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Developing Alumni Relationship Management using Thai Speech Recognition on Mobile Application

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Abstract*: Alumni are one of the most significant assets for the success of universities. After graduation, they enter a new society, have work and family responsibilities which change over time according to their age and economic status. It becomes more difficult to communicate between friends and university. This situation is challenging to collect up-to-date information about alumni from a university database as well as sharing it with all alumni. This article demonstrates the alumni relationship management (ARM) using speech recognition for the mobile application on smartphones. It has been designed and developed for Thai speech recognition to facilitate alumni especially the elderly who may have vision problems or typing by applied the ionic framework to support both iOS and Android. The contents were evaluated by five experts to identify each feature of the developed mobile application. Afterward, the application was evaluated by one hundred twenty alumni. The learning post-test results scored higher than the pre-test results. The effectiveness evaluation results in terms of the accessibility barriers at the high-level while being used has high consensus.

***Keywords*: alumni relationship management, Thai speech recognition, mobile application, visualization.**

I. INTRODUCTION

Alumni relationship management is a crucial feature of every alumni association or university. Educational institutions acknowledge the need to have accurate information and communication services [1]. Alumni are academic and ethical representatives of the university and are a vital asset who can enhance the university's reputation. This factor is significant in influencing the recruitment and preservation of students and in enhancing university programs. Many leading universities in various countries have alumni who love and are committed to their institutions and are excellent role models for students. After graduation, many students return to support the universities in various areas such as giving advice, scholarship donations and providing career opportunities for juniors. Countless alumni networks originated from regional groups of alumni who assembled for university fundraising activities. Thereafter, in terms of institutional development, the value of these networks was gradually recognized due to their far-reaching potential to serve the university and support current students in their professional advancement. Alumni groups have existed for decades and are steadily evolving [2]. Therefore, it is beneficial to facilitate these alumni in keeping in touch with their universities. It is challenging to collect up-to-date information about alumni from a university database as well as sharing it with all alumni. This is because, after graduation, they enter a new society, have work and family responsibilities which change over time according to their age and economic status. Hence, it becomes more difficult for them to stay connected with their friends and the university. Many students tend to reach out to close friends or colleagues and only occasionally remember their old friends. It would be nice if they could approach their old acquaintances, get updates about their lives and find ways to meet one another again. This could be an opportunity to create unity and make alumni happy and the university could also benefit from the data about their alumni.

Presently, the technological development of the internet, smartphones, and social networking has been greatly influencing the users' behavior and the easy installation of mobile applications. As stated in a recent study conducted by the Center for Marketing Research at the University of Massachusetts-Dartmouth [3], 98% of the participatory students had a Facebook account. Social networks are a compelling channel for individuals to interact and share their common interests. It additionally offers the alumni a chance to share their professional or personal advice, discover mutual interests and gain new collaborative opportunities [4]. This can also support the alumni by enhancing their quality of life, reducing loneliness and increasing their social interactions towards news, photos, and stories of their old friends embedded in the application. Several universities have paid attention to ARM. Scholars have studied the relationship between the university and its alumni regarding their mutual improvement and the participation of the alumni. Study on the correlations between current students' demographic factors, academic involvement, social involvement, alumni demographics, alumni social involvement, and alumni supportive attitudes and behavior. The researcher conceptualized a framework from his previous study to foresee the alumni's assistance.

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Universities are able to use this model to envision their studentsand alumni supportive behavior since the students first entered university [4]. Similar research explored the relationship between alumni engagement and two groups of variables; alumni characteristics and alumni favorable behavior [5]. The researcher collected data such as alumni demographics, experience, and attitudes to the use of a survey.

