

## **Evaluation Challenges and Solutions in the Disabled Community for ICT Utilization**

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### **ABSTRACT**

Network development and the World Wide Web and information technology has considered needs of people with disabilities more than before, and access to this technology creates opportunities for handicaps more than anyone else. Thus walls of discrimination, economic constraints and projects that lead to their deprivation and obstacles their path for participation shall be eliminated. Regarding the high cost of handicaps' life for the governments, findings of this research provided suggestions to increase the presence of handicaps in society by lower costs. This research has studied the current areas for familiarity and access of disables to ICT technology in Tehran. The results of this study show the needs of disabled community to take advantage of ICT technologies and their better and easier access to this technology. While unfortunately, due to the problems mentioned in the article, a significant percentage of the statistical samples in this study despite their desire have lost the opportunity to use and benefit of this technology.

**KEYWORDS:** challenges and solutions, the disabled community, ICT.

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### **1 – INTRODUCTION**

More than half a billion of the world population are considered as disables, due to mental disorders, physical and sensory disabilities. These disabilities along with physical and social barriers, often keeps them out the community. Disables are often deprived of basic educational opportunities, and are assigned to trivial jobs with very low wages. Today, in various countries many applications are underway to prevent disability, and enhance rehabilitation programs to ensure the full participation of disabled people in social and economic life. One of the main goals of these programs is equal benefits and social progress for people with disabilities, for all countries regardless of their level of development. These programs also emphasize the importance of direct participation of disabled people in planning, implementation and evaluation of activities related to them. The subject of information technology and disabled was first raised in 1994. There are many definitions for ICT. Global partnership has defined the ICT knowledge as "a technology that facilitates communication and process and transfer data by electronic equipment". Barrantes (2005) defines ICT as: Connectivity, which is the first means of communication, including communication equipment, wireless or fixed networks and end user equipment. These equipment make the necessary information possible for radio, television, computers and phones receivers with the capacity to transmit information. The OECD has provided an interesting definition because of its clear distinction between ICT manufacturing and services dimensions. In 1998 OECD countries have defined the ICT sector as a combination of manufacturing and services industries which gain, transfer and present data and information in an electronic form. This definition violets the traditional definition of international standard industrial classification (ISIC) which had divided products and services into two parts, and expresses that production and distribution activities of ICT products can be found anywhere in the economy.

### **2 - Theoretical Foundations**

Currently ICT in different parts of the State went beyond the management process and has focused on increasing the quality of services for citizens and firms. ICT has been introduced to the government through a series of new words such as e-Administration, e-Participation, e-Democracy and e-Government. (Llorca, Fernandez and De Souza Rech, 2009). One of the requirements for effectiveness of ICT is recognition of managers in this field. Therefore when managers make decisions in the ICT field, it is necessary to pay enough attention to the three main criteria of: goals, barriers and drivers (Corrocher and Fontana, 2008).

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With the advent of information and communication technology (ICT), new hopes emerged for the disabled. In 2002 the United Nations Economic Social Committee in the Asia Pacific region held a seminar titled "Recommendations in the legal areas to evaluate the access of disabled people in the Asia Pacific region to information and communication technology", in order to magnify the digital gap disabled people are grappling with. In this seminar, according to the United Nations rules about the equality of disabled people and other people in the society, with regard to the importance of equal access to opportunities in all aspects of a society, through introduction of applications, countries are required to design an appropriate physical environment, and commit to provide the opportunity to access information and communication resources. Using ICT is an effective step to increase employment, productivity, quality of life, equalization of opportunities, and life expectancy for people with disabilities. Non-utilization of ICT services shall be considered as a deprivation even for those without any disability. Therefore, understanding its relationship with facilitating the needs of disabled shows a great respect to disabled community. It will also highlight the importance of using ICT while it is considered as one of the basic criteria for equalization of opportunities and beyond that is one of the basic possibilities for replacing capabilities to disabilities. According to UN figures, on average about 10 percent of the world population is suffering from a disability. This amount may increase in future due to various factors. 18 percent of the world population is living with a kind of disability, some of which are related to aging. 10 percent of world population - more than 650 million people - is living with disabilities that endanger their lives, two-thirds of whom are living in developing countries. These statistics show the need of serious attention to the characteristics and special needs of this large group.

