

Eliminating disability digital divide in Sri Lanka

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Abstract— *Differently-abled People are not having equal opportunities to access information technology and systems compared to the normal population in Sri Lanka. The purpose of this research is to find reasons behind the digital divide among the people with disabilities in Sri Lanka and propose a set of guidelines to bridging the gap to eliminate disability digital divide in Sri Lanka.*

First phase in this research discusses literature behind the digital divide, disability digital divide, the information age, and the development of ICT in Sri Lanka. In the second phase in order to collect information in the Sri Lankan disability digital divide, interviews were conducted with a range of government representatives and 85 disabled computer users and trainers of them in the Ranawiru Sewana Ragama and Abimansala. Collected data were analysed based on qualitative approach according to four themes. In addition to that frequency analysis was used to find the most important accessibility problems and issues faced by this community. Experimental design is based on a four dimensional framework. It includes training and development, low-cost software and technology, awareness programmes and improving quality of life.

The outcome of this research indicates that Sri Lanka has taken several actions to eliminate the issue. Nanasala project via ICTA, improvements of telecommunication infrastructure and other development projects in private and public sectors are similar to solutions in developed nations. Survey results indicated that many more Sri Lankan people with disabilities are reluctant to use these systems and technologies due to poverty, lack of awareness, lack of interest and English language issues. Most of the differently-abled people who are using Nanasala do not have their own computers. High cost associated with licence software, lack of screen reading software and other supporting software and lack of training for them are the main issues. Lack of special trainers for training them is another considerable factor. The research proposes four main areas of implementations under the tested four dimensions to eliminate the Sri Lankan disability digital divide. These main areas are 1.) training and development, 2.) economic infrastructure development of disabled community, 3.) awareness and 4.) encouragement programmes. The above proposed implementations will be advantageous to the differently-abled community. By implementing these recommendations, they can be actively

involved in the process of making Sri Lanka acknowledge and commerce hub in Asia.

Keywords— **Disability digital divide, digital divide, differently-abled community**

I. INTRODUCTION

A. Background

Despite these initial developments in the public realm, the internet did not correctly address the accessibility requirement of people with disabilities. The 'digital divide', a term coined by the US Government in the mid-1990s, addressed the growing gap between those who had access to the Internet and those who had not'(World wide Words,1996). One of the groups identified in the original analysis of the digital divide were individuals with disabilities and in particular, people with vision disabilities.

According to Fourie and Bothma (2005) , always there is a gap between people and communities who can make effective use of information technology and those who cannot." Now more than ever unequal adoption of technology excludes many from reaping the fruits of the economy".

When accessing information and technology Sri Lankan differently-abled community also facing some problems and issues. It is similar to the problems and issues faced by the differently-abled communities in other countries. Therefore this research basically focuses on discussing issues related to differently-abled community.

B. Research Focus

This study mainly focuses on research questions such as, Reasons why Sri Lankan differently-abled community are having difficulties of accessing information technology and information systems. It is discussing current problems and issues associated with Information technology and systems in relations to differently-abled community in SL and how to eliminating those disability digital divide issues in Sri Lanka.

C. Overall Research Aim

Aim of this research is to find out to bridging the disability digital divide. In order to achieve this aim proposes a model to implement to eliminate technology related barriers.

D. Value of this Research

This research work will contribute to the development to the discipline of information technology accessing issues in relation to differently-abled community in Sri Lanka. It is possible to get a clear picture by critically examine existing problems and issues of the disability digital divide. The next rich picture of disability digital divide can be emerged by doing a meaningful comparison between theory and practice. Finally this research will helpful for the policy makers to their consideration to eliminate disability digital divide in relation to Sri Lanka.

II. LITERATURE REVIEW

A. The Internet

The Internet, a term formally adopted in 1995 to describe the development of a vast computing network, began as a military research project within the United States four decades ago (Leiner et al.,2002). Although the interface was crude by today's standards, the network expanded rapidly into educational institutions and then gradually into the public realm. Subsequently, the primary interface of the Internet became graphically oriented through the World Wide Web and the number of people using this technology grew rapidly around the world

B. Digital Divide

The internet did not correctly address the accessibility requirement of people with disabilities during initial developments in the public realm. The 'digital divide', a term coined by the US Government in the mid-1990s—as the growing gap between those who had access to the Internet and those who had not'(World wide Words,1996). One of the groups identified in the original analysis of the digital divide were individuals with disabilities and in particular, people with vision disabilities.

According to Fourie and Bothma (2005), always there is a gap between people and communities who can make effective use of information technology and those who cannot."Now more than ever unequal adoption of technology excludes many from reaping the fruits of the economy".

