

PharmaSys : Mobile Application for General Medical Terms. Dispensing Instructions and Communication in Pharmacy

A N Azlina¹, Y. Faridah², M Zaki M Amier Akram³

^{1,3}Software Engineering Section, ²Computer Engineering Section, UniKL, Malaysian Institute of Information Teknologi, Kuala Lumpur, Malaysia

¹nazlina@unikl.edu.my, ²faridahy@unikl.edu.my, ³amier2665@gmail.com

Article Info

Volume 82

Page Number: 13362 - 13368

Publication Issue:

January-February 2020

Abstract

Most common problem of diverse nation in the world is communication or language barriers. Miscommunication and misinterpretation are the results of this which can be life-threatening for some diseases. Country like Malaysia, the citizen consists of many Chinese speaking residents. There are also those who came from China resides in Malaysia without the ability to speak and understand English and Malay language. Health sector has the issue of language barriers with could lead problems in wrong medicines dispense, patients wrongly consume their medicines, just to name a few. A mobile application is designed and developed for the mentioned problem that have general medical terms, dispensing instruction and communication in the Mandarin language. Interview sessions with a certified pharmacist working of Alpro Pharmacy at Kemaman, Terengganu, Malaysia is from where the application requirements and design were gathered. With Java language and Firebase integration for the database, six modules of the app produced. Questionnaires given to thirty respondents to gauge the usefulness of the app. Findings showed that 66.67% strongly agreed that the application functions perfectly. Pharmasys, medical mobile application gained 80% satisfaction and considered good system by users.

Article History

Article Received: 18 May 2019

Revised: 14 July 2019

Accepted: 22 December 2019

Publication: 24 February 2020

Keywords; *mobile application, software development, speech translator, user acceptance test*

I. INTRODUCTION

Language is a method of two or more human interactions with common understanding. It has its own grammar and rule to be followed which plays principal part. According to [1] language consists of a set of rules and grammar with norm which allow two human to communicate when both understand the sounds and gestures.

Different ethnic speaks different dialect of common language.

In Malaysia, Chinese is the second major ethnic after the indigenous (Malays), most of them use and understand only Mandarin language in running their

daily routines. Language barriers are common problem for diverse nation countries like Malaysia.

Miscommunication can occur due to many problems such as when languages are misunderstood or lack of knowledge of the language being spoken. It can also lead to misinterpretation. These can cause serious effect in a certain way. When it comes to health perspective, miscommunication and misunderstanding can be life-threatening for human [2].

Health practitioners are still relying on interpreters stated by [3], [4], [5] when it comes to converse with Chinese person who uses a second language

which is weaker than his or her first language, Mandarin.

Most pharmacies in Malaysia does not translate prescription labels for patients who do not understand English and this could lead to poor adherence and negative health outcomes which may include adverse events and drug resistance.

Researchers in [6], [7], [8] agreed that non-English proficient patients have limited knowledge of medication and dosing instruction. It is important for pharmacist or medical officers to ensure that patients fully understand the interpretation and able to give medical prescription label in language that the patient understands [9]. With the advancement of technology and internet communication, came the idea of inventing application for this specific purpose.

PharmaSys application developed locally can address some of the related issues.

This paper is layout as per the following where Section II Comparisons, Section III System Design, Section IV Testing, Section V Result and last but not least the Conclusion.

II. HEALTH APPLICATIONS

There are not many-published literatures regarding existing apps that focus on communication with patients. Most literatures focus on developing communication skills of individuals and those deals directly with patients. The following section discuss available applications made locally and internationally that may help those involved in the healthcare field in order to communicate. Most apps are available and developed in the USA, not many apps are found in Malaysia.

A. Epocrates

This mobile application is for the use of US physicians and developed the USA. It helps better patient care by delivering the right information when needed.

It can prescribe medicines and safety information for thousands of brands, generic and over the counter drugs in US only. Pharmacist able to search for drug information instantly, including accessing the medical news and research information related detailed by [10], [11].

It makes uses of graphical button for navigation purpose and simple to use. User only has to type the medicines name in the search column.

Figure 1.0 is one of the interface for the application.



Figure 1 Epocrates Dashboard [12]

This application is available for Android and Apple operating system but the focus is not on the patients.

B. Drug Dictionary : Medication, Dosage, Uses of drugs

It acts as mobile medical handbook which gives many guides on almost all drugs available in the market. Developer of this apps is from India by the name Atomic Infoapps. Figure 2 describes the interface for the application.



