Users' Training Experiences in Local Language Computing across Developing Asia

Emmanuel C. Lallana
Mayette Macapagal

Center for Language Engineering (CLE)
Al-Khawarizmi Institute of Computer Science (KICS)
University of Engineering & Technology (UET)

www.cle.org.pk

www.idrc.ca

Published by

Center for Language Engineering (CLE)
Al-Khawarizmi Institute of Computer Science (KICS)
University of Engineering & Technology (UET)
Lahore, Pakistan

ISBN: 978-969-9690-02-2

This work has been carried out through a PAN Localization Project grant from the International Development Research Center (IDRC), Ottawa, Canada, administered through the Centre for Language Engineering(CLE), Al-Khawarizmi Institute of Computer Science(KICS), University of Engineering & Technology(UET) Lahore, Pakistan.

PAN Localization Project

PAN Localization Project (www.PANL10n.net) is a regional initiative to develop local language computing capacity in Asia. It is a collaboration between Pan Asia Networking (PAN) program of IDRC, Canada (www.IDRC.ca) and Center for Language Engineering (www.CLE.org.pk) at Al-Khawarizmi Institute of Computer Science (www.KICS.edu.pk), University of Engineering and Technology, Lahore, Pakistan (www.UET.edu.pk) to generate technology, build human resource capacity, and advance policy for local language content creation, access and use across Asia.

This project has been divided into two phases. Phase-I (2003-2007) focused on developing local language standards and technology across the partner Asian countries including Afghanistan (Pashto), Bangladesh (Bangla), Bhutan (Dzongkha), Cambodia (Khmer), Laos (Lao), Nepal (Nepali) and Sri Lanka (Sinhala, Tamil). Some major milestones achieved in Phase I include development of Linux distributions for Dzongkha and Nepali, working OCR systems for Sinhala, Bangla and Lao, Lexicon and spell checking utility for Bangla, Dzongkha, Khmer, Lao and Nepali, Text To Speech System for Sinhala and standards for local keyboards, collation sequences and fonts for a number of these languages. Phase II (2007-2012) aims to advance this work, with the following objectives:

1. Examine effective means to develop digital literacy through the use of local language computing and content
2. Explore development of sustainable human resource capacity for R&D in local language computing as a means to raise current levels of technological support for Asian languages
3. Advance policy for development and use of local language computing and content
4. Study and develop coherent instruments to gauge the effectiveness of multi-disciplinary research concerning the adoption of local language technology by rural communities

Phase II of the project has been extended geographically and linguistically to include Afghanistan (Pashto), Bangladesh (Bangla), Bhutan (Dzongkha), Cambodia (Khmer), China (Tibetan), Indonesia (Bahasa), Laos (Lao), Mongolia (Mongolian), Nepal (Nepali), Pakistan (Urdu , Torwali and other languages spoken in Pakistan) and Sri Lanka (Sinhala and Tamil). The teams have not only been working to enhance the technology already developed in the first phase, but have been actively collaborating to deploy this technology to different end-user groups and to evaluate local language computing adoption models across these countries.

About the Authors

This report has been designed and developed by Dr. Emmanuel C. Lallana and Mayette Macapagal, Ideacorp, Philippines. Ideacorp is an independent, non-profit organization in the Philippines that is devoted to research, training and advocacy on development issues, particularly on the use of ICT for development (ICT4D).

The country chapters are contributed by representatives from the following organization:

- Development Research Network (D.Net), Bangladesh
- National Information Communications Technology Development Authority (NiDA), Cambodia
- E-network Research and Development (ENRD), Nepal
- Center for Research in Urdu Language Processing (CRULP), Pakistan

D.Net is a non-profit organization, which envisages the use of information and communication technology (ICT) for economic development of Bangladesh. Incepted in January 2001, D.Net obtained legal status under the Societies' Act 1860 with the Registrar of Joint Stock Companies, Bangladesh. Working with interfaces of all development use, D.Net thrives to build up itself as a multi-disciplinary organization.

NiDA, Cambodia was established by a Royal Decree. NiDA promotes and regulates the ICT services in the country and encourages all agencies to implement their ICT plans. NiDA's plan to achieve its vision of "becoming a real partner in regional and global affairs, a truly free nation, free from want and poverty" can be affectively achieved through computerization and utilization of current technology. Computerization of government services aims to remove "rural" barriers from the development equation.

ENRD is a non-profit and non-governmental organization founded for the creation and transfer of economic self-sufficiency (e-governance) through the growing global concept of e-village. ENRD has developed a unique platform for IT professionals who are promoting IT in developing countries like Nepal where it was founded. The main strength of this platform is in its ability to bring together several fields of research and development such as in public administration, global management, and computer and communication sciences for discussion and for practical project participation that can immediately benefit the lives of economically challenged communities.

The Center for Research in Urdu Language Processing (CRULP) was formed in 2001, specifically to address local language support for Urdu and other Pakistani languages. The center has worked extensively on Urdu linguistics, standardization for computing, and modeling of script, speech and language. Research is being conducted on all aspects of Urdu, including acoustic phonetics, phonology, morphology, syntax and grammar and semantics. Project Dareecha was undertaken by the PAN Localization Project Pakistan Component at CRULP, to investigate sustainable strategies for ICT access and local web content generation in rural area students.

Acronyms

ADB	Asian Development Bank
APNIC	Asia Pacific Network Information Center
BADC	Bangladesh Agriculture Development Corporation
BARI	Bangladesh Agricultural Research Institute
BPO	Business Process Outsourcing
BNNRC	Bangladesh NGOs Network for Radio and Communication
BCCP	Bangladesh Center for Communication Programs
CC	Country Component
CIT	Center for Information Technology
CPI	Country Partner Institute
CMS	Content Management System
ccTLD	Country Code Top Level Domain
ESRA	Education Sector Reform Assistance
EGD	Electronic Government Directorate
EAS	Electronic Approval System
ENRD	E-network Research And Development
EUT	End User Training
FAQ	Frequently Asked Questions
FIT	Form for IT
FOSS	Free Open Source System
GAIS	Government Administrative Information System
GEM	Gender Evaluation Methodology
GOV	Government
GUI	Graphical User Interface
HLCIT	High Level Commission for Information
ICT	Information Communications Technology
ITES	ICT enabled services
IBM	International Business Machines Computer and Consulting Company
ICTD	Information Communication Technology for Development
LLLT	Local Level Leadership Training
MITA	Midas Interactive Audiovisual Educational Material
MoIC	Ministry of Information and Technology
MoST	Ministry of Science and Technology
MoIT	Ministry of Information & Technology
NADRA	National Database and Registration Authority
NEGC	National E-Government Council
NGO	Non government organization
NITC	National Information Technology Center
NiDA	National Information Communications Technology Development Authority
NIDU	National IT Development and Promotion Unit

NLA	National Language Authority
NTA	Nepal Telecom Authority
NUCES	National University of Computing and Emerging Sciences, Lahore, Pakistan
OLE	Open Learning Exchange
OMg	Gendered Outcome Mapping
PAC	Project Advisory Committee
PAIS	Provincial Administrative Information System
PANL10	PAN Localization Project
PSO	Public Service Obligation
PTCL	Pakistan Telecommunication Company Limited
READ Nepal	READ Global (a multinational NGO) dedicated to inspiring rural prosperity
RUPP Nepal	Rural Urban Partnership Program
SMME	Small, Medium And Micro Enterprises
SMS	Short Message Service
SSC	Secondary School Certificate
SIP	Session Initiated Protocol
TVET	Technical and Vocational Education and Training
TOT	Training of Trainer
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNDP	United Nations Development Program
USAID	United States Agency for International Development
Vfones	Wireless phone connection in Pakistan offered by PTCL
VSAT	Very Small Aperture Terminal
VoIP	Voice over Internet Protocol
Wi-Fi	Wireless network connection
YPSA	Young Power in Social Action

Table of Contents

1 Introduction

Bridges.org provides the rationale for ICT capability building:

Any technology will be insufficient if people do not understand how to put it to effective use as part of their lives or their work, either because they are not trained to use it, or they cannot imagine the possibilities for how they could use it. People will be encouraged to use ICT only when it is apparent to them that it will have a positive impact on their daily lives. Further, it is essential that people understand the broader potential for technology, so that users are empowered to innovate for themselves and use technology in creative ways that may not have been envisioned by the project or policy [1].

If ICT literacy is the goal, literacy through ICT is the means. Knowledge acquisition and learning in the 21st century is supposed to be easier than ever before. Information is now simply made available through the use of the internet and the computing and communications devices now available in the market. The World Wide Web and other sources of information through the internet offer a variety of data content vital and critical to development of a society.

Unfortunately, not everybody has the same access to ICT goods and services. The top five languages used in the internet are English, Chinese, Spanish, Japanese and Portuguese [2]. Except for Chinese, these languages are not largely spoken, written or read, in many parts of Asia.

Home to more than half or about 56 % of the world's population, a huge potential user for computing and internet use, Asia is estimated to have only about 24% users' penetration rate [3] contributing factor to low access is its cultural and linguistic diversity; the region accounts for about 2,197 languages, and only about 20% use of the English language for communications. These figures imply that a large number of Asians, especially those in the rural areas, are still unable to access computing, more so with the internet and the information that are critical to development. Unless these large non-English speaking populations have the ability to generate and access content in their native languages, they will not be able to use ICTs for their development effectively [4].

What prospects are there to enable the unserved and underserved population, particularly those with diverse languages, access ICT for development measures that ultimately aim for bridging the digital divide?

1.1 The PAN Localization Project (PANL10n)

Aware of the enormous potential of localization - defined as enabling computing experience in linguistic culture of the user - as a means to address the gap of low computer and internet use to access information - PAN Localization (PAN L10n) Project with the support of the IDRC was conceived. It was created as a regional ICT4D initiative to develop language computing capacity in Asia through concerted and coordinated efforts by ICT researchers, practitioners, linguists, social scientists and policy makers from government agencies, universities, civil society and the private sector.

The project aimed at (i) examining effective means to develop digital literacy through the use of local language computing and content; (ii) developing sustainable human resource capacity for research and development in local language computing and raise current levels of technological support for Asian languages; (iii) advancing policy for development and use of local language computing and content; and (iv) studying and developing coherent instruments to gauge the effectiveness of multi-disciplinary research on the adoption of local language technology by all communities.

The PANL10n project required the understanding that "linguistic culture is not just limited to the language but how the language is used by the environment of the user". Thus, it recognizes that "for Punjabi speakers in India, the computer should display the language in Gurumukhi script and for Punjabi speakers in Pakistan; the same language should be displayed in Arabic script". The localization project also required the definition and implementation of standards that include: character set encoding, keyboard (and keypad) layout, collation/sorting sequence, locale and ICT terminology. Moreover, to support access and generation of local language content, applications also need to be developed for local language computing [4].

The task of localization promoted the adaptation of computer software and web content to local languages, cultures and preferences [5,]. It encourages people, especially those in the rural areas, to appreciate learning, thereby increasing access to education. The ultimate users –- the ordinary community residents and citizens –- are open to more opportunities that motivate them to gain access to content and services.

The first phase of the PAN Localization project has developed a variety of local language computing software among partner countries, which will eventually be applied and used by their respective end users. As observed by researchers, "the PAN Localization Project has made considerable progress in developing the LINUX operating system in Nepali (Nepal) and Dzongkha (Bhutan); optical character recognition and text to speech software in Sinhala (Sri Lanka), Bangla (Bangladesh) and Lao (Lao People's Democratic Republic); and a wide range of applications and utilities, such as lexicons and fonts, in languages such as Khmer in Cambodia, Pashto in Afghanistan, Tamil in Sri Lanka and Urdu in Pakistan. The project also supports more localization standards/tools that are being developed in Mongolian (Mongolia), Tibetan (China), and Urdu (Pakistan) [6]."

1.2 Regional Research Component - Training

To draw the intended socio economic benefits of the project, training programs were deployed by instituting the localized computers and software for different end user groups within their countries. Training activities were expected to harvest a lot of data across languages, communities, applications and methodologies to help synthesize a comprehensive perspective on ICT diffusion into user communities.

The following questions were addressed in the regional research component (RRC) - training:

1. What are the issues related to development of training material of localized applications in local languages? Can material from English or other languages be re-used? What are the copyright implications?
2. How much more effective is training material in local languages compared to similar material in foreign languages? How large is language a barrier to use and to learn the use of technology?
3. How do different training methods and tools compare, when training a variety of user-groups, including gender? Is there a need to specialize training mechanisms and tools for these user-groups?
4. How hard is it to train different user-groups to use localized technology to access content? How much harder is it to train the same user-groups to create and publish content? What are different barriers to learning to use localized ICTs to communicate, and to access and publish local language content: age, gender, level of education, etc.?

5. What are the existing ICT training and diffusion policies and do they explicitly address the local language requirements? How can policy around training be strengthened in the region for effective diffusion of localized ICTs?

A variety of methods were employed to train a variety of user-groups for a variety of content access and generation applications and platforms. Though national level research consolidates the national experiences, the regional research component synthesizes these results across the regions among selected countries. The regional research component (RRC) worked with national initiatives in development of appropriate social tools to monitor and evaluate the training programs. This regional component collectively and comparatively analyzes the results of these social tools to research the role of local language computing in ICT diffusion in developing Asian populations. The regional research component also coordinated among different country components to ensure that same training across different components is not duplicated and training developed at one component may be reused by other partners.

The objectives of the RRC – Training are to:

1. Examine effective means to develop digital literacy through the use of local language computing and content
2. Investigate challenges and solutions to promote use of multilingual ICTs: Research into development and conduct of training to promote use
    a. Develop and trial reuse of training materials in local languages for different end-user groups in different countries
    b. Conduct end-user training to determine effective strategies to retrieve content
    c. Conduct end-user training to determine effective strategies to generate culturally-relevant content in local languages
3. Research into effective solutions to mature multilingual access to ICTs

1.3 The Purpose and Organization of the Book

This book presents cases of selected countries, which approached training and computer literacy in the context of the PAN Localization Project, and in their respective country national ICT development plan. These cases are written and discussed by country localization project leaders who described and illustrated their experiences in local language computing training programs. The four selected countries that participated in the PAN Localization Project and the corresponding authors are:

a. Nepal – ICT Localized Training Experiences in the Rural Mountain of Nepal by Rajendra Poudel from ENRD
b. Pakistan – Project Dareecha: The Pakistan Experience by Huda Sarfraz from CRULP
c. Cambodia – Governments' Experience in Localized ICT Training by Noy Shoung from NIDA, the National Information Communications Technology Development Authority
d. Bangladesh – Training of Infomediaries and other Users *by* Md Massum Billah from D.Net

The main purpose of the book is to draw good practices and lessons learned from the training process and consequently offer framework guidelines toward an effective training program for ICT localization programs.

The book is organized in chapters and sections (depending on country inputs). Aside from text, space is also provided for photo documentations.

The introductory chapter (Chapter 1) serves as a backdrop of the PAN Localization initiatives. Chapter 2 discusses and offers a review of literature on the importance of Literacy, Training and Language in the context of ICT for Development. It also provides an overview of the Instructional Design Framework and the RRC-Training conceptual framework.

The succeeding Chapters 3 - 6 focus on the country initiatives and experiences of Nepal, Pakistan, Cambodia, and Bangladesh. It provides a discussion on each country's National ICT Development Strategy and how localization fits into the ICT strategy. Each country also presents their training strategy and how they conducted and implemented the users training for local computing applications. An assessment of what worked and what did not work in their users training programs will also be disclosed leading towards a discussion on lessons in the field. Also included is a discussion on what lies beyond the project, where the authors explain the continuing imperatives for improvement and sustainability of their localization initiatives. Country experiences gave light on how gender considerations were addressed in the training programs.

The final chapter (Chapter 7) covers the common and differentiating experiences and a synthesis of the research experiences of the countries discussed in the book. It also provides a framework that could be used to meet the challenges and future implementation of training programs on localization, which include opportunities where gender considerations can be harnessed in the training on localization of ICT initiatives.

2 Literature and Framework Review on ICT Policy Strategy, Localization, and Training Design

2.1 New Skills for the 21st Century

In its review of The Lifelong Learning principles the UNESCO Educational Institute recognized that the unprecedented surge of ICT use and its impact in the global environment necessitates the inclusion of ICT literacy/skills to prepare learners, for them to succeed and cope with complex problems in life. ICT literacy/skills need to tie up with the other learning skills identified by the Partnership for 21st Century Skills (P21) a US based organization composed of major multinational information technology corporations, key education, library, publishing industry and media organization. The general skills identified core subjects and 21st century themes; learning and innovation skills, information, media and technology skills, and life and career skills [7].

Consequently, one of the challenges in incorporating a technology element in education is ensuring the teachers'/providers' ICT competency. Do teachers have the appropriate knowledge and skills to teach and promote ICT literacy/skills? UNESCO and 21st century skills partners recognize that curriculum and training providers lacked a clear set of internationally recognized guidelines on what constitute appropriate ICT professional development for educators. Aside from competency standards for teachers and their preparation for ICT, a national plan for ICT in education; adequate infrastructure; strategies and funding for developing school capability; and a vision for ICT in education are pre-requisites to ensure that ICT in education is in place [7].

2.2 National ICT Strategy

A national ICT strategy is essential to promote a country's socio-economic development. It can help position the country for competitive advantage in a global knowledge-driven technology. In [8], Hanna posits that a national ICT strategy would serve several roles. The process can

1. Raise awareness, resources and commitment to action
2. Build coalitions of policy institutional reforms
3. Clarify roles, build public-private partnerships, and facilitate participation by all stakeholders, including NGOs
4. Focus scare resources on exploiting ICT for national priorities and help sequence and phase complementary investments
5. Complement market forces, promote societal applications, enable bottom up efforts, and ensure shared learning and scaling up
6. Address the special needs and dynamics of promising segments of the ICT industry for export and economy wide competitiveness
7. Re-orient the national innovation system to meet the substantial and cumulative technological learning requirements of ICT (as a general purpose technology)
8. Address coordination failures, exploit network effects, and secure complementary investments to use ICT as empowerment and service delivery infrastructure

The enabling use of ICT, however, also poses several challenges for most countries. Such requires a great deal of learning in order to understand the impacts of ICT on markets, organizations, competitive strategies, and innovation. Understanding the implications of ICT on services, employment, education,

regional and spatial development and poverty reduction should also be considered. ICT use and development also involves radical transformation in education and training systems, science and technology policies, and even in creating development strategies.

The response of the growing number of governments in developing national ICT strategies varies. There are those that formulate national ICT policies and strategies where ICT is treated mainly as a sector or industry. Some focus largely on the state-sponsored build up of physical ICT infrastructure and the development of indigenous ICT services sectors that have lower personnel and operating costs, while also trying to encourage ICT adoption among the populace [9]. There are cases that mainly focus on the ICT skills for the ICT sector rather than for the economy as a whole. This results to underestimated demand and shortfalls in ICT skills in the ICT enabled sectors [10]. Unfortunately, most countries are slow in adapting, and poorly equipped to deal with technological learning requirements for this rapid technological revolution [9].

It is further argued by Hanna in [8] that the role of a national ICT strategy must leverage ICT as a general purpose technology. She also noted that "e-development strategies may target ICT as a core technological competency, in view of its requirements and its potential as a tool for competitiveness." It must consider the use of technologies and the different learning requirements of these technologies. The strategy must be able to set aims that have the most substantial potential and spillover effects that would result in greater dynamic benefits on economies. The uses of ICT must be distinguished based on the need for substantial and cumulative technological learning to realize its potential. It must consider the localization and adaptation, linkages among suppliers and customers, joint learning and standard setting, innovation intensity and co-investment in complementary institutional resources. It must allow space and time for organizations to go through several phases to leverage ICT-- phases that would ultimately lead to organizational and business transformation. The development strategy must also address the learning requirements to enable governments and the populace to use this technology for increased services and citizen's participation [11].

In [16], Rajesh Sreenivasan and Abhishek Singh cite that developing ICT markets in Asia seem to be realizing that they need to consider a more inclusive approach to enable larger segments of the population to use ICTs and benefit from them. Almost all the developing countries of the Asia Pacific region recognize the importance of ICT skills for the overall national, social, and economic development. For example, governments have identified that planning for competitive advantage will require a labor force that has literacy and numeracy skills beyond three to six years of primary schooling. They have also recognized the need for large scale training and retooling of current workforce [11]. Thus, the national ICT strategy considers the human resource needs, knowledge, and skills in preparing for the eventual changes that ICT would bring to society.

For an ICT policy to be significant, the framework strategy must be of national and local coherence. All levels of government must establish local information societies so that benefits are integrated into the economy.

2.3 ICT Literacy and Use of Local Language

Developing societies have longstanding issues regarding the language of instructions. In Africa, ICT4D practitioners have observed that the importance of literacy in the local language is clear. However, there are experts, who still argue that the provision of these programs are impractical and that international languages are most cost-effective [12]. Problems associated with local language of instructions were identified and include the following:

a. Poor and insufficient materials in local language of instructions

b. Lack of research based materials in local language of instructions

c. Facilitators and teachers who are poorly trained in local language of instructions

Emerging evidence from research studies indicate that ICT presents opportunities to create associations and make appropriate contextualized meaning to enhance learning. ICT in relevant educational contexts expand access to new information and support people's efforts to make opportunities and meanings for their lives [12]. In providing ICT capacity development and capability building activities, it is critical to identify the appropriate language to be used during the actual training. Research has clearly shown the importance of the mother tongue in learning: "Since language is the main way of communicating meaning in most learning activities without a sufficient understanding of the instructional language, learning is inferior to that of learners who are full proficient in the language [12]."

Dighe and Reddi [13] affirm the wide acceptance that the mother-tongue or the spoken language/dialect must be the medium of instruction not only for early childhood education, but also in literacy programs for non literate adults. They cite the case of poor rural women in India who only speak and understand the local dialect, and who only understand bits and pieces of the standard regional language.

In the same vein, capacity building projects undertaken for marginalized sectors, such as those conducted for the African women in Ghana comprised of a majority of aged citizens and semi literates, showed that "their ability to read and write and understand the local languages is far better and overwhelming than they do in a second language such as English." The report also underscores the importance of localization -- "customizing programs and materials to suit local people" – for ICT to have impact on the culture of the local communities.

The importance of technology and local language was shown in the capability enhancement program for rural women in Uganda. The program used interactive CD-ROM for training the women on marketing, credit, and sales management. Initially, training was given on the basic skills required to operate a computer. The use of CD-ROM was particularly appreciated as it was readily accessible for use and it allowed the women to learn at their own pace. Furthermore, it made "peer teaching" possible. Materials were first produced in English and were later translated in the local language. Rural women beneficiaries acknowledged that this made adoption of ICT easier [13].

With their ICT4D experience in Africa, Day and Grewan found that: *if we examine the wide range of needs of the broad spectrum of people in Africa, not just the elites, it becomes obvious that most imported software is of little use to the many millions of excluded people for reasons of literacy, language and or culture. Instead of importing the dominantly text-based materials from the developed world, materials can be developed locally that specifically address the needs of the majority. Content can be produced where text is replaced by the much more natural voice and in local languages. These materials can use visualization techniques rather than text to more accurately describe places, people and events. And they can use interactive animation and simulation to allow learners to actively investigate how things dynamically happen and work. Easily accessible digital multimedia tools exist to satisfy all these needs, many in the OSS stable. Providing the tools and developing the capability to support the local development and distribution of such relevant content could initiate a positive spiral of continuous development and use of new knowledge and innovation to benefit the African economy, society and all its citizens[12].*

2.4 Localization Studies

The premise of the research study of Sheetal Agarwal et al, "Content Creation and Dissemination by-and-for Users in Rural Areas" [14], is that the common problem of villagers across information sources is the lack of locally relevant content. While most newspapers, radio and television programs provide information that caters to a wider section of the population, there still not enough information sources that can create sufficient locally relevant content such as doctor visitor organized by the government, change in school timings, delay of the train service, list of movies in the village community and the like.

Their study [14] centered on creating a system that can enable this community to create their own content and to significantly improve their information and communication ecosystem through the use of the Voikiok, which uses the mobile phone with support system that helps create content relevant to their pilot village in India.

Cognizant of the fact there, dearth of studies about the rural population information system what is emphasized in the study is the methodology and design used comprised of the following principal steps:

1. Perform a needs-study to identify the information needs of this population. It is important to understand what communities consider as information. To enable easy access of information, a meaningful categorization is also needed.
2. Follow a participatory design process to develop a low-cost, low-literacy solution. Since a majority of this rural population in India lives below USD 2 per year, it is important that the solution is affordable.
3. Observe usage pattern of the solution for the rural population. Since not much research has been performed in enabling local content creation, the usage pattern of this population will be interesting to observe and can provide important insights.

Approaching the study systematically using the above steps, the research was able to discover that the village relevant sources of information: agriculture and related services; health information; education centers; and professional services relevant to the people's needs. The project was also able to provide opportunity to increase the client base and increase business opportunities for the said sources of information [23].

In a related study on local content [15], R.E. Ozioko, et al identified a critical issue in developing local content and that is capturing, repackaging, storing and disseminating them to a wider group of users. The study also contends that "content does not flow on its own accord; it needs owners or originators with motivation and innovative mind to create, adapt or exchange it; challenges as a result include lack of technical skills needed to capture, repackage, store and disseminate the local content. This is aside from other reasons for lack of local content noted by [16], such as: limited financial resources of developing countries for content production; inappropriate training opportunities for content creators; lack of access to advanced technology (production units, digital cameras, digital studios); low motivation and commitment at the decision-making level to change the situation; and market forces, which do not encourage diversity [16]. The study also supported the stand of Ballantyne [17] that ICTs can only be instrumental in the process of production, storage, and dissemination of local knowledge if the capacities are in place to make effective use of them [17].

2.5 ICT User Training Frameworks

2.5.1 Adult Learning

With the development and availability of localized computing device and software application, ICT courses training design and content must also be developed and made available. While the formal educational system is still in process to put together the curriculum for the integration of ICT literacy and skills for primary and secondary schools, adults must be made ready as well to experience and perform ICT learning in order to retain them and apply them later on.

There are many different theories of learning, both for the young and adults. Specifically for adults, research indicates that optimal learning takes place when:

a. They are actively involved in the learning experience, not passive recipients of information
b. They take responsibility for their own learning
c. The learning process or activity addresses affective, cognitive, and psychomotor aspects of learning
d. The examples and problems used are realistic and relevant, addressing real-life concerns and relating to the learners' background
e. The learning methods are varied. Variety stimulates learning, and more senses involved, the greater the retention
f. The learning environment is nonjudgmental and adult learners often resist new information skills when they feel threatened, manipulated or criticized
g. The trainer guides rather than dictates the learning process

Early studies on the use of computers classified users into five categories: innovators, early adopters, early majority, late majority and late adopters [18]. The late adopters are the ones considered most resistant to technology. The latter is also labeled as technophobes, they are persons who fear technology, feel inadequate using it, and generally have negative attitudes towards technology [19]. While the concept may have been coined two decades ago, the possibility of adults to resist change, particularly in handling computer devices could still be real and relevant in rural Asia. Strategies used by organizations to address resistance to change among employees included: taking the systems approach to the change, consultation with stakeholders, making the information systems easy to use, communicating the change, building competencies, selecting the right people, ensuring humane re-deployment [20].

2.5.2 The Conventional ICT Training Method vs the Herskin Method [21]

ICT training courses are most often taught by making students remember (memory) and practice (hands-on) pressing the menu and command buttons. The method, also considered as a conventional ICT training method, becomes problematic when the student forgets the command and when presented with more complex applications. The learner as a result has poor understanding of problem-related solution principles, missing procedure overview as well as need for navigation aid. Such is regarded as the effects of the behaviorist paradigm that *assumes the existence of objective knowledge as independent of the learners;* and by instruction it *assumes that the goal of learning is to efficiently transmit knowledge from the instructor to the learners, thereby making the process passive.*

Dubbed as a "User friendly ICT training" [21] developed a new pedagogical method to ICT training that changed the focus of the training from memorizing, recall and reproduction of knowledge to conceptual understanding of the underlying software. It proposes four ICT pedagogical principles and corresponding schemes:

a. The pedagogical mission in ICT training courses involves a shift from content to methods
b. The goal of ICT training courses is to help students to become independent learners
c. The pedagogical strategy consists of two strictly separated phases: A presentation or overview phase and a task-based or exercise phase
d. Teaching techniques are concerned with using "understanding tools" that provide support for understanding the underlying principles of software

The Herskin method [21] brings about an important objective and that is "to remove the details needed to be remembered, using a problem-oriented understanding process, and changing focus from "how to perform the software functions?" to "why to perform those functions? that is from memorizing to understanding". The learning theory influential to the Herskin method is the constructivist approach that "characterizes learning as the learners' ability to construct their own understanding and capability based upon their prior knowledge and pre-understanding."