The data was analyzed to enhance the ability to spot alumni donors and promoters. The findings show no disparity in the participation scores based on alumni characteristics. In addition, the participation scores had a positive correlation with various types of supportive behavior, donor status, recent donor status, annual supportive behavior, and regulated lifetime donation. Several models were applied to the data clustering. Another study presented a framework for market segmentation to identify suitable target customers [6]. A data mining technique was used to classify into groups those alumni who share similar preferences. This approach helped the researcher to design the instruments to obtain the alumni's demographics, lifestyles, expectations, and interests. The researcher anticipated that the designed instruments could gather data and calculate it to utilize the selected data mining technique. The outcomes from simple k-mean clustering portrayed the alumni's preferences in different sections. For example, the alumni were interested in diverse activities ranging from exercising, running, cycling, and playing football or tennis. They supposed the university could offer them the aforementioned sport center services. Moreover, the majority of students were becoming first-jobbers, so were fascinated with the new graduate's recruitment activities organized by the alumni association and wished to benefit from a job search service as well. Many of them used Facebook and LINE to do this and communicate with their alumni [7]. An initial program to establish an interactive alumni association according to experiences with alumni is known as ALFaMEB or MEB, and provides quality assurance in tertiary educational institutions. Feedback was accumulated through a wide range of activities as well as questionnaires about professional expectations, knowledge acquired at university, and university's obligations to improve their teaching and research activities. The alumni ALFaMEB activities are committed to the advancement of teaching and research offered at the university and have expanded higher education. Outstanding work in the contemporary context is the online community portal designed for assisting both alumni and higher education institutions in South Africa. The web-based secured database portal provides a platform for free-of-charge information transfer between alumni management parties and its members [8]. The prototype for such a conceptualized smart alumni system has been developed using a web-based interface with the appropriate features of an interactive alumni network; the supporting decision-making processes are founded on data mining principles. The chosen features are incorporated with social networking and data mining into alumni systems to improve the counsel system between alumni and students. This project thus provides two key contributions; a framework for smart alumni systems (SAS) and an evident prototype application of an SAS subset. The SAS framework extends the list of stakeholders beyond alumni by involving current students, faculty, staff, and patrons and is suitable for social networking-style interactions within and across the circles of each stakeholder type. The activities for this type of interaction include mentoring, fund-raising, and curriculum development. With the SAS framework, data mining is supposed to make recommendations for building bonds between stakeholders to assist current students in receiving improved mentoring. Another goal of the data mining is to analyze the results obtained from university and departmental surveys [2]. Although the aforementioned studies demonstrate the original efforts made to enhance alumni-based networking systems, they are restricted in terms of their communication capabilities and in executing the full potential of large-scale interactions between the alumni and the university. It can be implied that, to date, there has been no development of a digital display of alumni associations on a mobile application using speech recognition.

Therefore, this article aims to improve ARM by applying the speech recognition on a mobile application. This application will allow them to use their smartphones to manage their alumni information by giving commands to the interface on their smartphones. The older alumni can use spoken commands and touch screens to operate their information. This can alleviate the limitations of their eyesight due to their aging and reduce the problems of unclear tiny sized displays on the relatively small smartphones, while considering the mentality of the older alumni who still believe that they have the same capability as the younger alumni and acknowledging their privacy. Giving commands by using speaking voices solely also allows others to hear the commands. In results section, there are the results of the effectiveness evaluation of the mobile application. Finally, a conclusion section.

II. RESEARCH METHODOLOGY

A. Data collection

Alumni information was studied to understand the alumni relationship management as produced by alumni of Suan Sunandha Rajabhat University based on the feedback of volunteer groups who communicated via social media for a period of 90 days. They were divided into three groups, which comprised 40 Generation B (Baby Boomers) born before 1946, 40 prospective Generation X born between 1946-1979, and 40 prospective Generation Y born between 1980-1996 [9]. Each volunteer contacted the team by telephone and full information about the survey was provided and all queries were answered. This was performed with regard to the alumni relationship.

B. Design of the mobile application

In this section, the information collected from the data collection process was analyzed using requirement analysis processing in order to determine the features in the mobile application. The consistency of the contents was analyzed by five experts in the field of information technology andeducation which is related to the Thai language.

