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THE IMPACT OF SIGN LANGUAGE AND SPEECH TRANSLATORS ON THE MFD COMMUNITY: A STATISTICAL ANALYSIS

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ABSTRACT

This research introduces a survey on the impact of the existing and developed Automatic Sign Language Translator (ASLT) and Speech Translator (ST) systems on the hearing/speech impaired societies. The objective of the study is to examine whether these automatic systems are able to split the communication barriers between hearing/speech impaired people and hearing people. Essentially, the research explores the outcome of the survey which was conducted in collaboration with the Malaysian Federation Deaf (MFD) society in Malaysia. The significant of this research lies in the fact that it serves exceptional human course. Data and information collected are systematically organized for reliability purposes.

Keywords: ASLT, ST, survey, statistical analysis, MFD society, hearing/speech impaired people, hearing people

INTRODUCTION

This research is in line with the universal and humanistic doctrine which denotes the notion that: "everybody's voice must be heard loud". The research further endeavours to know more about the hearing/speech impaired societies to enhance their opportunities in life. It is with no doubt that, this study serves human course. Ultimately, hearing/speech impaired societies are part of the mainstream societies; hence, they should be accommodated and assisted so as to ease their burden and smoothen their daily activities with better facilities. As a matter of fact, deafness is a condition or disability which affects humans in all levels of life; it affects children, adults, woman and men in their social, education and religious activities. Nonetheless, the world communities have agreed that hearing/speech impairment should not be considered as a reason for discrimination in workplace, education and in the level of socialization. Similarly, religious teachings do not see deafness as a downbeat disability or a repulsive state of human condition. Islam, for instance, sees deafness as being deaf of wisdom and divine teachings. It is remarkable to note that, the Qur'an, the main source of Islamic teachings, has in no place used the term deaf to mean hearing/speech impaired people or deafness in the physiological sense.

The Qur'anic concept of hearing/speech impaired person (*assam*), connotes those individuals who consciously turn away from the universal moral essence to follow their own whims and impulses. The Qur'anic dictum on this contention reads: *"And so the parable of those who are bent on denying the truth is that of the beast which hears the shepherd's cry, and hears in it nothing but the sound of a voice and a call. Deaf they are, and dumb, and blind: for they do not use their reason." (Al-Qur'an 5:7).* On balance, the religious understanding of deafness is not the loss of the hearing senses, rather the inability to use sound reasoning to reach absolute truth.

BACKGROUND AND DEFINITIONS

The SL and ST are two systems which work in parallel form that they both function to enrich the communication level between the hearing/speech impaired and hearing people. The SL translator is a way of communication that can automatically translate the signs signed by the hearing/speech impaired person to an understandable language that the hearing people could understand (Starner & Pentland, 1995a, 1995b). Whereby the ST works on the other side, which means it automatically translates the spoken language of the speaker to a text or an avatar producing signs which translates the speech (Ypsilos, Hilton, Turkmani & Jackson, 2004). Therefore, the two earlier systems are

complementary to each other to establish a full automatic communication environment between the hearing/speech impaired and spoken people.

The survey took place within the diverse centres of MFD society in Malaysia. Questionnaires in Malay language were distributed to the aforementioned society, during which, 92 of them responded to the survey from four different centers; including Puchong, Shah Alam, Selayang and Penang. Despite the fact that the developing of such automatic systems (SL and ST) has taken place since the 90's, but such survey has not been done before the one at hand. For that, this survey is the first of its kind. The difficulties arise from the lack of reading and writing among the hearing/speech impaired societies where they prefer to use SL in their daily communication life. Interpreters have to translate and explain the questions in the classrooms to simplify the task to the respondents. In general the objectives of this paper are:

a. To discover mainly which method among the three available methods namely, writing, lip reading, and SL, the hearing/speech impaired people prefer to communicate with between themselves.
b. To find out whether the developed automatic systems such as SL translators and STs will help to establish a superior communication environment between the hearing/speech impaired people and the hearing people.
c. To know the preferable method from either writing or interpreters, the hearing/speech impaired people use with hearing people in private communication.
d. To find out whether the hearing/speech impaired people are ready to use such system as a way of communication, as well as, to value their enthusiasm toward using a new technology in their communication with others.

There are approximately 40,000 hearing/speech impaired populations registered with Social Welfare Department (SWD) of Malaysia by late December 2011. Malaysia had signed the UN Convention on the Right of People with Disabilities (UNCRPD) and passed the people with disabled Act 2008 (Act 685) to give the people with disabilities opportunities to live as normal citizens of Malaysia.

