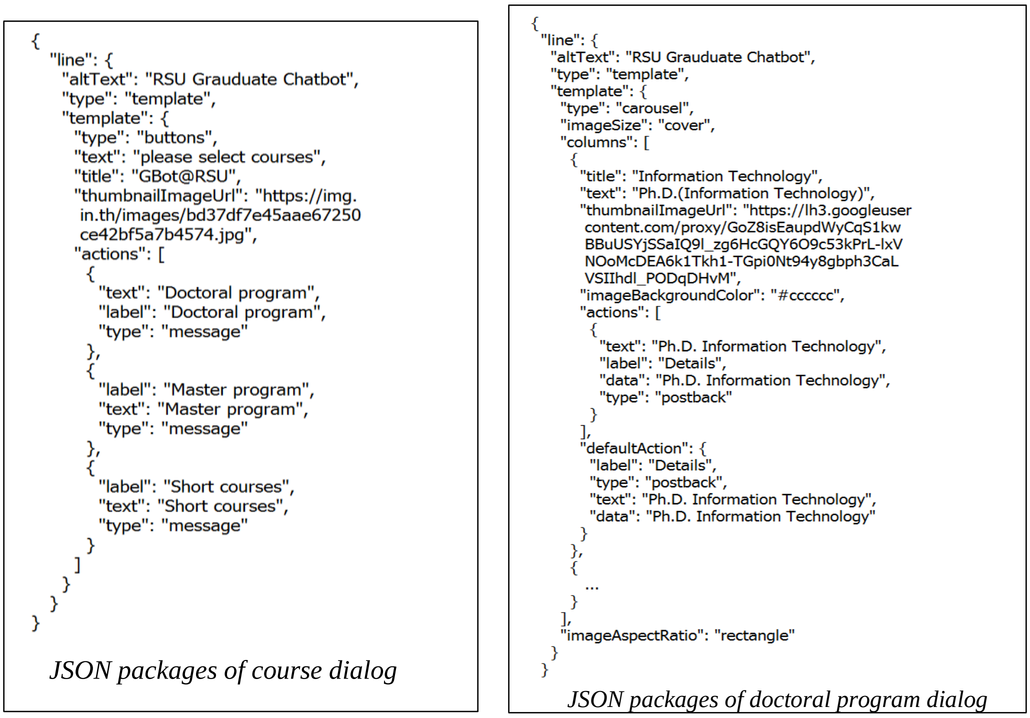

Figure 3. JSON programming package for DialogFlow

As illustrated in Figure 4, the pilot Line chatbot's interfaces present a rich menu based on the component design. A user's response messages and a chatbot system represent the course information's message dialog. A user can begin the first user interaction by selecting the course information menu. When a user selects the rich menu item "our course master-doctoral degree information," or when a user types a word such as "courses" or "course," the system responds. The system will then match the user's actual intent and response to select course majors. Following the user's selection of a major, the system will match the user's intent and respond to course information. On the other hand, NLP directly associates supporting course information with user-input texts. For instance, the user can enter text, such as IT, Information Technology, or Ph.D. The system then matches the similar intent with the training phrase service, and the user will receive direct access to the course information.