Due to physical problems, disabled require training appropriate to their circumstances. We are faced to people as a specific user, whom their limitations prevent them to attend classrooms. Thus there is a need for a cyberspace fitted the needs and conditions of disabled person or people in all quantitative and qualitative perspectives, with observation of E-Fitting or Virtual fitting. This theory is possible only with recognizing the ability and inability of disabled. When e-learning for disabled people is discussed, an educational system is discussed which, considering the circumstances of disabled, functions based on criteria and standards of E-Learning, and is able to gather people with disabilities together with healthy people. While healthy people easily continue their education, they prepare disabled to be accepted in community. As this method provides indirect and non-physical communication, not only prevents from isolation in virtual environment, but also consolidates relations without pity and with respect between disabled and healthy people. (Nemati, 2009).

ICT also created extensive global markets for goods and services, and the view of full competition is almost becoming a reality. ICT through eliminating barriers of knowledge, participation and social opportunities, in fact has eliminated barriers for human development which already was not easily possible. This technology provides valuable services to communities' prosperity, by breaking the monopoly, enhance productivity, facilitate communication, dissemination of knowledge, lowering the costs and hundreds of other profits. This technology is as the infrastructure of communities for next generation movement in all areas, and is as a platform and important tool for the growth of other sectors. This issue along with the planning in most countries shows that the impact of information technology is so deep that its effect is also observed on social, administrative and business behavior. Hence its importance is clear for all who live in the Third Millennium. Due to development of information technology, now the most needed human services are available without any personal visit or in any specific place, therefore in this new world anyone who cannot use this technology is considered as illiterate (Ali Ahmadi, Shams Iraqi, 2003, p 2).

Developing countries are trying to somehow make capacity for information. Efforts to build data capacity in these countries, are often not fully controlled. So it seems that developing countries should adopt policies to protect themselves against the shackles of foreign economic ties which are associated with cultural and political consequences. These countries should also try to create the necessary infrastructures and harness available resources in order to achieve self-reliance. What make a difference between forward-looking policies of the countries are the types of strategies they adopt for ICT. (Shiri, 2005). Anyway, now a high percentage of the disabled community is deprived to access this technology and participate actively in the society. Lack of appropriate policies of education and familiarity with ICT technology, is a pity and concern. In this study, more cost-effective solutions for disabled people are introduced and discussed to benefit from this type of critical and widespread technology, and then some factors preventing the access to this achievement will be examined according to type of their disability. The main topic of this research is to examine challenges and solutions in familiarity and access of disabled people to ICT technology in Tehran.

### **3 - Research Background**

Abbas Zadeh and Elahi (2007) in a study titled "The Role of Information and Communication Technology (ICT) in poverty reduction," stated that today, many believe that new technologies can provide a path for more rapid

improvement of welfare and quality of life, compared with traditional efforts in industrialization. In this study issues related to direct and indirect effects of the mentioned factors are studied. The results in this paper show a negative and significant relationship between ICT indicators and poverty.

Gregor, Sloan & Newell (2005) in a study titled "Disability and Technology: Building Barriers or Creating Opportunities" examined the relationship between technology and disability, and studied how technology can be both a source of liberation and an agent of exclusion for disabled people. Also they examined how demographic, moral and economic reasons involved in the development of technology should be taken seriously in accessibility to these technologies, and then drivers for inclusive, legislative, technical and economic design are discussed. Finally, they mentioned that they are looking towards a world where true potentials of technology can be fully reached to enhance the lives of disabled people. This research provided an overview of development and supports its inclusive design, along with challenges to overcome.

Priestley, Waddington & Bessozi (2010) presented findings of a participatory research on disabled organizations in European countries. The project titled "European Research Agendas for Disability Equality" (ERADE) sought to engage civil organizations as agents of change influencing future priorities for European disabled society. The paper examines findings from consultation with 68 organizations in 25 countries and illustrates the researched priorities. They also demonstrated how effective partnership between academia and activism adds to the social relevance and impact.