According to the above definitions it is indicated that digital divide is an issue in people and communities. But, this definition is not specifically indicating the different types or causes which are affecting for the digital divide.

C. Disability Digital Divide

It is clear that people with disabilities are getting large range of benefits from the Internet. But, there is a very low provision for new information and communication tools. It is making accessibility issues. According to the Hollier (2007) studies, suggests that there is a digital divide between people with disabilities and the able-bodied population. This disability digital divide is a direct consequence of disability-specific difficulties. It is compounded by issues of

poverty, unemployment contributing to poverty and a lack of tertiary education. Such issues are even more severe for people who are blind or vision impaired.

D. Sri Lankan Differently-abled Community

Provision of statistics about disabled persons in Sri Lanka are very important when considering the recent history of the country. The Sri Lankan society suffered with a civil war for 30 years prior to May 2009. It was between government forces and a separatist terrorist group. Thousands of armed forces were killed by the terrorists during this period and due to terrorist attacks in all around the country. There were thousands of civilians also killed by terrorists during this period. Not only life loss, there were thousands of soldiers and civilians who receive permanent and temporary disabilities. In addition, the government needs to find ways for those who were disabled due to other reasons such as natural disabilities and due to various types of accidents etc. (Unescap, 2011)

C. Current Sri Lankan ICT Initiations

In 2002 the government of Sri Lanka launched the e-Sri Lanka programme to spread the dividends of ICT across the country. Few of them are discussing as below.

1) Nanasala Project through ICTA (Information and Communication Technology Agency): The e-Sri Lanka initiative uses Information and Communication Technology (ICT) to develop the economy of Sri Lanka to reduce poverty and improve the quality of life of the people. The vision will be realized through six strategies such as 1.) ICT Policy. 2.) Leadership, and Institutional Development Programme, 3.) The Information Infrastructure, 4.) Re-engineering Government, 5.) ICT Human Resource Development, 6.) ICT Investment and Private sector Development and e-Society (ICTA, 2012). According to the Nanasala(2013) , this project is one of the projects implemented under the e-Sri Lanka Initiative. ICTA has incorporated this under the "Nenasala" label to introduce several models of the tele centres or knowledge centres .They have - established in all parts of Sri-Lanka to spread ICT services to the rural and semi-urban population. ICTA - is having four type of Nanasala such as 1.) Rural Knowledge Centres, 2.) e-libraries, 3.) Distance & e-learning centres 4.) Tsunami camp computer kiosks. Most of the disabled civilians in the rural areas can access Internet and ICT through these knowledge centres.

2) Enhancement of Sri Lankan Telecommunication Infrastructure: The main concern of Sri Lanka telecommunication infrastructure is bridging the digital divide in the country. Sri Lanka has initiated several initiations to eliminate the digital divide. They have shown many positive results in the year 2012. According to TRC(2013) statistics given below are showing the rapid growth in the internet and E-mail subscribers in the country .

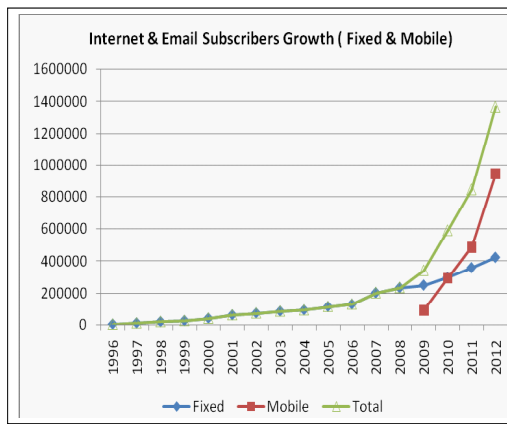


Fig 1. Internet and Email Growth & Email Subscribers (Fixed & Mobile)

Year	Fixed	Mobile
1996	2,504	
1997	10,195	
1998	18,984	
1999	25,535	
2000	40,497	
2001	61,532	
2002	73,468	
2003	85,500*	
2004	93,444*	
2005	115,000*	
2006	130,000*	
2007	202,348*	
2008	234,000*	
2009	249,756*	91,359*
2010	302,000*	200,000*
2011	359,000*	485,000*
2012	423,194*	942,461*