In view of UNCRPD and in line with the Act of 685, access of communication for hearing/speech impaired and hard of hearing person need more concern. There are lack of qualified SL interpreter for hearing- impaired in most of the countries to meet the high demand of SL interpreting services by hearing/speech impaired students studying at local universities, polytechnics and community college. Although the SL is the only common language which can provide the medium communication for the hearing/speech impaired people, not many people with the disability understand it. This condition gets worse when the number of normal people who understand the SL are limited (Ladner, 2009). The questionnaire has been written in Malay (Bahasa Melayu) and English language. Several terms used in the questioning paper requires an accurate definition. These terms constitute interpreters, cochlear implants, lip reading, and hand writing, as well as, SL translators and speech translator.

a. Interpreters: SL Interpreter is a professional who is fluent in two or more SLs and interprets between a source language and a target language and mediates across cultures. The interpreter's task is to facilitate communication in a neutral manner, ensuring equal access to information and participation. SL interpreters can be both hearing/speech impaired and hearing person but should always carry appropriate SL interpreter qualification from the respective country (Interpreter, 2012)
b. Cochlear implants: Cochlear implants are a small, complex electronic device that can help to provide a sense of sound to a person who is profoundly hearing/speech impaired or severely hard-of-hearing (Disorders, 2011). Use of a cochlear implant requires both a surgical procedure and significant therapy to learn or relearn the sense of hearing. Not everyone performs at the same level with this device and therefore, they are not available option for all hearing/speech impaired people.
c. Lip reading: lip reading is defined as "seeing the sound of speech". The movements of the lips and the tongue, together with facial expression and body language are all clues for the Lip reader (Short *et al.,* 2012). The Lip reader will also observe the syllables, the natural flow, the rhythm and phrasing and the stress of speech.

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d. Hand Writing: Writing is a skill that a person can develop since young age. (Meyer, 2007) studies how hearing/speech impaired children connecting writing to spoken/signed language. Based on that, she discovered that, the writing of children who are hearing/speech impaired begins to look noticeably different from their hearing peers. There are different terms used in the hearing/speech impaired society which are "Hand writing" and "Signwriting". Sign writing uses symbols to represent different hand shapes, hand movement, palm orientation, facial activity, and body movements. It is also written down in columns, thus spatial relationships may be encoded in the use of space within the column (Galea, 2006).
e. SL translators: is an automated system which is able to translate a particular SL of hearing impaired person into a chosen language.
f. Speech translator: It is an automatic system that can translate speech-to-text. There are some systems available in the market such as SpeechTrans™ from iPhone (InterprePhone™, 2012), Dragon Dictate 2.5 for Mac from Macintosh (Nuance, 2012), and voice to text software is available at http://voicetotextsoftware.net/.

STATISTICAL ANALYSIS

This section presents the results of the statistical analysis of the data using SPSS software ("SPSS Software," 2012) concerning the feedback from the hearing/speech impaired community based on the idea of developing automatic SLTs in selected centres of MFD society. The questionnaire is divided into three main sections. Based on these, the statistical analysis results are divided into four sections. Section I elaborates about respondents' demographic characteristics. Then, Section II contains responses about the most preferred method of ASLTs for communication among hearing/speech impaired and hearing communities as well as which system is most used by hearing/speech impaired communities for communication. Section III of the questionnaire is aimed to find out whether the developing system 'A' (SLT) and system 'B' (ST) could establish a level of acceptance in building mechanism between hearing/speech impaired and hearing people. Section IV of the statistical analysis describes the distribution of items in relation to demographic of gender.

Section I: Respondents Demographic Characteristics

Table1 below shows the distribution of questionnaires according to the selected demographic variables. A total of 92 hearing/speech impaired people from selected centres such as Penang centre, which consists of 30% (n=28), followed by Vocational School Shah Alam 24% (n=26), Community College Selayang 23% (n=25) and Puchong centre with 17% (n=19). The respondents of this study consist of 49% (n=45) male and 51% (n=47) female. In relation to age, 57% (n=52) of them are below 16-24 years of age, with 24 % (n=22) falling between the age of 25-30 years, and 17% (n=16) are 36-55 years old and only 1 % (n=1) is above 56 years old and 7-15 years old.

Table 1. Frequency and Percentages of the Demographic Characteristics of the Respondents

Characteristics	Frequency (n)	Percentage (%)
Centre		
Puchong Centre	17	19
Penang Centre	28	30
Vocational School Shah Alam	24	26
Community College Selayang	23	25
Gender		
Male	45	49
Female	47	51
Age		
7-15	1	1
16-24	52	57
25-30	22	24
36-55	16	17
56 above	1	1
Total	92	100

(n=92)

Distribution of Gender in the Centres

As shown in Table 2 and Fig. 1, from a total of 92 hearing/speech impaired males and females responded , the majority of them (n=28) are from Penang centre, that is to say, (n=8) males and (n=20) females have responded. Followed by Vocational School Shah Alam in which the male respondents are (n=24) which represented a large number and none of the females responded. Meanwhile, in Community College Selayang only (n=3) males responded compared to (n=20) females respondents. The small number of respondents came from Puchong Centre in which the males constituted of (n=10) and females consisted of (n=7). In total, female respondents (n=47) are higher than male respondents (n=45).