2.5.3 Self-Determined Motivation on ICT Training Outcomes

Techatassanasoontorn and Tanvisuth in their research study [22] examined the influence of self-determined motivation on ICT training outcomes and subsequent ICT acceptance with emphasis on Internet skill development and usage. The study was conducted among 204 respondents considered as socio-economically disadvantaged and had taken ICT skills training at selected Thai community technology centers supported by the Microsoft Unlimited Potential grants. The results suggested that individuals who have higher self-determined motivation to participate in ICT training programs are more likely to develop Internet computer self-efficacy, positive training satisfaction, and strong usage intention. In other words, attitudes towards ICT acceptance are shaped even before individuals enter training programs.

The results also offered some guidance for Community Technologic centers how they can improve positive outcomes of ICT skill training programs. In particular the study recommended the understanding of individuals' self-determined motivation to receive training and to cultivate that motivation by meeting the basic underlying psychological needs for autonomy, competence, and relatedness. For example, giving trainees choices in their learning process supports autonomy and may contribute to positive training outcomes.

Related to the thread of thought of the foregoing study are the research findings of Joe Sullivan, Maria Garrido, Khaled Dridi, Chris Coward, Andrew Gordon [23]. The research, "ICT training and employability: Integrated service delivery in United States workforce development networks" shows that lower wage, lower skill populations in the United States take ICT training to improve employability and that community based organizations and specialized training organizations collaborate for this purpose.

2.5.4 Design of a Training Program for Women Village Council Members

Local development requires inputs from training citizen-participants. In the case of good practices mentioned in a handbook for trainers on participatory local development [24], the following were the lessons learned relevant to community-based training programs:

a. Training should be both for trainees and trainers

b. Training programme should have a focus area and relevant content areas

c. Framework should be flexible and flow according to the participation of members and their viewpoint

d. Process of training should not be fluid but tailored to the needs and expectations of the trainees

e. The content should not be lecture-oriented, but based on interactions and discussions

f. Resource persons could function as catalysts to help local women council members understand roles and responsibilities

g. Local experts should have working knowledge of the local language and training methods and material should take into account sensitivities of women council members

h. Trainers should use participatory training methods and tools, which meet women trainees' expectations in the area of decentralized rural local governance, both in method and design

i. Field visits should be an integral part of the training programme for women council members

j. The training material should be pictorial wherever necessary

2.5.5 Competency based Approach for ICT Initiatives at the Community Level

Competencies are clusters of abilities, skills, knowledge and attitudes that enable a person to act effectively in a situation or a task to a minimum standard [25]. The competency requirements are put in statements to specify at what level a person should perform a job/task to be confident in that role. Some of the rationale for defining competency standards are: It serves as a reference on expectations regarding roles to be performed; to estimate how much autonomy stakeholders can be granted; to assess/test whether someone is competent at their job or capable to carry out tasks; to test stakeholder skill level with regard to their roles; to identify points of intervention – the intervention may come in the form of structured training, encouragement for a job is well done or personal attention where assistance is needed; and to estimate the level and frequency of training interventions needed to assist skills development.

Competency based standards are commonly used in industry throughout the world, especially where crucial tasks must be performed and measured, while at the same time interventions can be applied appropriately. To ensure continuity across a profession, most professional skilled jobs require prescribed competency standards. Many developed countries have a compendium of basic competency standards for certain job types in major industries to ensure efficient and effective job performances. An example of commonly used competency standards is the European Computer Drivers License (ECDL) series of certificate tests. The ECDL Foundation, which implements the program and serves as the certifying authority, covers a wide range of international computer certifications from introductory to advanced levels. Anyone who accomplishes a passing score on the ECDL exams is then automatically graded as competent with a worldwide equivalency as the test given is the same anywhere around the world.

Competency standards have long used in a variety of fields, yet their application in rural development remains immature. In the absence or the lack of strategic framework for ICT training initiatives in the rural areas, the UNESCAP put together a Technical Paper training guideline for competency standards and requirements in implementing community-based ICT initiatives, such as community e-centres (CeCs), in remote and rural areas in Asia and the Pacific. The guideline refers to three key stakeholder

groups including the CeC operators, service providers and the users who frequent the CeC (for any number of reasons).

Competency for	Basic	Proficient	Advanced
Users			
A. **Using the Internet** – ability to understand the concept of the Internet, the difference between the Internet and other networks and how it can help in a variety of contexts	• Understand the basic purpose, strengths and weaknesses of the Internet. • Understand the differences between basic Internet programs including Browsers, chat clients and the such	• Identify different types of information on the Internet • Able to use web browsers to search the Internet for information	• Able to upload/download files, access web forums, and send/receive e-mail. • Able to contribute to open websites via any of the web 2.0 methods (wikis, Blogs, forums, etc.)
B. **Researching** – an awareness for the role of ICT in accessing/retrieving and utilizing quality information (e-applications) to solve problems	• An awareness of available resources for finding information on issues/ problems • Find and use resources based on an issue or problem (agriculture)	• Understand the difference between subjective and objective information • Able to apply a variety of information sources and seek solutions to problems	• Carry out specified research functions as an assistant to an investigator or as Requested to assist others • Able to present research findings in an organized fashion
C. **Understanding Hardware** – ability to develop collaborative skills and utilize centre equipment for community development	• Ability to identify and describe functions of the available hardware in the centre (computer, fax, and other equipment)	• Able to teach others how to use available hardware, identify functions, Hardware specifications and capabilities	• A deep enough understanding of the available hardware to identify and troubleshoot issues, failures and find solutions for maintenance
D. **Outreach** – ability to develop collaborative skills and utilize centre equipment for community development	• Understand the importance of working collaboratively • Able to identify situations where the cec can serve to better your community	• Able to build a support network in the community uses cec facilities • Identify community development goals and think of ways in which the cec Can support such goals	• Make use of networks, collaborate, create and manage complex information Exchanges • Ability to lead and influence others when asked to, be a productive team Member when called for
E. **Safety** – development of the skills necessary to use computers and the Internet safely, responsibly and legally	• Identify the risks of using computer hardware and software • Understand security and safety issues with regard to ICT use in the Community	• Understand basics of computer viruses, malware, spyware and adware • Ability to deal with e-mail attachments, identification of spam e-mail and Other malicious attempts to break personal security	• Understand and demonstrate the social, ethical, legal and human issues surrounding the use of the cec • Able to teach others on crucial issues regarding safety, security and social Appropriate usages of the cec
F. **Language & Communication** – ability to express ideas, type in own language and share self generated information sources	• Able to type in your own language • Able to communicate clearly to express ideas	• Understanding of crucial issues regarding document storage/transmission In your native language • Understanding of common communication tools and their application for Community development	• Able to teach others how to type in your language • Understanding of fonts, transmission issues with regard to international typescripts and ability to solve issues
G. **Software** – able to start and stop applications, save files, edit/format documents and create basic graphical	• Understand the concept of software and able to identify machines in the cec that use software	• Able to identify different types of software, software categories, and the Types of tasks each software	• Able to install/uninstall, and maintain software upgrades • Identify what an operating

objects	• Understand that hardware and software have a connection and be able to Explain that connection	is most suited	system is, able to solve common problems with the Operating system

Table 2.1: Competency Standards Levels

2.6 Instructional Design

Instructional design means "creating instructions associated with the broader concept of analyzing human performance problems systematically identifying the root causes of those problems considering various solutions to address root causes and implementing solutions in ways designed to minimize the unintended consequences of corrective action"[26] .

While it is focused largely on organizational settings, the instructional design model, referred as "rigorous way of creating good training called instructional systems design, could be adapted in other environment settings. The goal is the improvement of human performance.

The Instructional Design model is a methodical system which covers process of Analysis, Design, Development, Implementation, and Evaluation. Below is a graphical illustration of the Instructional Design model. Each step is briefly discussed.

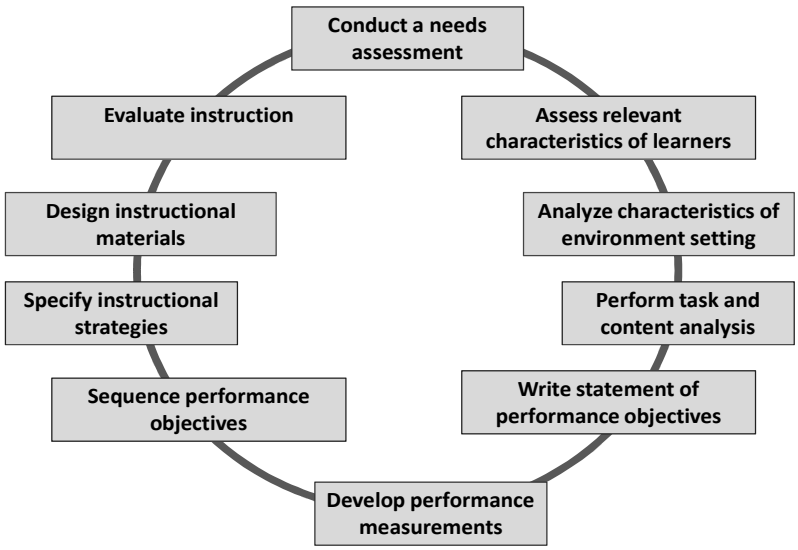

Figure 2.1: Instructional Design Model

2.6.1 Conduct Needs Assessment

Training must be premised on the performance problem requirements of users. The assessment looks into the gap or identifies the problem(s) that need to be met. Analysis of the problem is also desired to surface the underlying causes of the gaps between the ideal or desirable and the actual situations. A needs assessment plan provides a blueprint for collecting information about instructional needs. The assessment covers a research process that includes (1) objectives – results desired from the needs assessment; (2) target group – whose needs will be assessed; (3) sampling procedures – methods that will be used to select a representative sample from the target group; (4) data collection method – how

information about needs be gathered; (5) specifications for instruments and protocols – what instruments should be used during the assessment and how these will be used as well as the protocols required in the organization or setting of the problem; (6) method of data analysis - how the information will be analyzed; (7) description of how decisions will be made based on the data – how needs will be identified from the results of data collection and analysis.

2.6.2 Assess Relevant Characteristics of Learners

The process entails a process of examining who the intended learners to define the target population, target group, and the target audience of the training. Depending on the type of training, the characteristics that will have to be assessed should be relevant to the situation, decision and learner-related characteristics. Situation related characteristics refer to events or conditions affecting the learners and consequently result to the performance problem. Decision-related characteristics of the learners are concerned with finding out who will participate in the training program. Learner related characteristics learners' specific attributes – physical, traits, previously learned skills, previously learned knowledge, and previously learned attitudes. Other learner-related characteristics include demographic characteristics, physiological characteristics, aptitudes, experience, learning styles, attitudes, job categories, value systems, life cycle stages or career stages.

2.6.3 Analyze Characteristics of Environment Setting

The process involves gathering information about the organization or the environment's resources, constraints, culture so that instructions will be designed in a way appropriate to the environment. The purpose is to find out how these factors impact on training delivery.

2.6.4 Perform Task and Content Analysis

The process is also known as work analysis. It involves examining of the duties and responsibilities and related activities of the job. The assessment includes work flow and procedures if these are sufficient and carried out properly. Competency models are called for in the assessment of the work or tasks.

2.6.5 Write Statement of Performance Objectives

This step entails a description what the learner should know, do, feel, on completion of the planned learning experience vis a vis the problems identified. At this point the desired outcomes are articulated for the learning activities.

2.6.6 Develop Performance Measurements

The process is about identifying and establishing work or performance metrics and indicators to assess the performance of the learners.

2.6.7 Sequence Performance Objectives

The process entails the order and range of the work objectives. Rules of sequencing can be established to provide guidance for the instructional designs.

2.6.8 Specify Instructional Strategies

The instructional strategy is the organized plan to expose learners to experiences that will help them acquire information, cognitive strategy or develop intellectual skills, motor skills or new attitudes. The strategy must be based from the analysis of the work tasks that learners are being trained to perform

and from the corresponding performance objectives established to achieve the desired results. Choosing media and delivery methods must also be decided at this stage.

2.6.9 Design Instructional Materials

In selecting or designing instructional materials, the steps include (1) preparing a working outline; (2) conducting research to identify instructional materials available for the conduct of the training; (3) examining instructional materials; (4) arranging or modifying existing materials; (5) preparing tailor made instructional materials and (6) selecting or preparing learning activities. At this stage, some of the issues that are dealt with are copyright issues. It is important to secure permissions for the use of instructional materials that were accessed from vendors or borrowed from private organizations.

2.6.10 Evaluate Instructions

Formative and summative evaluations are considered when training activities are delivered. On one hand, formative evaluations are rendered mid-way of the delivery of the training project, assuming that these are series of activities. The purpose is to gain lessons to improve the delivery of the training. On the other hand, summative evaluation is conducted upon the completion of the training project and when the instructional materials have been used by the target learners and results have been measured.

2.7 Conceptual Framework

From the foregoing review of literature, concepts were selected and defined to design a framework for understanding training component for localization. Following figure presents the graphic illustration of the training process and related issues.

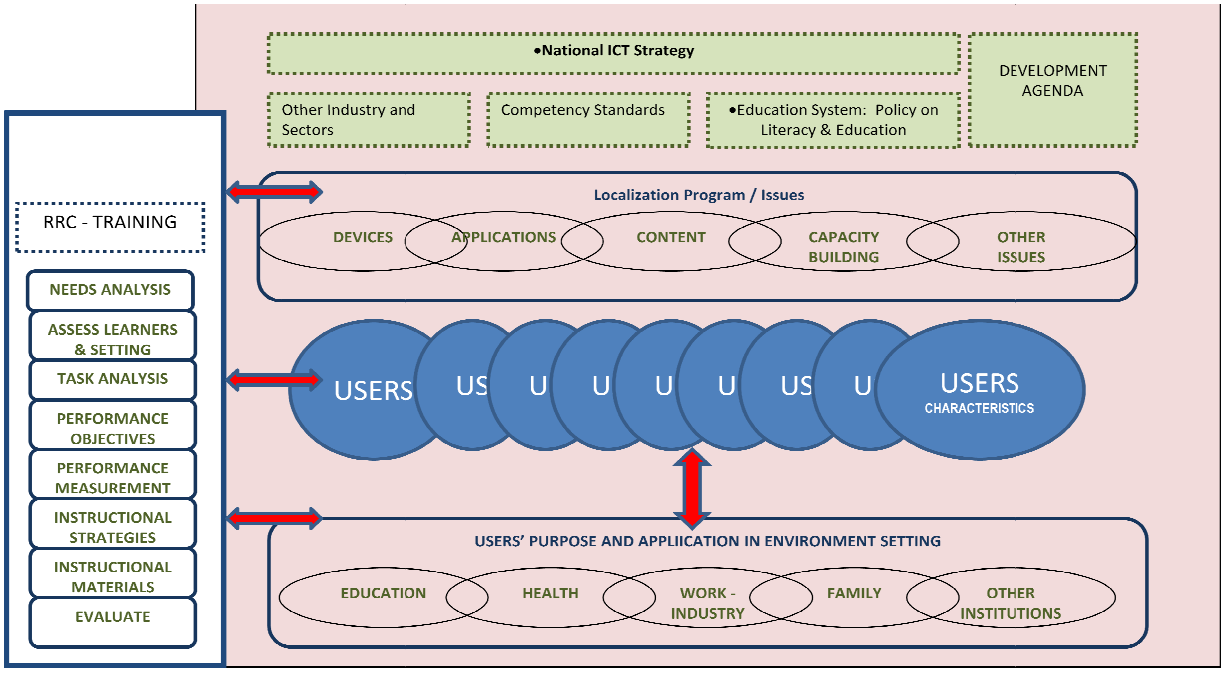

Figure 2.2: Conceptual Framework for Training Component on Localization

The left box comprised the training design initiatives. The specific activities chronologically listed were largely drawn from the instructional system design and other related training approaches reviewed. The arrows show the influence between the design and the users. The users and users' characteristics were

given emphasis to ensure stakeholders' are given importance in the process. Likewise arrows show the motivations and influence and relationship of the training with the environment setting, specifically the institutional environs of the users. The policy environments of the localization initiatives represented by boxes in dotted lines are taken into consideration because of its influence to the localization program as well as issues confronting the localization initiatives.

The case studies discussed herewith have adopted this framework for the conduction of end users training program on localized ICTs as explained in the following chapters.

3 Bangladesh: Training of Infomediaries and other Users

Development Research Network (D.Net)

3.1 ICT Policy in Bangladesh

Since 2002, Bangladesh has had a National ICT policy which focuses on ICT infrastructure development, human resource development, and on introducing ICT training at the primary level to university level. But due to resource constraints and improper implementation, Bangladesh has not fully benefited from the policy.

Recently, however, the Bangladesh government has realized the importance of ICTs. The current government has declared a target to build a digital Bangladesh by 2021, and is in the process of formulating long term strategies for this purpose.

In 2009, the Bangladesh government has approved a new National ICT Policy 2009 which has ten (10) objectives to develop the foundation of digital Bangladesh [27].

3.1.1 Objectives of National ICT Policy 2009

1. Social Equity: Ensure social equity, gender parity, equal opportunity and equitable participation in nation-building through access to ICTs for all, including persons with disabilities and special needs
2. Productivity: Achieve higher productivity across all economic sectors including agriculture and SMME (small, medium and micro enterprises) through the use of ICTs
3. Integrity: Achieve transparency, accountability, responsiveness and higher efficiency in the delivery of citizen-services
4. Education and Research: Expand the reach and quality of education to all parts of the country using ICTs, ensure computer literacy at all levels of education and public service and facilitate innovation, creation of intellectual property and adoption of ICTs through appropriate research and development
5. Employment Generation: Enlarge the pool of world-class ICT professionals to cater to the local and overseas employment opportunities
6. Strengthening Exports: Ensure a thriving software, ITES and IT manufacturing industry to meet domestic and global demands and thereby increase foreign exchange earnings, attract foreign direct investments and reduce dependence on imports
7. Healthcare: Ensure quality healthcare to all citizens by innovative application of ICTs
8. Universal Access: Ensure connectivity to all as a public service obligation (PSO)
9. Environment, Climate and Disaster Management: Enhance creation and adoption of environment-friendly green technologies, ensure safe disposal of toxic wastes, minimize disaster response times and enable effective climate change management programmes through use of ICTs as Bangladesh is facing the dual scourge of environmental pollution due to rising industrial and consumer wastes and also global-warming-induced climate-change due to excessive carbon emissions of the industrialized countries

10. Supports to ICTs: Develop appropriate infrastructure including power, and regulatory framework for effective adoption and use of ICTs throughout the country

Objectives 4 and 5 of the ICT policy are directly related to training and capacity development which is presented below:

3.1.1.1 Details of Objectives 4 of National ICT Policy 2009: Education and Research

a. Assess skills of ICT professionals and meet gaps with targeted training programs to overcome the short-term skills shortage in the ICT industry and adopt continuing education and professional skills assessment and enhancement programs
b. Encourage closer collaboration between academia and industry to align curriculum with market needs
c. Establish an ICT Centre for Excellence with necessary long-term funding to teach and conduct research in advanced ICTs
d. Extend the reach of ICT literacy throughout the country by incorporating ICT courses in secondary education and technical and vocational education and training (TVET) programs
e. Enhance the quality and reach of education at all levels with a special focus on Mathematics, Science and English
f. Ensure ICT Literacy for all in public service
g. Boost use of ICT tools in all levels of education including ECDP, mass literacy and lifelong learning
h. Ensure access to education and research for people with disabilities and special needs using ICT tools
i. Ensure that all universities provide global standard ICT education and introduce Postgraduate Programs in ICT education to encourage research and innovation

3.1.1.2 Details of objectives 5 of National ICT Policy 2009: Employment Generation

a. Provide incentives for investment in local ICT industry
b. Build institutional capacity for producing greater number of IT professionals in line with domestic and global demands for knowledge workers
c. Standardize skills for local ICT industry
d. Facilitate global employment of skilled ICT workforce
e. Provide financial assistance to ICT professionals for skills development

3.1.2 Localization Strategy in ICT Policy

The localization issue was not properly taken care of under the 2009 National ICT Policy. There is no proper guideline for localization of ICTs and its training. Only the following four action plans are focused on Bangla keyboard layout and Bangla scripts issue:

3.1.2.1 Four (4) Action Plans to ensure Bangla in all ICT activity mentioned in National ICT Policy 2009

a. Promote the use of standard Bangla keyboard and resolve related issues
b. Update Bangla encoding standard to align it with Unicode and ISO
c. Digitally publish all government publications in Bangla using a standard encoding to guarantee document portability

d. Join the Unicode Consortium as an Institutional Member

3.2 ICT Training in Bangladesh Component

Although the government is not focused on localization, volunteers and activist groups have been promoting this cause. These groups have developed many localized solutions for computer application, most of which are free and open source. Yet there is inadequate training and dissemination of localized tools for the target groups.

In 2003, D.Net started localization and development of content for *infomediaries* (information intermediary) and provided them training for the purpose of disseminating local language content at grassroots level.

Through PAN Localization Phase II, D.Net provided two types of training: (1) "Training on how to disseminate local language content to end user," and (2) "Training on local language content development." D.Net also conducted refreshers training to update skills among more advanced trainees.

3.2.1 Training On Dissemination of Local Language Content to End User

D.Net conducted the training from 23rd -31st January, 2008 [28]. For this training, D.Net invited Infomediaries from different tele-centers keeping in consideration the diversity of the tele-center model. Fourteen persons participated in this training.

3.2.1.1 Training Framework

In the beginning of the training, participants were asked to write their expectations in terms of what they actually desired to achieve from the training. Participants were then divided into two groups to collate their expectations, which is presented as follows:

Group 1: Winter	Group 2: Spring
- To know about instrument required to disseminate local content - How children can be involved - Development of skill on Jeeon (local language content base developed by D.Net) - Advice on income-generating activities for tele-center - Role of email, internet - Creating web page & development	- Ensure free flow of information - Develop skill as infomediary - Ensure child and women rights - Scale up access to information for marginal people - Training on hardware & trouble shooting for capacity building - Update content base with local content - Help community people to access information - How to gather information from the local community

Table 3.1: ***Expectations of the Participants***

The participants were then provided training on the following aspects:

Word Processing Fundamentals: To ensure that trainees were capable of operating computers and using required software packages, the training provided training on basic computing skills. In this session participants were introduced to MS Word, specifically on What is MS Word, How to open a file, etc. Gradually, they learned about file saving, as well as applying borders and shading in the text document. Finally, they learned how to write in Bangla script using Avoro software (Unicode based typing software which is used for Bangla script typing in MS Word). As a practical exercise each participant made his/her CV and saved it in his/her respective name.

Spreadsheet Fundamentals: Trainees learned basic skills to use Spreadsheet, such as how to insert a row, column, and cell, and how to use different arithmetical operators. As a part of their practical

session, each trainee completed an assignment on how to input and compute the monthly salary of a company, including monthly payment, bonuses, on a sample spreadsheet.

Internet and World Wide Web Fundamentals: During this session, the trainer provided lectures on basic ideas about the internet, such as basic definition, uses, and benefits. The trainees learned how to browse websites and use e-mail. Trainees opened their own email accounts on Gmail and sent messages to each other.

Working with Photos (Group and Individual): This session focused on how to transfer photographs from a camera to a computer, as well as how to edit and resize photographs. This session also discussed the properties of photographs sent through e-mail and pictures uploaded on websites.

Activities of Infomediaries (Daily Tasks):

All trainees wrote their everyday activities as infomediary which is presented in the table below:

Name of Centre	9.00- 12.00 am	12.00-3.00 pm	3.00-6.00 pm	6.00- 9.00 pm
RKC- YPSA	• Conduct training class for students • Practical training • Teaching multimedia, compose, photocopy • Maintain ledger book and accounts • Field visit	• Practical training • Content based information service delivery • Field visit	• Conduct training class for students • Photocopy, compose, paper cutting	• Reading books and journals, watching Television, • Doing office work (if any)
PGUS- BNNRC	• Deliver Information services • Update register • Conduct training • Laminating	• Problem Sharing, • Write up report • Service delivery to the users	• Office report	• Information sharing
GUP, RTC- Practical Action	• Attendance • Meeting with Project leaders • Planning	• Field visit and follow-up • Computer Training • Reporting • Service Record • Video show	• Training for report preparation	• Conduct Training • Update register • Other tasks
CRC – DAM	• Centre Visit • Contact with boundary partners • Information sharing • Contact with CRC members • Office report • Problem sharing	• Reporting • Sharing Problem	• Video show (Education and information related) • Computer Training	• Follow-up through phone
Digonter Dak, WARP –D.Net	• Internet and email service • Training to the students • Information services	• Service delivery to the clients • Maintain register	• Report preparation • New members entry • Computer type • Internet	

Name of Centre	9.00- 12.00 am	12.00-3.00 pm	3.00-6.00 pm	6.00- 9.00 pm
Ehut - brac Net	• Edit content • Content Management • Team meeting • Members service	• Design new project • Update register	• Follow-up activities	
GHAT- DEN	• Registrar maintain • Field visit • Data collection • Issue based service delivery	• Service delivery to the client	• Problem solve	
CRKC- Coast Trust	• Computer Training	• Information service delivery	• Update official document	• Computer training • Internet and email

Table 3.2: Documentation of Daily Tasks performed by Infomediaries

After identifying their daily activities, an informal discussion session was arranged among the participants. Some of the discussion topics were how to deliver services, charges or payment for particular services, the policy for disabled people, women and children, interaction of local people with tele-centres, and the problems and prospects of their respective centers.

Identification of Required Quality for a Good Information Services Provider: In general, a tele-centre provides three types of information. The trainer divided the participants into three groups based on these three types of information: (1) Information service group, (2) Technical service group; and (3) Auxillary services group. Each group identified the required skills and qualities for the delivery of particular services.

1. Information service	2. Technical service	3. Auxillary services
1. Motivation capacity 2. Industrious mind 3. Education 4. Willingness to work with rural people 5. Knowledge about local language 6. Honesty and dignity 7. Punctuality 8. Knowledge about information seeker	1. Education 2. Knowledge about local community 3. IT expertise 4. Acceptable to the community 5. Intelligence 6. Training skills	1. Local Language 2. Friendly attitude 3. Clear idea about service delivery system 4. Marketing skills 5. Skills on using technology

Table 3.3: Types of Service Group

***Using search engine*:** During this session, the trainer introduced the web search engine and taught the participants how to use the search engine to collect relevant information. The trainees searches websites on the following topics:

i. Mobile

ii. Newspapers
iii. NGO Network
iv. Email
v. Website
vi. Personal contact
vii. Local information
viii. Community Radio
ix. Video
x. Books and Journals
xi. Campaign

Video: In this session participants watched a documentary titled "Moni the Mobile Lady" which showed how Moni worked as infomediary in a rural community. The video inspired the participants as it demonstrated what they will be able to do in the future.

Figure 3.1: Pictures of Yard Meeting conducted by Moni the Mobile Lady

Livelihood Content Search: During this session, the trainees categorized information collected from different channels into offline and online content. The result of the categorization is as follows:

Offline	Online
• Books and Journals • Research Papers • Camp Newspapers • Journals • Audio Video • Local information	• Books and Journals • SMS • Email • Internet • Helpline • Television • Messenger

Table 3.4: Types of Content

Identification of Jeeon content category and others Information Sources: This session discussed effective content search methods using the Jeeon [34] offline CD, as well as other information sources.

The trainer gave a comprehensive discussion on how to search for information using key words. Using the Jeeon content base and Jeeon directory, infomediaries retrieved information on the following subjects:

i. Agriculture
ii. Fisheries
iii. Poultry and livestock's
iv. Health
v. Disaster
vi. Awareness
vii. Law
viii. Appropriate technology
ix. Non-farming economic activities
x. Education
xi. Government forms
xii. Job sites

Indigenous/Traditional knowledge collection process: This session focused on indigenous/ traditional knowledge collection process on different issues of livelihood, such as agriculture, heath, environment, disaster management, appropriate technology, and non-farm activities.