Accordingly, the information was taken from the experts to determine the Index of Item-Objective Congruence (IOC) value by using the formula as (1) [10]:

$$IOC = \frac{\sum R}{N} \quad (1)$$

$\sum R$ is the sum of the scores that the expertsrated.
R is the score that the experts rated.
N is the number of the experts.

The features in the mobile application were assessed by five experts specializing in the field of information technology and Thai language education. The IOC was applied to the evaluation to determine scores. If the criteria measured by the IOC value of each indicator was higher than 0.5 (the highest IOC value is 1) [11][12] because the number of experts answering the questionnaire met the following objective: the number of experts who answered that it was not a the questionnaire met the objective was more half of all the experts [13], it could be implied that the features met the objectives and possessed the contents suitable for the operation, showing that the features worked effectively. For instance, if the IOC value of each indicator was 0.8, it means the features met the objective and were suitable for use in the mobile application development. The experts were able to provide a rating by using the assessment criteria as in Table I.

Table- I: There is neither content consistency nor appropriateness to be used as a feature in the application

Rating criteria	Meaning
1	There is content consistency, showing suitability for inclusion as a feature in the application.
0	There is uncertainty in the content consistency, resulting in its inappropriateness to be used as a feature in the application.
-1	There is neither content consistency nor appropriateness to be used as a feature in the application.

Figure 1 shows a diagram of features in the operation, data input and outputs depicting the whole procedure of each user of the mobile application.

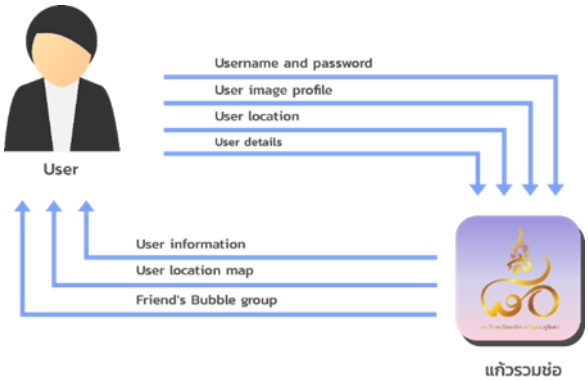


Fig. 1. Features on the mobile application.

C. Development of the mobile application

This research develops a mobile application which can be used on both iOS and Android operating systems by applying the ionic framework as a tool to develop the cross-platform. The mobile application was developed based on the ionic framework which allowed the application to work with iOS and Android operating systems. The architecture consists of ionic speech recognition, TypeScript, HTML, JavaScript and Google Map API. The process involves the information hyperlinks on web server which is the host service for clients. JavaScript Object Notation (JSON) is applied to share the data, while the data is stored in MySQL database showing the architecture used in the development of the mobile application as shown in Figure 2.

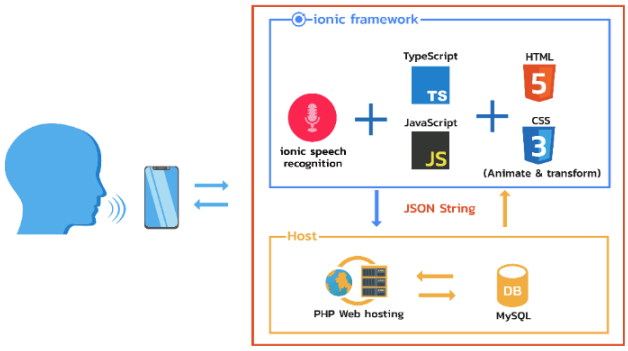


Fig. 2. Architecture of the mobile application.

