

Development of an Application Providing Information on Speech Rehabilitation Service based on Android Mobile Platform

Haewon Byeon¹, Dongwoo Lee² and Sunghyoun Cho^{3*}

¹*Dept. of Speech Language Pathology & Audiology, Nambu University, Gwangju, South Korea, byeon@nambu.ac.kr*

²*Dept. of Physical Therapy, Honam University, Gwangju, South Korea
Lee7810@naver.com*

^{3*}*Dept. of Physical Therapy, Nambu University, Gwangju, South Korea
nambupt@naver.com*

Abstract

Speech therapy service is an area with high level of demand from rehabilitation service users. Speech therapy applications so far developed in Korea have been mostly for rehabilitation purpose but no application has been yet developed that provides information on the operation of public speech therapy clinics including ones operated by universities. This study developed an Android-based application which enables users of speech rehabilitation service to easily find out information on the location, facility and operation hours of speech therapy centers affiliated to universities. The application was developed by using m-BizMaker. The application developed by this study was confirmed to be a convenient application which provides exact information on speech therapy centers affiliated to universities and was highly evaluated for necessity of application, usability of interface and applicability in usability assessment..

Keywords: *rehabilitation service, android-based application, speech therapy centers, speech rehabilitation*

1. Introduction

One of the major tasks to carry out in entering a welfare state is to raise the quality of treatment and rehabilitation service for the disabled. For the welfare of the disabled, Korea enacted 'Special Education Laws for Persons with Disabilities and Others' in 2007 and has provided related services including treatment support and support of supplementary workforce for the disabled [1] and especially, with the implementation of national licensing system for speech therapist from 2011, professional speech rehabilitation service has been implemented for the those with communication disabilities [2].

Due to social problems such as rapid aging and increase of children from multicultural families, it is expected that the prevalence rate of communication disabilities will steadily increase in the future and with this, demand for speech therapy service will also increase. According to Ministry of Employment and Labor, the number of people with disabilities in Korea as of 2013 was a total of 2.511 million, which is 162% increase from 958,000 in 2001, and when Korea enters super-aged society in 2026, it is predicted that number of subjects for speech therapy service will more rapidly increase with the increase in prevalence rate of senile dementia and stroke [3].

Speech therapy service is an area with high level of demand from rehabilitation service users. According to Survey Report on Disabled Children's Use of Rehabilitation Service by Ministry of Health and Welfare [4], speech therapy occupied 48.2% of all rehabilitation services, art therapy 15.4%, psycho-behavioral therapy 9.4%, play therapy

8.0% and music therapy 6.2%, demonstrating that speech therapy is not only in higher demand than other therapies but the voucher share, which is an index indicating the rate of voucher use based on the number of rehabilitation service provided by the Ministry of Health and Welfare, was as high as 85.7%.

Although the number of subjects for speech therapy voucher service radically increased 5 fold from 6,000 in 2007 to 31,000 in 2011, institutions which can provide speech therapy service is short supply given that each institution has 11.3 patients on the waiting list [4].

Meanwhile, mobile information processing service is on the increase in various areas including finance and medicine. Especially, as smart phones, which began to be released in 2009, are leading the mobile age with their function as powerful portable computers [5]. Smart phones are mobile phones equipped with operating systems with major PC (Personal Computer) functions such as transmission of emails and files, web-surfing, navigation and word-processing added to call-making function [6].

Market share of smart phone in Korea was 83% as of 2015 which is the 4th highest in the world after United Arab Emirates (90.8%), Singapore (87.7%) and Saudi Arabia (86.1%) [7]. Development of applications is required to effectively utilize mobile resources in daily living based on high distribution rate of smart phones. Speech therapy applications so far developed in Korea have been mostly for rehabilitation purpose [8, 9, 10] but no application has been yet developed that provides information on the operation of public speech therapy clinics including ones operated by universities.

This study developed an Android-based application which enables users of language rehabilitation service to easily find out information on the location, facility and operation hours of speech therapy centers affiliated to universities. Chapter II introduces present conditions of the speech therapy centers affiliated to universities and chapter III introduces characteristics of Android operating system and applications which provide similar services to the one which this study intends to develop while chapter IV explains service contents and major functions of the application and chapter V presents usability test of the developed application. Chapter VI suggests conclusion and tasks to be conducted in the future studies.