Table 1. Distribution of Gender in the Centre

Centre	Gender		Total
	male	female	
Puchong Centre	10	7	17
Penang Centre	8	20	28
Vocational School Shah Alam	24	0	24
Community College Selayang	3	20	23
Total	45	47	92

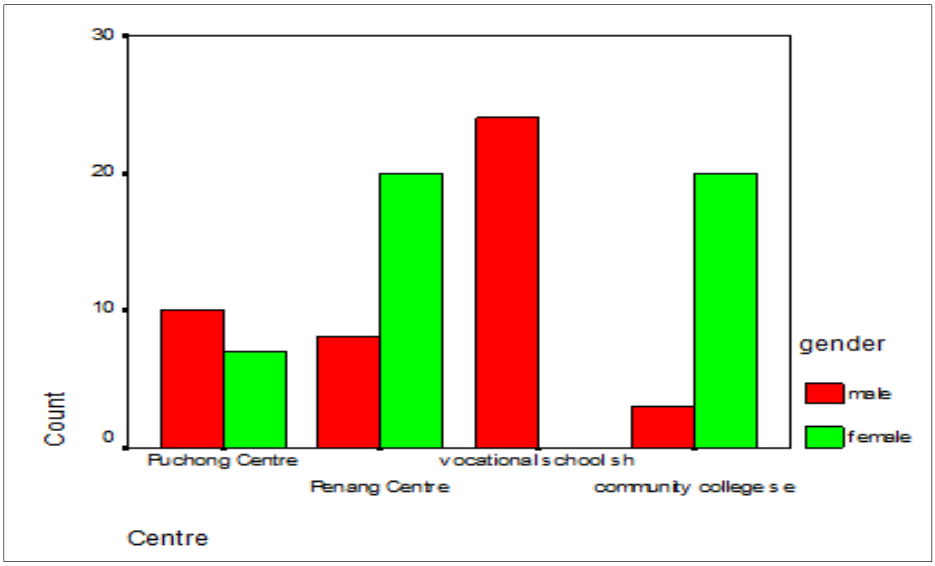

Figure 1. Distribution of Gender and Centre

Section II: Method Preferred by Hearing/Impaired Community

Table 2. The Most Preferred method of communication which respondent use within the hearing /speech impaired communities

Item	The Most Preferred Method	Frequency	Percent
1.	Writing Method	9	10%
2.	Lip Reading Method	13	14%
3.	Sign Language Method	70	76%

(n=92)

Under the first question, "*What is the most preferred method of communication which you use within the hearing/speech impaired communities?*" Table 3 clearly illustrated the result of the findings where

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majority of respondent preferred SL method (76%), followed by lip reading method (14%) and the least preferred method is the writing method (10%). This concludes that, the hearing/speech impaired communities favour SL method to communicate among themselves rather than lip reading or writing methods.

Table 3. Method respondent use to understand hearing people Speech

Item	Method	Frequency	Percent
1.	Lip Reading	13	14%
2.	Cochlear implants	15	16%
3.	Interpreters	64	70%

(n=92)

Under the second question, "*What method you use to understand hearing people speech?*" Table 4 clearly illustrated the result of the findings where majority of respondent used interpreters to understand hearing people speech at 70% (n=64), then followed by cochlear implants at 16% (n=15) and the least is lip reading at 14% (n=13).

Table 4. Method preferred to establish communication/interaction with hearing people

Item	Method	Frequency	Percent
1.	Writing Method	32	35%
2.	Interpreters Method	60	65%

(n=92)

Under the third question, "*What method do you prefer to establish communication/interaction with hearing people?*" Table 5 elucidates that, the majority of hearing/speech impaired community prefers interpreters method at 65% (n=60) to communicate or interact with hearing people. However, there are 35% (n=32) of hearing/speech impaired persons who like to make use of writing method to communicate or interact with hearing people.

Table 5. Method preferred to establish communication/interaction in private conversation with hearing people

Item	Method	Frequency	Percent
1.	Through Writing	36	39%
2.	Through Interpreters	56	61%

(n=92)

Under the fourth question, "*What method do you prefer to establish communication/interaction in private conversation with hearing people?*" Table 6 evidently demonstrates that the majority of hearing/speech impaired community have chosen interpreters at 61% (n=56) to communicate or interact in private conversation with hearing people. However, there are 39% (n=36) hearing/speech impaired persons have shown a preference in writing method to communicate or interact in private conversation with hearing people.