Mobilization & Marketing: In this session, the trainer focused on the importance of mobilization and how to develop mobilization and communication skills. The trainees showed their service delivery process by role playing. One trainee performed his/her role as an Infomediary while the rest acted as community members or information seekers. In that way, all the trainees gained practical experience. This session also explored the issues of service recipients.

Gender Issues: This session covered concept of gender, construction of gender ideas, the role of gender in development and content, and the gender aspect in the service delivery process. It also covered the barriers that hinder women from receiving and visiting information centers.

Field visit: The trainees visited a tele-centre operated by Gandi Asram Trust in Noakhali District, located at the southern part of Bangladesh. The trainees also visited two villages around the centre and interacted with service recipients of the community. They observed how a mobile lady worked with the community people, how she delivered information services, and what problems she experienced. A few of the villagers shared their success stories with the trainees. At the end of the training session, the participants presented their feedback, as detailed below:

Sharing of feelings at the end of the training:

i. "As an Infomediary, I faced some problems in the delivery of information for particular questions. From this training and field visit, I feel confident that I will be able to deliver information properly"
ii. "It would be helpful if there is a regular follow-up process"
iii. "Through this training, I came to know that different organizations work in different ways and that there are various contents which would be more helpful for other organizations"

iv. "There is a significant difference in the work process followed by D.Net and our organizations"

v. "For better information service delivery, content is more important than technology. 'Jeeon" (An off line content CD of D.Net) and jeeon online [29] is a good example of such sciences"

vi. "From the field visit, we observed that information services brought positive changes to the village people. People now visit Pallitathya Kendra (Village information centre) to resolve community disputes"

vii. "It is fulfilling to work with marginalized women and farmers"

viii. "I have learned a lot about hardware, software, website, digital camera, etc."

ix. "Learning through role play was very interesting"

x. "From the field visit we gained practical experience about working with community people"

Recommendations (From the Trainee):

i. There should be a helpline accessible to everyone

ii. More Infomediaries should be trained

iii. Duration of the training should be extended beyond nine days

iv. It would be better if the field visit is extended to one to two days

v. More discussions and training on local languages should be arranged

vi. University students enrolled in tele-centre education could take internship in the communities or grassroots level

vii. Information sharing should be increased among Infomediaries of different tele-centres

viii. A group of grassroots people should be invited through the PAN Localization project so they can further discuss local information

Skills improvement through refreshers training: During the refresher training session, some of the difficulties highlighted by the trainees were:

Disadvantages of offline information system

i. Information is not updated

ii. It is not possible to get all the information

iii. Technical problems in browsing information system

iv. The need for passwords to install information systems

Barriers of online information system

i. Most information online is in English

ii. Shortage of images along with information

iii. Limitation of internet bandwidth and access

iv. Limited knowledge on websites

v. Absence of list of useful websites

Barriers of helpline information system

i. Limitation of experts
ii. Limitation of experts' time
iii. User have no confidence in experts
iv. It takes time to disseminate / supply information
v. Experts are not available all the time
vi. Limited interest of users to get information through helpline

Information intermediation in the community: The information intermediation process in the community was understood by our trainees when they worked as infomediaries for more than six months. The following section presents the information process communicated by the infomediary during the training:

Subject	**Information seeker**	**Intermediary**
Agriculture	Farmer, Housewife	Farmer, dealer, BADC, Upazila Agriculture Office, Other Farmer
Education	Students, Teacher, Parents, Service Holder	Education Institute, Teacher, Students, GOs/ NGOs, Internet, CD, Newspaper, Radio, Mobile
Law and Human Rights	Farmer, Laborer, Service Holder, Students, Businessman, Women and Children, Journalist, Disable	Advocate, Court, Chairman, Member, Politician, GOs / NGOs, UP, Human Rights, Journalist
Health	Farmer, Laborer, Service Holder, Students, Day Laborer, Businessman, Journalist	Doctor, Indigenous Healer, Pharmacy, Gypsy, Health Complex, Clinic, Hospital, NGOs
Service	Unemployed, Service Holder, Students, Parents, housewife	Institute, Employment Organization, Service Holder, Newspaper, Internet, Relatives, Advertisements

Table 3.5: Information flow Identified by participants within their community

3.2.2 Training on Local Language Content Development

Local language content development is significantly needed as there is very little local language content in Bangla. In this light, D.Net started content development in 2005. Through PAN Localization II, D.Net provided local language content development training to content developers from various institutions so that they could develop content for their own organizations to help address content demand in Bangla.

It is worth mentioning that due to D.Net's intervention, many organizations have initiated local language content development to address this issue. From 25th - 30th March, 2008, D.Net provided training on local content development to content developers from different organizations. A total of 15 potential content developers from different tele-centres and government institutions like Dhaka Ahsania Mission, World Net, Dhoritry Samaj Kallyan Shongha, Digonter Dak, Gandhi Ashram Trust, Shariatpur Development Society, Ghashful, Socio Economic Development Association, Participatory Advancement Social Service and Darpan Samaj Unnayan Kendro and Agricultural Information Services, and Directorate of Agricultural Marketing attended this training.

3.2.2.1 Training implementation process

In the preliminary stage of the training the participants wrote their expectations focusing on what they expected from the training and what method could be applied in the training. The participants divided themselves into three groups and wrote down their expectation, which are tabulated as follows:

Group 1: Shapla	Group 1: Spring	Group 3: Royal Bengal Tiger
- Publish web pages on the Internet and learn about webpage design and update. - Writing in Bangla for website. - Process of writing views in Blog - Techniques of good content development.	- Ensure free flow of information to the marginalised for building information based society - Use ICT to disseminate market price information to farmer and help them to get fare market price of their commodities. - Ensure the involvement of general people in the process. - How to write Bengali using Avro? - Attachment of appropriate photographs in content. - Pay attention to considered matter of Indigenous knowledge, religious intuitions and heritage in content development.	- How articles can be posted easily in Bengali in Web site. - The process of collecting information from grassroots. - To learn step by step process for editing. - Basic rules of report writing. - Want to know about Content Management System.

Table 3.6: Expectation of the Groups

Introduction to Content Development and Existing Content Development Methodologies: During this session participants learned about content development methodology based on different delivery channels. Participants were also introduced to the content development life cycle. The following content development methodologies were discussed:

Step 1	Need Assessment		
Step 2	Curricular Unit Preparation		
Step 3	Material Preparation		
		3.1 Selection	
		3.2 Adaptation	
		3.3 Development	
			3.3.1 Folk Media
			3.3.2 Audio-Visual

			3.3.3 Written Material
Step 4	Pre-test		
Step 5	Revision and Finalisation		
Step 6	Duplication		
Step 7	Application		
Step 8	Evaluation		

Table 3.7: Content Development Methodology

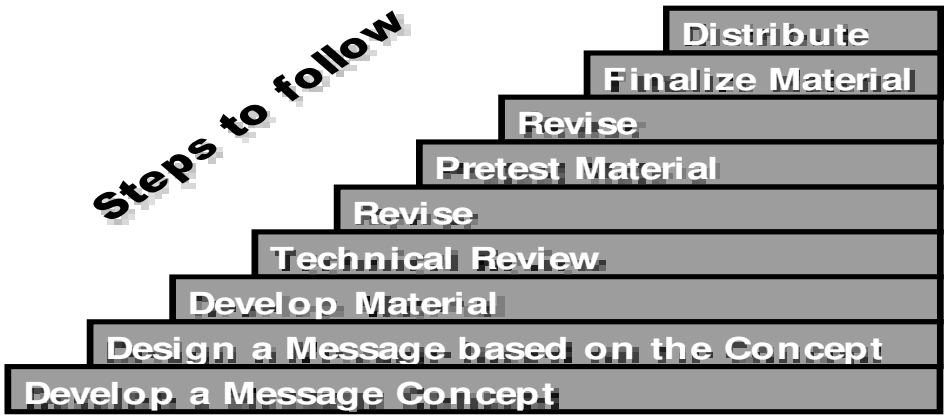

Figure 1.2 Content Development Methodology followed by Bangladesh Center for Communication Programs

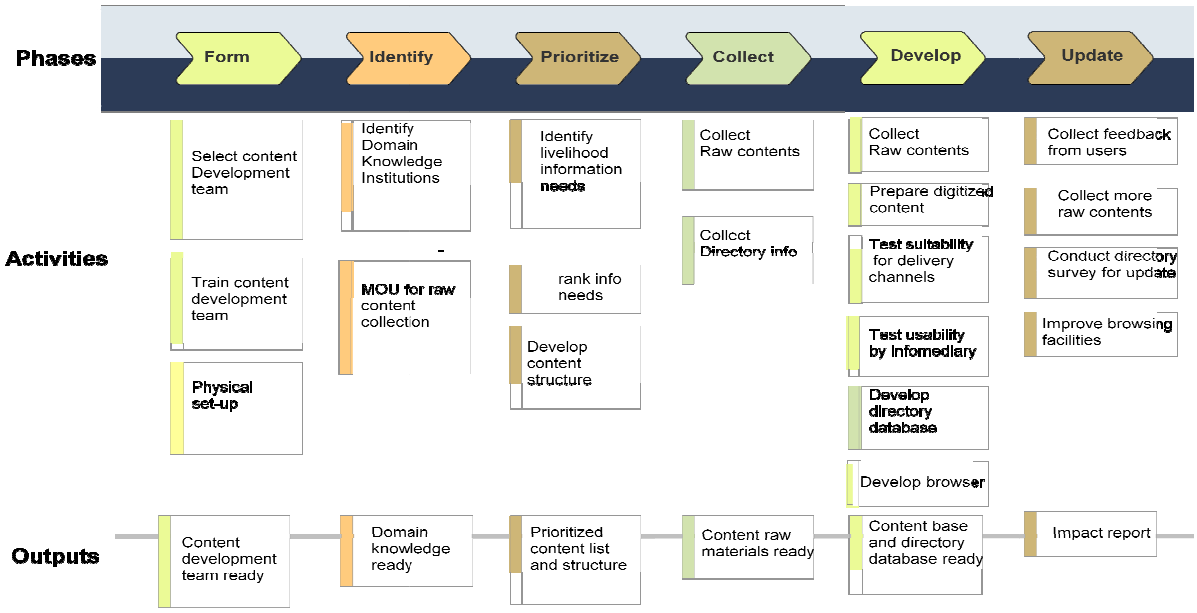

Figure 3.3: Content Development Methodology followed by D.Net

In the next session participants were trained on report writing. Some of the steps discussed during this session are as follows:

i. Definition of report

ii. Types of report

iii. Various characteristics of good report

iv. Difference of news and report

v. Content of report

vi. Various characteristics of good feature

During the training, each participant had to write a report on various topics of his/her choice. A handout on report writing was also disseminated.

Introduction to CMS and Joomla,(detailed training on posting articles in Joomla, including typing in Avro, browsing Joomla based website): During this session, different types of Content Management Systems (CMS), their properties, advantages, and disadvantages were discussed. Participants learned how to write Bangla scripts in CMS. They also learned the differences between Unicode font and ASCII fonts. As an example of CMS, detail content development using Joomla was introduced to the trainees.

Wiki and Bangla Wiki: Participants were also introduced to Wikipedia. All participants opened an account in Bangla Wikipedia. They also learned how to search content, search topics, edit topic, post articles, insert images, create external and internal links, and prepare references. A handout on how to register and write in Bangla wiki was also disseminated for further reference.

Introduction to Blog: Participants were introduced to the development of Bangla blogs through biggani.com. They opened their own accounts and added blog posts in Bangla.

Action/ Strategy Plan Finalisation: The participants expressed their deep commitment to ensure more service for the rural community through their dedication and hard work in the light of what they learned in the training. Following the training these were their "to do plans":

i. Upload information about mobile servicing, trouble shooting
ii. Inform the telecentres about the usefulness of Bangla wiki and teach the process of uploading content
iii. Upload and collect necessary information by blog
iv. Upload information about their local area, famous locations, and natural beauties to promote tourism
v. Inform people about local knowledge on different cultivation processes
vi. Upload information to jeeon.com.bd as collected from local people
vii. Upload the definitions of different local words
viii. Inform friends about Jeeon, blog, wiki
ix. Upload indigenous knowledge about purification of water
x. Upload information about cultivation process in extraordinary/emergency situations
xi. Encourage people to upload information by conducting training for local people
xii. Upload latest agriculture-related information, upload a list of registered insecticides and delete information of banded insecticides
xiii. Inform dealers about the appropriate registered insecticides to get perfect results
xiv. Upload market price information in Bangla
xv. Upload awareness building information of human rights
xvi. Upload information on the process of migration
xvii. Upload information on problems and solutions about tea gardens, tea workers and deforestation
xviii. Upload any indigenous knowledge
xix. Help people to collect information from Jeeon, wiki

3.3 Survey Findings

Following the two trainings, a monthly survey was conducted to capture behavioral changes among the participants. However, the process had some limitations such as the timeliness of the responses collected and the in availability of participants who attended the training to provide responses for the survey.

From the findings it was found that through the activities of the infomediaries, grass-root community became aware that information service and tele-centers are a new source of livelihood content. However, the percentage of community aware about this service varied. At some locations only 15-20% of locals knew about the service, while in some areas about 65-70% people were aware of this service. However it was observed, that people were gradually becoming familiar and the number of repetitive users of this service was increasing.

Through the survey, D.Net further tried to assess how the infomediaries were introducing this service to the new target groups. Thus through the survey questionnaire it was asked, that "What are your plans for next week?" Some of the responses gathered from the trainees were: inform everybody about the activity; initiate ICT related action on special days and festivals; make people aware through meetings and inspire them to make use of information services; produce posters and other public announcements; advertise on Satellite Channel, Upazila Workshop and Rally, Seminars; arrange demos on CDs; introduce Information Centre and information services through multi-media; introduce Information Centre and information to immediate locality; launch school-based discussions and community action groups; invite more volunteers; and organize workshops for communities, gov. and ngos.

The trainees were further asked to report the frequent sources from where content is gathered for the locals. The identified sources included: local knowledge, books, mobile, Internet, Jeeon-IKB, www.ghatbd.com, www.ruralinfobd.com, offline CDs for information, Bangladesh Agriculture Research Institute, Bangladesh Rice Research Institute, newspaper, library, T.V, health centres, Help-line, different government offices, Union Parishad, Youth Development, experienced people, fisheries centre, web search, NGOs, and guidebook. Through their response, it was observed that people have started using livelihood content and that they use the internet with the help of infomediaries and benefits of ICTs have started spreading among community people.

It was further noted whether the trainees considered gender issues in content development. Through the survey responses it was found that only two of fourteen participants considered gender issues in contend development.

It was further assessed that how infomediaries were helping women, marginalized, and disabled people in accessing the local language content. From the responses it was noted that they were taking steps to ensure that information access is provided to these groups. They specifically encouraged women to come and access content. One of the centers was offering 50% discount for women users. Another institute arranged issue-based meeting for increasing awareness of women through Gano Kendro. One of the infomediaries reported that she even went to women's houses to give them information service, conducted *uthan boithak* (yard meeting) with women, gave information service on health, education, law etc, and provided oral information to handicapped people. The intermediaries were attested that due to their service, women were becoming more aware of their rights and are cooperating in conducting awareness program for women.

While D.Net had only provided training on content development and introduced tools such as Joomla, Wiki and Blog. However most of the trainees had also started using other tools like MS Front Page and Word processors to develop static html pages.

The survey also assessed their attitude towards content update. Through the responses it was found that only two trainees were updating content during the second month, however in the last month it was found that eight participants that started updating the content regularly.

3.3.1 Skills Improvement among Trainees after Six Months of the Training

The following section present individual cases of content access and use by the infomediaries.

***Rita Rani Dey* (GHAT):**

"After taking the training we arranged a field seminar in 20 schools in my locality and informed those students about our services. I have also overcome my lacking [skills inadequacies] in most difficulty areas. I have all the information about colleges and school in my locality available to me now".

***Muhammad Abul Hasan* (RTC):**

"At the time of my last training, I was very new as an infomediary, and was not informed yet about the responsibilities and process of information collection. After that training I have overcome my lacking [skills inadequacies]".

***Motahar Hossain* (RKC: Dwip Unnyan Songstha):**

"From this training mainly my computer and Internet related knowledge developed. In [the] last Independen[ce] day, in a discussion session of my locality, I presented our services to the audience. I also gathered information about some facilities from doctors that I have included it in my information service centre".

***Azizul Hakim and Goutom Kumar Saha* (CRC: Dhaka Ahsania Mission):**

"Just after taking the training, I prepared a presentation for my office about what I have learned from the training. After that presentation our management easily understood what I will need more for smooth operation. In [the] last six months my organization fulfilled my maximum needs like Internet connectivity, digital camera, jeeon content etc. I am very happy to share with you a success story of my locality. A woman named Aklima Kathun learned about poultry business from me and started it. Now she is maintaining her livelihood better than the past. We now provide different government forms [from the center]. Every week we update the market price of our locality and provide it to the people".

***Ratna Rani* (GHAT):**

"At the time of my last training, I was very new to being an infomediary. I was not aware about the responsibilities of an infomediary. In my locality most of the people have information demand related to health, women entrepreneurship and communication. Recently we are giving information services by boat in my locality".

***Altaf Hossain* (RKC):**

"I learned how to become an effective and successful infomediary. I am happy to disseminate information from Jeeon because it is in Bangla".

3.4 Lesson Learnt From Training through the PAN Localization Project

D.Net conducted two training programs through the PAN Localization project. The first training aimed to develop Bangla language content development skills, while the second training aimed to develop skills among infomediary in disseminating local language content. To make the training effective, the same trainees were invited after six months for refreshers training. Based on the curriculum and the responses from the trainees, D.Net published a guide for infomediaries which is now being used by more than 200 infomediaries in Bangladesh. Some of the lessons learned through this process are highlighted below.

3.4.1 Learning from the Training

a. Competency standard is a major issue which should be fixed before curriculum development

b. Curriculum should address competency requirement properly and specifically. For example, if competency standard is defined for typing in word processor only then the description must not include competency for document formatting.

c. Training should not be on specific software. Rather it should introduce tools to but perform particular task. For example, we should not train them on MS Word or Open Office. We should train them in document development and introduce MS Word or Open Office as tools.

d. Training people with different skills is really challenging. The training manager should provide specific guideline to address this or arrange separate trainings for specific groups if the budget and time permits.

e. People who are already familiar with traditional tools may resist adoption of new tools. The trainer should identify and encourage people who are adopting the change and suggest that others should follow them

f. Performance indicators must be established at the beginning to evaluate before and after the training

g. At the beginning of the training, setting some ground rules helps. At the beginning, expectation from the trainees must be recorded and should be periodically refer to during the training. At the end, trainees must also provide their feedback regarding the fulfillment of their expectations.

h. Give examples related to trainees' everyday activities, or try to use examples contextualized in the mindset of the trainees in order to make the training more interesting

i. Healthy competition and rewards also make training interesting. There might be skill gap among trainees. Such trainees must be identified and should be provided extra time after training hours, if possible. In some cases, skills gap could even be identified before starting the training and extra training could be arranged to equalize skill levels. For example, if someone is found weak in computer usage, he could be provided training on basic computer or suggested that he/she try to learn on his/her own

3.4.2 Problems we faced and our Mitigation Strategy

Problems Faced	Mitigation Strategy
a. The prior skill level of the participants was un-known	The existing content developers and infomediaries were contacted to understand their competency requirement. Based on their feedback, training curriculum was developed in consideration of their current competencies
b. The invited trainees were from different institutions with different priorities and different specializations. The trainees also had different levels of computer skills, typing in Bangla and the internet.	Before the training it was requested that the trainees send their CV. Discussions with the institutes were also organized to understand the initial skill level of the nominated participants. Through discussions it was found that two trainees needed special attention regarding basic computer. Two extra hours were allocated at the beginning of the training to bring them at par with the others.
c. During the training it was observed that some participants were already familiar with the training contents.	To make the training equally interesting, such participants were invited to talk to the group when possible and deliberately tried to let

Problems Faced	Mitigation Strategy
Thus in some situations, these participants would influence the whole session	others were asked to speak more in common sessions.
d. The Unicode based Bangla typing layout was not familiar to all participants. This was a major problem during Content Development Training	This problem was overcome by giving assignments and extending practice time
e. As localization issues were new, sometimes it was hard to make the trainees understand the curriculum	The trainees were taken to the field where people worked using those tools and techniques they were learning. In certain cases video presentation were also included to help them understand the issues and uses of localized technology
f. Through the training experience it was observed that trainees faced new problems thus their subject knowledge had to be updated frequently	Refresher training must be arranged to update the infomediaries and resolve any issues which needed consultation with an expert. D.Net also started an email group which the trainees maintained where they share their experiences and ask help from each other. Mobile phone numbers were also shared among the group so they could stay connected.
g. The Bangla script had some computational issues which posed a major problem for content developers.	The trainees were introduced to existing knowledge base (Bangla blogs maintained by a group which archive FAQ and help people), in case they encountered problems.

Table 3.8: Problems and their Mitigation Strategies

3.5 Conclusion

D.Net directly trained twenty eight people through PANL10n Project. Most of the trainees were from grassroots institutes. The trainees developed or improved skill in their respective areas. The trainees delivered content to particular end users, developed content for community members, and provided training on ICTs tools. D.Net also developed and printed Infomediary Training Manual based on the feedback of the infomediary training. Many institutions in Bangladesh are now using the manual to train their infomediaries.

4 Cambodia: Governments' Experience in Localized ICT Training

Noy Shoung, Deputy Secretary General of NiDA for Human Capacity Building

4.1 Introduction

Cambodia is a country in Southeast Asia with a land size of 181,035 square kilometers, and a population of about 14.2 Million. The median age of the country is 21 years. Its Gross Domestic Product averages at USD 2300 per capita [30]. As of February 2009, Cambodia has about 42,000 fixed telephone subscribers along a fiber optic network in the country, 4.2 million mobile telephone subscribers covering all cities and provinces in Cambodia, 941 internet hosts, and 44,000 internet users.

On August 23, 2000, the National Information Communications Technology Development Authority (NiDA) was established by a Royal Decree. NiDA promotes and regulates the ICT services in the country and encourages all agencies to implement their ICT plans. NiDA's plan to achieve its vision of "becoming a real partner in regional and global affairs, a truly free nation, free from want and poverty" can be affectively achieved through computerization and utilization of current technology. Computerization of government services aims to remove "rural" barriers from the development equation. NiDA works closely with donor countries, government agencies, industries, and the community to achieve this vision [31]:

"With our strong core values of Professionalism, Extensive Experiences and Dedicated Staff, NiDA will be the only successful regulating, promoting and executing agency for all IT projects in the Kingdom of Cambodia".

The goals presented to address language and infrastructure barriers in the nation's ICT strategy were:

1. Use of content application in Khmer, so all content must have at least two languages: Khmer and English
2. ICT will be the best tool for Education, Communications, E-Trade, E-Government Service, Poverty Reduction, Transparency, and Anti Corruptions
3. Serve people better and faster

4.2 The National ICT Development Strategy and Localization

The Cambodian government has already launched e-government for all the ministries. This e-government initiative allows users to share information and exchange documents within and between ministries, and to create the national database for the country. Within Cambodia, NiDA is the authority in making ICT policy and strategies to promote ICT for all public institutions, private sector, and government ministries, especially in organizing and administrating the e-government.

Two e-Government projects have been implemented so far, the government administrative information system (GAIS) and the provincial administrative information system (PAIS). The e-government's core applications include the National Homepage [32]; the Electronic Approval System (EAS); Vehicle Registration Information System; Resident Registration Information System; and the Real Estate Registration Information System.

As of today, the National ICT Policy is still under consideration brought about by the changes in the national and international environments. The ICT Policy is approached in five areas, which include [33]:

1. ***Legal and Regulatory Framework***: use of ICT will promote transparency, competitiveness, efficiency in the public and private sectors; promote and regulate ICT services, active implementation of ICT plans of government agencies, deregulation of telecom and other relevant ICT sectors; support the use of broadband and more value added ICT services.
2. ***Human Capacity Development***: support the use of ICT for formal and non-formal education, skills development, and adult learning regardless of age, gender, ethnicity, disability, and location; mandate the Ministry of Education to provide basic education to all teachers; promote and support Community Information Centers in the country; promote radio and television as teaching and learning tools for citizens; introduce standard ICT curriculum in the educational system throughout the country.
3. ***Content Development***: support the e-Government system and mobilize resources for its expansion to all provinces in the country; develop suitable policy directives to encourage each agency to develop and promote quality content on ICT systems; for government to support and encourage government agencies to develop respective network application systems; NiDA will oversee the standardization of these application systems in order to integrate within the umbrella of the e-government system already in place; for government to continuously monitor and ensure that official information and content about the country are homogenous and correct; for government to develop and support a standard Unicode based Khmer character system to be adopted in all ICT applications and systems; for government to commit to develop the capacities of the rural areas to develop and manage content on ICT systems; for government to establish appropriate legal instruments to check and control indecent use of ICT such as spam, viruses, web squatting, fraud, copyright violation, denial of service, unauthorized entry, privacy infringements, misleading media content, and inappropriate broadcasting; and for government to streamline a standard reporting system for all public service activities.
4. ***ICT Infrastructure***: for government to continuously install and upgrade reliable and appropriate ICT infrastructures throughout the country; actively promote private sector and foreign investments in the ICT infrastructure sectors; establish the Cambodia's Network Information Center (CAMNIC) and NIDA will work closely with MPTC, CAMNET, and the Asia Pacific Network Information Center (APNIC) to carry out this activity and manage it; to allow and streamline the use of Voice over Internet Protocol (VoIP), Session Initiated Protocol (SIP), and other latest technologies throughout the country; support and encourage all universities and government agencies to establish computer networks and install other related systems; for NIDA to be responsible agency to manage and closely coordinate the Country Code Top Level Domain - ccTLD (.kh) with all relevant agencies.
5. ***Enterprise Development***: the reduction of import tax rate on ICT equipment and systems; to allow 100% equity shareholding of ICT enterprises by foreign partners; for government to support and encourage e-Commerce facilities; support and encourage the promotion of e-Commerce systems and facilities to small and medium enterprises; take appropriate measures to ensure efficiency, privacy, security, and reliability of e-Commerce systems based on international inter operable standards especially for electronic payments; introduce reforms and re-organizations in the banking and financial institutions to boost credentials and trust for the new economy; work out supportive policies on local production of ICT hardware; put in special investment package guidelines for investors in the ICT sector; encourage financial institutions such as banks to devise lending mechanisms to promote loans for small entrepreneurs in the ICT sector.

In 2005, NiDA embarked on a localization program. All content and application must have at least two languages: Khmer and English. The goal was to eliminate the gaps in ICT, such as inadequacies or the lack of:

1. Ownership of programs
2. Freedom in selecting language and programs
3. Speed of access and time reduction
4. Budget: the inadequacy slows down the training program intentions
5. Strategy: The training must always be based on multiplier strategy
6. Resources such as the Master Trainer and other Trainers

In short, localization of digital content for the community creates a competitive advantage and demand for localized digital communication for users. In 2003, the author, with the help of the NiDA staff started to localize the Khmer language. There was a growing community of users then who desired and were encouraged to localize open source applications such as Ubuntu [34] and Joomla [35].

4.3 The PANL10 Training Program Implementation

The International Development Research Centre (IDRC) through its Pan Asia Networking Program together with the National University of Computer and Emerging Sciences (NUCES) Pakistan through its Centre for Research in Urdu Language Processing (CRULP) assisted the Cambodian government to implement its Khmer FOSS Training Project through the PAN Localization Program. The key objective of the project was to expand the trainer base for FOSS-based end user applications in Khmer (such as OpenOffice and others), building from the success of the 2005 and earlier training activities. The project was aimed at training government officials and training providers to use Khmer FOSS applications and the Khmer Standard Unicode Keyboard. The program makes use of computer in the workplace with the appropriate technology and standardization.

The NiDA project was a twin initiative of the PAN Localization Cambodia (PLC) with the Ministry of Education, Youth and Sports (MoEYS) which embarked on the development of various Unicode based language processing applications including fonts and standardized keyboard for the first phase. This also included some text processing applications like encoding conversion utility, word segmentation, sorting utility, find and replace and spell checking (all these utilities were developed for windows platform only). During the second phase the MoEYS focused on conducting research on advance NLP areas like Optical Character Recognition (OCR), Text to Speech, Internationalized Domain Names (IDN), Part of Speech Tagging, and review of HTML standards for English and Khmer. While NiDA focused on the development of a localized keyboard and on the standardization of terminology translation and publication of terminology standards.