Table 1. Internet and Email Growth

3) *Other projects (public/private institution)*: Other than the ICTA projects initiated by the government many other projects have been implemented to eliminate the Sri Lankan digital disability. They are 1.) Providing operational expenses to an IT education centre (Horizon Lanka Foundation -<http://www.horizonlanka.org/>) in Mahavilachchiya, Anuradhapura - North Central Province. 2.) Establishing 12 IT education facilities in rural schools by providing over 100 computers and ancillary equipment. 3.) Assisting to develop and operate a rural IT centre (Lak Aruna Foundation - <http://www.lakaruna.org/>) in Hingurukaduwa, Passara - Uva Province, currently serving over 100 children. 4.) Establishing a rural computer centre in a tsunami affected settlement in Bandaragama, Panadura - Western Province

F. Need of bridging the disability digital divide

The rapid popularity of the Internet and ICT provide much potential for enhancing opportunities for people with disabilities. However, scarce evidence exists to prove that people with differently able are practicing these new developments in satisfactory level. But, there are some questions retain. Does the spread of information technologies (IT) increases equally by offering opportunities for people with differently-abled? Or will a growing reliance on IT lead to more inequality by leaving behind certain portions of the population including people with differently-abled? Many people in the differently-abled communities are facing problems and issues when they are accessing Internet and related technologies. There for this study is finding reasons for the disability digital divide in Sri Lanka, problems and issues faced by differently-abled community and proposing solution framework to bridging the disability digital divide. In order to develop the framework four dimensions will be tested in the phase 01 with the co relationship with digital divide.

III. METHODOLOGY

A. Introduction

This research study has a number of inter-related objectives sets within the context of use of ICT in differently able community in Sri Lanka .This study mainly focuses on research objectives to find out reasons why Sri Lankan differently able community is having difficulties of accessing information technology and information systems. It is further studying current problems and issues associated with Information technology and systems in relations to differently-abled community in SL and how to eliminating disability digital divide issues in Sri Lanka.

B. Research Strategy

Research strategy used for this study is mixed approach. Field and literature survey has been conducted to do this research. This research consists with three phases. In the first phase find out the difficulties faced by the differently-abled community. A field survey has been conducted in this phase. Second phase also included a field survey to find problems and issues faced by the differently-abled community. In the third phase field and literature survey has been conducted. The literature survey identified that how the other countries have sort out the above problems and issue. The field survey identified their viewpoints on how they think that these problems and issues eliminate and bridging the disability digital divide.

Total population included with the sample taken from Sri Lankan Army Soldiers who have followed computer training in Ranaviru sewana Ragama and abimansala Anurathapura. The research interviewed trainers and government representative also. Initial plan is to select sample as 100 and finally limited to 85 differently able persons. This community is including male, females and

temporary and permanently disabled people. Reasons to select this research approach is especially because the computer use in differently able community is unknown.

C. Data Collection

Data collected for this study based on two approaches. The primary data collection through observation and interviews done at Ranaviru sewana Ragama. Participants are excluding with mentally disorder differently-abled people. Total number of computers is fully allocated during the morning time. Most of participants were more interesting on games and tele-dramas. The next data collection method was interviewing the participants. Different levels of participants were interviewed for this research. They are differently able computer users, computer trainers of differently able users and senior administration of them. In addition to that different government officers who are working for this community, web developers and other software developers also interviewed. Face to face interviews conducted to get this information and all the information recorded in manually for further analysis.

D. Framework for Data Analysis

First phase in this study includes literature survey behind the digital divide, disability digital divide, the information age, the development of information technology and Internet related technologies. In the second phase in order to collect information in the Sri Lankan disability digital divide, interviews were conducted with a range of government representatives and 85 disabled computer users and trainers of them in the Ranawiru Sewana Ragama and Abimansala . Collected data were analysed based on qualitative approach according to four themes. Analysis techniques used in this research were comparing and contrasting findings. In addition to that frequency distribution used to find the most important accessibility problems and issues faced by this community.

E. Experimental design

Experimental design is based on four dimensional framework. Research design included with training and development, low-cost software and technology, awareness programmes and improving quality of life were tested to eliminating the disability digital divide.

on digital equipments is very high compare to the non differently-abled community. This creates automatic lack of interest within the community. Adoption on technology will take long time among this community.

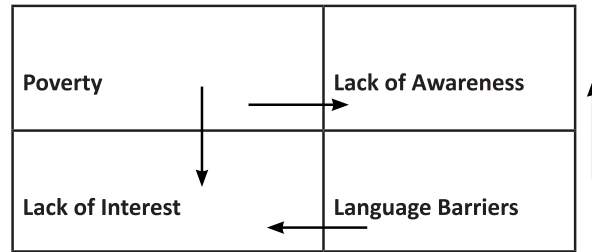


Fig 2. Disability Divides Technology Grid

This research has indicated that the Sri Lankan government has taken several actions to address the issue which are similar to developed nations. They are such as Nanasala project of ICTA to improve telecommunication infrastructure and many other projects via public and private sector institutes.