In this research, Thai speech recognition system was exploited to specify the input sounds to the giving commands by using speaking voices. The fundamental purpose of a speech recognition system is to figure out the most distinct symbol order out of all the valid sequences in the language L, from the given acoustic input O [14]. As mentioned above, the input refers to a set of distinct observations, in the way that:

$$o = o_1, o_2, o_3, \ldots, o_t \quad (2)$$

Likewise, the symbol sequence to be noticed is represented as:

$$W = w_1, w_2, w_3, \ldots, w_n \quad (3)$$

The primary automatic speech recognition (ASR) system goal can then be explained as:

$$\hat{W} = argmax\ P(W|O) for\ W \in L \quad (4)$$

Equation (4) implies that, for a given sequence W and acoustic input sequence O, the probability P(W|O) needs to be defined. It is possible to apply Bayes' theorem to this probability to obtain the following (5):

$$P(W|O) = \frac{P(O|W)P(W)}{P(O)} \quad (5)$$

The quantities on the right-hand side of the (5) are less complicated to calculate than P(W|O). P(W) which represents the preceding probability for the sequence itself. The calculation is made by applying the prior knowledge of occurrences of the sequence W. As each candidate sentence W has the same P(O), the (5) can be interpreted as [15]:

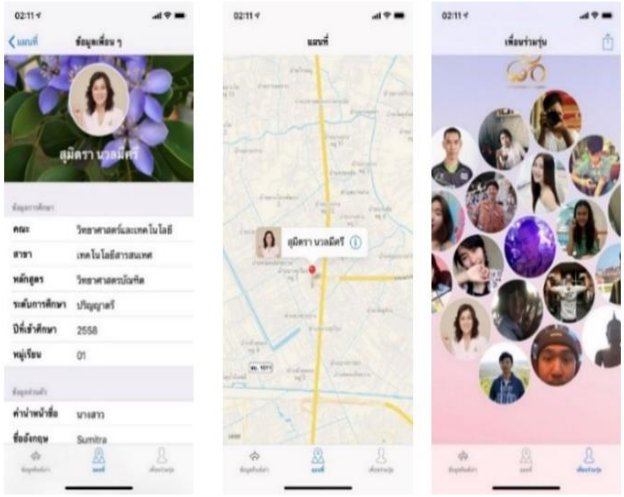
$$\hat{W} = argmax \frac{P(O|W)P(W)}{P(O)} = argmax P(O|W)P(W) \ \ for\ W \in L \quad (6)$$

The probability P(O|W) or the tendency of the acoustic input O, given the sequence W, refers to the observation likelihood called the 'acoustic score'. By employing the Hidden Markov Model, this quantity can be identified [16].

Before starting to develop the application, the ionic speech recognition applied in the system was evaluated for accuracy by five experts in the field of information technology and Thai language education. The evaluation results are 98% accurate in Thai speech recognition related to alumni information and menus in the system. All results of experts are consistent in the same direction.

The mobile application comprises three main menus: Alumni Information, Map and Classmates. The alumni menu presents the alumni profiles; the default information is their profiles provided since confirmation of graduation. The alumni can update the educational background, personal information, contact details, address and the profile picture.The profile picture can be taken with the embedded smartphone camera or uploaded via the mobile application as demonstrated in Figure 3(A) The Map menu is linked with Google Map which allows users to record and adjust their current addresses so their classmates can see where they live and arrange to visit them, as shown in Figure 3(B) The Classmates menu in this study applies the Bubble Group uses JavaScript to display the circular-shape classmate profile pictures. Once the alumni have uploaded their profile pictures from the Alumni Information menu, the Classmates menu will display the same picture in the bubble group. The users can click on each profile picture to see the profile and current address of the profile picture's owner and keep in touch with their friends, as illustrated in Figure 3(C). The alumni information used in this research was collected from the Suan Sunandha Rajabhat University alumni database which had recorded the information from 128,750 students from 1946 to 2017. The link with social media and the posts and shares can be considered a public relations strategy for both the mobile application and the university. The pictures of the alumni on social media allows outsiders to discover the profiles of their fellow classmates, as shown in Figure 4. This can help a university to advertise itself which could enhance their reputation.

The mobile application was validated with black box testing all three aspects: functional test, usability test and performance test [18] by five experts in the field of information technology and Thai language education. The data were analyzed to gain the mean value and the standard deviation value in regards to the Likert-scale scoring criteria [19] as illustrated in Table II. The mean value at 4.60 together with the standard deviation value at 0.51. This suggests that the accuracy of mobile application at the highest level.