Table 6. Prefer the SL translation in English or Malay

Item	SL translation in English or Malay	Frequency	Percent
1.	English	3	3%
2.	Malay	89	97%

(n=92)

Under the fifth question, "*Would you prefer the SL translation in English language or Malay language?*" Table 7 visibly confirms that the majority of the respondents favoured translation in Malay language at 97% (89) and only 3% (n=3) of them preferred translation in English language.

Section III: Development of two Automatic Systems: System 'A' and System 'B'

This section finds out whether the developed automatic systems such as SL translators and STs will help to establish a superior communication environment between the hearing/speech impaired people and the hearing people.

System 'A' (SLT)

It translates the SL to an understandable language such as English or Malay. This system can be used in situations where privacy is of high concern, such as in hospitals (or medical doctor's room) and/or lawyer's office. The system requires the signer to stand in front of a screen attached to camera. Then, the system automatically translates the SL into text or voice.

System 'B' (ST)

Speech translator is a system that can translate the speech into text or SL, which will be performed by an animation or an avatar.

Table 7. System used by hearing/speech impaired communities

Item	System used	Frequency	Percent
1.	System A (SLT)	42	46%
2.	System B (ST)	31	34%
3.	Never	19	21%

(n=92)

From Table 8, the result shows that the majority of respondents at 46% (n=42) have used system 'A', that is to say, SLT device to communicate with hearing community. While, 34 % (n=31) used system 'B', that tells, ST device to communicate with hearing community. However, 21% (n=19) neither answered system 'A' nor system 'B'.

Table 8. System necessary in helping to communicate with the hearing societies

Item	System necessary	Frequency	Percent
1.	Yes	52	57%
2.	No	40	43%

(n=92)

In Table 9, 57% (n=52) respondents agreed that, system 'A' SLT and system 'B' ST are necessary in helping them to communicate with the hearing communities. On the other hand, a huge percentage of 43% (n=40) thought that these systems are not necessary in helping them to communicate with the hearing societies.

Table 9. Volunteer in developing and testing the system

Item	Volunteer	Frequency	Percent
1.	Yes	54	59%
2.	No	38	41%

(n=92)

Table 10 shows that 57% (n=52) of the respondents accepted system 'A' and system 'B' in helping them to communicate with the hearing communities. Nevertheless, 43% (n=40) reflected that these systems are not necessary in helping them to communicate with the hearing societies.

Section IV: Gender

Table 11 and Fig. 2 show the methods of communication which respondents use within the hearing/speech impaired community namely; writing method, lip reading method, and SL method. The hearing/speech impaired people prefer to communicate between themselves through SL method. The

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results of the study indicate that female and male respondents mostly have preferred SL method (n=36) and (n=34). Male respondents preferred lip reading method (n=7) compared to female respondents (n=6). Similar trends are also observed for the second and least preferred methods. The least method is writing method which female respondents (n=5) preferred compared to their male respondents (n=4).

Method Preferred by hearing/impaired community

Table 10. Gender vice the most preferred method of communication which respondent use within the hearing /speech impaired communities

Item	Method	Male	Female	Total
1	Writing Method	4	5	9
2	Lip Reading Method	7	6	13
3	Sign Language Method	34	36	70

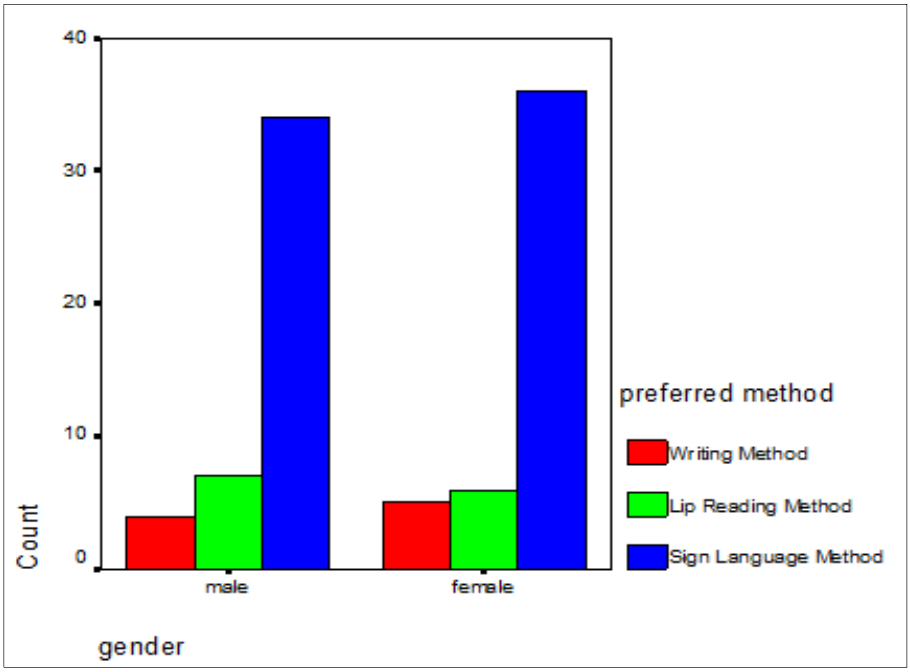

Figure 2. Gender and The Most Preferred method of communication which respondent use within the hearing /speech impaired communities