Figure 2 Drug Dictionary Interfaces [12]

The application looks like the printed dictionary that students physically carried to school long time ago. It makes use of simple and easy to follow interface. Available for both Google Play and Apple Store.

It is useful for lookup for both patients and the healthcare industry players.

C. Medscape

It is developed for physicians and healthcare personal in mind and one of the online system for providing latest medical news and expert answers. Developed in the USA and available in English, Deutsch, Espanol, Francais and Portugues languages.



Figure 3 Medscape Interface [12]

Everyone has access to the system including patients and also available online in the Store for Android and Apple phone users. But this application is not for patients monitoring of their own medicine, it is for education and communication purpose.

D. UpToDate

Another famous medical professionals' application in the USA and tailored for their usages. It's a one stop center for patients to look for information not for monitoring their medicines dispensing.

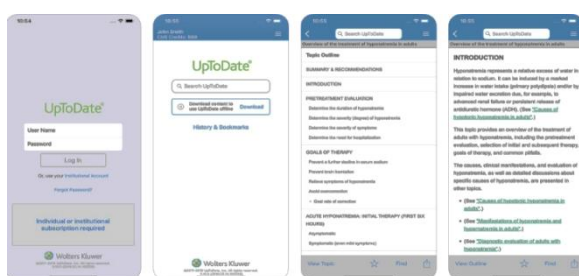


Figure 4 UpToDate Screenshots [12]

Searches can be done in 10 languages (Espanol, Portuguals, Italiano, Francais, Korean, Mandarin, Japanese, English). It helps physicians in making quick decision and getting update information on their related drugs.

E. BP Healthcare Mobile Application

This application is developed in Malaysia especially for BP Social insurance customers.



Figure 5 BP Healthcare Interfaces [13]

The application provides online appointment, coupon and reward systems.

As the internet is developing faster, application software for this area has seen quite number of development growth. Other mobile applications currently available in Malaysia are Doc2Us [14], BookDoc [15], Doctor2U [16], TeleMe [17], DoctorOnCall [18] and GetDoc [19]. All of the applications provide education, help in making appointment, talking and finding doctors. The only languages used are English and Bahasa Malaysia.

According to [20], in Malaysia, the most used drug related medical application used by pharmacists are Micromedex [21], Lexicomp [22] and Medscape. The same report [20], mention Malaysian practitioners preferred overseas application compared to local produced drug information application. In [23] findings from the survey stated that technologies have a huge impact in healthcare systems. In conclusion, use of apps among health practitioners for retrieving drug related information has been the trend, staying forever.

III. SYSTEM DESIGN

Rapid Application Development software development method used as the basis of designing the mobile application. Using the concept of incremental design, focus is given in creating prototyping.

Each components design in parallel. During requirement process, interviews were conducted. Figure 6 showed the use case diagram involving users and administrator.

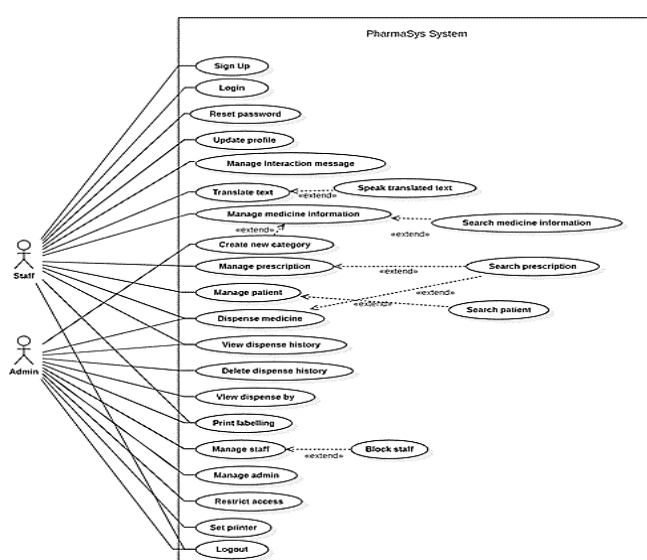


Figure 6 UML of System

It acted as guidance in developing the desired flow of the system.