(A) Alumni Information menu (B) Map menu (C) Classmates menu

Fig. 3. Main menu on mobile application.

Fig. 4. Shares on Facebook [17].

Table- II: Scoring criteria for the mobile application evaluation

Scale	Range of Weighted Mean	Level of Effective Mobile Application
5	4.51 – 5.00	The highest
4	3.51 – 4.50	The high
3	2.51 – 3.50	The medium
2	1.51 – 2.50	The little
1	1.00 - 1.50	The least

D. Mobile application training

The training was provided to one hundred twenty alumni who were the voluntary subjects participating in the mobile application test advertised on social networks. In this study, the participants received the documents explaining the protocols and research ethical conducts to sign. The 2-hours training involved a lecture, a demonstration and real practice to try out the mobile application.

There was a guest speaker who was a lecturer in the field of information technology and thirty information technology students as assistants. Both the guest speaker and the assistants had tested the developed mobile application and had participated before in the academic service projects related to mobile applications and social media for the alumni community.

The guest speaker used PowerPoint slides when giving the lecture and demonstrated the installation and the utilization of the mobile application practically with the use of a projector. Each participant received a copy of the lecture materials which illustrated the procedures and the explanations of how to use the mobile application. The participants literally practiced with the mobile application while the guest speaker was their supervisor and advisor. After the training, there were 1-hour online pre- and post-learning tests created by Google Form. The guest speaker explained and gave advice to the participants before taking the tests by using the projector. The assistants took care of and guided the participants on how to access the pre-test and post-test. However, the guest speaker and the assistants did not persuade or complete the tests for the samples. The tests consisted of ten questions each, in which the order of questions and answers in the pre-test and post-test were switched around. Finally, once the post-test was completed by all of the participants, the guest speaker gave the answers and stated where the training materials were published and could be downloaded. This included the mobile application demonstration video which was published on social media for the seniors to watch and give the others information about the application.

E. Evaluation of the mobile application

The mobile application was evaluated by one hundred twenty respondents. The sample consisted of 40 Generation B, 40 prospective Generation X, and 40 prospective Generation Y; they voluntarily registered for the training which was offered in the form of a group demonstration. So, researchers had no information with regard to alumni identification and their performance. This was the basis upon which ethics approval was obtained for the study. This is a key factor that considered when developing a mobile application for alumni by focusing on the accessibility barriers that older people might confront while using the mobile application for alumni. There were nineteen evaluation criteria which included the font size [20][21], text and complex languages [22][23], lack of help options [23], small space to click [24][25], vertical and horizontal screen orientation [21][23][26], little spacing between contents [26][27], automatic screen lock [28], difficulty with the touch screen [23][24][26][29], virtual or physical keyboard with small size [29][30], error messages without clarity [20][29], contrast [20][24][27][31], the difficulty of accessing the menu and submenus [21][27][29][32], inaccessible data insertion interfaces [21][29][31], difficulty with draganddrop features [24][29][33], difficulty in recognizing the symbols and icons shown in the application [26][29][34], recognition complications of audio notifications and reminders [24], complicated navigation and information flow, lack of options to resize the text [31] and poor sound quality [29]. The data were analyzed to gain the mean value and the standard deviation value in regards to the Likert-scale scoring criteria [35] as illustrated in Table II.

III. EXPERIMENTAL RESULTS

A. Evaluation with respect to the learning outcomes

The effectiveness evaluation results obtained from the learning outcomes of the trained sample people were collected from the pre-test and post-test before and after the training. There were ten questions in each test by which the order of questions and the answers were shifted around to create some differences between the tests. The pre-test and post-test results after the mobile application training from one hundred twenty people revealed that the post-test results of the sample group after training was better than their pre-test results. The results were analyzed by comparing the number of the subjects who could answer the questions correctly with their individual results. The learning results showed that the subjects had more correct answers after the training. From the comparative test results collected before and after the training, according to the statistical test of the following hypothesis:

The hypothesis was assumed as followed:

H0: The learning result before and after using themobile application were not different.