2. Current State of Speech Therapy Centers Affiliated to Universities

Since department of speech therapy was established in Daegu University in 1988, a total of 57 higher educational institutions including 23 graduate schools, 22 university departments and 12 junior colleges are raising speech therapists as of 2016 (Table 1). These institutions operate speech therapy centers affiliated to universities for educational course of clinical practice.

In speech therapy centers affiliated to universities, student speech therapists provide therapy services under the guidance of clinical supervisors with graduate degree and over in speech-language pathology. Speech therapy program conducts speech assessment and therapy on children, adolescents and adults. Speech assessment is conducted individually and speech therapy is composed of individual program and group program depending on the type and degree of disability.

Speech therapy centers affiliated to universities are required to provide information services which are easy for rehabilitation service users to utilize in that they not only are the very educational institutions producing professional workforce who will take charge of the treatment of patients with communication disabilities but also provides most of their speech therapy services free of charge. Therefore, it is very important to develop an application which provides information on location, facilities, operation hours, *etc.* of the speech therapy centers affiliated to universities.

Table 1. Speech Therapy Centers Affiliated to Universities

Institutions	Type	Locations
Kaya University	University	Gyeongsangnam-do
Gwangju University	University	Gwangju
Kwangju Woman's University	University	Gwangju
Gimcheon University	University	Gyeongsangbuk-do
Korea Nazarene University	University	Chungcheongnam-do
Nambu University	University	Gwangju
Catholic University of Daegu	University	Daegu
Daegu University	University	Daegu
Daegu Cyber University	University	Gyeongsangbuk-do
Tongmyong University	University	Busan
Dongshin University	University	Jeollanam-do
Luther University	University	Gyeonggi-do
Catholic University of Pusan	University	Busan
Sehan University	University	Jeollanam-do
Youngdong University	University	Chungcheongbuk-do
Woosong University	University	Daejeon
Wonkwang Digital University	University	Jeollabuk-do
Chosun University	University	Gwangju
Hanlyo University	University	Jeollanam-do
Hallym University	University	Gangwon-do
Honam University	University	Gwangju
Howon University	University	Jeollabuk-do
Keimyung College University	College	Daegu
Catholic Sangji College	College	Gyeongsangbuk-do
Gumi University	College	Gyeongsangbuk-do
Jeonju Kijeon Women's College	College	Jeollabuk-do
Daegu Health College	College	Daegu
Daelim University College	College	Gyeonggi-do
Baekseok Culture University	College	Chungcheongnam-do
Suncheon Jeil College	College	Jeollanam-do
Chunnam Techno University	College	Jeollanam-do
Jeju College of Technology	College	Jeju-do
Choonhae College of Health Sciences	College	Ulsan
Hyejeon College	College	Chungcheongnam-do
Gachon University	Postgraduate school	Gyeonggi-do
Kangnam University	Postgraduate	Gyeonggi-do

	school	
Kosin University	Postgraduate school	Busan
Kongju National University	Postgraduate school	Chungcheongnam-do
Kwangju Woman's University	Postgraduate school	Gwangju
Korea Nazarene University	Postgraduate school	Chungcheongnam-do
Nambu University	Postgraduate school	Gwangju
Dankook University	Postgraduate school	Gyeonggi-do
Daegu University	Postgraduate school	Daegu
Daegu Haany University	Postgraduate school	Daegu
Dongshin University	Postgraduate school	Jeollanam-do
Luther University	Postgraduate school	Gyeonggi-do
Myongji University	Postgraduate school	Seoul
Sehan University	Postgraduate school	Jeollanam-do
Yonsei University	Postgraduate school	Seoul
Yong In University	Postgraduate school	Gyeonggi-do
Wonkwang University	Postgraduate school	Jeollabuk-do
Ewha Womans University	Postgraduate school	Seoul
Chonbuk National University	Postgraduate school	Jeollabuk-do
Chosun University	Postgraduate school	Gwangju
Chungnam National University	Postgraduate school	Daejeon
Hallym University	Postgraduate school	Gangwon-do
Honam University	Postgraduate school	Gwangju

3. Android Operating System

Developed by Google Inc., Android operating system is mainly used by products like Galaxy series of Samsung Electronics Corp. and others. While Apple's imbedded operating system iOS is applied only to the products of Apple Inc., it is the characteristics of Android OS that the operating system is an 'open system' which can be applied to any products of any smart phone makers [11].