Table 11. Method respondent use to understand hearing people Speech

Item	Method	Male	Female	Total
1	Lip Reading	6	7	13
2	Cochlear implants	5	10	15
3	Interpreters	34	30	64

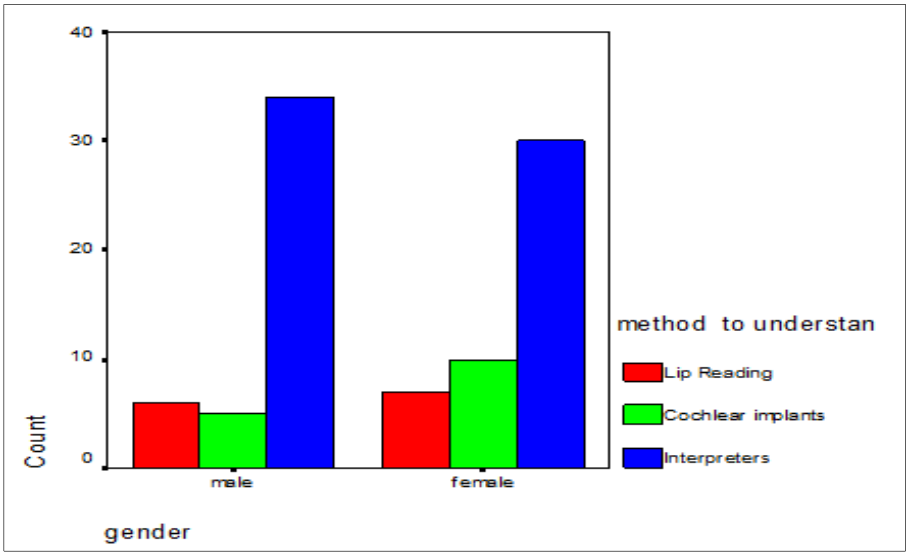

Figure 3. Method respondent use to understand hearing people Speech

Table 12 and Figure 3 show method of communication which respondents use with the hearing communities. The hearing/speech impaired people prefer to communicate with the hearing people through interpreters. The results of the study indicate that male respondents (n=34) mostly have preferred interpreters, similarly, a good number of female respondents (n=30) have chosen interpreters method. On the choice of cochlear implants method, female respondents (n=10) have chosen this method, where, lesser male respondents (n=5) have agreed to this method. The least method is lip reading of which female respondents (n=7) have favoured compared to male respondents (n=6).

Table 12. Method preferred to establish communication/interaction with hearing people

Item	Method	Male	Female	Total
1	Writing Method	20	12	32
2	Interpreters Method	12	35	60

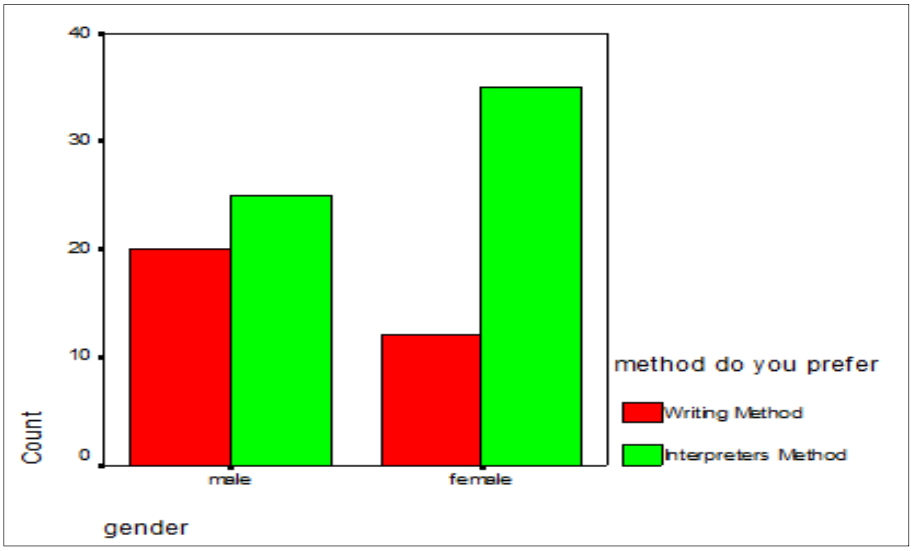

Figure 4. Method preferred to establish communication/interaction with hearing people

Table 13 and Fig.4 reveal numerous differences between the male and female respondents in the method preferred to establish communication/interaction with hearing people. Majority of female

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respondents preferred interpreters method (n=35) and only (n=12) male respondents preferred interpreters method. However, majority of male respondents (n=20) preferred writing method compared to female respondents (n=12).