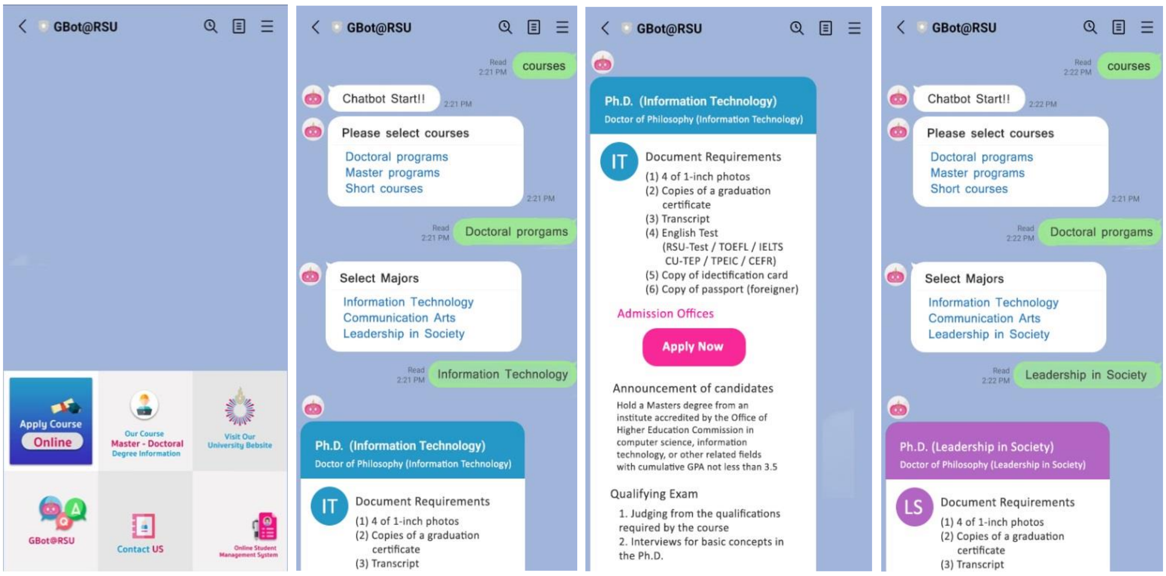

Figure 4. Interfaces of Line chatbot system

3. RESULTS AND DISCUSSION

This research has developed the pilot automation information services using chatbot according to the design of system components in Figure 2. Our design promises to achieve the first research question for the information architecture of the automated information services and retrieval using a chatbot system. The systems use Line API, Dialog Flow, and Google Forms technologies to compose the whole system components and develop the automated chatbot system.

Through our component design and prototype of the Line chatbot system for graduate school services, we demonstrated the possibility of users providing feedback on questions via a chat text box and a button while receiving responses in both English and Thai. The study enrolled forty students and received a 100% response rate. After analyzing participants' demographic data, gender, and (new and continuing) student status, it was determined that their scores were equal (50%). Ages ranged from 21 to 30 years (50%). The overwhelming majority of participants held a master's degree (55%). The following section contains the results of the user study experiment. This study expresses the significant feedback comparisons for the usage of traditional information services versus the chatbot system application. Numerous respondents confirmed the findings in Table 1.

Questionnaires were used in this study to determine the level of acceptance for chatbot system applications. All research questions are based on validated constructs from [33] and have been adapted to the context of this study. As a result, overall satisfaction with the chatbot system was more significant than that with traditional information and enrollment services. The average score was 4.17 and 2.95, respectively. The highest score for the chatbot system was discovered to be that users felt confident in using it (*mean=4.40*). In our opinion, the Line application is extremely user-friendly in Thailand [26]. The user may find it simple to access and utilize the chatbot system as an informal automated tool. Surprisingly, the traditional service received the highest score (*mean=4.35*), while the onsite service has a variety of functionalities for graduate school information. The study result can state categorically that the automated chatbot system cannot take the place of in-person service. The study could prefer to integrate some critical services, but face-to-face consultation should continue. Our study discovered the qualitative research method's system limitation through participant interview results.

Table 1. The comparison results of users' feedback

No.	Traditional information and enrollment services				Chatbot system applications			
	Questions of users' feedback	*Mean*	*SD*	%	Questions of users' feedback	*Mean*	*SD*	%
Q1	How do you feel self-confident to use the onsite services?	2.30	0.8013	46.00	How do you feel self-confident to use the chatbot system?	4.40	0.4961	88.00
Q2	How do you feel that onsite services easy to serve?	3.80	0.6156	76.00	How do you feel that the chatbot system easy to use?	4.18	0.5943	83.50
Q3	How do you agree to continuously use onsite services?	2.25	0.6387	45.00	How do you agree to install Line Apps to use the chatbot system?	4.15	0.6622	83.00
Q4	How does the onsite service provide various functionalities for graduate school services?	4.35	0.4894	87.00	How does the chatbot system provide various functionalities for graduate school service?	4.08	0.5723	81.50
Q5	How is administrators helpful and useful to meet your solutions?	3.35	0.7452	67.00	How is the rich menu helpful and useful to find your solutions?	4.23	0.6597	84.50
Q6	How would you prefer to use onsite services rather than automation information services?	2.10	0.7182	42.00	How do you agree buttons more useful than a text box?	4.10	0.5454	82.00
Q7	How would you voluntarily recommend people to use onsite services?	2.50	0.6070	50.00	How would you recommend the chatbot system to others?	4.08	0.4168	81.50
	Total	2.95	0.6593	59.00	Total	4.17	0.5638	83.43