The NiDA project was accomplished in two phases. The first phase was conducted from March to December 2006; and the second phase from January 2007 to December 2009.

4.3.1 Phase One

With the strong belief in the key advantages mentioned above, NiDA embarked and completed the 1st phase of the Free/Open Source Software implementation master plan.

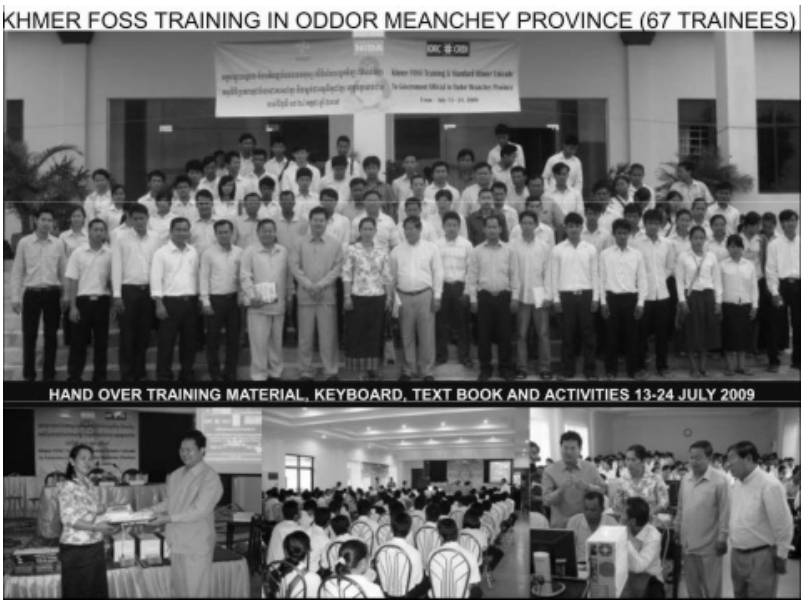

Figure 4.1: Khmer Foss Training Phase I

The target group of the project were government officials and trainers, a total of 1,500 trainees in all. The provinces and cities in which this training was undertaken included; (1) Phnom Penh, (2) Battambang, (3) Siem Reap, (4) Kampong Cham, and (5) Takeo.

The significant findings from the first phase of the project are as follows:

a. Successful translation of computer applications, e.g. word processing, spreadsheet, presentation tool, e-mail, browsing, touch-typing, etc. were made available in Khmer language

b. Development of training materials for all these programs, including teacher's slides, teacher's instructions, hand-outs, evaluation tools and training-for-trainers materials

c. Training in Phnom Penh continued for a complete year. The training took place weekly from January 2005 to December 2007, excluding only the national holidays

d. The training also took place in four different provinces during 2006, and another four provinces in 2007. These sessions, were focused on promoting FOSS usage in the local administrations, further reinforced by the province governors or vice governors inaugurating the courses.

e. Training material and curriculum on Khmer Windows Operating System, Touch Type of Khmer Unicode, FOSS Application on OpenOffice, Thunderbird and Firefox in Khmer language was prepared

h. About 100 high schools and orphanages in Cambodia have started teaching OpenOffice in Khmer

i. Three hundred eighty four (384 or 80% of 480 training opportunities) participants in five provinces were trained in FOSS end-user applications (in each of the province, four trainers trained 50 to 60 trainees, building on 2006, where 4 provinces were reached: Kandal, Kampong Cham, Siem Reap, Sihanoukville and Takeo). This meant that 40 hours of training was offered to teachers and government officials, training providers in five provinces of the country.

j. At least 200 core trainers were added to the pool of trainers who actually taught in their respective environment on how to use Khmer language FOSS end-user applications (word-

processing, spreadsheets, internet, email etc.) Most of these trainers work at teacher training centers or private training institutions in the provinces that have received the training.

k. FOSS-trainers and trainees exchanged technical information through electronic means and received information through newsletter. The mailing list was created. The effort to invite all Khmer Application Trainers to join this list has under way

f. In terms of partnership, NiDA was able to build a very strong relationship with all ICT stakeholders at all levels

In general, the result of the Khmer FOSS training project produced good results, but to NiDA its goals were not yet accomplished. Some of the future plans included the following:

a. The target to introduce FOSS-training activities in at least 15 of the 70-90 large private training providers of Cambodia through training and awareness raising activities were not accomplished at the University level.
b. There were only a small number of partner institutions in the provinces who had participated in the training process

4.3.2 Phase Two

The 2nd phase of the Khmer Free/Open Source Software implementation master plan undertaken by NiDA involved the following steps:

1. Development
    a. To translate Linux user interface (KDE) and a number of key applications, to develop a complete system running on Linux
    b. To develop training materials in Khmer language for teaching Linux administration and user guide for KDE
2. Linux Training
    a. To provide Linux and KDE training to all personnel in NiDA working or needing to work on FOSS
    b. To prepare NiDA key personnel for the LPI-1 exam
    c. To provide Linux Administration training to NiDA personnel who will be Linux trainer
3. FOSS Training
    a. To train teachers to teach the use of FOSS applications on Windows platform. Teachers were to be trained at the provincial training centers of the Ministry of Education Youth and Sport, and the provincial Vocational training centers of the Ministry of Labor and Vocational Training. All the trainers needed for this work would be trained by NiDA
    b. To train government officials (end users) on the use of FOSS applications

4.3.3 The Training Strategy

The Training Program Strategy – Skills and Technology Transfer in Cambodia used two approaches to deliver the program:

a. Training/Learning Need Life Cycle – Training needs assessment were conducted
b. Khmer FOSS Training – Open source was promoted

All training programs were focused on "multiplier training channel", which simply meant the following:

a. First training: NiDA staff conducts the training, and NiDA provides all curriculum, training material, handouts, and exercise papers

b. Second training: NiDA staff conducts the training, and the partner institute assists during the training

c. Third Training: The partner conducts the training and NiDA provides assistance

The NiDA staff conducted Learning Need Assessment prior to and after the delivery of the training programs for the following end-users:

a. Public Sector Employees

b. CIO from all ministries

c. IT Supporters

d. School Teachers

e. University Students

f. Small and Medium Enterprises

g. End User

h. Farmer – Communities

i. Grassroots level of students

Figure 4.2: Content Development Training

The instructional materials or the training modules were created in Khmer by the NiDA staff. All training programs provided instructional materials, which include the curriculum, course outline, hand out, text book, and exercises. All the training material was updated every six months based upon the feedback received from trainers and trainees. As a program strategy NiDA facilitated the establishment of a research and support center. The purpose of its establishment was to re-design the training material and to review the effectiveness of training upon feedback received from the users through phone calls

or personal visits. This information was gathered before the monthly review meeting and was collected by the instructor, research support center staffs.

In terms of resources, the participants' computer equipment ratio was 2:1. The proportion of one personal computer (PC) for every two participants was intended to:

a. Allow the two participants to help each other
b. Avoid the temptation of playing games during the theory or hands-on session
c. Allow participants to play some games only for mouse practice, including touch type games for keyboard practicing in class or at home

4.3.4 The Training Design and Delivery

Content: The training content ranged from the basic computer commands - such as, What is the *start* button?, *Create a file* or S*earch file*, and *Delete* – to more technical information for more advanced students.

Participants: In the second phase, the project aimed at conducting more training in the eight provinces. At first, NiDA trained forty people, five persons at each of the eight provinces. Five persons trained in each province were able to further train atleast 10 to 15 persons. Thus, for the succeeding trainings, the trainees became more than 60 to 70.

Training Staff: In the same project, there was a direct involvement of 20 to 24 people from the NiDA staff. Overall, there were over 200 total NiDA staff members in the human resource development and training department. The staff liked to be involved in the training activities. They were also interested in learning how to approach people.

Help Desk: To support the trainers and online users, a Help Desk was established so that the NIDA staff could talk to the trainees and guide them step by step in the use of the computer and the software applications.

Budget Reach: In the first phase, the training budget was allocated for only 4 provinces. With prudent measures, the training team was able to save money which enabled them to deliver training in another province. Overall the total budget for training covered five provinces.

Monitoring: During the two year training feedback and monitoring mechanisms were included. Participants were visited after every three months of the training. Information was gathered about problems encountered by the participants after the training. They were also checked if they were already ready and able to train others.

The Current Status: The provinces now conduct trainings on their own. Through the help desk, the participants can also directly approach NiDA to report issues or place their queries.

4.3.5 Training Evaluation

To know the results of the training, evaluation questionnaires were used in every training activity undertaken. There were a total of 441 to 1,366 respondents from cities and provinces of Kampong Speu, Kampong Thom, Kampot, Koh Kong, Prea Vihear, Pursat, Utdor Meanchey, Krong Kep. The questionnaire was developed using a 5-scale measurement from very poor to excellent. Questions asked were:

a. What do you think of the FOSS Localization Software Training?
b. What do you think of the discipline in this training course?

c. What do you think of the length of the training Course?

d. What do you think of the level of the teacher?

e. How do you rate the training?

f. How do you rate the quality of the facilitator?

g. What is the level of English by Province?

h. Did the training meet your expectation?

4.4 Results

The following were the results of the participants' evaluation of the training undertaken with NIDA for the second phase of the PAN Localization project.

1. Participants' thoughts about the FOSS Localization Software Training.

Over fifty-three percent (53.5%) responded that the FOSS localization software training was excellent. This was followed by forty-one percent (41.4%) of the respondents reporting it as good, and the fair rating of four percent (4.3%). Eight percent of the respondents thought of the FOSS localization training as poor, but no one rated it as very poor.

2. Participants' views about the discipline in this training course.

Majority or more than fifty-one percent (51.7 %) of the participants rated the discipline of the training course as good. This was followed by the excellent rating at twenty percent (20%); the poor rating at one percent (1.1 %) and the fair rating at point four percent (0.4%). There was no response in the very poor rating scale.

3. Participants' assessment on the Length of the Training

The dominant response for this question or forty-nine percent (49.5%) rated it as "a bit short". Succeeding this rating is the fair response or more than twenty-nine percent (29.8%). This was followed by the "too short" rating at fifteen per cent (15.5 %) and the "a bit long" rating at four percent (4.2%). Very few or point nine percent (.9%) respondents rated the length of the course as "too long". There was no response in the very poor rating scale.

4. Participants' assessment on the Level of Teachers

The level of expertise of the teachers per FOSS training module was also assessed. The FOSS modules include Calc (open source spreadsheet), Impress (open source power point presentation), Mayura, Mekala, Suse, Unicode, and Writer (open document). Three provinces, namely Kampong Speu, Kampong Theu, and Kampot had a full suite of training modules. Five provinces, such as Kokong, Preah Vihear, Pursat, Utdor Meanchey and Krong Kep were given the Calc module.

On the whole, majority of the respondents rated the level of teachers as good, followed by excellent. The fair and poor ratings had very few responses. Consistent with the other responses, there was no one who rated the level of teachers as very poor. The table below provides details of the level of teachers' by course ratings per province.

Course	Kampong Speu					Kampong Thom					Kampot				
Rating	VP	P	F	G	E	VP	P	F	G	E	VP	P	F	G	E

Calc	0	0	1	25	11	0	0	3	30	25	0	0	4	34	11
Impress	0	0	1	30	13	0	0	2	27	23	0	0	4	31	11
Mayura	0	0	0	7	2	0	0	4	13	2	0	2	1	9	6
Mekala	0	0	0	8	4	0	0	4	13	3	0	2	1	10	6
Suse	0	0	0	3	0	0	0	3	1	2	0	2	1	9	6
Unicode	0	0	2	25	18	0	0	3	33	23	0	1	7	36	13
Writer	0	0	1	30	15	0	0	2	31	26	0	0	6	36	11
Total	0	0	5	128	63	0	0	21	148	104	0	7	24	165	64
	KoKong					Preah Vihear					Pursat				
	VP	P	F	G	E	VP	P	F	G	E	VP	P	F	G	E
Calc	0	0	6	27	12	0	0	8	44	14	0	0	0	30	13
	Utdor Meanchey					Krong Kep					TOTAL				
Calc	0	0	2	54	15	0	0	3	25	6	0	7	69	621	291

Table 4.1: Course Ratings of Various Groups

5. General Rating of Participants about the FOSS Training

Two hundred sixty-seven (267) respondents rated the training as Good. This was followed by one hundred twenty –five (125) respondents who rated the training as Very Good, and twenty-five (25) respondents who rated the training as Fair. There was no one who gave a response in the Poor and Very Poor scales.

6. Participants' Rating on the Quality of FOSS Facilitators

The participants rated the quality of the FOSS facilitators as follows: sixty-two percent (62.4%) rated them as Good; thirty-one percent or (31.7%), and only two percent rated them as Fair. There was no response under the Poor and Very Poor scales.

7. Participants Rating if the FOSS Training Met their Expectations

Of the four hundred nineteen (419) participants who responded as to how much of their expectations were met, two hundred eleven (211) or fifty percent (50%) rated their expectations met as good. One hundred forty six (146) or thirty five percent (35%) rated their met expectations met as excellent, while fifty-eight respondents or fourteen percent (14%) rated their expectations met as fair. Four respondents or 1% of the total rated their expectations met as poor. There were no ratings under the very poor scale.

8. Comparison Rating of Participants on the NIDA Khmer Standard Unicode to Others (ABC, Limon etc)

There were four hundred twenty-nine responses to this question. Of the total, two hundred sixty nine gave their rating as follows: seventy-four or seventeen percent (17%) rated the Unicode as Excellent; one hundred six or twenty-five (25%) rated it as Good; fifty-three respondents or twelve percent (12%) rated it Fair; 15 respondents or three percent (3%) rated the Unicode as Poor and one respondent rated it very poor.

Very Poor	Poor	Fair	Good	Excellent	No Answer	Total
1	15	53	106	74	180	429
0.02%	3%	12%	25%	17%	42%	249

Table 4.2: Responses of the Participants

9. Level of English by Province

This question was meant to assess the English proficiency level of the respondents in terms of reading, speaking, understanding and writing.

Generally, fifty four percent (54%) of the respondents covered in this survey from eight provinces considered their English proficiency level as fair. Nineteen percent (19%) rated themselves as Good, while seventeen percent (17%) considered themselves Poor in rating; and an extreme three percent (3%) rated themselves as Excellent and seven percent (7%) as Very Poor in English language proficiency. The table below shows the details of the respondents' ratings in the English language proficiency by province. The provinces of Kandal, Siem Reap, Kong Preah Sihanouk, and Kampong Speu showed high percentages in rating between Good and Excellent proficiency levels.

	Kampong Cham					**Kampong Speu**					**Kampong Thom**				
	VP	**P**	**F**	**G**	**E**	**VP**	**P**	**F**	**G**	**E**	**VP**	**P**	**F**	**G**	**E**
Read	2	5	11	7	1	1	2	22	9	4	2	3	38	6	1
Speak	3	5	12	4	1	1	9	21	5	5	1	9	34	3	1
Understand	2	3	12	7	0	1	3	25	7	5	1	2	37	6	0
Write	2	5	12	5	1	1	5	24	6	3	1	8	34	5	0
Total	**9**	**18**	**47**	**23**	**3**	**4**	**19**	**92**	**27**	**17**	**5**	**22**	**143**	**20**	**2**
%	9	18	47	23	3	3	12	58	17	11	3	11	74	10	1
	Kampot					**Kandal**					**Siem Reap**				
Read	3	16	34	2	1	2	5	16	11	4	7	5	42	26	2
Speak	7	23	24	2	1	1	9	17	9	1	10	12	38	21	0
Understand	4	17	31	2	1	1	5	16	10	2	8	9	38	23	1
Write	5	21	30	2	1	1	7	18	9	1	10	9	43	19	1
Total	**19**	**77**	**119**	**8**	**4**	**5**	**26**	**67**	**39**	**8**	**35**	**35**	**161**	**89**	**4**
%	8	34	52	4	2	3	18	46	27	6	11	11	50	27	1
	Kong Preah Sihanouk					**Takeo**					**Total all Provinces**				
Read	1	1	9	6	2	2	9	19	5	2					
Speak	2	3	7	6	1	3	10	19	5	0					
Understand	0	3	8	6	1	2	5	20	7	0					
Write	1	3	8	6	1	2	7	21	6	0					
Total	**4**	**10**	**32**	**24**	**5**	**9**	**31**	**79**	**23**	**2**	**90**	**238**	**740**	**253**	**45**
%	5	13	43	32	7	6	22	55	16	1	**7**	**17**	**54**	**19**	**3**

Table 4.3: Language Proficiency Ratings

10. Gender Integration

The NiDA team attended the training on Gendered Outcome Mapping (OMg tool)[36] in Lahore Pakistan from August 16-19, 2008. The training was designed to orient participants with the importance and sensitivity of gender issues in the development projects. The OMg framework was discussed with the participants of the training and they also received hands-on experience on the OMg tool. It also provided the participants with a project planning, monitoring and evaluation approach that took gender issues specifically into account from the earliest stages, and integrated them throughout the project implementation.

In the project there were efforts to ensure awareness of gender needs in the project. However, there was limited gender integration undertaken because of the following reasons:

a. There was no gender specialist in the team, comprising of fourteen (14) men and three (3) women. Only two members in the team were able to attend gender training during the project implementation

b. Gender issues were not identified specifically during the needs analysis and project planning

c. The main project activities were translation from English to Khmer and there were no gender issues identified in these activities

d. The training was meant for everyone, whether male or female. Benefits of the training were also seen as equal for both women and men. There were no discriminatory criteria set in the selection process. The training activities were open to both women and men, however still most often there were more male participants than female

4.5 Challenges Encountered in the Training Program

Electricity

Five years ago, electricity was a major problem for some areas and districts in the provinces. There were areas which had only about 10 hours of power. However, at the provincial level, there are cities that have about 23 hours of electricity. Delivery of training was prioritized in those areas.

Not enough computer and training materials

Although the training was given for free and the invitation was open to all, the training resources were limited. The training team experienced running out of instructional materials or using only a few computers. The demand for the training was more than the supply (of resources);

Limited funding

Intentions to cover as many areas in the provinces as possible could not materialize because of funding limitations

NGOs and individual volunteer's participation

In executing social development projects, voluntary participation needs recognition in terms of stipend, awards and certificates for scholars and trainees. Some training organizers and participants expected to receive remuneration allowance from the training team. The latter however did not find the practice agreeable. To counter the situation, the team gave priority to organizers and participants who did not ask to be paid and those who were open to changing this practice.

4.6 Lessons Learned

Some of the lessons learnt from the program include the following:

a. Learning objectives and instruction design must match the curriculum and level of trainee and trainer. The levels of trainees are varied and must be considered in the design and delivery. During training classes, sharp participants were made to sit next to those who were a bit behind in the lessons. Some trainees were even asked to take up the role as trainer and assist in some of the training sessions.

The curriculum course outline, hand outs, text book, and exercises must continuously be updated and modified. Instructors must develop the training manual which will guide users to do the hands-on exercises; the instructors must prepare the training curriculum and should be open to improve the manual. The trainers must select the right content for the right target group. For example, English for rural application will not be effective.

There must be use and focus on more than one application

Open Source is 100% localized but users cannot use this application because it is too technical although the team worked hard to make the applications useful. Aside from the FOSS, Microsoft must also be taught

Training content of the curriculum must be practical so that users appreciate the training activities

Most people are new to the Khmer knowledge. Currently, the training content is still very useful; users gain confidence in the use of the computer and become proud users when they do the exercises. Assignments and hands on session should comprise 60% of the total course hours.

Selection criteria for the target group or the location must be in place before the training is conducted

The locations where the training is to be conducted must have electricity and access to computer equipment.

Use of and integration of the "old wisdom" in the delivery of the training especially with first time-adult learners is effective

Trainers must feel and make participants feel at ease with the presence of technology. Participants and first time users must be given "introductory talks" to motivate them and overcome the fear of technology.

4.7 Conclusions on ICT Local Language Localization Training Program

Training program in local language is needed to empower end users - the government officials and school teachers, local government members such as the council, district officers, as well as members of the local community. The use of local language has had a big impact on local government and the local community.

Cambodia is a developing country, its people speak Khmer and very limited population can speak and understand English. The localization programs and activities are relevant and should be implemented. These should include: E- Learning and hands-on training online.

4.8 Future Plans

The Government Administrative Information system (GAIS) started from the cities , and has expanded to the Province Administrative, the Rural Administrative, and to the Community Level. The Master Trainers are training the Trainers at all levels and reach all the users from different blocks. A module on the Open Office – Writer has been developed. Tests have been conducted and people have found it quite useful, although the text content has to be further modified. E-learning was not developed earlier because of the limited infrastructure in Cambodia however infrastructure is now ready in all provinces and districts.

5 ICT Localized Training Experiences in the Rural Mountain of Nepal

Rajendra Prasad Poudel, E-Network Research and Development Team (ENRD)

5.1 Background

Twenty-one (21) years ago in my village in the nearest city of Pokhara, my elder brother introduced me to a computer machine. He told me he can give commands to the computer and the computer can work according to his commands. He demonstrated some amazing examples and animations. I never thought that such a machine can be a tool for uplifting the livelihood of my rural community, an isolated and remote area which receives minimal social services including education, health and communication.

But now, time has changed. I realized that such a machine is in fact a powerful media tool that can be used to network and empower the rural community, not only through communication, but also through delivering the basic social services to the community.

Nepal, an infant independent Himalayan nation lies between India and China. The country has 147.181 square kilometers of land and is ecologically divided into mountains, hills and terai region. The total population of the country is 30 million. Eighty-five percent (85%) of the population resides in the rural areas [37].

This Himalayan nation began the journey in information technology in 1971 when an IBM machine was introduced to process the national population census data. The Nepal government formally initiated the Research and Development (R&D) and IT training program by establishing the National Computer Center inside the premises of Singadurbar, Kathmandu in 1974.

While the nation has passed through challenging political periods, the major milestone for promoting Information and Technology in Nepal is the involvement of the private sector. Private sector geared up its effort by establishing e-mail services in 1992 from Mercantile Communication Pvt. Ltd. At present, there are 26 Internet service providers, 9 VSAT network service providers, 5 telecom service providers, and almost 30 IT academic colleges and more than 500 private IT training institutes that play major roles in the Nepali market.

At present, there exist almost 4 million telephone and internet subscribers with a 15% penetration rate. From this figure, only 0.4% exists in rural part of the country. This is quite low in comparison with neighboring South Asian countries.

In 2000, Nepal government launched the country's first Information Technology (IT) Policy which has three clear objectives:

1. To make information technology accessible to the general public and increase employment through these means
2. To build a knowledge-based society
3. To establish knowledge base industries

Following the mandate of IT Policy 2000, the National Information Technology Center (NICT) was established in 2002 under the Ministry of Science and Technology (MoST). However, the country's complex bureaucratic structure and unstable national politics are the main obstacles faced by NITC in fulfilling its mission.

In 2003, the Nepal government took another important step towards ICT development by establishing High Level Commission for Information Technology (HLCIT) under the Chairmanship of the Prime

Minister. It is pleasing to note that that HLCIT successfully launched and carried out three specific projects:

1. The Rural Tele-center
2. The Software Outsourcing/ BPO
3. The IT Park/E-governance

The Rural Tele-center concept in Nepal was carried out by ICT for Development (ICT4D) program under the United Nations Development Program (UNDP) with the Ministry of Science and Technology (MoST). The project started by establishing 15 tele-centers in July 2002 with a total budget of $6,256,800.

The project was implemented with the direct involvement of the Ministry of Science and Technology (MoST), which unfortunately did not define the role of the local community. Although some development workers and analysts claim that the ICTD tele-center program of Nepal is a failure, it should instead be viewed as a program that has provided the opportunity for building a learning platform. The questions and queries raised may serve as the basis for improvement of information technology in rural communities.

Based on project results, the organizations working for rural tele-centers are now considering the importance of the participation of local community, sustainability, equal access and local content. Since 2004, more than four different tele-centers have developed their manuals through the assistance of the UNDP, RUPP, UNESCO, and HLCIT. The common features of these manuals are community participation and sustainability.

At present, 117 tele-centers provide live services to the rural community in the different parts of the country. Below is a map of Nepal and the areas with tele-centers.

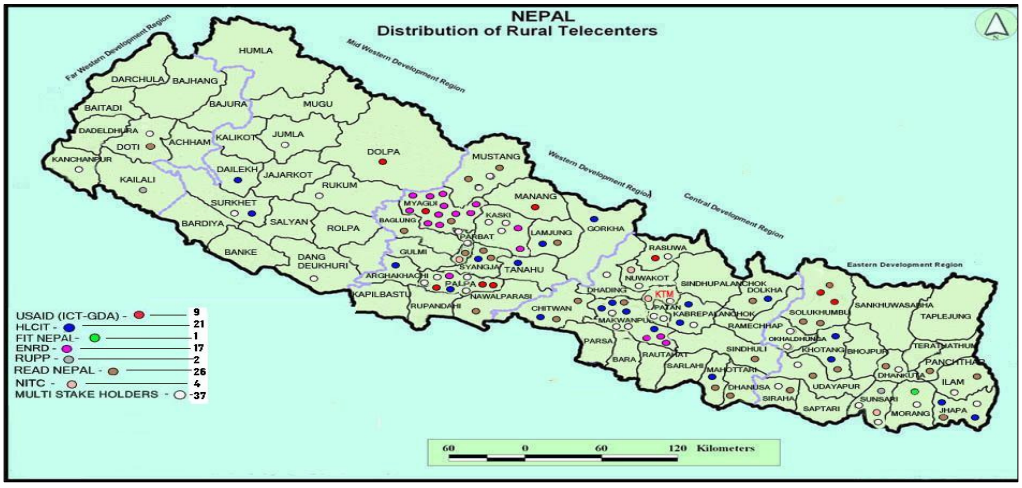

Figure 5.1: Map of Nepal and Location of Tele-centers

5.2 Rural ICT Development Strategy in Nepal

Although Nepal has passed through several political phases of turbulence, the governments of Nepal always considers the right of citizens to information and communication. This is manifested in the establishment of Radio Nepal in April 1, 1951 and Telecommunication Department in 1959 under the first National Five year Plan.

For a long time, Nepal has been doing efforts to mark its place on the global ICT map. Since the release of the IT Policy 2000, Nepal has been working on ICT development on the national level. The formation

of institutional government bodies, such as Nepal Telecom Authority (NTA) and High Level Commission for Information Technology (HLCIT), are milestones in national policy development.

However, given rapid technological development and changes, the country is not able to update the policy for deploying and managing demands of modern Information and Communication Technology. For example, the policy for online payment and many other internet-related issues are not regulated.

Government bodies are not able to fully address the issues of the rural communities where eighty-five percent (85%) of the population reside. Although development activities toward ICT in rural areas are in progress, there are still no defined and no concrete integrated ICT development strategies for the rural community of Nepal.

It should be noted that different government ministries, public non-profit organizations, and private organizations are working on their own separate initiatives using a multi-stakeholder approach for crafting successful ICT strategies. For instance, the Board of High-level Commission for Information Technology (HLCIT) under the chairmanship of Honorable Prime Minister has implemented a multi-stakeholders' partnership approach. However, the Board is hampered by bureaucratic attitude, and the representation from the private and public sector is weak. With private sector's involvement and efforts from multi-stakeholders, these policy level barriers can easily be solved.

What should be emphasized is the fact that both the private and public sector of Nepal have been playing major roles in ICT development and marketing in the country. Unfortunately, the private and public sectors do not receive enough support and security from the government on the policy level. If such situation continues, there is a possibility of paralyzing the private sector's capital, resulting in the possible diversion of capital to the development of sectors in other industries.

Still, the situation is not that discouraging. There are efforts made by governments, private, and public institutions in order to rapidly stimulate ICT development in rural communities.

On behalf of the government, the NTA, NITC, HLCIT and MoIC have been supporting public organizations to establish tele-centers and social service delivery programs for the rural community. The ADB has also been planning to pilot tele-center programs by connecting some districts through the wireless internet enabled network.

A number of activities and terms of references (TOR) for the promotion of rural ICT, developed by different departments of government and civil societies, use a common approach: the public-private partnership. All development communities have accepted the 4 components of this strategy:

1. Establishment of tele-center
2. Development of Local Content
3. Localization of the technology
4. Wireless infrastructure building

The government, through the High Level Commission for Information and Technology (HLCIT) and National Information Technology Center (NITC), gives emphasis on the establishment of rural tele-centers in association with the local government and community. Many private and public organizations are joining hands in this mission. For example, the Center for Information Technology (CIT), E-Networking Research and Development (ENRD), Form for IT (FIT)-Nepal, UNESCO, RUPP, READ Nepal, and Winrock International are working together to establish the multifunctional tele-center in rural Nepal. Similar initiatives conducted by the joint partnership of local government and local level community based organizations are in progress.