Table 13. Method preferred to establish communication/interaction in private conversation with hearing people

Item	Method	Male	Female	Total
1	Through Writing	23	13	36
2	Through Interpreters	22	34	56

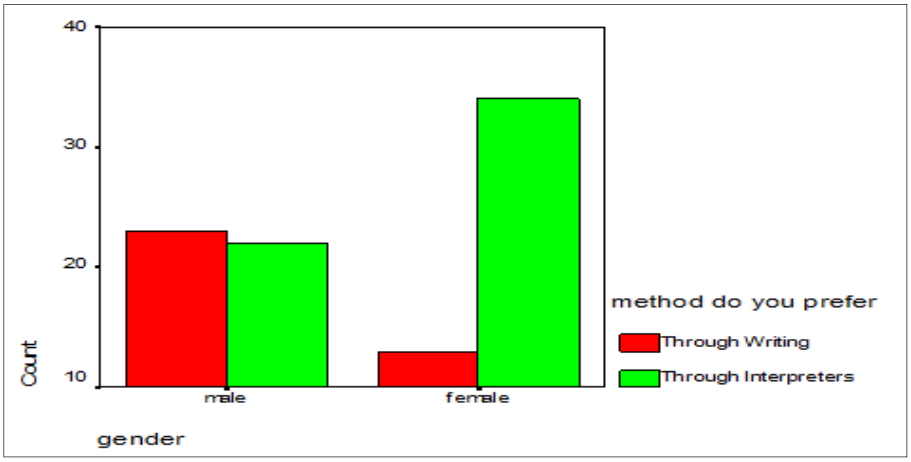

Figure 5. Method preferred to establish communication/interaction in private conversation with hearing people

Table 14 and Fig. 5 show huge differences between male and female respondents in the method preferred to establish communication/interaction in private conversation with hearing people. Bulk of female respondents (n=34) preferred interpreters method to communicate in private conversation with hearing people, meanwhile, only (n=13) of the female respondents preferred writing method. In contrast, male respondents (n=23) preferred writing method rather than interpreters method, where male respondents (n=22).

Table 14. Prefer the SL translation in English Language or Malay Language

Item	SL Translator Language	Male	Female	Total
1	English	3	0	3
2	Malay	42	47	89

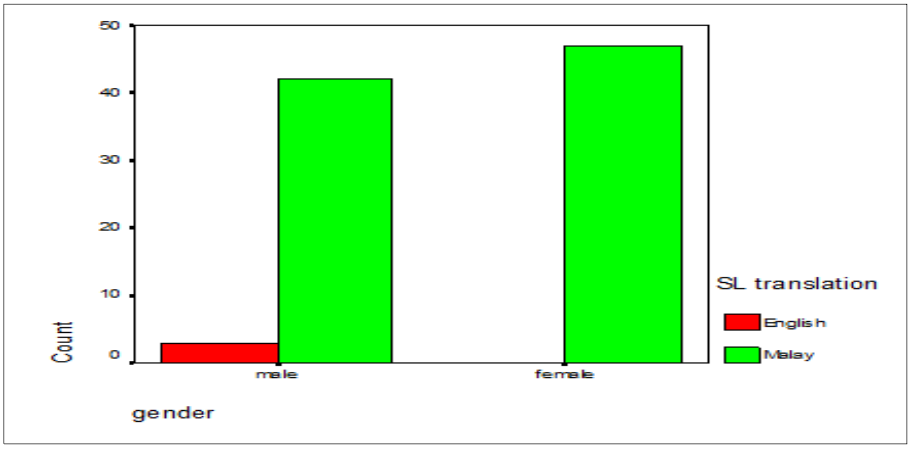

Figure 6. Prefer the SL translation in English Language or Malay Language

Table 15 and Fig. 6 show that, male and female respondents both have preferred SL translation to be in Malay language. (Refer to Table 7 in Section II), as the table clearly illustrates the result of the findings in which majority of respondents preferred translation in Malay language at 97% (n=89) and only 3% (n=3) preferred translation in English language. In total, number of female respondents preferred SL translation in Malay language are (n=47) and male respondents are (n=42).