But Survey results indicated that many more Sri Lankan people with disabilities are reluctant to use these systems and technologies due to poverty, lack of awareness, lack of interest and English language issues. Most of the differently-abled people who are using Nanasala do not have their own computers. High cost associated with licence software, lack of screen reading software and other supporting software and lack of training for them are the main issues. Lack of special trainers for training them is another considerable factor.

Factor	Responses	Percentage (%)
Poverty	22	25.8823529
Awareness	24	28.2352941
Language	29	34.1176471
Interest	10	11.7647059
Total	85	100
Non Responses	15	

Table 2. Summary of Responses

IV. FINDINGS

A. Proposed Model to Eliminate Disability Digital Divide

According to the literature survey behind the disability digital divide, it has been identified that there are four main reasons for this divide. They are 1.)Poverty, 2.)Lack of awareness, 3.)Lack of Interest, 4) Language Barriers. All these four components are interrelated with each others. According to the figure 01 poverty has interrelated with Lack of awareness and the lack of interest. This community is having difficulties to have their own desktop or laptop due to financial issues. Therefore lack of awareness

According to the survey data analysis it is indicating that 25 % of them believe that they have some financial difficulties to use information technology. Therefore disability digital divides cause due to this factor. In addition to that there are not enough funding resources to use genuine licence softwares. Due to the resonantly introduced Data Protection Act, use of pirated software has decreased in Sri Lanka. Therefore disabled community is facing difficulties to access some professional systems.

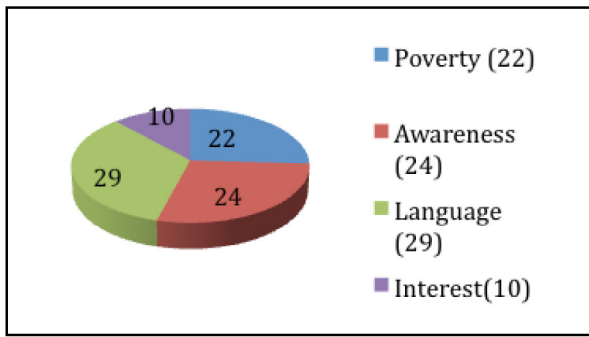


Fig 3. Summary of responses

Awareness becomes the largest issue. 28 % of responses agree that this become an important consideration to have Disability Digital Divide. This will basically happen due to the lack of proper trainer's availability on this subject. Very few people have trained to give computer training to differently-abled computer users. Especially, in community with visionary impairments.

Result indicated that 34 % of them are believing that language required to use new technology become a very important cause for Disability Digital Divide. This respondent indicated that screen reading S/W available today is supporting only for English language. There are few new Language supporting software have developed by the University of Colombo. But they are not much user-friendly systems.

11 % of them have selected that Interest will be a cause for disability digital divide. Most of blind users are having difficulties to select and type different URLs. Due to this , most of them are only accessing limited number of web sites. Therefore lack of web portal may cause for disability digital divide. In addition to that it is indicating that most of trainings which they have taken were not directly relating to their Jobs. Therefore they are not much interesting on learning since they are not seen high advantage on that. It is indicating that the technology trainings and their Jobs are having a relationship.

B. Problems related to accessing ICT by the differently-abled community

Poverty (25 %)	Awareness (28 %)
** S/W cost is high therefore difficulties purchase licence Softwares.	*** Lack of Proper Trainers to train this Community
** Gap in Funding ICT Resources.	

Interest (11 %)	Language (34 %)
* No Web Portal to access all resources in one place.	** ** Current Screen Reading S/W are more focus on English Language
* Not Having ICT Trainings align with their Job or Interest	**** Few Sinhala base screen reading S/W available
	** ** Available Sinhala S/W are Not User-friendly
	** Lack of Voice recognition S/W

Fig 4. Problems related to Disability digital Divide

V. CONCLUSION AND RECOMMENDATIONS

According to the survey results, it is proposed four main areas of implementation under tested four dimensions to eliminate the Sri Lankan disable digital divide. They are 1.) training and development, 2.) Economical infrastructure development, 3.) Improve the awareness, 4.) Encouragement programmes. This could be named as Disability Digital Divide Grid. Based on the findings and compare to the literature these four areas of implementations are recommending for implementation. These four areas of implementation will helpful to reduce the Gap of Disability digital Divide.