According to the interview findings, users can use the chat text box messages to include Thai polite words at the end of sentences. The user may add ending words in Thai cultural language to the sentences, making errors in determining the correct answer. If the chatbot system cannot recognize a user's message, our solutions propose that the chatbot system responds directly to staff or displays a rich menu of assistance. Users have stated that the system enables them to conveniently and quickly access courses and information, retrieve documents, and update information.

The following questions can match technology acceptance model (TAM) core variables by analyzing user perception. Q4, Q5, and Q6 were used to determine perceived usefulness, and Cronbach alpha values of 0.791 were calculated. Q1, Q2, and Q3 consist of the perceived ease of use, and Cronbach alpha values of 0.832 were calculated. All questions had Cronbach alpha values of 0.857. Effectiveness and ease of use are combined in an attitude toward Q7 to ensure that participants are willing to introduce others who can benefit from the chatbot system. The overall average scores of the topic rating values for user usability were 4.14 (82.73%) for perceived usefulness and 4.24 for perceived ease of use (84.87%). As a result, all usability scores (75%) were subjected to expectation analysis, which was consistently related to [30], [34], [35].

The statistical testing results showed ages of years and education level had a significant and positive influence on their perceived usefulness and ease of use. Both the perceived usefulness and the ease of use reached the significant level on education only, as shown in all results in Table 2. Master's degree students are more provisional on the usefulness of the chatbot system than Doctoral's degree students. Our research results found that the chatbot system should effectively assist graduate school information facilities' automated information retrieval and services.

Numerous researchers designed and developed chatbot systems that enable automated information retrieval in various contexts, including health [11], [36] and education [12]–[14]. Our findings indicate that a chatbot system enables student information centers to function effectively during epidemic situations. According to our proposed Line chatbot system, NLP is a critical component of machine translation that enables the system to comprehend user (human) language in accordance with [8], [10], [19]. Additionally, our user interview research solution suggests minimizing user text input, and we discovered a button-based response related to [37]. According to the research, using a button-based response can help avoid user information input errors, particularly in a chatbot system.

Table 2. The characteristics of respondents through chatbot system

Characteristics	Perceived Usefulness			Perceived Ease of use		
	F	*P*	Cronbach's Alpha	F	*P*	Cronbach's Alpha
Gender	0.228	0.410	0.770	-0.100	0.460	0.758
Age in years	0.288	0.000*		0.224	0.000*	
Education	0.135	0.000*		0.105	0.000*	
Student status	-1.652	0.053		-1.337	0.094	