Nepal is also working on the development of local content in the local language, such as actions initiated by Madan Puraskar Pustakalaya (MPP). Particularly, the Localization of the Nepali Linux and Open office is one of the significant milestones in local content development. With the full support of PAN Localization, MPP has been working on localizing the Linux operating system and other open source applications, including Open Office. The Free Open Source Society (FOSS)-Nepal has also been deploying Linux Terminal Services technology in the localized version. Many villages have already benefited from this technology. Now, village residents who are not able to speak and write in English language are able to use computers in Nepali language.

Similar efforts towards localizing computer content are currently in progress. Through the joint efforts of the Nepal Government High Level Commission of Information Technology (HLCIT), Tribhuwan University, Madan Purskara Pustakallya, and other private and non-profit organizations, a Nepali translated dictionary for the computer related words has been developed. In addition, for two years now, organizations such as MITA and Open Learning Exchange (OLE) have been working on developing digital content in local language for the students, a project that is highly supported by the Education Department of Nepal.

Building Wireless infrastructure is another significant ongoing project in Nepal. In March 2003, Nangi was the first mountain village in Nepal which was connected by wireless internet technology through the support of foreign volunteers. This was initiated by a local volunteer teacher, Mr. Mahabir Pun, of the Himanchal High School. The project is known as Nepal wireless networking project. After the successful implementation of this project, Mr Mahabir Pun received the Ramon Magsaysay Award for the Community Leadership. Now, many organizations in Nepal are working on the expansion of this wireless network. For instance, the organization called E-Networking Research and Development (ENRD) has been working on expanding wireless technology and enabling social services delivery through technology, such as as tele-education, tele-medicine

Recently, with support from the Asian Development Bank (ADB), the Rural E-community an ICT development project was launched. The project, which covers three districts, aims to build a wireless network to establish rural tele-centers. The NTA, USAID, Winrock International, and Mercentile Communication Pvt. Ltd are also involved in building wireless network in mountain areas of Nepal.

In summary, we have observed that Nepal has been adopting the public-private partnership strategy for ICT development in rural communities.

5.3 Adoption of ICT Training by Rural Communities in Nepal

What follows are accounts of local rural community residents about their experiences with ICT:

The Case of Mr. Mahabir Pun

Since 1979, Mr. Mahabir Pun, a local volunteer teacher, had been dreaming of establishing internet connection in his village primarily because he wanted to be able to access e-mail. Since Mr. Pun was educated in the Nebraska University in the United States, he was already aware of the benefits of wireless technology. He talked with key persons who could possibly help him, such as his friends in the United States and a few people in his village. Despite his efforts, he had problems getting the right equipment and reaching skilled technicians.

Fortunately, in 1996, Mr. Pun was able to launch a website about his village with the support of his professor. The website generated responses from volunteers who would later help him launch his internet project.

In early 2002, two volunteers from Belgium (Johan Verrept) and Finland (Jonni Lehtiranta), arrived in the village to help Mr. Pun with his wish to introduce the internet to his village. Jonni Lehtiranta brought two Cisco PC Wireless Cards (Aeronet), donated by IBM Finland, which they later used to test the possibility of internet access.

In the beginning, the team did not tell the villagers about what they were doing because they were not sure if the technology will work. After several tests, the team came to the conclusion that their project will work. Using old computer parts he acquired while abroad, Mr. Pun worked on assembling a computer, which appeared like a mysterious box to the other villagers. While working on the computer, Mr. Pun's co-workers and neighbors watched him curiously. Some even assisted Mr. Pun as he worked. Finally, Mr. Pun assembled a functional computer running on Windows 95. At first, people in the village thought that the mysterious box was actually capable of communicating with people who lived far from the village.

Mr. Pun's neighbors paid honor to Mr. Pun and the foreign volunteers. Neighboring villages that had limited communication services wanted to adopt the mysterious box which they believed could make their life more comfortable. Eventually, some villagers became motivated to learn how the computer and the internet functions, and they later on became local ICT-skilled technicians who are capable of troubleshooting computer and network-related problems. Later, residents from the nearest city, Pokhara also gained access to ICT.

From the account cited above, it was realized that technology development must be presented to the community in the simplest and easiest way. In fact, skills in technology are easier to learn than skills in health and agriculture if they are demonstrate to community members in the context of how technology can make their lives easier and more enjoyable. Although it is true that villagers in mountain areas are not highly educated, it is clear that they have common sense—they can motivate themselves for working towards making their lives easier.

The Case of Mr. Sete Tilaja

In 2003 Mr. Sete Tilaja, a villager from Nanji, discovered that the computer in the school village was not functioning properly. He decided to contact technicians residing in the nearby village for assistance. During troubleshooting, the technician told Mr. Tilaja to check the computer's Random Access Memory (RAM), display cards and power cable. The technician also warned Mr. Tilaja to be cautious in trying to fix the computer while the power is on, as faulty connections can damage the PC or even lead to fire from electric current.

The technician's warning frightened Mr. Tilaja so much that he and the colleague who was with him at that time decided to turn on the PC with a long bamboo stick, thinking that this would keep them safe in case the computer catches fire and explodes.

Eventually, through regular practice and observation, Mr. Tilaja learned his way around the computer. In fact, he is now a local hardware and network technician in his village.

The Case of Mrs. Lalsubha Pun

Mrs. Lalsubha Pun is 26 years old, a married woman with a 4-year old child from Shika Village. Her husband went to Dubai in 2005 for a 4-year work contract.

In 2006, Mrs. Pun learned that many of her friends were communicating with their relatives in far-off areas and abroad through internet chatting. She then decided to allocate her time in learning how to use the internet, with the aim of being able to chat with her husband in Dubai. Within a few days, she learned how to conduct internet browsing and how to use the Yahoo messenger text and voice chatting features.

Unfortunately, Mrs. Pun's husband has not yet learned how to use the internet and Yahoo messenger. Mrs. Pun has requested that her husband ask help from friends in order to learn how to use Yahoo messenger while he is in Dubai. Mrs. Pun is confident that she can further teach her husband how to use these communication tools once he comes back to Nepal.

The cases show that villagers are adopting technology according to their perception of usefulness, and their personal motivation to learn. Community members are learning by themselves. Those who have family members residing or working in far away areas are aggressively adopting the technology because of the need for communication. But in the same village, some residents think technology is only beneficial to those whose relatives are away. What approach can we use for those who are unaware of the benefits of technology?

Young people in villages have shown interest and have been adopting the technology. Members of the younger generation are worried about their future careers. They seem to have realized that learning skills in ICT can increase their chances for better job opportunities. However, the adopted skill level is

limited to basic computer secretarial work, e-mail, and chatting. They have yet to realize the necessity for advanced skills training which can further increase their chances in building professional careers.

5.3.1 Installation of Computer Labs in Villages

Many students and teachers have access to ICT since most information centers and computer labs are located inside school premises. School administrations also provides ICT access to other villagers in their community. Some schools even have cyber cafes and VoIP telephone services, which benefit villagers residing nearby.

However, ICT access in schools is still hindered by several problems. For instance, limited resources have resulted in a low computer-student ratio—there are not enough computers for every student.

Moreover, teachers still need to be motivated to make use of ICT. Although in some areas, where computers are free of use, teachers do show interest in learning computer skills. Some think that computer skills training is a separate subject, like Math or Science. They do not realize that ICT is a tool that can be useful to every sector of the community.

ENRD has organized several computer training camps especially for school lab operators. In these training camps, trainees taught them how to install hardware devices and operating systems, as well as how to configure drivers and LAN network, among other skills. Now, technical/computer problems that occur in these villages can be solved by school lab operators. They can identify which parts are not functioning or need to be replaced. The support of these local human resources helps in sustaining rural tele-centers.

However, lab operators still need additional training. Training lab operators is challenging, because admittedly, most of them have low educational levels. In some cases, it is difficult for rural lab operators to understand advanced computer problems, as some do not have English language background, or lack basic math and science skills. This makes it difficult for us to explain some computer terminologies.

Given this difficulty, ENRD designed our training materials and outline according to the skills level of lab operators. For instance, ENRD made efforts to convert and associate computer terminology to ordinary things so they could better understand what ENRD were teaching. ENRD also did not follow the top-to-bottom course style, since found that it was easier to repeatedly explain frequent PC errors, given the background of the lab operators.

To further help lab operators, it is important to provide a computer handbook through efforts from local human resources. Although it is a very basic idea, it is sufficient to give general troubleshooting options for common LAN and computer errors.

5.3.2 Motivation vs Participation

There were different experiences during the installation of computer labs in the villages.

Himanchal High School Nangi

Once a year, Himanchal High school, Nangi organizes computer training for lab operators. Computer science courses are made available to students in Grades 9-12, which means that human resources are locally available through the school.

However, these training programs are not based on long-term strategies. Given the fast-paced development in technology, these training programs require regular updating of knowledge and equipment. Lab computers in the village are already outdated. We need to introduce new technology to be able to understand and access global

technology. Once we realize that training is necessary, we will be able to convince the schools to invest in these trainings.

In Nangi, once Mahabir Pun and his co-workers had successfully installed the wireless network, community members immediately experienced the benefits of internet communication. This rapidly spread to the neighboring villages. Residents in neighboring villages became interested in accessing such technology—they wanted to introduce this mysterious box to the children.

This shows that the self-motivation of the villagers is based on two reasons:

a. Gaining access to facilities of communication via e-mail/internet and VoIP
b. Providing the opportunity of computer training to improve the education of their children

In schools, the management committees have taken the initiative to support and assist in the installation of wireless network in their villages. In September 2003 the team of foreign volunteers, local people and Mahabir successfully connected 5 villages (Nangi, Shikha, Paudar, Ghara, and Histan). Many young people in the villages voluntarily participated in the installation work. During the time of installation, villagers who supported the team also learned basic things about the setting up network and assembling computers. In this way, people were able to adopt the new technology, much like how they manage the radio and TV in their homes. (Radio and TV can be found in every household, while the PC is too costly for each household to own. If the PC becomes as cheap as radios and TVs, villagers will be more interested in investing in computers).

In one of the villages in Tolka, mobile signal and internet connection only became accessible in 2005. Like other villages, Tolka gained access to the internet through the village school. After holding meetings with the village development committee, villagers eagerly collected funds for purchasing computers.

ENRD collaborated with the HLCIT and collected two new computers and three donated old computers for Tolka village. However, the team encountered difficulties in the transfer of computers. The village could only be accessed through patched roads; it took six hours to walk through the mountain road from the nearest bus stop.

The villagers carried the computers to the Tolka. They were planning to keep the computers in the school premises. However, some villagers expressed their concerns because the school building was frequently broken into by thieves who stole important goods used in the science laboratory, including sports goods and radio transistors. The villagers had a full-day discussion to find ways around the security problem. Finally, the villagers decided to guard school premises by the village youth volunteers.

Through self-motivation, Tolka village now has two qualified computer lab operators who are capable of troubleshooting computer hardware, operating system, office application, anti-viruses, and wireless network setup.

The computer lab inside the school has become one of the vital areas in Tolka. With the increasing number of computers and community tele-medicine centers, the villagers have recently discussed the problem of electricity shortage, as the village only has 2 kilowatt hydropower. For a long time in Tolka, villagers have been using electricity only at night. To address this problem, the villagers are now planning to install high power 35 Kilowatts hydropower from the nearest river.

Regarding the sustainability of the ICT projects, many organizations cite the need for local participation of community members in ICT development projects. There are two clear types of local participation in rural communities:

a. Active participation in building infrastructure

b. Active participation in sharing facilities.

To effectively deploy ICT projects in rural communities, it is not necessary to increase participation from each and every household. Quality is better than quantity of the participation. For example, in Tolka village, there are only two volunteers in charge of ensuring that the computer labs and the wireless network are running properly. The two volunteers have successfully trained more than 30 youth volunteers in the village who can take over in the absence of those two volunteers.

In all the other villages, only a few volunteers are in charge of safekeeping ICT service. This practice is working, and the villagers value the work that the volunteers are doing. Although this is the case in most villages, the sharing of the actual ICT services facilities must be quantified. We must share the existing resources to as many people as possible.

It must be noted, however, that ICT development projects in villages are still at the initial stages. More than 70 percent of the population in rural communities is still not able to access these ICT facilities.

5.4 PAN Localization Training

5.4.1 Research Implementation

The E-Network Research & Development (ENRD) has been working in Nepal since 2004 with the aim of expanding computer and internet access in rural communities. It is working closely with members of the rural communities for the expansion of the Wi-Fi network and associated services such as e-mail, internet, VoIP phone, tele-education, and tele-medicine. In many areas of the Nepal roads are mostly accessible by foot. Establishing a Wi-Fi network in rural communities will be beneficial for the residents as this will provide access to basic services such as communication, education, and health.

From May 2007 to September 2009, PAN Localization phase II project was carried out with aid granted by the International Development Research Centre (IDRC) based in Ottawa, Canada. The project was administered through the Center for Research in Urdu Language Processing (CRULP) and the National University of Computing and Emerging Sciences, Lahore, Pakistan (NUCES).

Under the PAN Localization project, ENRD conducted ICT training in five (5) selected project sites. The ENRD took the role of Country Partner Institute (CPI) and worked with the Madan Puraskar Pustakalaya (MPP), which worked as Country Component (CC). The ENRD conducted training programs at Danda Gaun in Rasuwa district, Jhuwani of Chitwan district, Tolka of Kaski district, Nangi and Shika of Myagdi district, and Kathmandu.

Through the PANL10n project, ENRD has organized the training in three phases:

The first layer training focused on the Training of Trainer (TOT), which aimed to develop local trainers in the project areas. The TOT was conducted in Kathamandu. This training was attended by five participants who were working as tele-center operators at five of the selected tele-centers, while three participants were from ENRD staff.

The second layer training, called the Local Level Leadership Training (LLLT), focused on the selected leaders from each center, defined as a specific boundary partner, according to the outcome mapping framework. The LLLT was given to further five (5) participants from each of the centers and was conducted by the tele-center operators trained through the TOT.

Later, a third layer training was organized by the local community with the help of the leader of each Center. This training, called the End User Training (EUT), focused on delivering basic computer operating knowledge to the local community. This training was conducted at the five tele-centers, by the five local

leaders trained through the LLLT. Each center aimed to produce 25 end-users trained to use basic computer operations.

This project has been evaluated on the basis of all three layers of training, as well as through the responses gained from the 31 respondents belonging to different project areas.

5.4.1.1 Research Questions:

The specific objectives of this research have been:

i. To identify the changes across boundary partners after the training
ii. To analyze the skill improvement of the participants after the training
iii. To discuss the different factors necessary to sustain the program

5.4.1.2 Methodology:

To answer the above research questions, quantitative methods including questionnaires, interviews for skills improvement, as well as onsite observation have been used. Sample selection was purposive as the data was gathered from 155 respondents who participated in the training [44]. Further, this research is based on interviews conducted at the five (5) sites where ENRD conducted training on basic ICT use. The research areas were:

i. Danda Gaun, Rasuwa
ii. Jhuwani, Chitwan
iii. Tolka, Kaski
iv. Nangi, Myagdi
v. Sikha, Myagdi

At each site data was gathered from 31 respondents who had received in the training. For example, in Tolka of Kaski and Shikha of Myagdi, hotel professionals who received the EUT were selected. While in Nangi of Yagdi, ex-army members and forest users groups were selected. In Jhuwani, male and female youth groups were the respondents.

5.4.1.3 Limitations:

This research study only covered 155 respondents who participated in three phases of the training. It is focused only on training participants and in particular their age, gender, ethnicity, social status, and output knowledge and capacity. Based on the observations made on the performance of the participants during the three layers of training, the study did not intend to conduct a comparative study.

5.4.2 Result Findings and Analysis

The following section presents the findings of the research study based upon the responses gathered.

5.4.2.1 Social Status of the Trainees:

The social status of the trainees was studied by classifying them in terms of gender, age, ethnicity, and education level, as described below:

1. Gender Participation of the Trainees

The table below shows that there were 155 participants of the training which 47% included men and 53% women.

SN.	Location	TOT			LLLT			EUT		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
1	Shikha Center	1	0	1	3	2	5	9	16	25
2	Nangi Center	1	0	1	4	1	5	8	17	25
3	Jhuwani Center	1	0	1	4	1	5	11	14	25
4	Tolka Center	1	0	1	3	2	5	17	8	25
5	Danda Gaun	1	0	1	2	3	5	7	18	25
	Total	5	0	5	16	9	25	52	73	155

Table 5.1: Number of Participants and their Gender Distribution

2. Age Participation of Trainees

In the TOT two persons were within the age group of 20 – 30 years old; and three participants were within the age group 30 – 40 years old. In the local leadership level, 24% were in the age group of 20 years old and below, 40% were under the age group of 21 – 30 years old, and 28% under the age group 31 – 40 years old. In the End-User Training, close to half or 46% are ages 20 and below; 32% within the age group of 21- 30 years, 15% under 31- 40 years, and only 8% from ages 41 and above. This is tabulated in table 5.2 below.

TOT Level		Age Group						
S.N	Center Name	>+20	21-30	31-40	41-50	51-60	61-70	Total
1	Shikha Center	0	0	1	0	0	0	1
2	Nangi Center	0	0	1	0	0	0	1
3	Tolka Center	0	0	1	0	0	0	1
4	Jhuwani Center	0	1	0	0	0	0	1
5	Danda Gaun Center	0	1	0	0	0	0	1
	Total	0	2	4	0	0	0	5
Local Leadership Level								
1	Shikha Center	1	1	2	0	1	0	5
2	Nangl Center	0	3	1	1	0	0	5
3	Tolka Center	2	1	2	0	0	0	5
4	Jhuwani Center	2	2	1	0	0	0	5
5	Danda Gaun Center	1	3	1	0	0	0	5

	Total	6	10	7	1	1	0	25
End User Level								
1	Shikha Center	7	12	4	0	1	1	25
2	Nangi Center	1	9	10	4	1	0	25
3	Tolka Center	20	5	0	0	0	0	25
4	Jhuwani Center	23	1	1	0	0	0	25
5	Danda Gaun Center	6	13	4	2	0	0	25
	Total	57	40	19	6	2	1	125
	TOTAL	64	52	29	7	3	1	155

Table 5.2: Age Distribution of Participants

The ages of the respondents classified by age group shows that generally the participants were young, as most of the participants belonged to the age groups, below 20 years, 21-30 years and 31- 40 years.

3. Ethnic and Caste Groups of Trainees

Respondents were grouped on the basis of their ethnic and caste groups. The ethnic group refers to those such as Gurung, Magar, Tharu, Tamang and Newar, etc. Even though Dalit is a caste group, they were also covered in this study. Also included are the Adhikari, Sapkota, Poudel, and Thakur from Brahmin and Chhetri ethnic groups.

Overall, 65% were classified under the ethnic group, while 3% and 33% were under the categories of Dalit and Brahmin /Chhetri caste groups respectively.

In the TOT, only one participant belonged to an ethnic group in the Shikha Center. In Nangi Center, there was also one participant from an ethnic group. The same is true in the Tolka Center, where one participant belonged to the Brahmin and Chhetri. In the Jhuwani Center, one participant was from an ethnic group. Similarly, in Danda Gaun Center, one participant belonged to the Brahmin/ Chhetri group, while three other participants belonged to ethnic group.

In the LLLT, there were five participants each in the Nangi Center and Shikha Center who belonged to an ethnic group. In the Tolka Center there were two participants who belonged to an ethnic group, while three participants were from the Brahmin Chhetri group. In the Jhuwani Center, two participants belonged to an ethnic group, while three were from Brahmin and Chhetri. Finally, in the Danda Gaun Center, three participants represented an ethnic group, while two were from Brahmin/Chhetri.

In the EUT in Shikha Center, twenty participants were from ethnic groups and three participants belonged to the Dalit group. From Nangi Center, twenty three participants belonged to an ethnic group, while only two participants were from Brahmin and Chhetri group. From the Tolka Center, seventeen participants belonged to ethnic groups, one participant belonged to Dalit, and seven participants belonged to Brahmin and Chhetri. In Jhuwani Center, nine participants belonged to ethnic groups, sixteen participants were from Brahmin and Chhetri. From the Danda Gaun Center, eleven participants belonged to ethnic groups while fourteen participants came from Brahmin and Chhetri.

		TOT				LLLT				EUT			
S. N	Center	Ethnic	Dalit	Brahmin/ Chhetri	Total	Ethnic	Dalit	Brahmin/ Chhetri	Total	Ethnic	Dalit	Brahmin/ Chhetri	Total
1	Shikha	1	0	0	1	5	0	0	5	20	3	2	25
2	Nangi	1	0	0	1	5	0	0	5	23	0	2	25
3	Tolka	0	0	1	1	2	0	3	5	17	1	7	25
4	Jhuwani	1	0	0	1	2	0	3	5	9	0	16	25
5	Danda Gaun	0	0	1	1	3	0	2	5	11	0	14	25
Total		3	0	2	5	17	0	8	25	80	4	41	125

Table 5.3: Distribution of Participants by Ethnic and Caste Groups

4. Formal Education Status of Respondents

In terms of educational status, the participants were categorized as follows

- only read and write
- primary level,
- lower secondary,
- secondary level,
- higher education (defined as those who were able to reach the college level and beyond)

In the TOT level, the participants from all centers received secondary education, which meant they were familiar with the Nepali and English languages.

In the LLLT training level the 80% of the participants achieved secondary and higher levels of education. Not one was under the Only Read and Write category. At one training center, Jhuwani, all five participants reached higher level education.

In End-User training level, 66% of the participants reached secondary and higher education levels. In the Shikha Center, all educational categories were evenly distributed. At the Tolka Center, two participants could read and write; 7 received lower secondary level education, 11 held secondary level education, and 5 reached higher level education across. At the Nangi Center, there were more or 9 persons under the only can read and write category, 5 reached primary education, 1 received lower secondary level education, 5 reached secondary level education, and 5 reached higher level education. In the Jhuwani Center, 1 participant reached secondary level while 24 of the participants received higher education. In Danda Gaun, 2 participants can only read and write, 1 reached primary education, 9 reached secondary level education, and 13 persons reached higher level education.

S.N.	Center Name	Only Read & Write	Primary Education	Lower Secondary Education	Secondary Education	Higher Education	Total
1	Shikha	0	0	0	0	1	1
2	Tolka	0	0	0	0	1	1
3	Nangi	0	0	0	0	1	1
4	Jhuwani	0	0	0	0	1	1
5	Danda	0	0	0	0	1	1

	Gaun						
Total		0	0	0	0	5	5
Local Leadership Level							
S.N.	Center Name	Only Read & write	Primary Education	Lower Secondary Education	Secondary Education	Higher Education	Total
1	Shikha	0	1	1	2	1	5
2	Tolka	0	0	1	2	2	5
3	Nangi	0	1	0	2	2	5
4	Jhuwani	0	0	0	0	5	5
5	Danda Gaun	0	0	1	3	1	5
Total		0	2	3	9	11	25
End User Level							
S.N.	Center Name	Only Read & write	Primary Education	Lower Secondary Education	Secondary Education	Higher Education	Total
1	Shikha	5	5	5	5	5	25
2	Tolka	2	0	7	11	5	25
3	Nangi	9	5	1	5	5	25
4	Jhuwani	0	0	0	1	24	25
5	Danda Gaun	0	2	1	9	13	25
Total		16	12	14	31	52	125
TOTAL		**16**	**14**	**17**	**40**	**68**	**155**

Table 5.4: Distribution of Participants by Educational Attainment

Based on the data presented above, the overall trend shows that 10% of the participants were under the only read and write category, 9% under the primary level category, 11% under the lower secondary level, 26% attained secondary level and 44% were able to reach higher educational levels.

5.4.2.2 Comparison of Knowledge among the Participant according to Pre and Post Status

In the TOT level training, one person from each center was selected as participant. These five participants were operators in their respective tele-center centers. Before the training, participants of TOT had no knowledge about Open Office and NepaLinux. After the training, they were not only capable to use this software themselves but were also able to successfully train the participants in Local Level Leadership training.

The following table presents the Pre and Post assessment of technical skills of the TOT participants.

Pre-Status of knowledge	Post-Status of Knowledge
1. Basic computer operating knowledge • Turn on and manually shut down computer • Use CD to play music and movies	1. In-depth computer hardware assembling knowledge 2. Microsoft Windows and Nepalinux operating

through CD player 2. Launching and terminating Window based Microsoft Office applications 3. Launching Window based Internet Browser and Messenger • Internet Explorer, Yahoo Messenger and MSN.	system installation knowledge • Nepalinux live CD • NepaLinux in PC 3. Open office and Microsoft office application installation • Open office org • Open office calc • Open office empress 4. Open software Base Internet Browser and Messenger • Mozilla Firefox and Gimp Messenger etc 5. Troubleshooting and error management • Hardware • Operating System • Application

Table 5.5: Pre and Post assessment of technical skills of TOT Participants

The LLLT was provided by the participants who received the TOT. From the results of the previous baseline study, it was validated that the trainees had almost no knowledge of computing system. After receiving in-depth training in Open Source Software, they were capable of providing similar training. After receiving the training they could operate the software system and develop content according to their needs.

The following table presents the Pre and Post assessment of technical skills of the LLLT participants.

Pre-Status knowledge of Local Level Leadership Training Participant	**Post-Status Knowledge of Local Level Leadership Training Participant**
1. Participants had seen and heard lot of about the computers but never got chance to touch and use the computer.	1 Basic computer Knowledge 1) Knowledge in Open source software 2. Can use open office suite • Open office org. • Open office calc. • Open office Impress 3.Open software Base Internet Browser and Messenger Mozilla Firefox and Gimp Messenger etc

Table 5.6: Pre and Post assessment of technical skills of the LLLT participants

5.4.2.3 Pre and Post status of Knowledge based on training among the End-User Training Participant

The EUT involved 25 participants from each center. They had no knowledge about ICT and they did not have any idea on how to use the computer before training. They were curious to gain access and use ICT knowledge for daily activities. After receiving the training on OSS, each participant became aware about the computing system and was able to use the computer to write letters, documents, and send mail. The participants were now involved in diffusing ICT knowledge and its positive impacts in their local community.

Pre-Status knowledge of End-User Training Participant	Post-Status Knowledge of End-User Training Participant
They have not seen computers but have heard about them • They were keen to learn about the computer but they had no knowledge about computing system	1. Basic computer Knowledge • They can use the computer • Knowledge in open source software 2. They can use Open office suite • Open office org. • Open office calc. 3. Knowledge about Internet Browser and Messenger • Mozilla Firefox and Gimp Messenger etc 4. They can use computer for general purposes 5. They can express their ideas about computers

Table 5.6: Pre and Post status of Knowledge

5.4.3 Discussion

Based on the observations, it was found that the inclusion of participants from various ethnic groups made the training program very effective. For instance, in the TOT the participants from various ethnic groups acquired knowledge about OSS and are now continuing to disseminate this knowledge to others in their community. They are capable of maintaining their ICT infrastructure without any assistance from outside sources. Likewise with the LLLT and EUT, ethnic participants gained basic ICT knowledge and skills. They learned how to use OSS which can be used in their daily activities. This was a significant step as most of the times ethnic communities do not have access to computer training opportunities. However through this training, the participants were able to show that even participants from the ethnic groups had equal participation in the training program. Through the training, they were able to organize and build ICT knowledge and were able to localize computing technology.

In terms of the gender participation, there was inadequate gender balance in TOT. However women's participation in the LLLT and EUT was satisfactory. The women participants played a vital role in learning ICTs. They succeeded in sharing knowledge with other women who did not have opportunity to learn ICT in the past. By learning to use computers, they had opportunities to easily connect with their family members who live abroad through the help of Internet.

Although the training was open to all age groups, however most participants were below 20 years and of middle-aged groups. Advantage of having more participation from these groups was that as these groups are more active, they could rapidly share the knowledge further with others from their respective age groups. They could even organize unemployed people of their age and provide further ICT training to improve their livelihood opportunities.

In LLLT one person within the 40 to 50 age group categories participated in the training. It is commendable that senior members of the community can also receive such training. This participant did not have prior knowledge about ICT; the training was an opportunity which he found useful. He disseminated this knowledge to others in his group and organized them to use ICTs.