Şimşek, Altun & Ateş (2010) in a study titled "Developing ICT skills of visually impaired learners". The purpose of this study is to reveal problems which visually impaired learners (VIL) encounter during development of skills in information and communication technologies (ICT) and suggest solutions for these problems. The results showed that some regulations are necessity for VIL to develop their ICT skills. Krahn (2011) in a study titled "A world report on disability: a review" expressed that there are recurrent themes in connection between disability and poverty, and in disabled groups, there are relatively greater vulnerability for women, children, and persons with mental disabilities. He added that the report successfully illustrates a great need for improved data, policies, and programs, while describes promising practices that can supply the needs of policy makers. This report is highly recommended for anyone interested in a global view on disability and is required for any students studying in the field of disability and public health.

## 4 – METHODS

### 4-1 – Assumptions

First hypothesis: There is a significant difference between the type of disability and use of ICT.

Second hypothesis: There are relations between the type of disability and degree of familiarity with words related to ICT

### 4-2 - Statistical Population

The study included all blind, deaf and physically disables people residing in Tehran.

### 4-3 - The research model and method

In this study to select the number of statistical sample of disabled people, simple random sampling was used. The descriptive statistics were used to answer research questions. To analyze the collected data, «SPSS» software Version 19 has been used. For all hypotheses the significant level of  $\alpha=0.05$  was considered. In inferential statistics, to confirm the research hypotheses and compare the use of ICT in each disability group, ANOVA statistical test and chi-square test and T-student test was used. Then the results were analyzed.

## 5 - Research findings

In this part of the research hypothesis are examined.

First hypothesis: There is a significant difference between the type of disability and use of ICT.

To compare the use of ICT among the deaf, blind and physical - movement handicapped variance analysis test and (ANOVA) test was used. To review the test, the following statistical hypotheses are assumed. The results are presented in Table 1.

$H_0: \mu_1 = \mu_2 = \mu_3$

The mean use of ICT in two groups of disabled people is not the same. :  $H_1$

Table 1: Results of ANOVA test

Source of variance changes	Sum of squares	Degrees of freedom	Mean squares	F-statistic	Level of significance
Between groups	20.935	2	10.468	15.597	0.000
Within groups	58.387	88	0.671		
Total	79.322	90			

According to the table (1) the significant level is 0.000. It means that in more than 95% of significant level it can be concluded that the mean of factors in the mentioned disable groups in the study are different. In other words, there are significant differences between the mean of communities. As it can be seen, the variance between groups of research is due to the variance of ICT usage by three groups of physical - motion, deaf and blind disabilities. By Post Hoc tests, it was evaluated and found out which of the disabled groups were different. Tukey tests were used, and the results are shown in Table (2).

Table 2: Results of Tukey test for the mean of use of ICT in the sample of disabled people

Disable groups		Number of total sample	Difference mean	Standard variation	Level of significance	Estimate the mean difference according to 90%	
						Low	High
Physical - movement	Deaf	90	-0.505*	0.211	0.03	-1.011	-0.005
	Blinds	90	0.688*	0.208	0.04	0.192	1.185
Deaf	Physical - movement	90	0.505*	0.211	0.03	0.005	1.011
	Blinds	90	1.194*	0.215	0.000	0.681	1.708
Blinds	Physical - movement	90	-0.688*	0.208	0.004	-1.185	-0.192
	Deaf	90	-1.194*	0.215	0.000	-1.708	-0.681

In the column of mean difference, the significant difference between groups is marked with asterisk. Because the significant level for all three groups together is less than 0.05, therefore there is a significant difference between the levels of ICT in any group.