4. CONCLUSION

A chatbot system provides an alternate channel for ensuring that users are satisfied with their experience with the COVID-19 disease. Automated information retrieval and real-time services to assist customers in locating the precise information they require. The entire application process for student courses is critical to the study's success because it enables automated course information retrieval and access to an online course without using a human workforce. To automate information services and retrieval, our research design uses natural language processing technology. By implementing a chatbot system based on a DialogFlow and Line application for graduate school electronic services, this research achieved 83.43 percent user feedback and 88 percent user confidence. The system outperforms traditional services by 24.43 percent during the COVID-19 disease. The information architecture of a chatbot system highlights the various potential service areas, including promotion of graduate school programs, information access, electronic document retrieval, and information updating. While numerous research chatbot systems have been proposed, our chatbot system is built on a divide-and-conquer approach to information components in order to ensure the quality of automated information retrieval and services: i) user response: the chatbot system enables the delivery of superior information services and documents wherever and whenever they are needed; ii) flexibility: the extensive menu can easily be modified to accommodate new information requirements without interfering with system operations; iii) adaptability: changes require fewer system-wide modifications and more straightforward support for new information technologies; and iv) extensibility: the chatbot system rapidly adapts to new keywords that correspond to user services. We designed and implemented the Line chatbot system in this research to facilitate the automated collection of data from Google Forms. To advance the chatbot service, we will create an online chatbot for the student management system that will be capable of retrieving all information from our university's servers, including uploading and downloading electronic documents and notifying graduates. Additionally, the forthcoming study intends to enhance the interface design to make it more user-friendly via the chatbot system, including the addition of carousel views, the addition of additional images, and the use of background color.

REFERENCES

[1] M. Jang, Y. Jung, and S. Kim, "Investigating managers' understanding of chatbots in the Korean financial industry," *Computers in Human Behavior*, vol. 120, Jul. 2021, doi: 10.1016/j.chb.2021.106747.

[2] B. A. Shawar and E. Atwell, "Chatbots: can they serve as natural language interfaces to QA corpus?," in *Advances in Computer Science and Engineering*, 2010, pp. 183–188, doi: 10.2316/P.2010.689-050.

[3] M. Rajbabu, P. Prabhuraj, and S. Jeyabalan, "An intelligent behaviour shown by chatbot system for banking in vernacular languages," *International Research Journal of Engineering and Technology (IRJET)*, pp. 1210–1212, 2019.

[4] M. Kocaleva, D. Stojanov, I. Stojanovik, and Z. Zdravev, "Pattern recognition and natural language processing: state of the art," *TEM Journal*, vol. 5, no. 2, pp. 236–240, 2016.

[5] R. Pathak and B. Thankachan, "Natural language processing approaches, application and limitations," *International Journal of Engineering Research and Technology*, vol. 1, no. 7, pp. 1–8, 2012.

[6] D. Ofer, N. Brandes, and M. Linial, "The language of proteins: NLP, machine learning & protein sequences," *Computational and Structural Biotechnology Journal*, vol. 19, pp. 1750–1758, 2021, doi: 10.1016/j.csbj.2021.03.022.

[7] A. R. T. de Lacerda and C. S. R. Aguiar, "FLOSS FAQ chatbot project reuse - how to allow nonexperts to develop a chatbot," in *Proceedings of the 15th International Symposium on Open Collaboration*, Aug. 2019, pp. 1–8, doi: 10.1145/3306446.3340823.

[8] M. Bagchi, "Conceptualising a library chatbot using open source conversational artificial intelligence," *DESIDOC Journal of Library and Information Technology*, vol. 40, no. 06, pp. 329–333, Dec. 2020, doi: 10.14429/djlit.40.06.15611.

[9] R. Khan, "Standardized architecture for conversational agents a.k.a. chatbots," *International Journal of Computer Trends and Technology*, vol. 50, no. 2, pp. 114–121, Aug. 2017, doi: 10.14445/22312803/IJCTT-V50P120.

[10] G. Baudart, M. Hirzel, L. Mandel, A. Shinnar, and J. Siméon, "Reactive chatbot programming," in *Proceedings of the 5th ACM SIGPLAN International Workshop on Reactive and Event-Based Languages and Systems*, Nov. 2018, pp. 21–30, doi: 10.1145/3281278.3281282.

[11] C. Lebeuf, M.-A. Storey, and A. Zagalsky, "Software bots," *IEEE Software*, vol. 35, no. 1, pp. 18–23, Jan. 2018, doi: 10.1109/MS.2017.4541027.

[12] G. D'Aniello, A. Gaeta, M. Gaeta, and S. Tomasiello, "Self-regulated learning with approximate reasoning and situation awareness," *Journal of Ambient Intelligence and Humanized Computing*, vol. 9, no. 1, pp. 151–164, Feb. 2018, doi: 10.1007/s12652-016-0423-y.