Development of two Automatic Systems: System 'A' and System 'B'

This section discuss the position of both genders on whether the developed automatic systems such as SL translators and STs are beneficial to them or vice versa and how they can contribute during its development stage.

Table 15. System used by hearing/speech impaired communities

Item	System used	Male	Female	Total
1	System A	16	26	42
2	System B	15	16	31
3	never	14	5	19

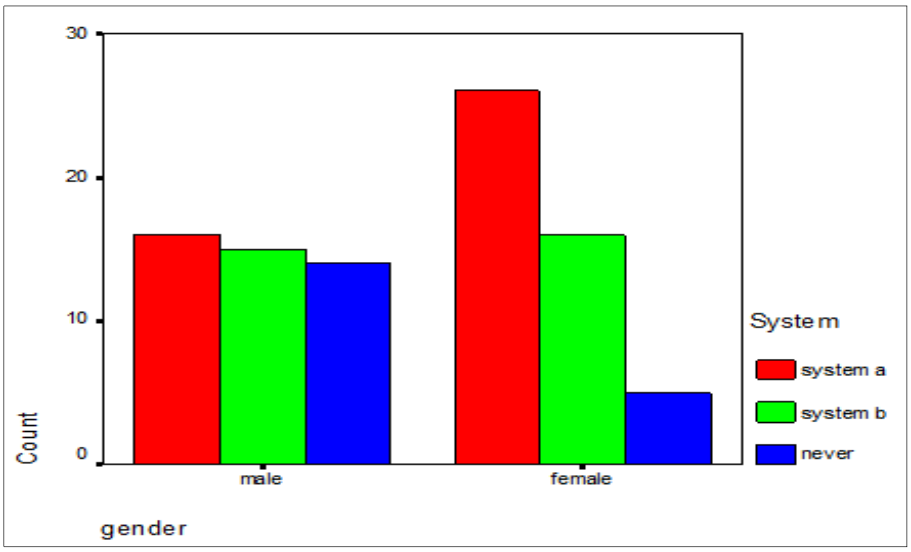

Figure 7. System used by hearing/speech impaired communities

Table 16 and Fig. 7 show different number of respondents who used the system based on gender. In the table we see that, twenty six (n=26) female respondents used system 'A' as a way of communication that can automatically translate the signs signed by the hearing/speech impaired person to an understandable language that the hearing people could understand and only (n=16) male respondents used system 'A'. Meanwhile, system 'B' has been used by 16 female respondents (n=16) and 15 male respondents (n=15). However, small number of female respondents (n=5) and 14 of male respondents (n=14) have never used both systems.

Table 16. System necessary in helping to communicate with the hearing societies

Item	System necessary	Male	Female	Total
1.	Yes	24	29	53
2.	No	21	18	39

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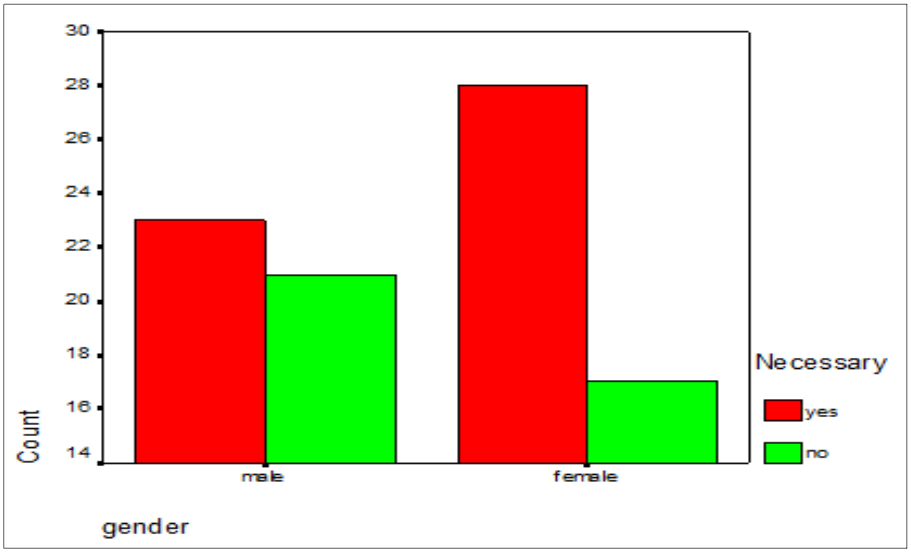

Figure 8. System necessary in helping to communicate with the hearing societies

Table 17 and Fig. 8 show number of respondents who thought that these systems are necessarily in helping hearing/speech impaired community to communicate with hearing societies. Majority of female respondents (n=29) and (n=24) of male respondents have agreed that both systems ('A' and 'B') could help them to establish communication with hearing community. However, there are certain numbers of people who have disagreed with the statement as the results shows that 21 male respondents (n=21) and 18 females respondents (n=18), have both responded 'No'.