The training in relation to the educational attainment of the participants showed that those who had acquired higher education were more familiar with Nepali and English languages. They easily absorbed instructions and as trainers they were able to prepare training materials for LLLT in Nepali. They independently provided LLLT at their own Centers.

During the LLLT, participants who were more qualified helped explain confusing terms to their friends during the training. They proactively provided training their respective groupsand modified manuals which were prepared by Center operators.

In EUT, it was observed that almost all participants were literate. Thus the knowledge transfer became easier because of the literacy factor.

In terms of sustenance of this training program it was observed that with the support of the local community and local level participation, any program can be sustainable and can run smoothly. Nonetheless the local level management committee played a vital role, as throughout this project they cooperated with the project management team of ENRD, in providing space for the training and encouraging the local community to participate.

The local management committee used various approaches in organizing the training activities. For example at the Jhuwani Center of Chitwan, the team from the library management committee helped arrange the training logistics in cooperation with the ENRD training management team. In the case of Tolka, Kaski, the government, school, and some mothers managed the training and mobilized the community. The group of mothers prepared the training space, computers, and electricity facilities, while teachers from the school helped in facilitating the TOT level. In the case of the Danda Gau of Rasuwa, the school appointed a teacher in the TOT level to mobilize the community. Similarly, in the case of Nangi of Myagdym, the school teachers and community group helped in conducting the training activities. In the case of Shika, the training was organized and managed by the school management body.

The participation of the local government body in the training was also effective. Although the local government body could not send trainers, the Village development committee (VDC) strongly promoted the program. Thus, members of the community were aware that there was an ongoing computer training program in their village. Despite the absence of top local officials in the program, the centers were able to effectively coordinate with and receive support from the ward committee and VDCs.

5.5 Challenges of the Training Project

The social divisions in the Nepalese context were the primary challenges to be met during the project. In Nepal, there is a cultural barrier that hinders the mobilization of women in ICT. There are social status categories to consider for women participants, such as sex and kinship. In this study, women's social status was considered a factor that hinders their participation.

Single women can participate in the training, but married ones are not expected because they have to take care of the household. There is no guarantee that their husbands at home can provide the environment for women to access and use ICT tools. Nepalese women are expected to perform responsibilities at home. In the family, women are subordinate to male family members. Most often women are afraid of sharing knowledge within the family, and they cannot easily leave their homes to go to training programs. This case is apparent in the Tolka centers of the Kaski. Despite this backdrop, women's participation was found effective in the EUT. However, women should have been involved in the TOT level training as well so that they could conduct ICT training independently.

Apart from gender, the Nepalese society divides people based on a Caste system. In this system, the *Brahmin* group is considered the pure and highest status. On the other hand, the *Dalit* group is considered the untouchables and the lowest caste group. The *Dalit* worked for those in the higher caste and in some cases are not able to participate in public ceremonies. At present, those in the higher caste group hesitate to join activities which involve participants from the Dalit group. Higher caste people might not be encouraged to mingle with lower caste people in community programs, while lower caste people might not be accepted as trainers in their local areas.

5.6 Lessons and Strategies

Below are the lessons and strategies learned from each of the end-user group of the the project

5.6.1 Farmers' Group

a. They can share their ICT knowledge to friends and relatives
b. They can correspond with family members who are working or studying abroad
c. They can extend help to the program and to other areas of their community through coordination with local leader
d. They can be empowered to share their basic knowledge acquired and diffuse benefit of localized technology
e. They can apply their ICT knowledge and skills to their daily activities
f. They can organize further training for other farmer groups following the LLLT model
g. They can advocate the use of ICT and can disseminate content inside and outside the community

5.6.2 Women

a. Women can exchange their ICT literacy skills with other women
b. They can create environment for further training to other women groups following the LLLT model
c. Women can communicate with their husbands and other family members who are abroad by using Internet and email
d. They can raise their women's issues using localized technology
e. They can help disseminate digital content among the community members

5.6.3 Youth

a. Youth can actively participate in community activities and share the knowledge with others
b. Youth can publish and disseminate digital content in the form of activity reports through their local website
c. Youths can organize discussions and advocacy programs related to ICT in their rural communities
d. Youths can use their ICT knowledge to find jobs.
e. Youths can mobilize other unemployed youths to exchange ICT knowledge and benefits

f. Youths can provide training to other youth through Local Level Leadership

g. Youths can mobilize community to sustain programs

5.6.4 Students

a. Student can use and apply ICT knowledge and skills to their learning process

b. Students can disseminate their skill to other student groups

c. Students can organize workshops and advocacy programs about ICT and localized computing system among student groups

d. Student can encourage training for other students through Local Level Leadership

e. Students can mobilize and empower other students through ICT knowledge, and can show initiatives in sustaining ICT infrastructure

f. Students can extend the program and coordinate with people in other areas

5.6.5 Teachers

a. Teachers can implement their ICT knowledge and skills in their teaching process.

b. Teachers can disseminate their skills and knowledge to their students and other teachers.

c. Teachers can organize workshops and advocacy programs in their local community

d. Teachers can encourage trainings through Local Level Leadership

e. Teachers can mobilize and empower community leaders to sustain ICT infrastructure

f. Teachers can extend the program to other areas by coordinating with local people

g. Teachers can better manage the school system through ICT applications in student record keeping, financial record keeping, preparation tests, printing, and other school related data management

5.6.6 Ex-Army Members

a. They share their ICT knowledge to family and friends

b. They can extend program to other areas by coordinating with the local leaders

c. They can train other ex-army members by sharing the knowledge of localized technology

d. They can communicate with family members and friends aboard

e. They can organize further training to other ex-army groups through Local Level Leadership.

f. They can advocate and disseminate ICT knowledge and content within the community.

5.7 Summary

Through PAN Localization Phase II, ENRD organized different training levels in coordination with local communities on five selected sites in project areas. ENRD has been working since 2004 in the five selected sites, Danda Gaun in Rasuwa, Jhuwani in Chitwan, Tolka in Kaski, Shikha in Myagdi and Nangi in Myagdi. ENRD has mobilized local people through the use of ICT for 4 years, thus local people have developed keen interest in learning to use the computer.

ENRD organized different phases training under PAN phase II from the TOT level, LLLT and EUT in the selected five sites with the aim to empower local people through the use of localized technology. In the TOT levels training, 5 participants involved were also operators of the located five centers. In the LLLT level, 25 participants participated in the training. Each center had 5 participants from different boundary partners. They were trained by operators at the TOT training level. In the EUT level training, 125 participants were involved, with each center being represented by 25 participants who were selected from the same boundary partners. The End-User training provided by Local Level Leadership was done in coordination with local management. ENRD trained a total of 155 people from rural Nepal in localized computing technology. They can, in turn, mobilize other local people through the use of localized computing system.

In all training levels, most trainees were from the 10 to 40 age groups. There were also participants from the 40 to 50 age group. Participants from all age groups got the opportunity to learn the localized computing system.

In the different phases training, except of TOT level, the number of women participants was high. The training was also made available to people from ethnic communities. The Dalit group participation was effective in the training.

Most of the participants acquired higher level education which made it easier for them to understand training material and handle local level training on their communities.

Some participants had low literacy level on ICT knowledge and had no knowledge about localized computing system. At the end of the training, they gained ICT knowledge and developed a clear perspective about localized computing system. With enhanced ICT capacity, they can mobilize and train other people on the computing system and encourage awareness about ICT. Through the training, local people can build their capacities as they are empowered through the localized computing system.

PAN phase II training management team coordinated with local management team to conduct the training in the local level. The local management team encouraged participants to participate in the training and provided support for infrastructure.

While the training was successful, there is still a big gap among some social groups. For instance, women were encouraged by the training but they still have to invest most of their time in the house chores. This is because the Nepali family structure is still based on paternal residence model which makes it difficult for women to be involved in ICT programs if they live far from the maternal home. In terms of ethnic divisions, the Dalit group participated largely in the training program. However, until now, those from the high caste find it hard to recognize the Dalit as local leaders in the community.

6 Project Dareecha: The Pakistan Experience

Center for Research in Urdu Language Processing, National University of Computer and Emerging Sciences

6.1 Introduction

This chapter presents the ICT training program being conducted in rural area schools by the Pakistan Country Component of the PAN Localization Project. The Pakistan Component team was setup in February 2007 at the Center for Research in Urdu Language Processing (CRULP), National University of Computer and Emerging Sciences (NUCES) to investigate strategies for ICT access and local web content generation in rural communities of Pakistan. The chapter starts by discussing the ICT development strategy of Pakistan, the need to include localized ICTs into the national policy, and goes on to discuss Project Dareecha, being conducted by the Pakistan Country Component. At the time of writing, the project is in its final phase, thus lessons learned and recommendations for future projects will also be discussed towards the end of the paper.

6.1.1 National ICT Development Strategy

The Government of Pakistan first recognized the need for ICT development through the IT Policy and Action Plan of 2000 [39], which is the working policy through which the national ICT development strategy can be determined. The guiding theme for this policy states that the "Government shall be the facilitator and enabler to encourage the private sector to drive the development in IT and telecommunication", and the policy envisions to "harness the potential of Information Technology as a key contributor to development of Pakistan".

Focus of the policy document is largely on development of the IT industry in Pakistan, including ICT usage and localized ICT. The focus area on IT Usage states that "to embark on an aggressive program to improve efficiency and provide quality services to the citizens of Pakistan, IT would be inducted at all levels of government".

The focus area on Software Industry Development stresses that local language content development and Urdu and regional software development will be encouraged. Standardization measures for Urdu software development are also mentioned. The policy covers IT education and training, but that is mostly in the context of developing human resources for the IT industry. Training for women is also stressed, but that is also in the context of recruiting women into the IT sector. In effect, the main beneficiaries of this IT policy appear to be the IT industry and the government.

Following the 2000 IT Policy, in 2008 the Government of Pakistan initiated a process to formulate the National IT Policy for the next five years [40]. In the meantime, the IT policy of 2000 has paved the way for significant developments. Among these is the establishment of the Electronic Government Directorate (EGD) in October 2002 as the implementation arm of the Ministry of Information & Technology (MoIT) that initiated various e-government projects. The EGD proposed the E-Government Strategy & 5 Year Plan in April 2005 for implementing e-government at the Federal Government level, which was approved by the National E-Government Council (NEGC) and endorsed by the Federal Cabinet in June 2005[41].

One significant recent development is the proposal of the National Information and Communications Technology (NICT) Strategy for Education [42] in 2007 by the Ministry of Education, in collaboration with the Education Sector Reform Assistance (ESRA) program supported by the United States Agency for

International Development (USAID), the Ministry of Information Technology and the provincial educational departments. The strategy aims to use ICT to augment the current education system.

This is an interesting development in context of the Pakistan Country Component training program, because both are looking into the use of ICT in education.

6.1.2 Localization and the National ICT Development Strategy

Article 251 of the 1973 Constitution of Pakistan declares Urdu as the national language and commits to endorsing its use, instead of English, in official and other purposes within fifteen years [43]. In 1979, the National Language Authority (NLA) of Pakistan was established under Article 251 of the constitution in order to facilitate the adoption of Urdu as the official language, and to make recommendations to the government in related matters. A variety of measures have been taken by the NLA, including development of keyboard layouts to facilitate the usage of Urdu, and translation of terminologies of a diverse set of fields including IT. However, to date, English is still widely used for official purposes, even though only a small percentage of the population understands this language [44].

Subject to Article 251, the constitution also has a provision under Article 28 granting citizens with distinct languages the right to preserve and promote their language [43].

The Center of Excellence in Urdu Informatics is the Urdu IT wing of the NLA, with a vision of providing "a short-term and long-term language policy, ways and means of adoption of Urdu as the official, judicial and instructional language of Pakistan, and to conduct research and development for Urdu standardization and academic support to national and international stakeholders and to the government of Pakistan" [45]. Currently, the center is working on a font development, a machine translation, and an Urdu database project.

NLA projects and other initiatives launched to localize ICT show that localization is considered an important aspect of national ICT strategies. However, training has not been given much importance in general. Some localization efforts are briefly described in the next section.

6.1.3 Localization Efforts

The National Database and Registration Authority (NADRA) was established in 2000 to assist the government in developing a good governance system to solve the problem of undocumented population growth and to register items belonging to its citizens and organizations [46].

A very significant step in the area of localization is the launching of the Urdu Localization Project funded by the Electronic Government Directorate of the Ministry of IT [47]. This project includes research and development in the area of machine translation, text-to speech synthesis and Urdu lexicon development.

The provincial government of the Punjab in Pakistan has started the computerization of land records and aims to "improve service delivery and to improve service delivery" [48].

There have also been significant government efforts in the creation of local language content. The National ICT Research and Development Fund of the Ministry of IT has launched a competition for content creation in local and national languages [49]. The National IT Development and Promotion Unit (NIDU), an initiative of the Ministry of IT, has set up a working group for content development which aims to identify content needed in local languages, and to support the production, use and distribution of digital content to promote linguistic and cultural diversity [50].

6.1.4 Beneficiaries of ICT Training

There are significant portions of the population who stand to benefit immensely from localized ICT training. These include the education sector and the judiciary, especially the lower courts where all proceedings are carried out in Urdu. Other sectors where Urdu is used as the official language include the police, land and revenue departments, and the local government. Thus, there is definitely a need for more efforts to localize ICT in the context of the needs of the population, and also to impart the requisite training.

This chapter focuses on the education sector and describes a training program on localized ICTs being conducted for school students in rural areas of Pakistan.

6.2 Dareecha Training Strategy

Project Dareecha is being conducted at the Center for Research in Urdu Language Processing (CRULP), National University of Computer and Emerging Sciences (NUCES) by the PAN Localization Pakistan Country Component.

Project Dareecha aims to investigate sustainable strategies for ICT access and local web content generation in rural communities of Pakistan. The project is working on a localized ICT literacy training program in rural areas for secondary school students, both girls and boys, focusing on:

1. Content access: to enable students to access required information using ICTs
2. Communication: to enable students to communicate effectively and efficiently using ICTs
3. Content generation: to enable students to create and present their own content.

The training program has been developed to address these three objectives, using the local language (Urdu) as the medium of instruction.

6.2.1 Identification of Key Learning Areas

The first step in the design of the training program was the identification of learning areas which would meet the objectives of the program. These areas were:

a. Basic computer skills (content access): An introduction to the concept of computers and basic computer skills was thought to be necessary because the training program was being implemented in areas where people had little or no exposure to computers. This area was intended to introduce the concept of computers and their use, to familiarize students with computers and peripheral devices, to familiarize students with operating systems, and to enable them to perform simple tasks using the mouse and keyboard. These skills can be categorized as content access skills as they form the basis upon which content access skills, further detailed below, can be learnt.

b. Web browsing (content access): Web browsing was selected as the primary skill which would enable students to access content. Students were introduced to the concept of the Internet, and were taught how to access information using the web browser.

c. Email (communication): Email was selected as one of the modes of communication for students.

d. Instant messaging (communication): Instant messaging was the second mode of communication, selected to further facilitate students in their communication needs.

e. Word processing (content generation): Word processing was selected to enable students to develop their own content.

f. Graphics editing (content generation): Graphics editing was selected to enable students to produce graphical content.

g. Webpage development (content generation): Web development was selected to equip students with the skills to deploy their content on the Internet.

6.2.2 Competency Development

In order to develop a training program, practice material, and a corresponding ICT literacy evaluation methodology, competency levels were developed for each of the seven key learning areas listed in the preceding section.

Competency levels for each learning area consisted of a set of entry criteria, exit criteria, and a set of progressive skill levels. The entry criteria defined the pre-requisite knowledge required for a student before embarking on a course based on the skill levels. The exit criteria defined the level of knowledge a student was expected to have attained after attending a course designed using the skill levels. The levels themselves categorized a learning area into multiple steps. For example, the competency levels designed for the Basic Computer Skills learning area consisted of six levels, where the description for the first level was "the student is aware of the concept of a computer and is familiar with the different components of a computer". The description for the last level was "the student is aware of simple problems that may be encountered and is equipped to conduct basic troubleshooting". Each description was then further described in a series of steps. The number of skill levels developed for each area varied depending on the breadth of the key learning areas.

These levels were used to develop training material, practice material, and also to develop assessment material which would help in determining the level of competency a student had accomplished.

6.2.3 Software Selection and Urdu Localization

Software was then selected corresponding to each learning area. For the purposes of the program, it was decided that the software should be open source to avoid licensing costs, and also because open source software would provide some flexibility in localization options. The software applications selected were also cross-platform. All the application software used in the training program was open-source and localized in Urdu by the project team, with the collaborative efforts of both linguists and technical personnel. The following software was selected for each leaning area:

a. Basic computer skills: Microsoft Windows XP was selected as the operating system. This was the only proprietary software selected, and this selection was made because it was anticipated that there would be better support for Windows troubleshooting and maintenance in rural areas as compared to open source options. Microsoft Windows XP was also not localized. Although it had Urdu support, i.e., Urdu text could be read and typed, the entire GUI was in English.

b. Web browsing: SeaMonkey Navigator is the browser that is part of the SeaMonkey Internet Suite [51], which is cross-platform, open source and freely available on the Internet. The localized version is also freely available for download on the official SeaMonkey website [52].

c. Email: SeaMonkey Mail & Newsgroups is the email client that is part of the SeaMonkey Internet Suite. The localized version is freely available on the official SeaMonkey website [52].

d. Instant messaging: Psi is a cross-platform open source instant messenger that is freely available on the Internet [59]. The localized version is also freely available on the official Psi website [53].

e. Word processing: OpenOffice.org Writer is the word processor that is part of the open source, cross-platform office suite OpenOffice.org [54].

f. Graphics editing: OpenOffice.org Draw is the vector graphics editor that is part of the open source, cross-platform office suite OpenOffice.org [54].

g. Webpage development: SeaMonkey Composer is the web page development tool that is part of the SeaMonkey Internet Suite. The localized version is freely available on the official SeaMonkey website [57, 58].

6.2.4 Training Sessions

The training program was divided into three training sessions as follows:

a. Training I
   i. Basic computer skills
   ii. Web browsing

b. Training II
   i. Email
   ii. Instant messaging

c. Training III
   i. Word processing
   ii. Graphics editing
   iii. Web development

The primary target of the training program was school students. To facilitate students, teachers were also selected from each school as participants in the training program. Each of these trainings was designed to be conducted by project trainers over a three to five day period. The strategy was to train the teachers first, and then to have them as facilitators during the student training session, and eventually leave the students to work under only the teachers' supervision at the end of each training session. To control the number of training sessions, teachers from each school were trained at a single location for each training session. After the teacher training session, the training team conducted the same training session at each school for students. This scheme is summarized in Table 1.

After the training by the project team at each school, the teachers at the school were given practice material developed by the team for the students, and were required to help students reinforce their skills. Another project strategy was to form a team composed of exclusively female members to conduct trainings in the girls' schools, and a team composed of exclusively male members to conduct trainings in the boys' schools. A girls' and a boys' school at nearby locations were then selected, so that the training could be conducted in parallel at a girls' and a boys' school by two different training teams.

Training	Conducted at	Duration (days)	Hours per day
Teacher training I	One location	3	8
Student training I	Ten locations	5	3
Teacher training II	One location	3	8
Student training II	Ten locations	5	3
Teacher training III	One location	3	8
Student training III	Ten locations	5	3

Table 6.1: Dareecha Training Session Plan

6.2.5 ICT Literacy Evaluation

The ICT literacy evaluation strategy assessed students at different intervals during the training program. Tests were developed to assess the ICT literacy level in each learning area based on the competency levels discussed earlier. Three types of tests were developed for each learning area:

a. Pre-training test: to determine the ICT literacy level of a student in a learning area before the training for that learning area.

b. Post-training short-term test: to determine the ICT literacy level of a student in a learning area at the end of the training for that learning area.

c. Post-training long-term test: to determine the ICT literacy level of a student in a learning area around two months after the training session, during which the student will have had time to reinforce her/his skills under the supervision of school teachers using the practice material developed by the project team.

6.2.6 Lab Deployment

A major component of the training strategy was lab setup at project schools. The training program was to be conducted at rural area public schools, and the candidate schools did not have computer labs. Before the training program could commence, each school was provided with eight desktop computers, a scanner, a printer and Internet connectivity, as well as lab furniture.

6.3 Dareecha Implementation

This section covers the implementation of the strategies described in the previous section.

6.3.1 Needs Assessment

An informal needs assessment activity was conducted by CRULP to determine the current status of ICT integration in Pakistan schools. It was found that ICT is being taken up as a subject in a few cases, but ICT integration into the curriculum was not being done anywhere. This observation led to the design of a program which would fulfill general purpose academic needs by enabling students to access content, communicate, and generate content. The skill areas were then identified.

Also, because the English literacy rate in Pakistan is very low, proper access to ICTs meant that ICTs had to be localized. The national language Urdu was selected as the localization language because it is the medium of instruction in rural area schools.

6.3.2 Training Program Implementation

The training program was implemented at ten schools in rural areas of Pakistan starting from 3rd November 2008 and ending on 12 June 2009. Ten schools were selected for the program through district level support in the districts of Sargodha, Attock, and Chakwal. Five of these were boys' schools and five were girls' schools. A pair of boys' and girls' school was chosen at each location (or at least at nearby locations) so that training could be conducted conveniently in parallel at two schools.

Eight out of ten schools were in Sargodha district, so a single contract was signed with the district. Each of the remaining two schools was in a separate district, so a contract was signed with each school with the knowledge and approval of the concerned district. For a complete list of school names and locations, please see Appendix A.

6.3.3 Training Material

Seven books, each focusing on a key learning area were developed in Urdu.

i. Basic computer skills
ii. Web browsing
iii. Email
iv. Instant messaging
v. Word processing
vi. Graphics editing
vii. Webpage development

Figure 6.1: Training Books in Local Language

The books were developed based on the competency levels described earlier, and accompanying each book was a course outline, a detailed lecture plan, slides, practice material (including online exercises) and testing material. All the material was developed in the national language Urdu with the collaborative efforts of both linguists and technical personnel. The strategy used to keep the material as readable as possible was to keep linguists as the primary authors of the books. This was done to ensure that the language used in the book was user friendly and was not too complex from a technical perspective. Technical personnel were also present throughout the development of each book, and played a key role in book reviews, where they served the dual role of ensuring technical correctness and simplicity of language.

All training material developed for the project is freely available under the Creative Commons license at the project website (http://www.crulp.org/dareecha/).

6.3.4 Training Team

Two training teams were deployed in parallel to conduct the training sessions. The program was implemented in both boys and girls school. With social context in mind, a team composed of female members only was formed for the girls' schools, and a team composed of male members only was formed for the boys' schools. The two teams worked together during the teacher training sessions (which included all teachers of the program, both male and female). For each subsequent student training session, the female team would work at the girls' school, and at the same time the male team would work at the boys' school at the same or nearby location.

Each training team had one linguist, who conducted the training session, and one technical person, who served as technical support and back-up for conducting training sessions. The training team personnel also worked on the development of the training material, and so were completely familiar with it by the time of the training.

6.3.5 School Support

At each school, the Principals/Heads had a key role in the implementation of the project, so it was imperative to gain their trust and confidence. All lab equipment, furniture, training material and internet connectivity charges, were given to each school in the care of the Principals/Heads. Each Head was also required to sign and stamp receipt forms for all items provided through the project.

Each Head was requested to nominate two teachers to play the role of facilitators during the training program. The nomination process was left up to the Heads and most Heads nominated the teachers on the spot, during the initial meeting with the project team. Leaving the nomination to the Heads was also a strategy employed to encourage schools to take ownership of the training program. Teachers nominated for nine out of the ten schools have stayed with the program to date (at the time of writing). There have been multiple changes in one school, however, due to teacher transfer and leave issues.

Each Head was requested to nominate at least fourteen and up to around thirty students from grade eight to participate in the training program for the duration of the project (November 2008 to April 2010). Fourteen was an ideal number because each lab being set up by the project team had seven workstations, so two students per workstation would be an optimum number. If the number went up to thirty, they could be accommodated by the project team working on two shifts during the five day training session for each school. Most schools nominated eighth grade students, while two nominated ninth grade students citing logistic and scheduling issues. Appendix B shows the details of students nominated for the program.

6.3.6 Lab Setup

After selected schools had signed up for the training program, lab equipment and furniture was delivered to each school and a project team member setup the labs at all schools.

6.3.7 Training Conduction

The training was conducted as planned, starting from 3 November 2008 and ending on 12 June 2009. Each teacher training was conducted at Govt. Boys Higher Secondary School Chak No. 88/SB, where the first lab was setup by the project team. The subsequent student trainings were conducted at each school. The complete training schedule, as executed, can be seen in Appendix C.

As planned, for each of the three training sessions, a teacher training session was first conducted collectively for all teachers at one location, Govt. Boys Higher Secondary School Chak No. 88/SB, by the training team. Thereafter, the same training session was repeated at all schools by the training team,

with the teachers at each school acting as facilitators. Each training session was customized for teachers, female students, and male students and included relevant examples.

As planned, during the teacher training sessions, the training team was composed of both genders. But for each school, a team with female members only conducted the trainings at the girls' schools, and a team with male members only conducted the trainings at the boys' schools.

Figure 6.2: End User Training

During the first teacher training sessions, teachers were taught the basics of email to facilitate communication with the project team, although as planned, email was to be covered during the second phase of training.

Training books were distributed to all training participants at the beginning of each training session, and the training sessions were carried out using the lecture slides prepared by the project team. The linguists in the team were the primary trainers, and technical team members were available to provide support and back up. The training sessions were designed to be as interactive as possible, so that students would have the maximum possible hands-on experience under the supervision of the project trainers. The lecture slides were designed such that a hands-on activity would be introduced at frequent intervals.

As planned, ICT literacy tests were conducted in conjunction with trainings for each learning area. This was done before the training, immediately after the training and two months after the training. The tests included objective questions only (multiple choice and true/false), and were in Urdu, as was the rest of the training material.

Exercises were developed for each learning area to keep students in touch with the program, and to enable them to reinforce their skills until their next training session. After the first training session, these exercises were distributed to schools in the form of worksheets (in hardcopy). After the second training, all students had email accounts and exercises were distributed and submitted online.

After each training session, three competitions were also conducted within each school to keep students motivated.

6.4 Program Evaluation

Gendered Outcome Mapping (OM^g) [36] is being used for monitoring and evaluation of the project. OM^g is based on the Outcome Mapping (OM)[56] methodology which involves a range of stakeholders in a participatory process, from the earliest stages of the project planning until project completion. The OM framework is influenced by the Gender Evaluation Methodology (GEM)[57], which facilitates integration of gender analysis into evaluation of projects using ICTs for social change. OM^g therefore is a comprehensive evaluation methodology which explicitly addresses gender issues at every stage of the project.

In the OM^g framework, boundary partners are defined as "those individuals, groups and organizations with whom the program interacts directly and with whom the program anticipates opportunities for influence". For Project Dareecha, three boundary partners were identified: students, teachers and principals. These three were further subdivided with respect to gender to ensure that gender-segregated data was collected, to ensure gender equity throughout the project, and to measure gender differences. So there were actually six boundary partners, male students and female students, and so on.

Out of these boundary partners, students were the one with the primary focus, because they were being targeted as end users. Teachers had the role of facilitators during the training, and principals had a pivotal role in the execution of the project, so they were significant boundary partners of the program as well.

Keeping in mind the aim of the project, to determine and evaluate sustainable strategies for ICT access and local language content generation in rural schools, the project evaluation was designed:

1. To measure behavioral change, learning and performance of boundary partners during project trainings, i.e.,
    a. To gauge teachers' proficiency in using localized software and to measure the extent to which they were able to deliver training on localized software for ICT access.
    b. To gauge students' proficiency in using localized software for ICT access and to measure the extent to which they improved their academic routine with the use of localized software.
    c. To gauge the principals' receptiveness to training program.
2. To measure the efficacy of different strategies in enhancing the productivity of projects trainings.
3. To measure the contribution of localized ICT in raising digital literacy, specifically,
    a. To measure the extent to which localized software has facilitated end-users' ability to use software.
    b. To measure the impact of local language (encoding, font and keyboard) support on effective access and generation of content, and communication.
4. To measure the equitable participation of both women and men in the project.

The overall project evaluation covers these four evaluation questions, but this chapter will only discuss the methodology used to investigate the first question in depth. The rest of the questions are not directly related to end-user training, so they will not be covered.