H1: The learning result before and after using the mobile application was different.

Statistically tested by T-Test, the main hypothesis (H0) was rejected because the significance value was lower than the significance level (α) which was previously determined. In this study in which $\alpha = 0.05$, the H0 was rejected and the H1 was accepted.

The efficiency of the developed model was different in their methods. From the Table III of Pair Sample Testing, the significance value was analysed to consider whether the mean values of the two groups were different. In fact, it was found that the significance value was lower than the predetermined significance level. Therefore, the mean values of the two groups were different. Considering the comparative differences of the learning results both before and after the use of the mobile application, it was found that there were differences at the statistical significance p value < 0.001 show as Table III.

Table- III: Comparation test results before and after the training, according to the statistical test of the hypothesis

Comparison issue	N	Pre-test		Post-Test		t	P
		Mean	*SD*	*Mean*	*SD*		
Gen B							
Learning results	40	4.67	0.23	8.89	0.36	-15.200	.000
Gen X							
Learning results	40	6.59	0.78	9.44	0.28	-8.2219	.000
Gen Y							
Learning results	40	7.11	0.61	9.67	0.25	-14.5464	.000

B. Effectiveness evaluation of the mobile application from the comprehension and user experience aspects

In this section, the information collected from the data collection process was analyzed using requirement analysis processing in order to determine the features in the mobile application. The consistency of the contents was analyzed by five experts in the field of information technology and Thai language education. Accordingly, the information was taken from the experts to determine the Index of Item-Objective Congruence (IOC) value by using the formula as presented in (1).

The effectiveness evaluation results of the mobile application, focusing on the accessibility barriers that could be detected by samples while using the mobile application, showed that, among the nineteen indicators, "ease of access to the menu and submenus" criteria had the highest mean value at 4.30 together with the standard deviation value at 0.46, followed by "easy to identify the symbols and icons used in the application" with the mean value of 4.29 and the standard deviation of 0.46. Next, "spacing between contents" received the mean value of 4.25 and the standard deviation value of 0.43. The other indicators had almost the same mean value which was higher than 4.10, meaning the effective-ness level was high.

The overall mean was 4.19 and the overall standard deviation was 0.40, showing that the developed mobile application was highly effective when the users were alumni, as shown in Table IV.

Table- IV: The evaluation results of the mobile application based on accessibility barriers that could be detected by alumni while being used

Assessment Indicators	Arithmetic Mean	Standard Deviation	Level of effective mobile application
1. Font Size	4.23	0.42	The high (84.50%)
2. Text and complex languages	4.21	0.41	The high (84.17%)
3. Help options	4.13	0.33	The high (82.50%)
4. Space to click	4.12	0.32	The high (82.33%)
5. Vertical and horizontal screen orientation	4.21	0.41	The high (84.17%)
6. Spacing between contents	4.25	0.43	The high (85.00%)
7. Automatic screen lock	4.24	0.43	The high (84.83%)
8. Easy to use touch screen	4.20	0.40	The high (84.00%)
9. Virtual or physical keyboard	4.13	0.37	The high (82.67%)
10. Error messages	4.21	0.41	The high (84.17%)
11. Contrast	4.20	0.40	The high (84.00%)
12. Ease of access to the menu and submenus	4.30	0.46	The highest (86.00%)
13. Accessible data insertion interfaces	4.22	0.41	The high (84.33%)
14. Easy with draganddrop features	4.09	0.29	The high (81.83%)
15. Easy toidentifythe symbols and icons used in the application	4.29	0.46	The highest (85.83%)
16. Perception of audio notificationsan d reminders	4.19	0.40	The high (83.83%)
17. Easy navigation and information flow	4.13	0.34	The high (82.67%)
18. An option to resize the text	4.14	0.35	The high (82.83%)
19. Sound quality	4.19	0.40	The high (83.83%)
Total	**4.19**	**0.40**	**The high (83.87%)**

The result of evaluation for acceptance of the mobile application based on accessibility barriers that could be detected by alumni while being used has high consensus. All of values the interquartile range no more than 1 and the quartile deviation no more than 0.5 in 19 assessment indicators shows as Table V.