Table 17. Volunteer in developing and testing the system

Item	Volunteer	Male	Female	Total
1	Yes	25	29	54
2	No	20	18	38

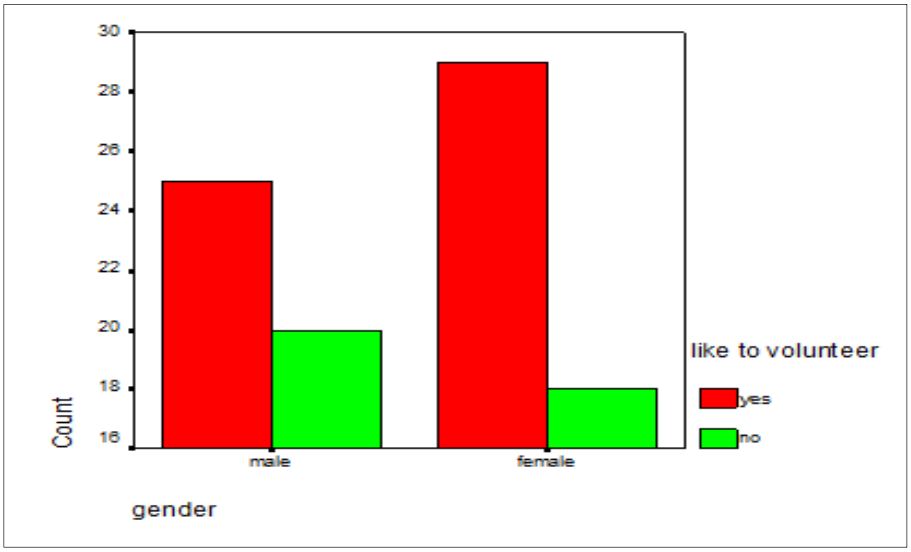

Figure 9. Volunteer in developing and testing the system

Table 18 and Fig.9 show number of respondents who would like to volunteer in developing and testing the system in the stage of design. Twenty nine (n=29) of female respondents and twenty fifth (n=25) of male respondents agreed to volunteer in developing and testing the system in the future. However, twenty (n=20) male respondents and eighteen (n=18) female respondents answered 'no'.

DISCUSSION AND SUMMARY

From the aforementioned analysis that based on the questionnaire response from the MFD society, we can observe the followings:

a. SL method is the most preferred method of communication which respondents use within the hearing/speech impaired communities rather than lip reading method and writing method.
b. Respondents preferred interpreters as a method of understanding hearing people speech rather than using cochlear implants or lip reading.
c. Respondents prefer interpreters as a method to establish communication/interaction with hearing people rather than writing method.
d. In private conversation, respondents prefer interpreters as well as to establish communication/interaction with hearing people.
e. Most of respondents prefer SL translation in Malay rather than English language.
f. When it comes to the question of "*Do you think such system necessary in helping you to communicate with the hearing societies?*" Many respondents, 43% (n=40) answered 'no' to this question. However, 57% (n=52) answered 'yes' which encourages the development such of automatic systems. The high percentage of disagreement with using such systems could be due to the fact that respondents have less reading and writing exposures; which in turn could lead to the lack of exposure to advancement of knowledge and technology. This is observed during the time of conducting the research at MFD centres, where the interpreters had to translate and explain the questions in classrooms to simplify the task to the respondents. For that reason, it is suggested that a group of researchers from the Intelligent Mechatronics System Research Unit (IMSRU), International Islamic University Malaysia (IIUM) need to build a team of educators and trainers in order to provide appropriate knowledge on the subject matter. This will surely help to build a culture of appreciation among the hearing/speech impaired communities toward hearing people.
g. Some of the respondents have answered "no" to item "*Would you like to volunteer in developing and testing the above system?*". However, majority of respondents are ready to volunteer themselves in developing and testing the automatic systems in the future. They also agreed to provide their emails and contact numbers for the researcher to be able to contact them in the future.

To sum up, the research found that the most current method for hearing/speech impaired persons to communicate between each other is SL. The research also found that the preferable method for hearing/speech impaired community to communicate with hearing people even in private conversations is interpreters. Even though 80% of the respondents have undergone through system 'A' and system 'B', but still the percentage of acceptance and rejection is quite comparable to each other. Nonetheless, as majority of them are ready to accept the involvement of technology to help their communication skills, both systems could be extremely beneficial to both parties. These systems are remarkably needed and hopefully will help both groups of societies (the hearing/speech impaired society and the hearing society) in establishing a new, modern way of communication between them, remote from the existing ones.

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