

Nation Development by Bridging the Disability Digital Divide in Sri Lanka

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Abstract— *The differently abled population in the country has increased due to the 30 years of humanitarian operations .The Sri Lankan development strategy focuses on rebuilding the nation after having completed operations in 2009.The development of Information Communication Technology (ICT) sector rises to fulfill the national requirements. The differently abled community experiences difficulties in use of ICT. This is known as the disability digital divide. Therefore, this community is isolated in the society. Bridging the disability digital divide will provide equal opportunities for this community. Objective of this study is to propose a framework in order to develop a technology focused educational model to bridge the disability digital divide and develop the nation. Outcome of this research proposed general ICT training requirements and focused training requirement aligned for port and aviation, highways, health, agriculture and fisheries, tourism, urban development, power and energy sectors.*

Keywords— Disability Digital Divide, Sri Lanka National Development

I. INTRODUCTION

A. Background to the study

Digital Divide is a phrase coined to refer the gap between “Have and Have not” in Information and Communication Technologies, In other words Digital Divide is the gap between those who have access to Information Technology resources and those who do not (Balarem,2004). This digital divide is not limited to the absence of ICT Technologies but also to the inadequate access of Information. Most of the ICT resources are available worldwide, but these resources have poor accessibility to different segments of the society. Digital Divide is widening in developing countries, when it comes to disabled versus non-disabled, this divide is even wider. Some studies indicated decreasing trends of Digital Divide, especially in developed countries (DPI, 2004).World

community recognizes the fact that knowledge based growth is a must for sustainable development. Information and Communication Technology can play a vital role in the lives of millions of disabled around the globe. Ordinary tasks which is otherwise not possible for people with disabilities can be performed using this technology, for example, any physically challenged person can access extensive information resources, transaction through on-line banking services, communicate through email, share views via on-line Chat rooms, utilize telemedicine for health care, and utilize leisure opportunities. People with visual disabilities can access web through specialized software which can translate web content into audio file.

Different disability groups and different organizations define disability using many definitions. These interpretations are influenced by historical, social, legal and philosophical aspects. In addition to that disability models too have different disability definitions. According to the MDRC (2012) there are diverse models of disability such as social model, medical model, expert or professional model, right based model, charity model, religious model, economic model, customer model and rehabilitation model. According to different definitions it is indicated that this community is a disadvantaged group in the society. ICT access by this community is also considered a common problem in the world.

There is a divide of access of information among the world. It could happen due to many reasons and disability is one aspect of it (Internet world statistics, 2013). This divide is called disability digital divide. According to the definitions of inventor and director of world wide web Tim Berners Lee states that: “The power of the web is in its universality. Access by everyone regardless of disability is an essential aspect”.

Different solution models have been proposed by numerous researchers to solve this digital gap. According to the above models these digital divide solutions basically depend on the culture, political influences, social view point on differently abled community and the technology usage of the country.

B. *Research Objectives*

Objective of this study is to propose a framework to develop technology focused educational model to bridge the disability digital divide. It aligns with national development. Therefore this community can be effectively engaged in the national development process and quality of life, could be improved.

C. *Research Questions*

This research basically finds out what are the three levels of ICT technologies required for national development process. Then it Identifies what are the problems faced by the differently abled community in Sri Lanka. Based on that it discovers how the disability digital divide could be eliminated and be productively engaged in the national development process. Improving the Knowledge on ICT education is considered as a main factor to propose the framework.

The government strategic plan and Rogers diffusion of innovation theory is tested to modeling the technology related educational framework for Sri Lanka. Experimental design categorized into three different areas of technologies including basic level, intermediate level and high level ICT technologies are required for national development process.

A. *Purpose of the research*

Outcome of the research proposes an ICT technology education framework to overcome the disability digital divide. It effectively contributes to the national development process in the area of port and aviation, highways, health, agriculture and fisheries, tourism, urban development, power and energy sectors.