3.1. Similar Web Services; I-home T

'I-home T' is a mobile application which connects speech therapists with language rehabilitation service users and users can not only have counseling service but also search personal information on speech therapists in the local communities (Figure1). However, it has limitations that its language rehabilitation service is restricted to home visiting service and it is a commercial program which can be utilized only when the users join membership.

Its major functions are as follows;

- ① Provides counseling related to speech therapy service through [counseling inquiry] bulletin.
- ② Users can search out-of-pocket payment and governmental subsidy amount in [developmental rehabilitation voucher service] bulletin.
- ③ Users can search therapists by area in [Search] bulletin.

3.2. Information Application for Cerebral Palsy

'Information Application for Cerebral Palsy' is a mobile application which provides rehabilitation service for patients with cerebral palsy (Figure 2). Although one can use the program without joining membership, it has the weakness that most information provided is limited to general explanation on cerebral palsy.



Figure 1. Main Page of 'I-Home T' Mobile Application



Figure 2. Screen of Information Application for Cerebral Palsy

4. Results

4.1. Application Services Configuration

‘SLT-CA’, an application providing information on speech therapy service based on Android mobile platform developed by this study, has major functions such as search for speech therapy centers affiliated to universities, their locations and hours of operation, phone connection and inquiry (Contact Us).

Major services provided by the application are as follows;

- ① Search for speech therapy centers affiliated to universities by region
- ② Procedure to use services
- ③ Hours of operation, contact phone numbers, maps
- ④ Phone connection
- ⑤ Contact Us (for inquiries)

The application was developed by using m-BizMaker [12] of Wonderful Soft Inc. m-BizMaker has the strength of enabling users to develop mobile applications with powerful graphical user interface (GUI) program based on AI engine. In addition, as it can be distributed in the form of pure web applications such as HTML5, CSS3 and JS, in can be operated in most mobile devices regardless of mobile OS. Table 1 presents menu and contents of the developed application and Figure 3 shows initial screen of the application.

Table 2. Menus of Application

Main menu	Sub menu	Contents
Search for speech therapy centers by region	Information as facilities,	Hours of operation, phone number and map
Procedure to use speech therapy centers	-	Procedure to use centers
Phone connection	Phone connection	Phone connection
Inquiries	Contact Us	Contact Us

4.2. Major Functions of Application: Search for Speech Therapy Centers Affiliated to Universities by Region

This page enables a user to search speech therapy centers affiliated to universities by region (Figure4). Region is divided by the unit of province. If a speech therapy user clicks a logo of a speech therapy center affiliated to a university which is most closely located to the user, not only is it connected to the page introducing the center which provides such information as facilities, hours of operation, phone number and map but also is it possible to connect the homepage of the speech therapy center if the user clicks another icon (Figure5).

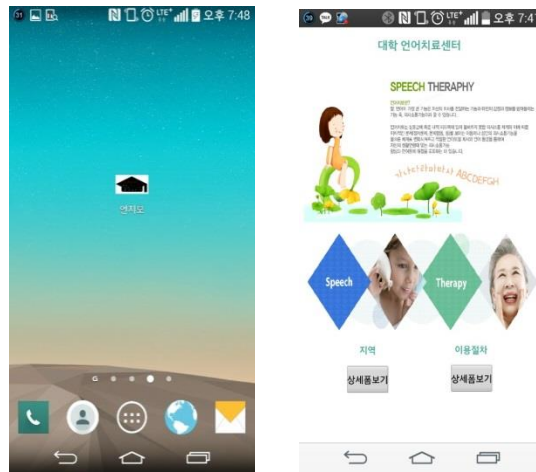


Figure 3. Initial Screen of Application



Figure 4. Search for Speech Therapy Centers by Region

4.3. Procedure to Use Speech Therapy Centers

Main page provides information on the procedure to use speech therapy centers affiliated to universities by stage (Figure6). The procedure to use services is presented in flow chart and when a user clicks on each stage, the page automatically moves to the page with detailed information.