Table 3: Results of Tukey test, the mean difference between ICT usage of sample disabled groups

Disability groups	Number	Subnet		
		For aloha = 0.05		
		1	2	3
blind	30	1.227		
Physical - movement	30		1.916	
Deaf	30			2.422
The level of significance		1.000	1.000	1.000

Based on the data in table (3), considering that the average use of ICT is very low and is even below the average, it is concluded that the use of disables from this technology is very low. Also as it can be seen the average use of ICT in deaf group is higher than other groups. In other words, deaf people are using this appliance more than other groups. The lowest mean is related to blinds. It shows that the blind use of ICT is less than other groups.

Second hypothesis: There are relations between the type of disability and degree of familiarity with words related to ICT.

The ANOVA test was used to examine this hypothesis. But first, using a sample t-test, the level of familiarity of disables with ICT terms was reviewed and the results are shown in Table (4):

Table 4: Results of the t test for the level of familiarity of disables with ICT terms

Significance level	freedom	calculated T	test degrees	standard deviation	Mean	number
0.000	89	-9.271	0.5	0.168	0.335	90

As the results in Table 4 shows, the calculated t is less than t in the test and the obtained mean value of this variable (0.335) is less than the average 0.5, so the total amount of familiarity of disables is low.

## **6 – Conclusion**

The results show that only about 25 percent of the disabled sample, can access the Internet but there may not be found a relationships between type of disability and access to the Internet. Blind Internet access was very poor, which can be attributed to the level of poverty. Blinds are a disabled category which according to their special needs, these kinds of facilities is in their lower priority, because these facilities demand a higher economic level of the community. About 80 percent of total disables in all three groups did not know there is special computer software for disables. When this unaware 80 percent is examined for non-use component, an interesting result emerges. In this case deaf can be called as the successful group, because hopefully about 40 percent of them are aware of this possibility. This part of the research results is inconsistent with the results presented in Krahn in 2011 and also Gregor, Sloan & Newell in 2005.

Given that the SMS is one of the axioms of life and is an excellent alternative to costly phone calls, disabled people increasingly are using this opportunity as 93 percent of deaf and 73 percent of physical-movement disables are using SMS. Interestingly enough, many deaf people in their everyday communication also use SMS as an important messenger means, along with sign language. Unfortunately, in the questionnaires all of the members of the blind group answered negatively to this question. This failure of the blind can be attributed to not taking advantage of "Talking SMS" technology as can be seen in all developed countries.

According to a research, blind do not use computer game which not only shows the severe lack of computer optimization for the blind, but also shows the unorganized state of home entertainment for the blind, especially based on the information technology. Among the physical-movement handicaps and deaf also about 70 percent do not use computer games, while still deaf are the successful group. The only 30 percent use of computer games in these two groups of disabled people shows that entertainment, which is one of the measures of welfare, is at the bottom of the disables needs list. Also about 60 percent of the physical- movement handicaps and deaf unlike the remaining 40 percent pay their bills traditionally and manually, without the use of Internet. Also it can be expressed that 100 percent of deaf and about 95 percent of physical- movement handicaps take advantage of ICT to rehabilitate their disability, while 65 percent of blind did not take any advantage from this technology.

In total, about 75 percent of disables benefit from ICT. Comparing statistics with the net use of ICT in the same disable group, it can be concluded that when the use of ICT is enforced or optimized, these three groups will show a high success in usage. Blind with 40 percent positive response and deaf with 100 percent positive response are relatively the weakest and most successful groups. Anyway the low rate of ICT usage can be attributed to both infrastructure suppliers for the blind and the blind themselves.

Low development of hardware for the blind and poor public and specialized education for the use of hardware - many of them are in the testing phase - and also the high expense of these technologies are the most important causes of failure in blind group. In total, about 95 percent of people with disabilities believed that ICT helps them develop their capabilities and can help them to achieve equalization of opportunities. Blind in research samples either were not familiar with two terms of blog and website (46%) or did not have the necessary hardware. It is contemplating to see the high proportion of blind unfamiliar with these two words, in an era when one of the most important ways of providing service to the blind is through the Internet. Interestingly the 33.3 percent success of deaf group is in active use of blog or website which is promising the success of this group of disable people in the use of ICT.