II. LITERATURE REVIEW

According to the literature the digital age is a period in human history characterized by the change from traditional industry that the industrial revolution brought through industrialization, to an economy based on information computerization. According to the Dobransky (2012) the increasing

usage of Internet holds much potential for enhancing opportunities for people with disabilities. However, scarce evidence exists to suggest that people with disabilities are, in fact, participating in these new developments. Will the spread of Information technologies (IT) increase equality by offering opportunities for people with disabilities or will a growing reliance on IT lead to more inequality by leaving behind certain portions of the population including people with disabilities? When considering the above arguments it is necessary to consider that disabled people are do not have equal opportunities to access information technology.

Earlier in the United Kingdom, people were either discouraged or not actively encouraged to enter the workforce. In 1958, the British government realized the potential economic benefits in having people with disabilities in the workforce. As a result, sheltered workshops were introduced and shared accommodation was encouraged (Schlesinger & Whelan, 1979). Other countries, including Australia, implemented similar policies shortly after the British Government initiative.

As a result of requesting from the government for many years, the disability movement in SL could approve a National policy on Disability in 2003. This was the initial consideration for this community on Technology. Later in 2012 National action plan for disabled was taken in to consideration in Sri Lanka. Sri Lanka has taken many initiatives to bridging the gap of disability digital divide. Information and Communication Technology Agency (ICTA), the government authorized body on ICT in Sri Lanka, has initiated some project to bridging the Sri Lankan digital divide. ICT literacy was 4 % in 2003, and in 2014 it is 50% (Dewapura, 2013). ICTA offered its full co-operation for the rehabilitation and reconstruction work in the north and east. E-Sri Lanka revamp and continue e-Sri Lanka development initiations under the name 'Smart Sri Lanka'. This initiation is aligned with national development process.

A. *Theory Used for this Study*

Based on the Innovation - Diffusion Theory the status of Digital Divide of a disabled community was specified by means of an Index. This theory is basically used to identify the technology adoption of the differently abled community in Sri Lanka.

Rogers' diffusion of innovations theory is the most appropriate for investigating the adoption of technology in higher education and educational environments (Medlin, 2001; Parisot, 1995). In fact, much diffusion research involves technological innovations so Rogers (2003) usually used the word "technology" and "innovation" as synonyms. For Rogers, "a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome" (p. 13). It is composed of two parts: hardware and software. While hardware is "the tool that embodies the technology in the form of a material or physical object," software is "the information base for the tool" (Rogers, 2003, p. 259). Since software (as a technological innovation) has a low level of observability, its rate of adoption is quite slow.

An ordered logistic regression technique is employed to estimate the coefficients of the model. The model is given in the figure 01

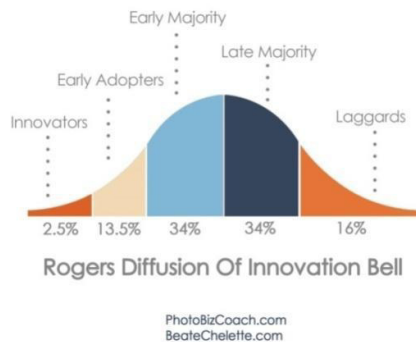


Figure 1: Rogers Diffusion Theory

III. METHODOLOGY

The empirical model used to examine the relationship between the level of adoption of ICT in a disabled community, associated factors and the methods used to collect and analyse data are discussed below.

A. Research Strategy

This study applies a mixed approach. Field and literature surveys have been conducted to do this research. This research consists of two phases. In the first phase the study on Technology adoption for differently abled community is found out via a literature survey. Second phase included a field survey to find data related to dependent and independent variables.

B. Data Collection

Data is collected for this study based on two approaches. The primary data is collected through observation and interviews done at Sri Lanka Army CLI, unit Panagoda. Around 40 Information Technology undergraduate students participated to interview the participants. Structured interviews were conducted. This study interviewed 314 differently abled people using a non-probability sampling method such as convenience sampling. Age group of the participants was between 20 to 50. Participants for this study were selected from different communities, disabled categories and various geographical locations. Data is collected under different themes.

