



# Assisting the visually impaired to deal with telephone interview jobs using information and commutation technology



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## ARTICLE INFO

### Article history:

Received 22 April 2014

Received in revised form 16 July 2014

Accepted 6 August 2014

Available online 7 September 2014

### Keywords:

Information and commutation technology

Visually impaired

Text-to-speech

Braille

Telecommuting

Telemarketing

## ABSTRACT

This study proposed a new information and commutation technology assisted blind telephone interview (ICT-ABTI) system to help visually impaired people to do telephone interview jobs as normal sighted people and create more diverse employment opportunities for them. The study also used an ABAB design to assess the system with seven visually impaired people. As the results, they can accomplish 3070 effective telephone interviews per month independently. The results also show that working performance of the visually impaired can be improved effectively with appropriate design of operation working flow and accessible software. The visually impaired become productive, lucrative, and self-sufficient by using ICT-ABTI system to do telephone interview jobs. The results were also shared through the APEC Digital Opportunity Center platform to help visually impaired in Philippines, Malaysia and China.

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## 1. Introduction

Blind and low vision people are often considered as lacking ability to work because of the defects in visual acuity. A lot of visually impaired people are in the long-term unemployed status, and they are disadvantaged group in employment. The employment rate of them is low, and most of them make a living by massage in Taiwan (Jang, Wang, Lin, & Shih, 2013). This may be caused by the long-term legislation protection of massage jobs for the visually impaired to do only in Taiwan. Although the intention is good to protect the visually impaired people's right for working, it also encourages them to make a living by massage. After Taiwan's grand justice constitutional interpretation announced that the massage is no longer the exclusive rights and interests of the visually impaired. The unemployment situation of the visually impaired will become more serious.

At mean time, the government also announced "Taiwan People with Disabilities Rights Protection Amendment Act". The new clauses stipulated that if the telephone service of government agencies employed more than 10 people, they should hire more than one visually impaired agent. This is a very good chance to follow government policy and help visually impaired people to do telephone service. There are many kinds of telephone service. Some telephone services are too complex for the visually impaired to do. The authors cooperated with resources center for the blind in Tamkang University to evaluate proper

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telephone services and found that telephone interview or telemarketing jobs are very suitable for visually impaired to do. Not only the information is less than the others but also the operation steps are simpler than other telephone services. So we decided to choose these services as development target and plan to establish an information and communications technology (ICT) assisted telephone interview teleworking system for the visually impaired to undertake customer satisfaction telephone interview, telephone market research, telephone opinion polls, and telephone audience survey jobs. It also offers a new choice for government agencies and enterprises to hire visually impaired people.

There are several assistive technologies have been developed for the visually impaired and the disabled. These techniques help them in learning, communicating with other people, getting information, working, and improving quality of life. For example, blind computer with screen reader software (McCarthy, Pal, & Cutrell, 2013), Braille display device (Yeh, Tsay, & Liang, 2005) and computer-aided telephone system with microswitch hardware to assist the disabled (Lancioni, O'Reilly, Singh, & Oliva, 2011; Lancioni, O'Reilly, Singh, Sigafos, et al., 2011; Lancioni et al., 2013; Perilli et al., 2012, 2013). If we give appropriate assistance to the visually impaired to meet their need, it will be able to shorten the gap with the sighted people. Not only assist them to learn and get information, but also help them to do computer typing, customer service, or other ICT related jobs. There was a project named Towards Handicap Integration Negotiating Knowledge (THINK) supporting physical disabled employment in Europe. It professionally integrated 300 physical disabled people as teleworkers in 5 European countries. In Taiwan, there were also some similar cases and projects which tried to assist physical disabled people working in cell phone repair service. However, these employment opportunities are only available for the disabled with normal vision and do not take care of the visually impaired.

In this study, the authors cooperate with resources center for the blind in Tamkang University and use ICT assistive technologies to help visually impaired people to do telephone interview jobs. Among the many types of the customer service telecommuting jobs, the authors found that customer satisfaction telephone interview service is very suitable for visually impaired to do. The information of this service is limited. It does not like other customer services which have huge information to read and will cause blind people have trouble to get all information in time. Also, the visually impaired can work at home or remote accessible working environment by assisting with the internet and voice over internet protocol (VoIP) technologies. So we chose customer satisfaction survey telecommuting service as our first target and try to assist blind people to do this kind of jobs with ICT. In order to achieve the goal, several assistive technologies, like text-to-speech technology, Braille display technology, customer service technology, VoIP, and internet technology are integrated in one blind user interface to overcome the issues that visually impaired encountered in this service.

The first issue is reading customer's information. Because the visually impaired people cannot read the information which displayed on the computer screen, including customer's name, address, service type, and so on. So, an assistive technology of reading customer's data was used to solve this issue. We can use text-to-speech technology and Braille display technology to assist visually impaired getting information of the customer. The text-to-speech technology can convert the text into speech signal then output to headset. Let visually impaired people can hear the content of the customer's information displayed on the computer screen. A text-to-speech engine contains text processing, prosody prediction, and synthesizer. First, it converts text to phonetic transcriptions, divides, and marks the text into prosodic units (phrases and sentences). Then the proper prosodic information will be generated according to the nearby phonetic transcriptions context. This part includes the computation of the target prosody (pitch contour and phoneme durations). Finally, the synthesizer uses the output information from text processing and prosody prediction modules to produce the speech signal. The Braille display assistive technology can be used to help visually impaired people to understand the content on the computer screen. It can translate the text information displayed on computer screen to Braille character. A Braille character is made up of six dots positions which arranged in a rectangle containing two columns of three dots each. A Chinese character consists of an initial, a final, and a tone. Each cell of Braille display can express one part. For example, a Chinese character 'ba' will be translated to dot 'one, three, five' as initial part 'b', dot 'three, four, five' as final part 'a', and dot three as tone in three cells. The Braille character is widely used by visually impaired people to read and write.

The second issue is following the questionnaire and filling the answer of each question. The text-to-speech technology and Braille display technology are also used to solve this issue. When visually impaired people realize the content of the questionnaire, they can interview customers about service satisfaction by telephone. A Braille computer input method is also used to assist blind people filling the comment of the questionnaire. They can use 'F', 'D', 'S', 'J', 'K', 'L' keys on the computer keyboard as Braille dot one, two, three, four, five, six to input Chinese characters. For example, the input steps of Chinese character 'ba' are described as follows. The first step is pressing 'F', 'S', 'K' on the keyboard at the same time. It will be translated into Chinese initial 'b'. The second step is pressing 'S', 'J', 'K' on the keyboard at the same time. It will be translated into Chinese final 'a'. The final step is pressing 'S' to choose Chinese tone one to complete the input of this Chinese character.

The third issue is making out bound call for visually impaired people. The traditional telephone equipment is not suitable and not easy for them to use. Visually impaired people have to memorize and dial the number themselves, after they read customer's phone number from speech synthesis or Braille display device. It is very inconvenient for them. If we can assist them to dial from computer directly and communicate with customer by wearing a headset attached to computer sound card, it will enhance the performance of telephone interview greatly. So, a method of integrating VoIP, speech synthesis, and Braille display technologies to help visually impaired control the telephone from computer directly was proposed. It can control the computer telephone integration (CTI) server, make phone call, and hang up phone. It also can transmit speech data between computer headset and customer via VoIP. The speech synthesis and Braille display technologies are also used to prompt the dialing progress and telephone status to assist blind people.

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