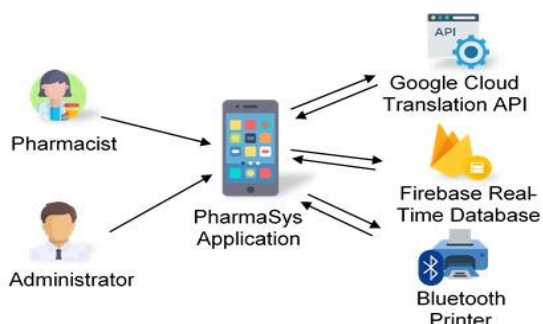


Figure 7 PharmaSys System Architecture

PharmaSys has two users as shown in Figure 7. It make used of Google Translation API for the translation process while Firebase Real-Time

Database used as the database. All related data is stored in here.

The structure of data used here based on JavaScript Object Notation (JSON), a hierarchical data structure. Coding the system interface itself is using Android Studio, which is based in Java code.

A. System Feature

PharmaSys requires user login to access the system, which can be done once user fill in the online registration form. It provides the features of the following:

- 1) Translator from text to speech
- 2) Interaction Access
- 3) Prescription Labelling
- 4) Voice Speech from voice to text
- 5) Medicine Information
- 6) Patient Information

The translator module let user translate English to Mandarin language. Translation will appear with a click of button.

Figure 8 – Figure 10 showed the interface built for the application.

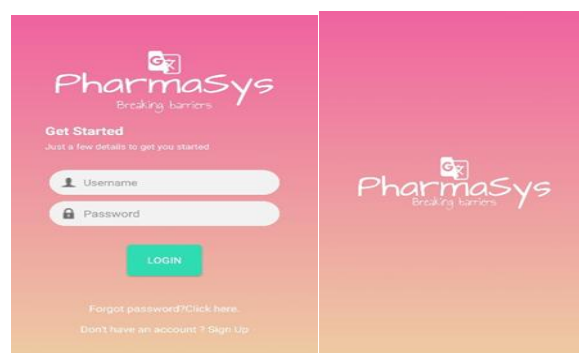


Figure 8 Login Page of PharmaSys

The figure on the right of Figure 8 is the introduction page of the application and it will direct user to the login page. For first time user, registration is required and returning user just need to login with existing user id.

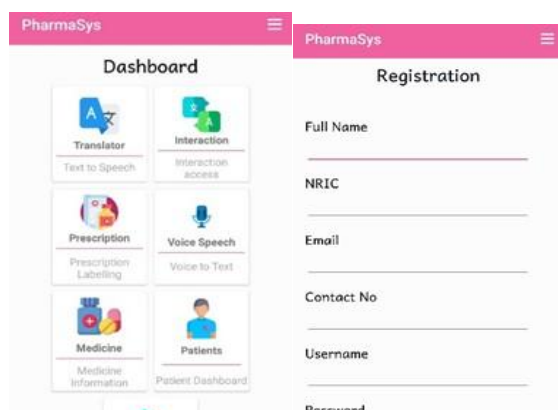


Figure 9 Registration & Dashboard Interfaces

Once registration and login process done, user directed to the dashboard page. This page tells user where they want to go next and let them select their choices.

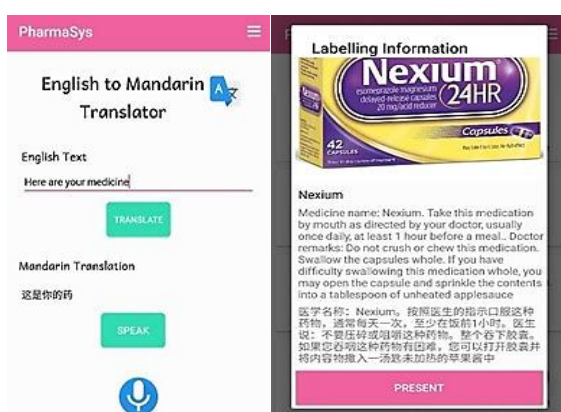


Figure 10 Translator Interface & Labelling

Figure 10 is the important feature that other applications lacking off. User may enter text in the field or use their voice to translate. Label information in dual languages are displayed after user clicked a prescription from the list.

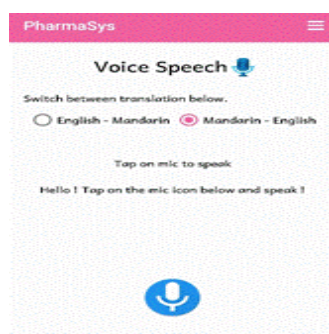


Figure 11 Voice Speech

Figure 11 shown the voice speech module that enables user o speak in chosen language. The language option is in the form of a toggle button that may be selected accordingly. At the bottom of the interface is a button with a microphone icon for user to click before speaking.