Digital Divide Index (DDI)

Following steps were used to calculate the DDI, which reflects the sample with respect to adoption of ICT facilities. To obtain a valid and reliable estimate reflecting this phenomenon, first, based on the ICT literature, there were 10 distinct ICT facilities ($s = 1, 2, 3...10$) available for this community, adopt to increase its overall efficiency considered. Based on the literature 10 ICT facilities were, in turn, classified into three categories, namely: (1) "Basic ICT" (B1,B2,B3), (2) "Intermediate ICT" (I1,I2,I3,I4), and (3) "Advanced ICT" (A1,A2,A3,).

Table 1: Type of Dependent Variables

Variable Name	Description
CICTK	Current ICT Knowledge
RICT	Relevance of Information and Technology for job related activities
FNICT	Future need of ICT

Table 2: Type of Variable Used for the Empirical Model

Variable Name	Type of Accessibility	Variable Description
B1	Basic	Telephone Use
B2	Basic	Web Access – Information Search and Email use
B3	Basic	Computer Use
I1	Intermediate	Office application Use
I2	Intermediate	Multimedia use
I3	Intermediate	Screen reader Software use
I4	Intermediate	Social media use

A1	Advance	IT Administration
A2	Advance	S/W Design Development related
A3	Advance	High-tech S/W Use (Eg. CAD/ CAM Operations)

Table 3: Dependent Variables Used in the Empirical Model

Type of Users	Dependent Variable	Range of the Digital Divide Index
1. ICT Innovators	DDI1	0.8 < DDI > 1.0
2. Early ICT Adopters	DDI2	0.6 < DDI > 0.8
3. Early Majority ICT Adopters	DDI3	DDI3 0.4 < DDI > 0.6
4. Late Majority ICT Adopters	DDI4	DDI4 0.2 < DDI > 0.4
5. Laggards in Adopting ICT	DDI5	DDI5 0.0 < DDI > 0.2

Level of Adoption of Basic ICT (B Basic ICT Facilities ICT) = Basic ICT Facilities/ 3 (i)

Level of Adoption of Intermediate ICT (I Intermediate ICT Facilities ICT) = Intermediate ICT Facilities/ 4 (ii)

Level of Adoption of Advanced ICT (A Advanced ICT Facilities ICT) = Advance ICT Facilities/ 3 (iii)

C. Data Analysis Framework

In this sample set differently abled community adopts 2 out of 3 ICT facilities listed under the Basic category, its BICT would be $2/3 = 0.66$. Similarly, if the same set adopts 2 Intermediate and 1 Advanced ICT facility, its IICT and AICT would be $2/4 = 1/2 = 0.5$ and $1/3 = 0.33$, respectively.

IV. FINDINGS AND DISCUSSIONS

Descriptive statistics of the sample, the general information of differently abled community (age, experience in technology), and the other details are reported in Table 4.

Table 4: Descriptive statistics

Description	Type	Mean	Medium	Mode
Current ICT Knowledge	Age	25	25	28
	English Knowledge	Low	Low	Low
	Mgt Level	Low	Low	Low
Relevance of IT for Job related activities	Age	29	30	27
	Mgt Level	medium	medium	medium
	Type of Work	office package	office package	office package
Interest of ICT for future needs	Age	20	25	24
	Mgt Level	medium	medium	Medium

According to the descriptive statistics three main areas were taken into consideration such as current ICT knowledge, Relevance of IT for job related activities and Interest of ICT for future needs. Result of the study indicated that the level of Current ICT Knowledge is high among the age between 25 to 28. Reason for this could be that younger generation is using more smart phones and they are likes to incorporate new technologies. Adaption level is high among this community.

English language issues among this community can be considered as a significant issue. It is indicated that majority are having language barriers to use technology. 90 percent of the participant had English language issues and they are working in Sinhala language. Most of them are in the medium level .Most of the computer users are using office package in day today life at the same time some participants in young age like to use new innovative technology. But employees who are closer to retirement age do not like to learn new technologies. Their ambition is to have their pension and stay at home. But they are interested in giving IT education to their children rather than learning themselves.

On the other hand according to the findings social media usage is 0% among the community. Restriction of social media with in the office hours and office computer are cause for this result. Most of them do not have a computer at home and as a result less usage of social media among the community.