A set of outcome challenges was also developed under the OM[g] framework to structure the evaluation of the training program, specifically to monitor evaluation questions 1a and 1b. The OM[g] framework defines outcome challenges as "changes in the behavior, relationships, activities or actions of a project's boundary partners, i.e., the people, groups, and organizations with whom a project works directly".

Strategy journals were also used for monitoring and evaluation. Strategy journals record data on the strategies being employed to encourage change in boundary partners [36].

Various tools were used to collect data for the outcome and strategy journals. Before describing these, the outcome challenges associated with male and female students, and male and female teachers are detailed in the next sub-section [36].

6.4.1 Outcome Challenges for Students

The outcome challenges for female and male boundary partners have been designed differently because of the contrast in their roles in their community. Based on observations which showed that female students had lesser exposure to ICT than male students, female students were assigned less demanding outcome challenges. Also, noting the restrictions on mobility for female students, they were not expected to disseminate their acquired skills outside of their school.

Female Students: The program intends to see that female students are able to use localized software for ICT access. Female students are demonstrating competency in basic computer skills. They are using the Internet as a medium of communication and are generating web content in the local language. Female students are also able to use word processing and graphics editing software to create content in the local language. They are using ICT skills in their routine activities. They request more localized software to advance their skill level. They act as new learners of ICT within their school and motivate other female students to learn computer skills through localized software.

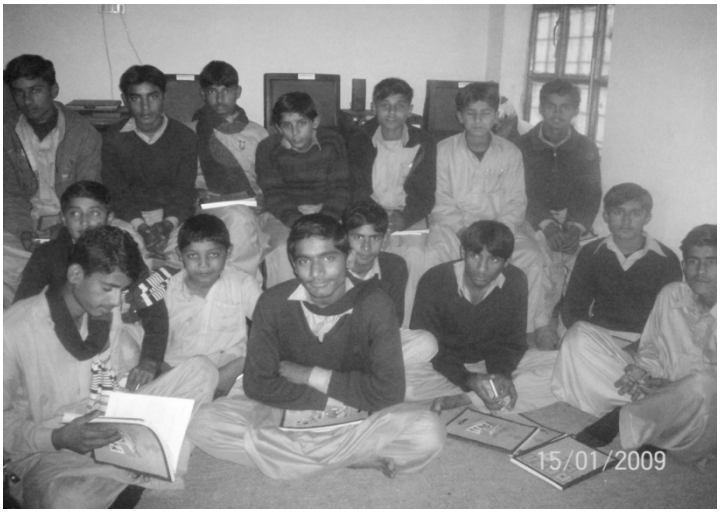

Figure 6.3: Training in Boys School

Male Students: The program intends to see that male students are able to use localized software for ICT access. Male students are competent in basic computer skills. They are using the Internet as a medium of communication. They are not only enhancing their general knowledge by exploring web content, but are also generating web content in the local language. Students are also able to use word processing and graphics editing software to create content in the local language. They are using ICT skills in their routine activities. They request for more localized software to advance their skill level. They act as new learners of ICT in their communities and motivate others to learn computer skills through localized software.

6.4.2 Outcome Challenges for Teachers

Outcome challenges for male and female teachers were designed differently because it was expected that male teachers would be able to work on the sustainability aspect more easily as compared to female teachers. This was assumed because most of the schemes that could be used to introduce sustainability into the training program required the computer labs to be open for extra hours after school. Female teachers were not expected to be able to do this easily because they would probably have responsibilities to tend to at home after school hours. Also, it was thought that male teachers would be able to disseminate the training better than female teachers because mobility for females is somewhat restricted in the area that are being targeted.

Female Teachers: The program intends to see that female local trainers are able to use localized software and maintain the school computer lab. Trainers are themselves convinced to learn and use ICT as an effective tool for socio-economic gains. They are maintaining lab facilities and imparting training to students regularly and constructively. They are enhancing their teaching techniques by using ICT in their routine work. They also persuade students to use this ICT for their academic work. They are communicating regularly with the project team, sharing their needs and expectations. They are motivating other school teachers and students by sharing their learning and experience.

Male teachers: The program intends to see that male local trainers are imparting training to students who are not part of the training program, which helps bring sustainability to program. Trainers are convinced to learn and use ICT as an effective tool for socio-economic medium. They are able to use localized software and maintain the school computer lab. They are maintaining lab facilities and imparting training to students regularly and constructively. They are enhancing their teaching techniques by using ICT in their routine work. They also persuade students to use ICT for their academic work. They are communicating regularly with the project team, sharing their needs and expectations. They act as champions for utilizing localized software in their communities and motivating other school teachers and students by sharing their learning.

6.4.3 Strategies

The following strategies implemented in the project are being monitored for the duration of the project with the help of OM[g] strategy journals:

a. Development of localized training material: As described earlier, all training material, including books, training slides and literacy tests have been developed in Urdu by linguists. The strategy was designed so that the training would be accessible to users in their native language and they would be able to learn in a more efficient and comfortable manner.

b. Competitions: Competitions, as described earlier, are an integral part of the training program, designed to motivate participants.

c. Follow-up: The project team is in constant contact with the project participants to provide technical support and also to motivate the participants. This follow-up started off over the phone lines, because as discussed earlier participants were not immediately comfortable with email. But towards the end of the program email was used along with telephone calls to keep in touch with project participants, to assist them wherever needed and to make sure that they are on the right track. Phone calls and emails are monitored separately.

6.4.4 Evaluation Tools

This section describes the evaluation tools that were used to collect data for the evaluation. All of the tools discussed below were used for both teachers and students, except for the ICT literacy tests, which were used only for students. The ICT literacy tests were not used for teachers because students were being targeted as the primary boundary partners, and teachers were playing the role of facilitators to help the project trainers train the students in the program.

a. Attendance sheets: Attendance was taken during all training sessions, and participants were required to sign in and sign out for training sessions. So, attendance sheets provide valuable data indicating regularity (which has an effect on learning and performance).
b. Daily observation forms: Two types of daily observation forms were designed. One was designed to collect data on students and teacher participation, and the second one was designed to collect data on the teachers' performance on localized software usage. Both the forms were filled during the training sessions. The project evaluator filled these forms using personal observation and also sought input from the project trainers. The daily observation form used to record participation was based on questions asked by the trainers and by participants during training sessions. Table D.1 in Appendix D shows the sample daily observation form used to record participation.
c. Competition records: The purpose of competitions and activities during the training program was not only to make the trainings more interactive and interesting for participants but also to assess the learning and performance of students and teachers. The project evaluator and project trainers observed all competitions and activities conducted during training sessions, and recorded all results. Results for all competitions conducted over the Internet were also recorded.
d. Logs of Internet communication: Email and instant messaging accounts were created for all participants of the program, and three email groups were created to encourage and facilitate email communication between program participants. These logs were also used to determine language preferences for participants.
e. Interviews and observations: The project evaluator accompanied the two training teams (female and male) at each location to conduct interviews and to observe the participants, especially to monitor changes in behavior.
f. ICT literacy tests: ICT literacy tests were conducted at various intervals to gauge the ICT literacy level of students.

6.4.5 Supportive Mechanism

A variety of supportive mechanisms were implemented to ensure proper and efficient execution of the training program. Some of these are described in this section.

6.4.5.1 Technical Support

At the start of the program, when the participants were not comfortable with communication through the Internet (email and instant messaging), all technical support was carried out either by the team when they were on location at each school or over the telephone. During this period teachers were encouraged to contact the project team for technical support, and students were directed to get help from their school teachers.

Later on, when the training program participants were able to use email and instant messaging applications, all participants were encouraged to contact the team directly via email or instant message.

They were especially encouraged to use the email groups, as this would disperse any issues reported and solved to all participants of the training program.

Support was provided for issues including lab networking, Internet connectivity, printer and scanner accessibility, software configuration, and usage of software features.

All school teachers were also provided with a trouble shooting guide compiled specifically for the program, tailored to help teachers manage and maintain their labs. As the training program progressed, new issues were identified which were documented and made available to the participants.

Some of the schools participating in the training program identified technically adept people in their locality to provide support. They also worked under the guidance of the training team to resolve computer lab problems. At one school, such a person was an old student of the school who had gone on to study computer science. At another school, a teacher's brother was often available to help out with problems. These individuals were very helpful, especially during the initial stages of the training program, when the teachers were very ill-equipped to take care of the lab. They were also helpful when the team was also not on location to help out with minor issues, which were very hard to diagnose over the telephone. For example, an apparently complex issue was reported once, and the project team, not being on location at the time, was unable to diagnose it properly. However, when the school called their local support person for help, she detected that a power cable was not plugged in properly which was causing a computer to shut down soon after it booted.

6.4.5.2 Honoraria

Each teacher nominated for the training program was granted an honorarium of Rs. 1,500 per month for the duration of the training program (18 months).

The project is also receiving considerable support from the District of Sargodha, as the program is being implemented in eight schools in Sargodha. For this the Executive District Officer (Education) of Sargodha District is also being granted an honorarium of Rs. 3,000 per month for the duration of the project.

6.4.5.3 Competitions

To keep participants motivated for the duration of the training program, several competitions are being conducted at frequent intervals.

During each teacher training, several competitions are planned and winners are awarded prizes. These are short and simple competitions with simple prizes. For example during the first training, all participants played a computer game, and the participants with the highest score were the winners. During the first training, the participants learned how to conduct a web search, so another competition was conducted where participants had to look up some information from the web. The participants who found the information first were declared the winners. Prizes for these competitions included books, stationary, and other similar items.

During each student training, similar competitions were held, and students were given small prizes including books and stationary items. After the end of each training sessions, three competitions were also conducted over the Internet to keep the participants involved in the program until the next training, and also to give them a feel for Internet communication.

At the end of the training sessions, a final website development competition was conducted for both school staff and students. There were three categories in the competition:

i. Student group competition: One group of students from each school to create a website on their local community.

ii. Student individual competition: Individual students from participating schools to create a website on a predefined topic (related to the local community).

iii. School staff competition: One group of school staff from each school to create the school website.

Participants created their websites over the summer and a total of Rs. 120,000 in cash were given out to the winners.

6.5 Barriers and Issues

Several barriers and issues were faced during the implementation of the program.

6.5.1 Government and Local Support

In order for government schools to participate in the training program, it was imperative to obtain government support. This was sought at a provincial level initially, but these efforts did not turn out to be successful. As an alternative, district level support was requested. A very positive response was received from Sargodha District, after which eight schools were selected for the program. Later on, Chakwal and Attock Districts also extended their support, and one school was selected in each location. The training program was supported by the Executive District Officers (Education) for each district. After obtaining district level support, community level and school support followed and the training program was implemented.

6.5.2 Nominated Teacher Issues

Each selected school nominated two teachers to participate in the training program. These teachers were to start as facilitators for the project trainers and then advance to a level where they would be training and providing support to the student participants. It was intended that the teachers stay with the project for the duration of the training program. However, availability issues started coming up. One of the nominated teachers was replaced because she was unable to travel to the location being used for the teacher training sessions. After the first training session, two nominated teachers from a school had to be replaced because one went on leave and the other one was transferred. This was a serious situation, because the two new teachers nominated had no experience with computers at all, and the students from that school were not able to properly continue with their post-training exercises.

Apart from these, there were other minor issues where the nominated teacher would not be available due to various reasons, sometimes during a training session, and sometimes during the post-training period. For example, three of the nominated teachers in the program were heads of schools, and would have administrative duties to attend to, due to which their work with the training program would suffer. Apart from this, several teachers had other work to attend to. All this significantly affected the time they could put into the training program.

The teacher training sessions were conducted at a central location in Sargodha District. This was relatively convenient for the teachers based in Sargodha, but difficult for the teachers in Attock and Chakwal district. This was quite a serious issue for the female teachers because in some remote areas, it is culturally unacceptable for women to travel without a guardian. Due to this and other reasons, the female teachers from Attock missed all three training sessions, except for one, which was attended by one teacher (who was accompanied by her father for the trip). The project team tried to make up for this by sending them the training books in advance and spending extra training time with the teachers when they went to the school for the student training.

As a strategy to gain the confidence of the schools, teacher nomination for the program was left entirely up to the heads of schools. The downside to this was that the selection was not always based on competency and enthusiasm. In some cases, schools selected the most able teacher in their school to participate in the program. This had a significant effect on the implementation of the program, because it was a challenge to work with novice users, especially when the support was being provided remotely in most cases.

6.5.3 Computer Lab Issues

The criteria for school selection were that each school should have a secure room available that could be set up as a lab, and that the lab room should have electricity.

One of the schools being considered for the program (in District Attock) did not have electricity at the time of the initial visit. The school, however, was very enthusiastic about the ICT training program, and managed to mobilize the community to get the school connected by the time the training program was launched.

The training program implementation dates also coincided with a severe, ongoing power crisis throughout the country. This affected the program in two ways. Firstly, the lab facility was not available for training conduction or practice sessions when there was no electricity. This could be for up to twelve hours per day, and as such, program participants had limited or no access to labs. Power generators were used during training sessions when the problem grew more severe. The second way the program was affected was with the power going on and off at frequent intervals, accompanied by fluctuation. A lot of lab equipment was damaged and had to be replaced, and software got corrupted frequently and had to be repaired. Participants also suffered due to the replacement and/or repair time.

PTCL Vfones were used to provide Internet connectivity at all locations. All of the schools were in remote locations, so signals were not easily accessible. Antennas were required at all locations in order to improve Internet connectivity.

A project team member visited all schools to set up labs. The plan was to have nominated teachers assist during the lab setup so they would get some exposure and learn as much as possible. This worked out at the boys' schools where the teachers were male and could easily interact with the project lab setup person (who was a male member of the team). However, the situation was not very comfortable in most girls' schools, where due to cultural restrictions the teachers were not able to interact freely with the lab setup person, and therefore lagged somewhat behind their male counterparts. In hindsight, it would have better to send a female lab setup person to setup the labs in the girls' schools.

All the rooms selected for lab setup were inspected by the team before selection. An issue arose at one school where the Headmistress was not present at the time of the teams visit. In the absence of the Headmistress, the team approved a room proposed by the school staff. But by the time the lab setup team arrived at the school, the Headmistress had returned and insisted that the lab be setup in another, much smaller room. The lab was setup as desired by the Headmistress, but it turned out to be too small to accommodate all lab equipment and students. The room had to be changed again when the team arrived for the training session, because it was not usable.

The Internet connection provided did not have enough bandwidth to effectively support seven workstations. Problems were faced due to this during and after training sessions. Options are currently being explored to improve the bandwidth.

6.5.4 Training Issues

In some cases during training sessions, nominated teachers would not be available and are not able to support students through practice sessions in the post-training period. Such occurrence significantly affected the program.

The three day and five day training sessions designed for students and teachers were also too short to properly cover the course material, especially when the majority of the participants had no exposure to computers at all. This problem was aggravated by the power crisis, thus even when the team was available on location, it was not possible to use lab facilities at all times.

There were also some schedule conflicts with the training program. Although care was taken to design the schedule to avoid exams and holidays, there were still some cases where the training sessions clashed with exams. In one such case, the training session was shortened, but continued on schedule after negotiation with the school head. In another case the training sessions for two schools were switched to accommodate their schedules. But for the most part, the training sessions went ahead as planned.

6.6 Training Program Sustainability

For sustainability, the project intended for schools to start using the labs to generate funds to enable them to keep the labs functioning when the program ends. Schools were given various ideas and encouraged to pursue them, for example, opening the labs after school and charging a small fee for usage, composing documents (letters, notices etc.) for the local community for a small fee etc. All the schools were enthusiastic about the ideas in theory, but the plans have not been successfully implemented in any school, except one. In Attock District, students are being charged a nominal fee for lab usage. The school in Attock District also provided access to exam results online for a small fee. The girls' school at Bhalwal had plans to issue lab cards to students and charge a fee for lab usage but this has not been implemented at the time of writing.

6.7 Lessons in the Field

At the end of the training program, two significant lessons have come to light.

Firstly, teachers, who for the purposes of the program have been used more as support personnel than end-users, have been identified as a much more significant user group which needs to go through a more rigorous training session. It was mistakenly assumed during the design phase of the program that teachers, after undergoing roughly the same amount of training as the students, would be well-equipped to maintain computer labs and start training students. At the end of the training program, it can be seen that teachers have not been able to cope as well as planned. In fact, towards the end of the training program, a strategy was implemented to start training some of the brighter students in trouble shooting techniques to help solve computer problems, as most of the teachers were not very successful at it. A better option would have been to have rigorous training sessions focusing on teachers. In the long run this would end up being very beneficial for school students as well, because once the school staff has been trained and is able to integrate ICT into their daily routine, they can then train students as per their requirements. Whereas, with the main target group selected now, students, the training program has been able to focus on only a specific number of students, who will be leaving the schools soon, and will not be in a good position to further disseminate their ICT training. So, in retrospect, it would have been more feasible to focus on one user group only, and that user group should have been teachers.

The second observation made throughout the training program was that although the participants were learning ICT techniques in a satisfactory manner, they were unable to properly grasp its utility. For example, most of the students regularly using email were using it without any purpose (e.g., sending multiple attachments with no text explaining the significance of the attachment), and they did not seem to have grasped the concept that email was an efficient mode of communication. An effort had been made during the training program to explain all concepts with the help of relevant examples, even going so far as to include different examples for boys' school trainings, girls' school trainings and teacher trainings, but participants still were not able to properly integrate the ICT skills they were learning into daily routine work. To improve chances of integration, the training program should probably have been tailor-made to meet the end-users requirements. That is, the daily routine of the end users should have been analyzed first and the training program should then have been developed around that. For example, if it had been identified that school staff regularly need to prepare budget, then a training session could have been designed to help staff create budgets using spreadsheets, instead of just teaching them to use spreadsheets. A few examples can be given to help them understand how spreadsheets can be used in the general sense. Basically, the perspective of the ICT training needs to be changed keeping the end users in mind.

A counter argument can be made that because the end users being targeted for this specific training program had no exposure to computers at all, a basic introduction was needed to help them to get to a point where they could benefit from such training as mentioned earlier (developing budgets using spreadsheets). Most of the users had to be taught how to use a mouse during the first training session. At least the first training session was necessary, but the remaining ones could have been more focused on user needs rather than ICT skills.

6.8 Towards a Framework on Local Language ICT Training

As discussed earlier, it was found that a better approach to disseminate ICT skills would be to target school teachers as end users and to use a more direct method to integrate ICT into their daily lives. This is because once teachers are trained they are able to pass on the training to numerous more students due to their position in the academic system. A trained student, on the other hand, has little chance of passing on the training to others. A more direct method is needed to target the actual needs of the teachers so they are readily able to use the skills.

Keeping these two points in mind, towards the end of the training sessions, a need assessment activity was planned to elicit the ICT needs of the teachers working with the project. To understand exactly what ICT skills could be usefully integrated into the day to day activities of school teachers, a focus group activity was conducted during the third teacher training. All nominated teachers attending the third teacher training participated in the focus group. The participants were divided into four groups, and each group was assigned one of the following roles:

1. Teacher teaching humanities
2. Teacher teaching sciences
3. School head doing administrative work
4. Teacher doing administrative work

The activity was moderated by a project team member. Each group was also provided with a facilitator from the project team, and one project team member was assigned to minute the entire activity and one was assigned to collect pictures and video footage.

Participants were given an introduction to the activity and asked to note down and prioritize their day to day tasks. These were discussed during the session and later analyzed, to show a great variety of activities which could be supported by ICTs. The analysis of the tasks showed that the four roles identified above could actually be collapsed into two: administrative and pedagogical activities. Table 2 shows the categories of tasks (that could be augmented by ICT use) that were identified after analysis of the task reported by the teachers during the focus group discussion.

Pedagogical Tasks
Lecture delivery
Lecture preparation
Character building
Homework assignment
Course preparation
Student assessment
Administrative Tasks
Administrative Tasks
Communication
Financial management
Performance monitoring
Attendance record management
Result preparation
Planning
Admissions management
Library management
Timetable preparation
Personnel management
Maintenance
Purchase
Issuing official documents

Table 6.2: Categories of tasks identified during need assessment activity (listed in priority)

Based on these requirements, two types of programs can be designed: one focusing on training school staff to use ICTs to make their administrative work process more efficient and one focusing on training school staff, teachers specifically, to enhance and improve their pedagogical activities. The first would include a major portion on financial management and the second would include a major portion on augmenting lecture delivery with ICTs, since these were found to have the highest priority for the teachers who participated in the focus group. The program would be based on local language ICTs, in a similar way to Dareecha, as so far, it has shown to yield positive results. Also, the same strategy, to ensure equal participation and benefits for both genders will be followed.

7 Towards A Framework for Localized ICT Users Training

The four countries presented in the previous chapters showed the backdrop of each country on ICT and ICT capability building policies, as well as the training design, and the results of the conduct of ICT Training experiences in local language computing. The target users for each country varied. Nevertheless, similar training and capability building approaches in different country contexts have elicited unique and common results and lessons, raising insights in the conduct of localized training initiatives.

7.1 Country ICT and Localization Strategy

Each country has a national ICT strategy and ICT agencies mandated to implement these policies. However, these national strategies have yet to integrate, harmonize and standardize country skills development policies with formal and non formal education institutions to ensure a pervading strategy for universal literacy and 21st century life skills to reach all citizens.

Some countries appear to be more aggressive and more specific in their stances on localization, ICT training, and content development. However consistency in policy implementation may also be challenged by current infrastructures, governance and human capacity, and political will to sustain initial gains from the implementation.

7.2 Training Design and Delivery

From the foregoing cases, the instruction design process was used to determine the uniqueness and operational extent of the training activities rendered to the target groups of each country. While the target groups varied as well as the internal processes used by each implementing organizations there were observations and insights gained common to most if not all and distinct to each country. The table below provides a summary of the observations and insights derived from the cases.

Design Categories	Bangladesh	Cambodia	Nepal	Pakistan	Observations and Insights
Target group for training	Infomediaries	▪ Public Sector Employees ▪ CIO from all ministries ▪ IT Supporters ▪ School Teachers ▪ University Students ▪ Small and Medium Enterprises ▪ End Users ○ Farmer - Communities	Community trainers, leaders and users	Secondary level students and teachers	All saw the importance of intermediaries or trainors from the natural setting to facilitate learning. Needs of target particular groups are varied, and more complex

Design Categories	Bangladesh	Cambodia	Nepal	Pakistan	Observations and Insights
		○ Grassroots level of students.			if there are multiple target groups.
Conduct of needs assessment	The review could have been done before the project	Needs assessment was conducted but results were not specified	Baseline study was conducted finding out what target group required	Needs assessment per group was conducted	All have conducted needs review but done at different levels and depth.
Assess relevant characteristics of learners	Prior assessment have been done	Not clear if this has been done	Not clear if this has been done	Done together with the needs analysis	All may have done an assessment but done at different levels and depth
Analyze characteristics of environment setting	Prior assessment done – setting of tele-centers and communities served	Prior assessment could have been done based on the country study	Assessment done based on baseline study	Done together with needs analysis	Some countries may require in-depth study
Perform task and content analysis	Identification of Required Quality for a Good Information Services Provider during the training	Learning Need Life Cycle was mentioned but not as detailed and discussed in the study	Not specified in the report	Competency study undertaken	All may have done an assessment but done at different levels and depth
Write statement of performance objectives	Roles of the intermediaries were articulated	Articulated in the expectations	Articulated in generalities	Expected performance of the students and	The more specific the targets the clearer the

Design Categories	Bangladesh	Cambodia	Nepal	Pakistan	Observations and Insights
				teachers were articulated	design.
Develop performance measurements	Some articulations	Not specified	Not specified	Specified	Metrics are helpful to provide indications for training outcomes
Sequence performance objectives	Some articulations	Not specified	Not specified	Specified	Prioritizing the objectives give clearer targets for the training strategy
Specify instructional strategies	Specified and discussed in details as implemented	Strategy was stated including training outline	Specified	Specified	Some strategies used were commonly sought example the TOT while others were varied depending on the context and need of target group.
Design Instructional materials	Specified and discussed in details as implemented	Specified and discussed in details as implemented	Mentioned general outline	Specified and discussed in details as implemented	Details must also relate to the design and the needs assessment
Evaluate instructions	Evaluation was based on the feedback of participants	Evaluation based on a survey	Evaluation was based on the feedback of	Evaluation was both based on the survey and	Evaluation done at different levels and

Design Categories	Bangladesh	Cambodia	Nepal	Pakistan	Observations and Insights
			participants	feedback of participants	depth

Table 7.1: Summary of Insights from the Case Studies

7.3 What worked?

7.3.1 The Experienced Implementing Organizations

Most of the institutions that implemented the action research on localization of ICT training (as a result of the technological breakthrough in language computing) were organizations that had track records in community organization, ICT capability, and in project development, and project implementation. Admittedly though, the competence in capacity building and knowledge of the "educational pedagogy" still prove to be wanting. Nevertheless the desire to explore and innovate brought about fresh perspectives in the outcomes of the training program. They were able to understand their stakeholders, boundary partners. The end-users had high respect for their project implementers and trainers as articulated by participants. There were expressions of appreciation for participatory consultations and dialogues with target community members, school personnel, government personnel and community infomediaries. Efforts to meet expected outcomes in the preparation and delivery of the training design, curriculum, and materials were evident.

7.3.2 Use of Training Strategies

The limited resources of the training program and the desire to quickly and efficiently promote the localized ICT training programs required the Training of Trainers strategy which the is the first training layer for the Nepali training program, the "multiplier training channel" for the Cambodian experience, the creation of the facilitating team for the Pakistani experience and to some extent for the Bangladeshi experience with infomediaries. All the countries saw the necessity to implement the TOT strategy and realized its value to the program.

7.3.3 Use of Methodical Process

The planning and preparation for the training that started from the training need assessment up to the evaluation of the program were mostly observed for the implementing organizations. The practice was mostly exemplified by the Pakistan case study. The latter was also able to provide examples of creative means to motivate students by instituting competition and rewards in the program. For most cases though the use of the methodical process especially in the pedagogical approach need in-depth understanding and practice for the localized ICT designers and trainers.

7.3.4 Understanding the context of the Users

The baseline studies provided opportunities not only to assess the rationale of the training program but also to recognize the needs and problems of the target groups who will directly benefit from the program. However to some extent there is still a need to conduct a thorough assessing of the learners' characteristics which include their motivation for learning.

7.4 Challenges and Lessons from Localized ICT Training Experiences

Like any endeavor, the training experiences were lessons in themselves. The experiences were rich sources of information and insights to search and improve better ways of building the foundations of knowledge creation and management. From these experiences, some of the lessons arising from the country experiences include the following categories:

7.4.1 Training Design

The experiences in each country case study support the need to establish competency standards for specific users/groups are identified and established, which will serve as basis for the monitoring and evaluation of the training design, materials, and actual conduct of training. The Bangladesh case study articulated the need for competency standards to be established as part of the needs assessment study and to incorporate the findings in the curriculum design. One of the insights of the Cambodia case study is that learning objectives and instruction design must match the curriculum and level of trainee and trainer. The levels of trainees are varied and must be considered in the design and delivery. It was also learned that identifying and establishing indicators at the onset to facilitate design of monitoring and evaluation tools.

7.4.2 Thorough Assessment and Analysis of Learners and End-Users Characteristics vis a vis the Learning Needs

The target participants as end-users for each country are varied in terms of age, sex, educational attainment, occupation, and caste. The heterogeneous background of the participants proved to be challenging. One of the lessons learned in the process is the selection of a strategic group which will bring about sustainability and continuity of the program. In the case of Pakistan lesson in the field, it was realized after the fact that "the teachers who were supposed to take a supportive role were actually found to be the more significant user group who needs to go through a more rigorous training session". In the case of Nepal, the lesson acknowledged the need to know and understand the motivation of the community members to learn the localized ICT. While in the lesson of Bangladesh is understanding of participants who resist changing the adoption of new tools. They also realized that people who want to learn new tools can be the change makers.

7.4.3 Content Development for Localized ICT Training

The training approach is still quite conventional, and technology-driven. Although there were efforts to contextualize and seize all the available information required at the local level, the bottom line is there is a dearth of content in the local language. The inadequacy of local content is a great challenge to future ICT training initiatives. The training design will be enriched by the local examples as exercises that could be utilized in the experiential training methodology. The Bangladesh and Pakistan shared lessons indicated the importance of focusing not on particular software applications but on the relevant content that serves the learners' purpose eventually leading the learner to use or access an application. All cases also recommend the use of practical examples in the hands on exercises. In Cambodia, it was learned that the use of "old wisdom" can be integrated in the delivery of instructional materials most appreciated by young and adults alike.