Figure 5. The Page Introducing the Center

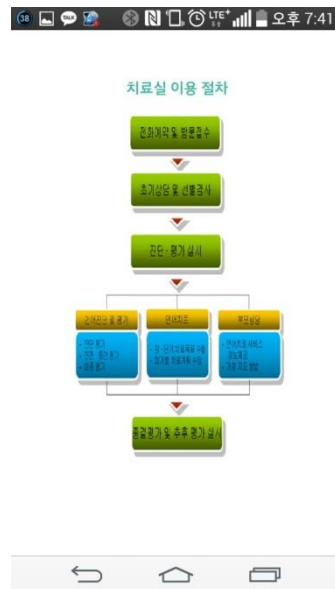


Figure 6. Procedure to Use Centers

4.4. Phone Connection

If a user clicks on the phone number on the page introducing a center, phone is automatically connected to the center (Figure 5). Java source for 'phone connection' is presented in (Figure7).

```
package jsh.exam.call;
import android.app.Activity;
import android.content.Intent;
import android.net.Uri;
import android.os.Bundle;
import android.view.View;
import android.view.View.OnClickListener;
import android.widget.Button;
public class main extends Activity implements OnClickListener {
    /** Called when the activity is first created. */
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);
        Button bt1 = (Button) findViewById(R.id.button1);
        bt1.setText("전화감기");
        Button bt2 = (Button) findViewById(R.id.button2);
        bt2.setText("다이얼번호");
        bt1.setOnClickListener(this);
        bt2.setOnClickListener(this);
    }
    @Override
    public void onClick(View arg0) {
        // TODO Auto-generated method stub
        switch (arg0.getId()) {
            case R.id.button1:
                startActivity(new Intent(android.intent.action.CALL,
                    Uri.parse("tel:010-0000-0000")));
                break;
            case R.id.button2:
                startActivity(new Intent(android.intent.action.DIAL,
                    Uri.parse("tel:010-0000-0000")));
                break;
        }
    }
}
```

Figure 7. Java Source for Phone Connection

5. Result of Usability Test

The result of questionnaire evaluation in 5-point scale on overall development goal, contents, teaching-learning strategy, usability, composition of management mode and general UI of the application was very positive with 4.24 points (Table 3). As for specific evaluation by item, while responses to 'necessity for development (4.88 points)' and 'contribution to communication (4.75 points)' were the most relatively positive among constituting factors of user interface, responses were relatively negative to 'thickness and color of the buttons (3.85 points)' and 'composition of screen (3.98 points)'.

Table 3. Results of Usability Testing

Items		Tests	Mean scores
Development goal	1	Is development necessary?	4.88
	2	Does it contribute to provision of information?	4.75
Contents	3	Level of expression of function buttons	4.03
	4	Thickness and color of buttons	3.85
	5	Composition of screen	3.98
Convenience	6	Efficiency	4.25
	7	Ease of search	4.33
Usability	8	Usability at home	4.42
Grand mean			4.24

6. Conclusion

The application developed by this study was confirmed to be a convenient application which provides exact information on speech therapy centers affiliated to universities and was highly evaluated for necessity of application, usability of interface and applicability in usability assessment. This application developed by this study is expected to provide useful information for those who can't receive rehabilitation service due to lack of institutions providing speech therapy service. In order to provide more effective information for the subjects of rehabilitation service, applications which provide reservation service for treatment and professional consultation service are required to be developed in the future.

This study developed an application which provides information on location, facilities and operation hours of speech therapy service for speech rehabilitation service users based on Android Mobile Platform and conducted usability assessment on the parents of the children with disabilities.

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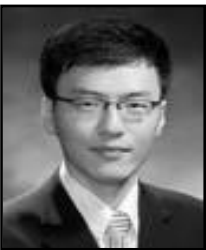
Authors



Haewon Byeon, received his Dr. Sc. degree in Biomedical Science from Ajou University School of Medicine. He is a professor in Department of Speech Language Pathology & Audiology and director of Speech Language Pathology Center in Nambu University. His recent interests focus on health promotion and biostatistics.



Dongwoo Lee, received his PhD degree in Physical Therapy from Dongsin University. He is a professor in Department of Physical Therapy in Honam University, Gwangju, Republic of Korea. His recent interests focus on therapeutic exercise.



Sunghyoun Cho, received his PhD degree in Physical Therapy from Daegu University. He is a professor in Department of Physical Therapy in Nambu University, Gwangju, Republic of Korea. His recent interests focus on Biomechanics and Therapeutic exercise.