All related functions of the application worked as expected and app web page functions well. Next, we discussed on testing section.

IV. TESTING

Rigorous testing done to ensure the system performed as intend using two types of testing.

A. Unit Testing

In this testing, assessments are focused on specific components to determine its functionality. It is done the developer which includes Black Box and White Box testing. For Black box testing does not require the test on internal code structure. Test cases created based on software requirements and specifications as shown Table 1.

Table 1 Test Case Example

Tested By:	Mohamad Al Suhaimi Bin Zaharudin		
Test Type:	Unit Testing		
Test Case Number:	TC_006		
Test Case Name:	User use voice speech to be captured and translated		
Test Case Description:	To test whether a user is able to use speech to text in the Voice Speech module		
Pre-condition:	1. User is logged in 2. User in Translator module		
Item(s) to be tested			
1	Button		
Specifications			
Input		Expected	
Speech		Output/Result/Post-condition	
		Speech will be converted to text and then translated	
Test Scripts			
Test procedure	Expected Result	Pass/Fail	Comment
1. User clicks "Mic" icon below the page and speak	Speech will be captured and translated; result will be shown below the textbox		

B. User Acceptance Testing(UAT)

UAT is the for the benefit of end users, to validate the application with the business requirements. Testing was conducted at UniKL City Campus with 5 users with 7 tasks. The objective is to evaluate on the difficulty level of the completed task. Table 2 is the outcome of the testing.

Table 2 Average Tasks

Task No	Task Description	Average Time Taken (sec)	Time Limit(sec)
Task 1	View Medicine	5.00	10.00
Task 2	Reset password	20.80	40.00
Task 3	Search Medicine	8.10	20.00
Task 4	Dispense a medicine prescription for a patient	28.20	60.00
Task 5	Print prescription labelling	10.50	20.00
Task 6	Voice to speech translation	8.40	20.00
Task 7	Create new medicine information	25.60	30.00

In conclusion, most of the tasks were finished before the time limit., within the time limit, which showed that PharmaSys is a workable prototype with good performance in executing the required tasks

V. RESULTS

30 respondents selected to answer questionnaires with regards on the usability of the software. 24 of them strongly agreed that the app is easy to use and understand. On the navigation within the app, 20 respondents strongly agree it is easy and 28 out of 30 agreed that the app performed efficiently.

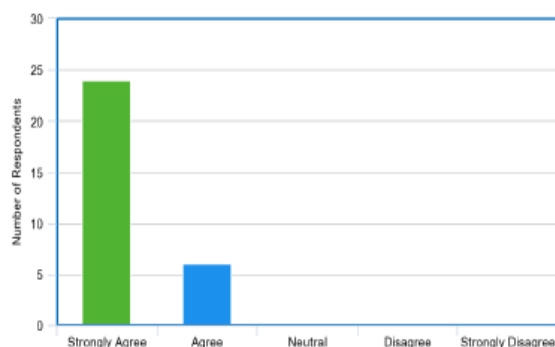


Figure 12 Satisfaction Toward Prototype

Most of the responses are positive towards the application.

CONCLUSION

Conclusively, the mobile application was successfully implemented with good user interface and ready to deployed for users. It has passed all related testing and related modules function as expected.

It enables non-Chinese speaking pharmacist to communicate with non-English and non-Malay speaking Chinese patient. The application intended to be used by local pharmacist in area with high population of Chinese non-English neighbourhood.

Mobile application is useful in daily life to help human manage own difficulties at time. These apps can be developed using the open source software and less costly.

REFERENCES

- [1] R. Nordquist, "ThoughtCo - What is a language," ThoughtCo, 25 May 2019.[Online]. Available: <https://www.thoughtco.com/what-is-a-language-1691218>. [Accessed 23 September 2019].
- [2] C. G. N. S. S. A. G. R. a. J. H. Renata F.I. Meuter, "Overcoming language barriers in healthcare : A protocol for investigation safe and effective communication when patients or clinicians use a second language," BMC Health Services Research Part of Springer Nature, p. 371, 10 September 2015.
- [3] A. M. R. J. K. S. H. a. B. D. W. Barb Jacobs, "Medical Interpreters in Outpatient Practice," Annals of Family Medicine, vol. 16, no. 1, pp. 70-76, 2018.
- [4] M. D. D. N. J. P. &. A. B. Patricia Hudelson, "Interpreter-mediated diabetes consultations: a qualitative analysis of physician communication practices," BMC Family Practice Part of Springer Nature, vol. 14, no. 1, 2013.
- [5] V. P. C. a. P. J. GaurabBasu, "Clinicians' Obligations to use Qualified Medical Interpreters When Caring for Patients with Limited English Proficiency," AMA Journal of Ethics, vol. 19, no. 3, pp. 245-252, 2017.
- [6] G. B. a. N. M.G.C.A. Manchanayake, "Patients' ability to read and understand dosing instructions of their own medicines - a cross sectional study in a hospital and community