7.4.4 In-Depth Understanding of the Cultural and Social Environment

Most of the training experiences presented saw the importance of matching training implementation strategies corresponding with the cultural demand and situation of the country setting. For countries where traditional values and belief systems affect gender roles and social status as in the caste system,

training strategies and methodologies must be able to capture these needs to ensure the delivery of the training outcomes. The experience in Bangladesh, Nepal and Pakistan showed the cultural barriers that prevent women from participating in the program. In Pakistan such reality was emphasized in the case of the "nominated teacher issues" when female teachers were prevented from attending the training because it was culturally unacceptable for women to be traveling without a guardian" or for girls or female teachers to interact with male technicians in the computer lab" to learn computer and software installations. Likewise for married women in Nepal who were prevented to participate in training programs because their primary responsibility is in the household. Being sensitive and aware and knowledgeable of the socio-cultural environment enables the training implementer to create alternative plans of action or identify risks that could be mitigated at the onset of the event or the issues at hand.

7.4.5 Technology

Learning is much appreciated when the language used is in one's mother tongue. This is validated in the training experiences presented in each country. Whilst the software and learning program devices are at its pilot stage, it could already demonstrate its usefulness and plan for some sustainability and improvement measures where government can participate and support the gains derived from using the local language computing technology. A lesson in Cambodia that the use and focus on more than one application is encouraged. In their experience they found that Open Source is 100% localized but users cannot use this application because it is too technical. That is why they also recommend aside from the FOSS, to learn applications working in other operating systems such as Microsoft commands.

7.5 Localized ICT Training for Teachers in the Formal Education System

In the formal education system, there is a need for trained personnel who will implement technology integration in the schools. The role of the teachers in ICT education is strategic, and thus capacity building for teachers is critical. There is a need to ensure from the start that teachers are competent and committed to carry on the task before embarking on massive ICT infrastructure development.

The above discussion brings to mind the diagram below, which looks into the integration of ICT in the educational system and the vision of learning. Adapted from the "Academy of Academy of Finland and TEKES 2006," the framework can also be used to harness innovation for content development in training. The diagram shows the linkage of technology, living learning environment, organizational learning (e.g. schools), the IT tools and the multidisciplinary learning researches which support learning and knowledge creation. While technology is the cornerstone in the diagram, the policy environment is the platform of the learning environment and the latter as well as the multidisciplinary learning research give the flesh and spirit to the actualization of the individual's and organizational learning processes.

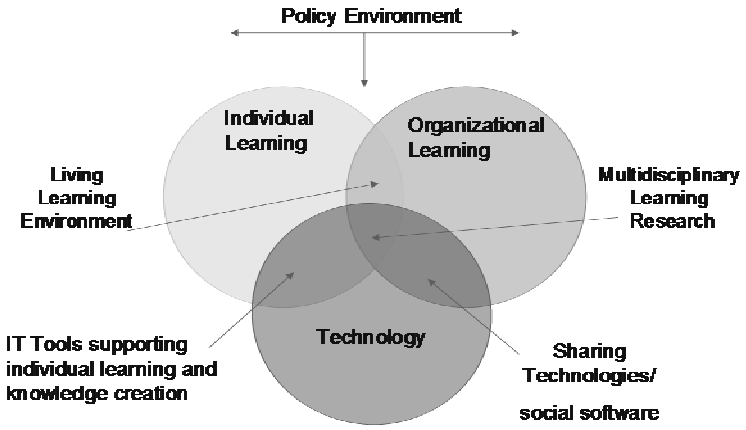

Figure 7.1: Diagram showing the Integration of ICT in the Educational System and the Vision of Learning (Academy of Academy of Finland and TEKES, 2006) [58]

The Pakistan case study suggest new directions for localized ICT training focused on teachers as significant users of the initiative. After a careful study of the teachers these requirements in the specific setting, two types of programs were proposed: one focusing on training school staff to use ICTs to make their administrative work process more efficient and one focusing on training school staff, teachers specifically, to enhance and improve their pedagogical activities. The program would be based on their Urdu local language ICTs, which to their experience has shown to yield positive results as well following the same strategy to ensure equal participation and benefits for both genders.

As a final thought: the localized ICT training for end users is relatively new trail blazing what could be the ideal in the future. Thus, these endeavors open new perspectives that could make the ICT tools more useful to end users not only in the educational institutions but also in government, in health, business industry, and the community.

References

[1] Bridges.org, *Real Access/Real Impact Criteria* , Retrieved from 1http://www.bridges.org/Real_Access

[2] Internet world Stats (2010). *Top 10 languages in the internet*, Retrieved from http://www.internetworldstats.com/stats7.htm

[3] Internet world Stats (2010). *Internet usage in Asia*, Retrieved from http://www.internetworldstats.com/stats3.htm

[4] Hussain, S. (2004). PAN Localisation Regional Initiative: Developing Local Language Computing. *i4d Online*, retrieved from http:// www.i4donline.net/june04/panlocal.pdf

[5] International Develop and Research Center Canada, Retrieved from http://www.idrc.ca/en/ev-87747-201-1-DO_topic.html

[6] Anderson, J. (2010). *ICT Transforming Education, A Regional Guide*. Bangkok: UNESCO

[7] UNESCO. (2009). *UNESCO ICT Competency Framework for Teachers*. Paris: UNESCO.

[8] Hanna, N. H. (2003), "Why National Strategies are needed for ICT Enabled Development" ISG Working Papers.

[9] Sreenivasan, R., & Singh, A, (2009). An overview of regulatory approaches to ICTs in Asia and thoughts on best practices for the future, In Akhtar, S & Arinto, P (Eds.). *Digital Review of Asia Pacific 2009-2010*.India: Sage Publications.

[10] Raina. R. (2007). *ICT Human Resource Development – Status, Emerging Trends, Policies and Strategies*. APCICT: United Nations.

[11] Akhtar, S & Arinto, P (Eds.). 2009. *Digital Review of Asia Pacific 2009-2010*. India: Sage Publications.

[12] Day, B., & Grewan, R. (2006). Lessons and Uses of ICT for Out of School Youths and Adults in Developing Countries, *In ICT and Learning: Supporting Out-Of-School Youth And Adults*. Organization for Economic Co-operation and Development (OECD).

[13] Dighe, A., Reddi, U. V. (2006). *Women's literacy and Information and communication Technologies: Lessons that experience has taught us*. New Delhi: Commonwealth Educational Media Centre for Asia (CEMCA).

[14] Agarwal, S. K., Kumar, A., Anil, A., & Rajput, N.N. (2009). Content Creation and Dissemination by-and-for Users in Rural Areas, In *Proceedings of the 3rd international conference on Information and communication technologies and development*. USA: IEEE.

[15] Ozioko, R. E, Igwesi, U., & Eke, H. N. (2011). Generation and Dissemination of Local Content Using Information and Communication Technology (ICT) for Sustainable Development" *PNLA Quarterly: The official publication of the Pacific Northwest Library Association,* Vol. 75, no. 4, pp. 58-65.

[16] Khan, A.W. (2010). Promoting local content. Web World- UNESCO and World Summit on the Information Society. Retrieved from http://www.itu.int/wiss/docs/pc2/roundtables/rt2/khan.pdf

[17] Ballantyne, P. (2002). Collecting and propagating local content development: Synthesis and conclusions. Retrieved from http://portalnesco.org/ci/en/files/5578/10342670280.)

[18] Rogers, E.M. (1995). *Diffusion of Innovations. New York*: The Free Press.

[19] Rosen, L. D., & Weil, M. M. (1999). *Computer availability, computer experience and technophobia among public school teachers. Computers in Human Behavior,* 11(1), pp 9–3 1.

[20] Hechanova, M., Regina, M. & Franco, E. P. (2008*). Leading Philippine Organizations in a Changing World: Research and Best Practices*. Ateneo de Manila University Press.

[21] Brodahl, C., Fagernes, M., & Hadjerrouit, S. (2007). Applying and Evaluating Understanding-Oriented ICT User Training in Upper Secondary Education, *Issues in Informing Science and Information Technology*, Volume 4, Retrieved from http://proceedings.informingscience.org/InSITE2007/IISITv4p473-490Brod287.pdf.

[22] Techatassanasoontorn, A. A., & Tanvisuth, A. (2008). The Integrated Self-Determination and Self-Efficacy Theories of ICT Training and Use: The Case of the Socio-Economically Disadvantaged. *GlobDev 2008.* Paper 19. Retrieved from http://aisel.aisnet.org/globdev2008/19.

[23] Sullivan, J., Garrido, M., Dridi, K., Coward, C., & Gordon, A. (2007). ICT training and employability: Integrated service delivery in United States workforce development networks, *Center for Internet Studies Working Paper Series*, USA: University of Washington.

[24] Jain, S.P., & Polman, W. (2003). *A handbook for trainers on participatory local development*: *The Panchayati Raj model in India*. Bangkok: Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific. Retrieved from ftp://ftp.fao.org/docrep/fao/007/AE536e/AE536E00.pdf.

[25] Denny, T. J., & Okuda, A. (2009), Competency-based Training Guidelines for ICT Initiatives at the Community Level, *ESCAP Technical Paper*, Retrieved from http://www.unescap.org/idd/working%20papers/IDD_TP_09_04_of_WP_7_2_914.pdf.

[26] Rothwell, W. J., Kazanas, H. C. (2004). *Mastering the Instructional Design Process: A Systematic Approach*. San Francisco: John Wiley & Sons.

[27] Ministry of Information Technology (2009). National ICT Policy of Bangladesh, Retrieved from http://www.mosict.gov.bd/dmdocuments/National%20ICT-Policy2009-Bangla%20%28Approved%29.pdf.

[28] Pallitathya (2008). *Training workshop on Accessing and Intermediation of Local Language Content*, Retrieved from http://www.pallitathya.org.bd/NewsDetails.php?NewsId=21.

[29] www.jeeon.com

[30] CIA World Factbook (2012), *Cambodia,* Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/cb.html

[31] http://www.nida.gov.kh/beta/index.php?Page=03000000

[32] Government of Cambodia Retrieved from www.cambodia.gov.kh

[33] Sinawong, S. (2011). *ICT Policy in Cambodia*. Retrieved from http://www.itu.int/ITU-D/asp/CMS/Events/2011/ITU-ADB/Cambodia/ICT_Policy_Cambodia_NiDA.pdf.

[34] https://translations.edge.launchpad.net/ubuntu/hardy/+lang/km

[35] http://groups.google.com/group/jugcam/web/khmer-localization-of-joomla

[36] Shams, S., Hussain, S., & Mirza, A. (2010). Gender and Outcome Mapping. In T. Belawati & J. Baggaley (Eds*.), Policy and Practice in Asian Distance Education*. India: Sage Publication.

[37] CIA World Factbook (2012), *Nepal* , Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/np.html

[38] ENRD (2007). *Baseline survey report on computer literacy and awareness on ICTS in the Selected Sites For Nepalinux Deployment, Pan L10n Phase II*. Retrieved from http://www.panl10n.net/english/Outputs%20Phase%202/CCs/Nepal/ENRD/Papers/2007/0701/baseline_survey_report_enrd_nepal.pdf

[39] Ministry of Science & Technology (2000) *IT Policy and Action Plan,* Government of Pakistan, Islamabad. Retrieved from: www.pseb.org.pk/UserFiles/documents/National_IT_Policy.pdf

[40] Ministry of Information Technology, Retrieved from http://www.moit.gov.pk/

[41] Electronic Government Directorate, Ministry of IT, Government of Pakistan. 2005, *E-Government Strategy and 5-Year Plan for the Federal Government*, May 2005. Retrieved from:http://www.pakistan.gov.pk/e-government-directorate/standards/EGD.Assets/e-gov_strategy%20-%20version%206%20_16.05.2005_.pdf

[42] Ministry of Education (2009) *National Information and Communications Technology Strategy for Education in Pakistan*. Retrieved from http://www.educationdev.net/educationdev/docs/p5.PDF

[43] http://www.pakistanconstitution-law.com/theconst_1973.asp

[44] National Language Authority, Retrieved from www.nla.gov.pk

[45] http://www.nlauit.gov.pk/

[46] www.nadra.gov.pk/site/351/default.aspx

[47] CRULP (2008) *Urdu Localisation Project*, Retrieved from www.crulp.org/research/ulp/UrduLocalizationProject.htm

[48] Project Management Unit, Board of Revenue Government of Punjab, Retrieved from http://www.punjab-zameen.gov.pk/

[49] National ICT R&D Fund, Ministry of Information Technology, Retrieved from http://www.ictrdf.org.pk/

[50] http://www.nidu.gov.pk/

[51] The SeaMonkey® Project Retrieved from http://www.seamonkey-project.org/

[52] SeaMonkey Download & Releases, Retrieved from http://www.seamonkey-project.org/releases/

[53] Psi, Retrieved from http://psi-im.org/

[54] Official Psi 0.14 Downloads, Retrieved from http://psi-im.org/download/

[55] Apache Open Office, Retrieved from http://www.openoffice.org/

[56] Earl,S., Carden, F., & Smutyl, T. 2001. *Outcome Mapping: Building Learning and Reflection into Development Programs*, Retrieved from: http://www.idrc.ca/en/ev-9330-201-1-DO_TOPIC.html

[57] Association for Progressive Communication(APC), Women's Networking Support Programme Retrieved from http://www.apcwomen.org/projects/evaluation

[58] Academy of Finland & Tekes (2006). *The Outlook for Science, Technology and Society.* Retrieved from *http://www.aka.fi/Tiedostot/Tiedostot/Julkaisut/Finnsight_2015_EN.pdf*

Appendix A: NiDA Standard Curriculum for Students

<table>
<tr><th colspan="3">Ubuntu/SUSE Linux Beginner Curriculum</th></tr>
<tr><td>Requirement:</td><td colspan="2">No requirement. Those who are interested starts from computer basics.</td></tr>
<tr><td>Objective:</td><td colspan="2">Understanding what is computer and computer components
Be able to use computer hardware
Be able to manipulate Windows applications
How to type Khmer Unicode
Understanding Linux file and folder structure
Be able to manage file
Be able to use OpenOffice.org Writer, Calc
Be able to use Browser (Firefox)</td></tr>
<tr><td>Time:</td><td colspan="2">45 h (both theory and practice)</td></tr>
<tr><td colspan="3">Lesson Summary and Objectives:</td></tr>
<tr><td>Chapter 1: Beginner to Computers</td><td><u>Section 1: Understanding Computer</u>
▪ What is computer?
▪ Computer hardware
▪ Desktop screen
▪ How to turn computer on and off

<u>Section 2: Getting Start</u>
▪ Logging in
▪ Starting graphical desktop
▪ Using the mouse
▪ Main components of the desktop
▪ Menu system
▪ The panel
▪ Desktop space
▪ Using the Windows manager
▪ Title bar
▪ Manipulating the Windows
▪ Focus
▪ Maximize and minimize
▪ Resize
▪ Move
▪ Roll up and Unroll
▪ Close
▪ Move to workspace
▪ Ending the session
▪ Log out
▪ Shutting down the system</td><td><u>Section 3: Basic Desktop Customization</u>
▪ Desktop background
▪ Desktop theme
▪ Default fonts
▪ Menu and the toolbars
▪ Using the desktop
▪ Running application
▪ The Panel
▪ Placing an applet on the panel
▪ Remove an applet from the panel

<u>Section 4: File and Folder</u>
▪ The file system
▪ Files
▪ Folders
▪ Accessing files and programs
▪ Copy, cut and Paste, file and folder
▪ Creating new folders
▪ Moving files and folders
▪ Deleting new folder
▪ The trash can
▪ Restoration</td></tr>
<tr><td>Chapter 2: Using Application</td><td><u>Section 5: OpenOffice.org</u>
▪ OpenOffice.org Writer (word processor)
▪ Input text
▪ Text Formating
▪ Cut, copy, paste, undo and redo
▪ Formatting paragraph
▪ Page setup
▪ Using table

▪ OpenOffice.org Calc
▪ Input text and edit</td><td><u>Section 6: Introduction to Internet and E-mail</u>
▪ Internet and Mekhala (Firefox)
▪ Introduction to Internet and Mekhala browser
▪ Using Mekhala Web browser
▪ Using Webmail
▪ How to add/remove item using toolbar

▪ E-mail and Moyura (Thunderbird)
▪ Introduction to e-mail and Moyura
▪ Send and Receive e-mail</td></tr>
</table>

<table>
<tr><td></td><td>

- How to insert, edit and delete data
- Formatting cell
- Basic calculation
- Formula (SUM, AVERAGE, MIN, MAX, COUNT, COUNT IF, SUMIF, RANK)

</td><td>

- Reply and Forward
- Send and Reply to many people

Section 7: Advanced Lessons on File, Folder and Using Mass Storage Device

- Find File and Folder
- File size
- Share File using SAMBA
- The Floppy Disk Drive
- The CD-ROM Drive
- The USB Mass Storage Device

</td></tr>
<tr><td colspan="3">Open Office Curriculum</td></tr>
<tr><td>

OpenOffice.org Writer 2.0-3.0

Lesson 1: Introduction to OpenOffice.org and Khmer Unicode

What's OpenOffice.org Writer 2.0-3.0?
Change Keyboard to Khmer
Learn how to type Khmer with Khmer Unicode keyboard
How to save a document
How to print a document

Lesson 2: How to type Khmer Unicode

How to open a document
How to type Khmer Unicode coeng, above signs, zero width space and non-breakable space
How to close the program

Lesson 3 Working with Text and Select Text

Formatting text (bold, italic, Underline, font name, font size)
Paragraph Alignment (Left, centered, right, justified)
Select Text by mouse
Change text format
How to use icons, undo and redo

Lesson 4: Cut Copy Past, Find Text

How to select text by keyboard
How to copy, cut and paste
How to search and replace text
How to save a document and print specific page

Lesson 5: More formatting text and Clip Art

How to change the font color
Insert image from Gallery
Move, resize and border an image
Default formatting
How to use Format Paintbrush
Insert special character

</td><td>

OpenOffice.org Calc 2.0-3.0

Lesson1: Introduction to OpenOffice.org Calc and its basic use

Definition
Cell address
How to insert, edit and delete data
Operator in cell: summarization, subtract, multiplication, division
Data type (Alignment: text: align right, number align left by default)
How to print
Exit from OpenOffice.org Calc

Lesson2: How to select using mouse: contiguous cell, noncontiguous cell, row, column, all cells in a sheet

How to resize: row(s), column(s),
Text formating: color, font, font size, alignment, italic, bold, background
How to insert data series (Cardinal number)
How to copy data, move data, delete data from multiple cells
Cell range address
Formula: SUM() AVERAGE()

Lesson3: Cell, Data and Formatting Data

Data type (text, number, formula)
Cell formatting(border, background, font color)
Text alignment and Orientation in a cell
Number format: Khmer number, decimal, preceded by zero, percentage, currency

Lesson 4: Using Date Formula and Date Formatting

How to enter date: dd/mm/yyyy
Date formatting
Formula: TODAY, NOW, YEARS, MONTHS, DAYS
Cell address: Relative and Absolute address

Lesson 5: Working with Sheet and

</td><td>

OpenOffice.org Impress 2.0-3.0

Lesson 1: Introduction to Impress

Create a presentation (from empty presentation)
Choose slide layout
Insert text in slide
Save and Close presentation
Exit impress

Lesson 2: Formating Slide and Text

Open existing presentation

Format page.
Use undo and redo.
Format text.
Format paragraph.
Copy/Paste/Delete slide.
Navigating during Slide show.

Lesson 3: Working with Slide

Insert slide.
Rename slide.
Insert and Format image.
Insert and Format text box.

Lesson 4: Using Different Object in Slide

Insert and Format table.
Insert and Format auto shapes.
Text/Object Animation.
Print Slide.

Lesson 5: Hide and Show panel and slide

Show/Hide slide pane/task pane.
Slide show view.
Hide/Show slide.
Slide transition.

Lesson 6: Font Work and Gallery

Insert and Format font work.
Import and Format graphic.
Add/Delete graphic to/from gallery theme.
Add/Delete new theme to/from gallery.

Lesson 7: Chart and Chart Menu

Insert and Format chart.

</td></tr>
</table>

<table>
<tr>
<td><u>Lesson 6: Working with Page and Image</u>
Page margin setting and adjustment
Set, insert and delete tab stop
Insert image from file and image caption
Align and wrap text around image

<u>Lesson 7: Working with Paragraph and Fontwork</u>
Formatting the paragraph(border, background...)
How to use and edit fontwork
How to insert header and footer

<u>Lesson 8: Working with Paragraph</u>
Superscript and Subscript
Bullet and Numbering
Paragraph spacing and line spacing
Automatically insert reference number and change its format into Khmer
Page preview

<u>Lesson 9: Using Table</u>
Insert table
How to add, select and delete cell, row, and column
Split, insert and format cell</td>
<td><u>Formula</u>
How to create New document
How to rename sheet name
How to insert sheet
How to delete sheet
Formula: COUNT, COUNTA, COUNTBLANK, COUNTIF, CONCATENATE, MIN, MAX, INT, MOD

<u>Lesson 6 : Logic and Statistic Formula</u>
Formula: IF, RANK, SUMIF
Percentage
Print Preview
Print with Row/Column Header

<u>Lesson 7: Date Formula</u>
Formula: NETWORKDAYS, HOUR(); MINUTE(); SECOND(),DAYS360()

<u>Lesson 8: Working with Data Operation</u>
How to sort data
How to filter data
How to take out standard filter
Advanced filter

<u>Lesson 9: More Detail on Absolute Cell</u>
Using Absolute row, Absolute column
Geometry Formula

<u>Lesson 10: Working with Chart</u>
How to create and edit chart
How to insert note
Track change
How to protect record</td>
<td>Format menu.
Insert menu.

<u>Lesson 8: Master Slide and Print</u>
Use master slide.
Insert header and footer.
Print slide (many slides in a page).</td>
</tr>
<tr>
<td colspan="3">Ubuntu/SuSE Linux Curriculum</td>
</tr>
<tr>
<td>Objective:</td>
<td colspan="2">This material is tending for end user to get to know about:
Linux Installation
Using and Managing Linux Desktop
Using KDE application
Manipulate and manage file and folder
Access the Internet and use the WWW and Internet email
Using computer device (printer, and storage device)
Some introduction of application in Linux
Linux administration</td>
</tr>
<tr>
<td>Time:</td>
<td colspan="2">Theory 40 hours
Exercise 50 hours</td>
</tr>
<tr>
<td>Topics</td>
<td><u>Day 1</u>
Fundamentals of Linux
How to Install SuSE Linux 10.1</td>
<td><u>Day 2</u>
Introduction to KDE
History of KDE
Feature of KDE
Starting KDE Desktop
Menu
Menu Editor</td>
</tr>
</table>

		Find Files/Folder Windows Management Help Center Exercise
	Day 3 Panel Add/Remove item on Panel Utility	**Day 4** Kcontrol Exercise
	Day 5 Konqueror as File Manager Konqueror Exercise	**Day 6** Kinfocenter KDE Print Kwallet
	Day 7 Arc IO Slave Public File Server File Sharing Remote Access Samba Configuration Exercise	**Day 8** YaST Exercise
Moyura (Email) Curiculum and Objectives		
Lesson	**Topic/Objectives**	**Notes**
1	Concept of e-mail How to send e-mail How to set e-mail	This lesson requires two learners to send email to each other and then read partner's email. Therefore, please make a group of 2 learners before starting this lesson
2	How to reply e-mail How to forward e-mail How to delete e-mail How to restore e-mail	The two learners who were the partners in the last session are the partners again. Tell everyone to forward the received message from his/her partner to teacher and then from the teacher's email check whether he/she gets the messages from all learners
3	How to send message to many people. How to reply to many people Save as draft	The teacher has to make groups of students. A group has to have 3 students. A student should send mail to his/her group and the teacher (hidden). After that another student will reply to many.
4	How to send mail with attachment How to open attachment How to save attachment	This lesson requires two learners to send email to each other and then get partner's email with one file attached to read. Therefore, please make a group of 2 learners before starting lesson.
5	How to print message Show only unread message Search message Is e-mail secure?	This lesson requires printer.
Mekhala (Internet) Curriculum and Objective		
LESSONS	**TOPICS/OBJECTIVES**	

1	Introduction to Internet / ISP / technical words used on the Internet / Internet Browser Load web page or Open website using Mekhala (Internet Browser in Khmer) Web page navigation / Run on web page Open new tab for running other website Search engine
2	Open New Windows Save web page in the computer Find on web page and Find again Add Bookmark to this web page in Mekhala (Mozilla Firefox) How to print web page
3	Open a web mail page (e.g. Yahoo mail) Register a new username Login to Yahoo mail Write or compose mail to send to your friends or classmate How to read e-mail How to reply e-mail Logout from mail account
4	How to add remove items by dragging to or from the toolbars How to remove items by dragging to or from the toolbars
5	How to install new extensions How to delete extensions Download and install themes Delete themes Study Options such as General, Privacy, Contents, Tab, Download, and Advance
Linux Administration Curriculum	
Requirement:	Must be knowledgeable about computer hardware Experienced in software installation on Windows
Time:	75 hours (both theory and practice)
Objective:	Be able to understand computer work Be able to understand operating system Be able to install Linux SuSE Be able to use Linux desktop Be able to configure Linux desktop Be able to backup and restore file Be able to maintain Linux system Be able to use network file sharing Be able to configure network
Lesson Summary:	**<u>Section 1: Linux Operating System and Open Source Concept</u>** Introduction to computer and its components Introduction to operating system Introduction to linux system Open source vs proprietary software Reasons for choosing Linux **<u>Section 2: Installation</u>** Pre-installation Requirement Boot loader Run Level Installation with YaST

	System Repair Automatic Repair User define repair Expert Tool **Section 3: Using Desktop** User Accounts (Power user and Normal user) Logging in and selecting desktop Controlling Session Switching Desktop Locking Your screen Panel Kcontrol Konqueror KDE utitlity Klipper KwikDisk Krantray Kdar **Section 4: Yast2-Configuration** Hardware User and Group Administration System Security Install and Remove Software

Appendix B: Selected Schools in Pakistan

District	Tehsil	School
Sargodha	Sargodha	Govt. Girls Higher Secondary School Chak No. 88/SB
		Govt. Boys Higher Secondary School Chak No. 88/SB
	Bhalwal	Govt. Girls High School Chak No. 10/ML
		Govt. Boys High School Chak No. 10/ML
	Sahiwal	Govt. Girls High School, Kud Lathi
		Govt. Boys High School, Kud Lathi
	Sillanwali	Govt. Girls School Chak No. 152 North
		Govt. Boys School Chak No. 152 North
Attock	Pindi Gheb	Govt. Girls High School Maluwala
Chakwal	Chakwal	Govt. Boys High School Hasil

Appendix C: Student Enrollment in Pakistan

School	Students enrolled from grade	No. of enrolled students
Govt. Girls Higher Secondary School Chak No. 88/SB	8th	29
Govt. Boys Higher Secondary School Chak No. 88/SB	9th	14
Govt. Girls High School Chak No. 10/ML	8th	32
Govt. Boys High School Chak No. 10/ML	8th	14
Govt. Girls High School, Kud Lathi	8th	30
Govt. Boys High School, Kud Lathi	8th	14
Govt. Girls School Chak No. 152 North	9th	13
Govt. Boys School Chak No. 152 North	8th	14
Govt. Girls High School Maluwala	8th	24
Govt. Boys High School Hasil	8th & 9th	13

Appendix D: Sample Evaluation Form

Daily Observation Form for Student and Teacher Training Sessions

Name of Project Trainers 1: ---------- 2: ----------

Training Phase: ---------- Day of training: ---------- Date: ----------

School name: ----------

Start time of Training: ---------- End time of training: ----------

……

The following two questions are applicable if project trainers ask questions from at least half of the class. (excluding activities or exercise)

Questions:

1: L M H

2: L M H

3: L M H

Ratio of students who contribute when asked:

Low Medium High

Ratio of students who do not contribute when asked:

Low Medium High

Is whole class frequently asking questions?

Low Medium High

Number of students who frequently ask question:----------

Request for more explanation about current application	Related to new things / concepts	Related to old things which were taught	Any other question\observation
Fill in Ratio in column : L for low	M for medium		H for high

Concepts	ratio

Concepts	ratio

Concepts	ratio

Concepts	ratio

Any other observation / experience ----------