Table- V: The result of evaluation for acceptance of the mobile application

Assessment Indicators	Mean	SD	Quartiles			Interquartile Range	Quartile Deviation
			Q 1	*Median*	*Q3*		
Gen B							
1. Font Size	4.05	0.22	4	4	4	0	0
2. Text and complex languages	4.10	0.30	4	4	4	0	0
3. Help options	4.10	0.30	4	4	4	0	0
4. Space to click	4.08	0.27	4	4	4	0	0
5. Vertical and horizontal screen orientation	4.13	0.33	4	4	4	0	0
6. Spacing between contents	4.23	0.42	4	4	4	0	0
7. Automatic screen lock	4.15	0.36	4	4	4	0	0
8. Easy to use touch screen	4.18	0.38	4	4	4	0	0
9. Virtual or physical keyboard	4.05	0.22	4	4	4	0	0

10. Error messages	4.13	0.33	4	4	4	0	0
11. Contrast	4.08	0.27	4	4	4	0	0
12. Ease of access to the menu and submenus	4.25	0.44	4	4	4	0	0
13. Accessible data insertion interfaces	4.15	0.36	4	4	4	0	0
14. Easy with drag-and-drop features	4.08	0.27	4	4	4	0	0
15. Easy to identify the symbols and icons used in the application	4.40	0.50	4	4	4	0	0
16. Perception of audio notifications and reminders	4.10	0.30	4	4	4	0	0
17. Easy Navigation and information flow	4.08	0.27	4	4	4	0	0
18. An option to resize the text	4.10	0.30	4	4	4	0	0
19. Sound quality	4.03	0.16	4	4	4	0	0
Total	**4.13**	**0.33**	**4**	**4**	**4**	**0**	**0**
Gen X							
1. Font Size	4.25	0.44	4	4	4.25	0.25	0.125
2.Text and complex languages	4.43	0.50	4	4	4.25	0.25	0.125
3. Help options	4.15	0.36	4	4	4.25	0.25	0.125
4. Space to click	4.23	0.42	4	4	4.25	0.25	0.125
5. Vertical and horizontal screen orientation	4.33	0.47	4	4	4.25	0.25	0.125
6. Spacing between contents	4.43	0.50	4	4	4.25	0.25	0.125
7. Automatic screen lock	4.45	0.50	4	4	4.25	0.25	0.125
8. Easy to use touch screen	4.38	0.49	4	4	4.25	0.25	0.125
9. Virtual or physical keyboard	4.10	0.30	4	4	4.25	0.25	0.125
10. Error messages	4.30	0.46	4	4	4.25	0.25	0.125
11. Contrast	4.15	0.36	4	4	4.25	0.25	0.125
12. Ease of access to the menu and submenus	4.43	0.50	4	4	4.25	0.25	0.125
13. Accessible data insertion interfaces	4.15	0.36	4	4	4.25	0.25	0.125
14. Easy with drag-and-drop features	4.08	0.27	4	4	4.25	0.25	0.125
15. Easy to identify the symbols and icons used in the application	4.30	0.46	4	4	4.25	0.25	0.125
16. Perception of audio notifications and reminders	4.15	0.36	4	4	4.25	0.25	0.125
17. Easy Navigation and information flow	4.15	0.36	4	4	4.25	0.25	0.125
18. An option to resize the text	4.25	0.44	4	4	4.25	0.25	0.125
19. Sound quality	4.30	0.46	4	4	4.25	0.25	0.125
Total	**4.26**	**0.44**	**4**	**4**	**4.25**	**0.25**	**0.125**
Gen Y							
1. Font Size	4.38	0.49	4	4	5	1	0.5
2. Text and complex languages	4.10	0.30	4	4	5	1	0.5
3. Help options	4.13	0.33	4	4	5	1	0.5
4. Space to click	4.05	0.22	4	4	5	1	0.5
5. Vertical and horizontal screen orientation	4.18	0.38	4	4	5	1	0.5
6. Spacing between contents	4.10	0.30	4	4	5	1	0.5