- pharmacy setting,” BMC Health Services Research, vol. 18, no. 1, p. 425, 2018.
- [7] A. H. Anandi V. Law, “How do patients read, understand and use prescription labels? An exploratory study examining patient and pharmacists perspectives,” International Journal of Pharmacy Practice, vol. 18, no. 5, pp. 282 - 289, 2010.
- [8] T. P. C. O. L. T. E. M. T. H. Jennifer White, “The Experience of interpreter access and language discordant clinical encounters in Australian health care : a mixed methods exploration,” International Journal for Equity in Health , vol. 17, no. 1, 2018.
- [9] J. S. C. K. F. M. P. P. M. D. T. P. Aisling Kerr, “How can pharmacists develop patient-pharmacist communication skills? A realist review protocol,” Systematic Reviews, vol. 2, no. 14, pp. 2-7, 2017.
- [10] M. Mufin, “Epocrated drug and reference app review,” iMedicalApps MEDPAGE TODAY, 26 April 2016.[Online]. Available: <https://www.imedicalapps.com/2016/04/epocrates-drug-reference-app-review/#>. [Accessed 23 September 2019].
- [11] M. Murfin, “From the PDA to the iPhone 6S: Review of the latest Epocrates drug reference app,” 26 April 2016. [Online]. Available: <https://www.imedicalapps.com/2016/04/epocrates-drug-reference-app-review/>. [Accessed 24 September 2019].
- [12] All, “Application in Google Store and also Apple store,” Google.com and Apple Store, USA, 2019.
- [13] Tiseno.com, “BP Healthcare Mobile Application,” Tiseno.com, 2008 - 2015. [Online]. Available: <http://www.tiseno.com/portfolio-bphealthcare-mobile-appointment-booking-mobile-app-malaysia.html>. [Accessed 27 September 2019].
- [14] DOC2US, “Doc2us,” Doc2us, 2018. [Online]. Available: <https://www.doc2us.com/>. [Accessed 27 September 2019].
- [15] BookDoc, “BookDoc Connect and Unite,” BookDoc, 2017. [Online]. Available: <https://www.bookdoc.com/>. [Accessed 27 September 2019].
- [16] All Health SdnBhd, “Doctor2u One Stop Healthcare App,” All Health SdnBhd, 2019. [Online]. Available: <https://www.doctor2u.my/Home/>. [Accessed 27 September 2019].
- [17] Teleme 2016, “Teleme Feeling Unwell? Find a doctor online,” Teleme, 2016. [Online]. Available: <https://teleme.co/>. [Accessed 27 September 2019].
- [18] Doctor On Call, “Doc Doctor on call,” Doctoroncall, [Online]. Available: <https://www.doctoroncall.com.my/>. [Accessed 27 September 2019].
- [19] Jireh Group, “Get Doc,” Jireh Group, 2019. [Online]. Available: <https://www.getdoc.com/>. [Accessed 27 September 2019].
- [20] M. A. H. D. D. L. P. S. M. L. M. A. H. Y. M. A. A.-W. a. T. M. K. Long Chiau Ming, “Use of Medical Mobile Applications among Hospital Pharmacists in Malaysia,” Therapeutic Innovation & Regulatory Science SAGEPUB.COM, vol. 50, no. 4, pp. 1-8, 2016.
- [21] IBM Corporation, “IBM Micromedex Web Applciations Access,” IBM, 2019. [Online]. Available: <https://www.micromedexsolutions.com/home/dispatch>. [Accessed 27 September 2019].
- [22] Wolters Kluwer, “Lexicomp Online,” Wolster Kluwer, 2019. [Online]. Available: <https://www.wolterskluwercdi.com/lexicomp-online/>. [Accessed 27 September 2019].
- [23] S. Jusoh, “A Survey on Trend, Opportunities and Challenges of mHealth Apps,” International Journal of Interactive Mobile Technologies, vol. 11, no. 6, pp. 73-85, 2017.