[13] O. Zahour, E. H. Benlahmar, A. Eddaoui, H. Ouchra, and O. Hourrane, "A system for educational and vocational guidance in Morocco: Chatbot e-orientation," *Procedia Computer Science*, vol. 175, pp. 554–559, 2020, doi: 10.1016/j.procs.2020.07.079.

[14] M.-C. Ko and Z.-H. Lin, "CardBot: a Chatbot for business card management," in *Proceedings of the 23rd International Conference on Intelligent User Interfaces Companion*, Mar. 2018, pp. 1–2, doi: 10.1145/3180308.3180313.

[15] N. Phaokla and P. Netinant, "Design an environment information chatbots system for a smart school framework," in *2021 The 4th International Conference on Software Engineering and Information Management*, Jan. 2021, pp. 152–157, doi: 10.1145/3451471.3451496.

[16] R. M. Schuetzler, G. M. Grimes, and J. S. Giboney, "The effect of conversational agent skill on user behavior during deception," *Computers in Human Behavior*, vol. 97, pp. 250–259, Aug. 2019, doi: 10.1016/j.chb.2019.03.033.

[17] F. Colace, M. De Santo, M. Lombardi, F. Pascale, A. Pietrosanto, and S. Lemma, "Chatbot for e-learning: a case of study," *International Journal of Mechanical Engineering and Robotics Research*, vol. 7, no. 5, pp. 528–533, 2018, doi: 10.18178/ijmerr.7.5.528-533.

[18] I. Salhi, K. El Guemmat, M. Qbadou, and K. Mansouri, "Towards developing a pocket therapist: an intelligent adaptive psychological support chatbot against mental health disorders in a pandemic situation," *Indonesian Journal of Electrical*