7. Automatic screen lock	4.13	0.33	4	4	5	1	0.5
8. Easy to use touch screen	4.05	0.22	4	4	5	1	0.5
9. Virtual or physical keyboard	4.05	0.32	4	4	5	1	0.5
10. Error messages	4.20	0.41	4	4	5	1	0.5
11. Contrast	4.38	0.49	4	4	5	1	0.5
12. Ease of access to the menu and submenus	4.23	0.42	4	4	5	1	0.5
13. Accessible data insertion interfaces	4.35	0.48	4	4	5	1	0.5
14. Easy with drag-and-drop features	4.13	0.33	4	4	5	1	0.5
15. Easy to identify the symbols and icons used in the application	4.38	0.49	4	4	5	1	0.5
16. Perception of audio notifications and reminders	4.33	0.47	4	4	5	1	0.5
17. Easy navigation and information flow	4.18	0.38	4	4	5	1	0.5
18. An option to resize the text	4.15	0.36	4	4	5	1	0.5
19. Sound quality	4.18	0.38	4	4	5	1	0.5
Total	**4.19**	**0.44**	**4**	**4**	**5**	**1**	**0.5**
Grand total	**4.19**	**0.40**	**4**	**4**	**4**	**0**	**0**

According to the effectiveness evaluation results among one hundred twenty samples, there were a higher number of Android users than iOS users. There were 93 Android users which made up 77.0% of the users, while there were 27 iOS users which accounted for 23.0%.

It was found that, among the 40 Gen Bers samples, there were 38 Android users (95.0%) and 2 iOS users (5.0%). For Gen Xers, there were 33 Android users (82.5%) and 7 iOS users (17.5%). Finally, there were 22 Gen Yers Android users (55.0%) and 18 iOS users (45.0%), as illustrated in TableVI.

Table- VI: Mobile application use of the sample by generation and operating system

Generation	Android	iOS
B	95.0%	5.0%
X	82.5%	17.5%
Y	55.0%	45.0%

IV. CONCLUSION

This research hereby presents the development of the mobile application for alumni relationship management using oral commands and touchscreen systems. The ionic framework was applied to develop the application in a cross-platform. Especially, the ionic speech recognition was utilized and evaluated the accuracy before developing this system. The evaluation results are 98% accurate in Thai speech recognition related to alumni information and menus in the system. The content consistency was evaluated by five experts in the field of information technology and Thai language education in order to select the features for the developed mobile application. Next, the developed mobile application was distributed to the one hundred twenty samples; the results of the training as well as the pre- and post-learning tests showed that the samples scored higher on the post-test than on the pre-test. Furthermore, the effectiveness evaluation results of the mobile application based on the accessibility barriers that alumni could experience while using the mobile application, showed that, among the nineteen indicators, “ease of access to the menu and submenus” criteria had the highest mean value followed by “easy to identify the symbols and icons used in the application”, and “spacing between contents” respectively. Overall, the mean was 4.19 and the standard deviation was 0.40 on average, showing the developed mobile application was effective for the alumni at a high level and high consensus. All of values the interquartile range no more than 1 and the quartile deviation no more than 0.5 in 19 assessment indicators. The users could learn and employ the application on their mobile devices to manage their alumni relationship effectively. They stated that the distinctive points of the mobile application were the ease of access to the menu and submenus, the easy to identify the symbols and icons used in the application and spacing between the contents. There were also no differences in the evaluation results obtained from the users of three generation. Indicating that the alumni relationship management mobile application using speech recognition is highly effective and could be used to creates a valuable relationship between alumni and their university, and promotes the university to the public.

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