Table 5: Use of Technology

Variable	Description	Respondent	Percentage
B1	Telephone Use	252	98 %
B2	Web Access	150	58 %
B3	Computer Use	155	60 %
I1	Office application Use	131	51 %
I2	Multimedia use	28	11 %
I3	Screen reader Software use	4	0 %
I4	Social media use	10	0 %
A1	IT Administration	2	0 %
A2	S/W Design Development related	1	0 %
A3	High-tech S/W Use	0	0 %

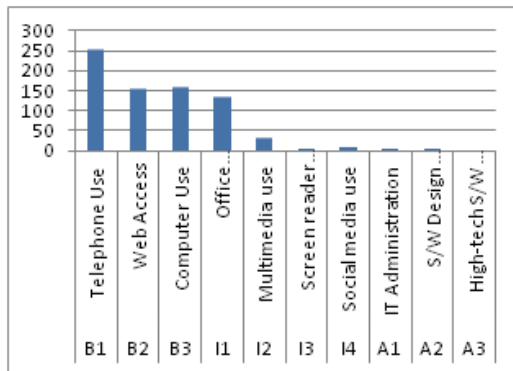


Figure 2: Technology usage by the respondents

A. Level of Adoption

According to the Rodgers adoption theory discussed above following calculations were done to identify the level of adoption.

$$\text{Level of Adoption of Basic ICT (B Basic ICT Facilities ICT)} = \text{Basic ICT Facilities} / 3$$

According to the formula values for adoption in basic ICT is 72 % .Therefore this study conclude that level of adoption among the use of basic ICT Facilities are between 0.8 to 0.6.Terefore it is proved that this community are early users for basic level of ICT facilities. This is shown in the figure 3.

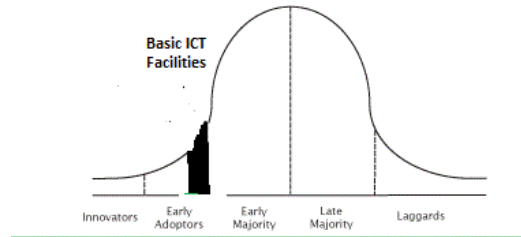


Figure 3: Adoption on Basic ICT Facilities

$$\text{Level of Adoption of Intermediate ICT (I Intermediate ICT Facilities ICT)} = \text{Intermediate ICT Facilities} / 4$$

According to the formula, values for adoption in Intermediate ICT is 15.5 % .Therefore this study concludes that level of adoption among the users of basic ICT Facilities are between 0.2 to 0.0.Terefore it proves that this community are Laggards in Adopting ICT for Intermediate level of ICT facilities. This is shown in the figure 4.

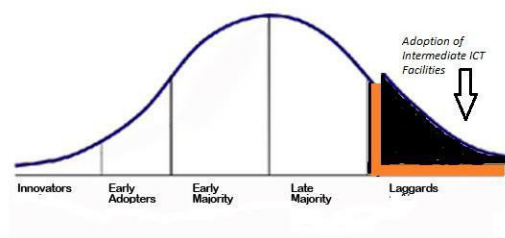


Figure 4: Adoption of Intermediate ICT Facilities

$$\text{Level of Adoption of Advanced ICT (A Advanced ICT Facilities ICT)} = \text{Advance ICT Facilities} / 3$$

According to the formula values for adoption in advance ICT is 0 % .Therefore this study concludes that level of adoption among the use of basic ICT Facilities is between 0.2 to 0.0.Terefore, it is clear that this community are Laggards in Adopting for advance ICT facilities. This is shown in the figure 5.

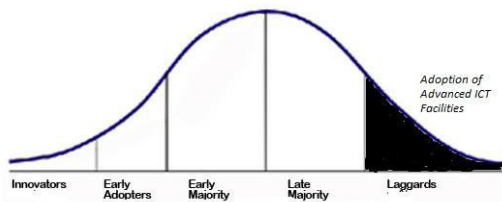


Figure 5: Adoption on Advance ICT Facilities

According to the analysis, 58 % are using web services including E-mail system, but it is noticeable that the usage of Social media is 0%. Reasons for this deviation is that this community does not have social relationships with the use of High technology.