<i>Training and development</i>	<i>Economic infrastructure development</i>
<i>Awareness</i>	<i>Encouragement programmes</i>

Fig 5. Development Grid to eliminate Disability Digital Divide

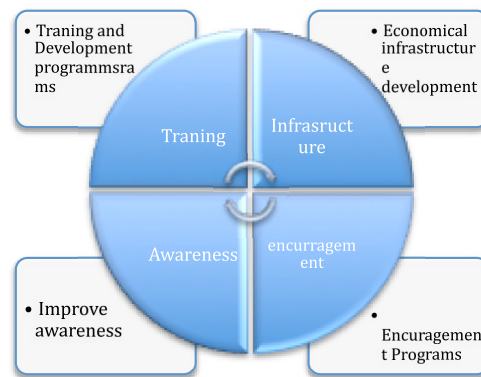


Fig 6. Framework to eliminate disability digital divide

A. Poverty

Introduction of low cost softwares for differently able community is one main requirement of them. Purchasing high cost licence software for them will be burden for them since they are not economically sound enough.

It is possible to use open source software since they are freely available.

Allocating more funds for differently-abled community from government and donor organization is important to develop their ICT skills among this community.

B. Awareness

Lack of Trainers for differently-abled community is a main issue. National level concentration for development of trainers is important. These facilitators need to support for training disable community with new technologies and relate the work for their day to day activities and current and future employments. It is possible to implement a special project with assistance of ICTA.

C. Interest

Losing interest happens due to the difficulties of hardware and software barriers in the information technology. Special use of internet is difficult for them. It is recurred to have development of web accessibility. Most of Sri Lankan government and other web sites are not up to the standard which can have access to disable community. Develop a web portal to differently-abled community also one suggestion. Users can login from one entry and use different facilities from one web site rather than searching different website. Improve the interest on technology; it is necessary to focus the training based on the employment.

D. Language

Most of the users are having confidents on their own mother language (Sinhala) rather than English language. Therefore it is better to support more Sinhala and Tamil friendly Operating systems, Softwares and other Information systems and web browsers rather than forcing them to learn English language.

A voice recognition software is also an important aspect required by the differently-abled community

According to the Framework four areas of proposed ICT implementations are listed in the following Table 02.

Area	ICT Solutions
Training	<p><u>Operational skills</u></p> <ul style="list-style-type: none"> • Operate an Internet browser • Operate an online search engines • Complete an online form <p><u>Formal skills</u></p> <ul style="list-style-type: none"> • Navigate on the Internet by recognising and using hyperlinks • Maintaining a sense of location while navigating <p><u>Information skills</u></p> <ul style="list-style-type: none"> • Locate, select and process information • Evaluate the information source <p><u>Strategic skills</u></p> <ul style="list-style-type: none"> • Taking advantage of the Internet by goal oriented action and making decisions to gain personal benefits

Infrastructure	Connected Private and Public Sector organization with Internet access, the number of computers available for differently-abled people increasing, the availability of assistive technologies, the use of computers and other forms of ICTs as pedagogical tools by differently-abled community
Awareness	1. Assistive IT and ICTs: (i) Word processing (spell-checker, word prediction, keyboard/mouse modification), (ii) Speech synthesizer, (iii) Real-time transcription of text for lessons with an instructor using a microphone, (iv) Apps for tablets and smart phones, (v) Assistive learning equipment, (vi) Large print screens, (vii) Braille printer output. 2. Accessible web sites. 3. Multi-sensory approaches with different functioning learning channels. 4. Appropriate Learning Resources: (i) Appropriate hand-outs and visual aids, (ii) Integrated diaries with advanced notice of class schedule and/or room changes, (iii) Assignments available in appropriate electronic formats, (iv) Audio recording of instructors' presentations and of students' work, (v) Thesauri, (vi) Assignments - modifications (use of a computer with voice synthesizer), (vii) Captioned versions of videos and films, (viii) Communication channels (e-mail, fax, word processor for discussions with the instructor).
Encouragement	<p>-Provide a better Services by improving web accessibility</p> <p>- The portability and affordability of tablets has made them a popular tool for speech and language therapist</p> <p>-Using voice control to navigate smartphones</p> <p>-Improving communication skills of people with difficulties</p>

Table 3. Propose ICT Solutions to eliminate disability digital divide

According to the findings, the above four categories of implementations support the elimination of the disability digital divide. Sri Lankan differently-abled community can be involved in the national economic development process with the support of ICT. Therefore they can be actively involved in the process when Sri Lanka becomes the knowledge and commerce hub in Asia.

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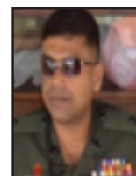
BIOGRAPHY OF AUTHORS



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