Engineering and Computer Science (IJEECS), vol. 23, no. 2, Aug. 2021, doi: 10.11591/ijeecs.v23.i2.pp1200-1211.
[19] V. Kasinathan, A. Mustapha, M. F. C. A. Rani, and S. A. Mostafa, "The role of chatterbots in enhancing tourism: a case study of Penang tourism spots," *IAES International Journal of Artificial Intelligence (IJ-AI)*, vol. 9, no. 4, pp. 569–575, Dec. 2020, doi: 10.11591/ijai.v9.i4.pp569-575.
[20] H. Shum, X. He, and D. Li, "From Eliza to XiaoIce: challenges and opportunities with social chatbots," *Frontiers of Information Technology and Electronic Engineering*, vol. 19, no. 1, pp. 10–26, Jan. 2018, doi: 10.1631/FITEE.1700826.
[21] O. B. Ayoko *et al.*, "Communication in virtual teams: the role of emotional intelligence," *Computers in Human Behavior*, vol. 28, no. 1. American Psychological Association (APA), pp. 2046–2054, 2012, doi: 10.1037/e518332013-240.
[22] E. Luger and A. Sellen, "Like having a really bad PA," in *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, May. 2016, pp. 5286–5297, doi: 10.1145/2858036.2858288.
[23] Z. Xiao *et al.*, "Tell me about yourself," *ACM Transactions on Computer-Human Interaction*, vol. 27, no. 3, pp. 1–37, Jun. 2020, doi: 10.1145/3381804.
[24] "Dialogflow." Googlecloud.com. https://cloud.google.com/dialogflow (accessed Mar 1, 2021).
[25] S. Perez-Soler, S. Juarez-Puerta, E. Guerra, and J. de Lara, "Choosing a Chatbot development tool," *IEEE Software*, vol. 38, no. 4, pp. 94–103, Jul. 2021, doi: 10.1109/MS.2020.3030198.
[26] TWF, "User statistics of LINE Thailand in 2020," *TWF Agency*, 2020. https://www.twfdigital.com/blog/2020/04/line-user-stat-in-thailand-2020 (accessed Mar 2, 2021).
[27] A. M. Saleh, H. Y. Abuaddous, O. Enaizan, and F. Ghabban, "User experience assessment of a COVID-19 tracking mobile application (AMAN) in Jordan," *Indonesian Journal of Electrical Engineering and Computer Science (IJEECS)*, vol. 23, no. 2, pp. 1120–1127, Aug. 2021, doi: 10.11591/ijeecs.v23.i2.pp1120-1127.
[28] M. Rukhiran, P. Netinant, and T. Elrad, "Multiconcerns circuit component diagram apply to improve on software development: empirical study of house bookkeeping mobile software," *Journal of Current Science and Technology*, vol. 11, no. 2, pp. 240–260, 2021, doi: 10.14456/jcst.2021.25.
[29] J. Martin, *Rapid application development*. Macmillan Publishing Company, 1991.
[30] V. Venkatesh and F. D. Davis, "A theoretical extension of the technology acceptance model: four longitudinal field studies," *Management Science*, vol. 46, no. 2, pp. 186–204, Feb. 2000, doi: 10.1287/mnsc.46.2.186.11926.
[31] M. Rukhiran and P. Netinant, "A practical model from multidimensional layering: personal finance information framework using mobile software interface operations," *Journal of Information and Communication Technology*, vol. 19, no. 3, pp. 321–349, Jul. 2020, doi: 10.32890/jict2020.19.3.2.
[32] D. L. Kasilingam, "Understanding the attitude and intention to use smartphone chatbots for shopping," *Technology in Society*, vol. 62, Aug. 2020, doi: 10.1016/j.techsoc.2020.101280.
[33] R. Veral and J. A. Macías, "Supporting user-perceived usability benchmarking through a developed quantitative metric," *International Journal of Human-Computer Studies*, vol. 122, pp. 184–195, Feb. 2019, doi: 10.1016/j.ijhcs.2018.09.012.
[34] F. D. Davis, "Preceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, Sep. 1989, doi: 10.2307/249008.
[35] M. Rukhiran and P. Netinant, "Mobile application development of hydroponic smart farm using information flow diagram," in *2020 - 5th International Conference on Information Technology (InCIT)*, Oct. 2020, pp. 150–155, doi: 10.1109/InCIT50588.2020.9310780.
[36] D. Ma *et al.*, "Automated health chats for symptom management of head and neck cancer patients undergoing radiation therapy," *Oral Oncology*, vol. 122, Nov. 2021, doi: 10.1016/j.oraloncology.2021.105551.
[37] H. Ryu, S. Kim, D. Kim, S. Han, K. Lee, and Y. Kang, "Simple and steady interactions win the healthy mentality," *Proceedings of the ACM on Human-Computer Interaction*, vol. 4, no. CSCW2, pp. 1–25, Oct. 2020, doi: 10.1145/3415223.

BIOGRAPHIES OF AUTHORS

Meennapa Rukhiran received the B.Sc. in Computer Information System from Burapha University, Thailand, in 2006, the M.S. in Information Technology management from Rangsit University, Thailand in 2014, and the Ph.D. in Information Technology from Rangsit University, Thailand in 2020. Currently, she is a head of Department of Computer Science at the Faculty of Social Technology, Rajamangala University of Technology Tawan-OK, Thailand. Her research interests include automated software design, system software framework, technology acceptance models, Internet of Things, information systems with chatbots, web-based development, mobile development, multidimensional software design and implementation, data mining, and theory of computation. She can be contacted at email: meennapa_ru@rmutto.ac.th.

Paniti Netinant earned the B.S. second class honors in Computer Science from Bangkok University, Thailand, in 1994, and the M.S. and Ph.D. in Computer Science from Illinois Institute of Technology, the United States of America in 1996, and 2001, respectively. He is currently an associate dean of the graduate school at Rangsit University in Thailand, where he is responsible for information technology and international affairs. Automated software design and development, adaptive software architecture, operating systems, bot information systems, mobile development, compiler, object-oriented approach, aspect-oriented approach, python programming, database system, and cloud computing services are among his research interests. In addition, he is international technical committees and reviewers of ACM conferences. He can be contacted at email: paniti.n@rsu.ac.th.