B. National Development and ICT Needs

According to the Mahinda Chinthanaya Vision of the Country, plan is to establish over 100 employees reserving at least 3 % of employment opportunities to differently abled persons. Small and medium scale enterprises where differently abled persons can be provided employment is also to be established.

According to the government website development.lk, it identifies development of Sri Lanka focusing on port and aviation, highways, health, agriculture and fisheries, tourism, urban development and power and energy sectors.

According to the literature survey different ICT requirements of various sectors were identified. The details of the findings are shown in the Table 6.

Table 6 : National development and disability digital divide

Development Sector	IS/ICT Applications
Port and aviation, highways	3 G Mobile usage and video conferencing. email and SMS to travel agent , PDA to find out a plan , electronic air ticketing ,online transaction, online entertainment services. Intelligence databases to connect pickup travellers baggage at the agreed time before departure, Bio metric usage for individual recognition etc.
Health,	Health management information management System

Agriculture and fisheries,	Web Portals Online marketing Mobile Applications related to this area decision support systems (DSS), forecast systems, instructive videos, and text – message information by mobile phone between farmer and advisor E-document management systems, Data warehouses, Groupware or collaborate software, Community of practice (CoP), Social communities of interest, Individual communities of interest
Tourism,	Intelligence systems in Tourism, Tourism management Systems
Urban development	Multiple information systems could be used in different requirement
Power and energy	Information Trading Systems, Management information systems, Decision support systems

C. Digital Divide and National Development

It can be further analysed on the possible problems and issues faced by differently abled community. This is given below:

- Most of the web sites are not supporting on line educational courses for Differently abled community
- Not providing any online Jobs for this community and Not having Special training for them. Virtual collaboration is low among the community
- Per capita income is low among the community. Therefore, this benefit is not much popular among them, both Telemedicine and the Video relay Service.
- Uses of Chat systems are comparatively higher than the telemedicine and video relay services.
- High cost of a smart phone cause for not using it by this community.
- This community is reluctant to use high technology: sometimes touch systems are complicated to them compared to push button system.
- Some web sites are not popular among the Disabled community due to the limited functions which specifically concern for disabled community. eg. Screen large Facility, Voice output.

- Most books in libraries are not in e-books version. Therefore, people face difficulties in reading books.
- Low cost open sources Software are not popular among Sri Lankan community. Therefore, trainers do not train this community to use low cost open source software.

V. CONCLUSION AND RECOMMENDATION

Findings indicated that the different levels of ICT facilities are used by the differently abled community in Sri Lanka. Three different variables are positively co-related with disability digital divide in the country. It indicates that the basic level facilities which are used by the differently abled community are not sufficient for the national development. It shows that the use and knowledge of high and medium level ICT applications are less among this community.

This paper proposes an ICT technology education framework to overcome the disability digital divide. It effectively contributes for the national development process in the area of port and aviation, highways, health, agriculture and fisheries, tourism, urban development and power and energy sectors. This frame is discussed in the following Figure 06



Figure 06. Focused ICT Educational Training Framework

Two main aspects are required to be considered in order to bridge the disability digital divide among the differently abled community by giving focused ICT educational training. The first dimension is general office application and ICT Basic Knowledge Training courses. The second dimension is conducting a forces training on the technology and application used in the area of the above seven segments. This is further presented in the figure 07.

Trainings on General Application	
<ul style="list-style-type: none"> • Word Processing • Work book preparation • Presentations • Graphics • Programming • HTML Creations 	
Specialised areas –Focus Trainings	
Port and aviation, highways related Applications	Health related Applications
Agriculture related Application	Fisheries related Application
Tourism related Applications	Urban Development related Applications
Power and Energy related Applications	

Figure 7: Education related Framework

Therefore, providing special Training on the above discussed applications will be useful for them to find job opportunities in the above sectors and it will improve their quality of life and eliminate the disability digital divide in Sri Lanka.

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