Finally, a suitable solution is provided according to the type of disability, that is applicable simply and with low cost:

1. Strategies to facilitate software and Web sites for people with low vision: to convert symbols to loud and audible speech, screen reader software can be used. This software is able to convert web symbols to Braille pages output and audio devices output such as speakers and headphones. The display screen magnification software can be used to display Web content for people with low vision. In order to benefit the Web contents in blind and severely low vision people, Braille printer is used, especially for the limited literature. For large text, Braille and audio tape is used.

2. Strategies to facilitate computers and software for hearing impaired and deaf: The make appropriate communication between hearing impaired and deaf, and virtual environments and applications, a variety of hardware and software are used regarding the level and type of hearing impairment and the time of infection. These software and hardware are as follows. In cases where the background sound negatively affects the comprehension of a verbal message, a high-resolution audio message without background sound is used through headphones. Also, hearing impaired and deaf can send and receive text messages by phones or multimedia messages through mobile

phones, and use text chat and electronic service list, in order to establish communication between individuals or organization.

3. Strategies to facilitate websites and software for motion handicaps:

- Using tools with simple mobility, in substitution for the mouse.
- Using mouth wood and wood attached to the head for people with spinal injuries, unable to move and use their hands and feet.
- Using software and hardware to recognize and process voice commands.

In people suffering from lack of proper control of movement, to prevent unwanted characters typing, a keyboard guard is used. This tool by covering the keyboard, and cavities for each key, prevents unwanted diversion of user's fingers on other keys. In a group of people who are only able to use the head and neck movements, there are mouse pointers which move over head movement, and mouse keys can be enabled by blowing on the sensitive plates. In cases where the keyboard optimization cannot enable a person to use it, alternative keyboards are used, which are presented in the following types:

- Extensive keyboards.
- Miniature keyboards.
- Head motion keyboards.
- Keyboards associated with eye movements.
- Morse code input.
- Scanner keyboards with switches which work through scanning movements of head, hand and eye.
- Audio keyboards which through audio processors equipment, are able to process the commands.

## 7 – Recommendations

Below are some suggestions for future research:

1. The effect of culture on the use of ICT among the disabled.
2. Relationship between education level of household and use of ICT among the disabled.
3. Review the performance of developing countries for disabled access and familiarity with ICT technology.

## REFERENCES

1. Abbas Zadeh, Nusrat. Elahi, Saeed. "The role of information and communication technology (ICT) in poverty reduction". Quarterly Journal of Economics and modern commerce. No. 9. Summer 2007.
2. Nemati, Mansour Aydin. "Electronic learning of disables in electronic city". Proceedings of the Second Conference on Electronic City. 2009.
3. Ömer Şimşek, Eralp Altun & Alev Ateş., "Developing ICT skills of visually impaired learners", *Procedia - Social and Behavioral Sciences.*, Volume 2, Issue 2, 2010.
4. Gloria L. Krahn., "WHO World Report on Disability: A review". *Disability and Health Journal*, Volume 4, Issue 3, July 2011.
5. Peter Gregor, David Sloan & Alan F. Newell., "Disability and Technology: Building Barriers or Creating Opportunities". *Advances in Computers*, Volume 64, 2005.
6. Mark Priestley, Lisa Waddington & Carlotta Bessozic., "New priorities for disability research in Europe: Towards a user-led agenda", *ALTER-European Journal of Disability*. Volume 4, Issue 4, October–December 2010.
7. Barrantes, R. "Analysis of ICT demand; What is digital poverty and how to measure it" *Digital Poverty*, 2, 29-53, 2005.
8. Mathison, S. "Digital dividends for the poor, ICT for poverty reduction in Asia, global knowledge partnership". 2002. Available at: <http://www.fdc.org.au>.
9. UNDP., "Human development report; Making new technologies work for human development", 2001.
10. Llorca, A., L. Fernandez-Duran, G. De Souza Rech. "ICT introduction in the city councils". *Aregional analysis*. Springer, 2009.
11. Corrocher, N., R. Fontana., "Objectives, obstacles and drivers of ICT adoption: What do IT managers perceive". *Information Economics and Policy*. P 1-14, 2008.