



Exploring New Modalities

Experiences with Information and Communications
Technology Interventions in the Asia-Pacific Region

A Review and Analysis of the Pan-Asia ICT R&D Grants Programme

Michael Dougherty

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The Asia-Pacific Development Information Programme (APDIP) is an initiative of the United Nations Development Programme (UNDP) that aims to promote the development and application of information and communications technology for sustainable human development in the Asia-Pacific region.

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List of Abbreviations

A&RD	Agriculture and Rural Development
aAQUA	Almost All Questions Answered
AI	Artificial Intelligence
AI3	Asian Internet Interconnection Initiatives Project
AMIC	Asian Media Information and Communication Centre
APBioNET	Asia-Pacific BioInformatics Network
APDIP	Asia-Pacific Development Information Programme
APNIC	Asia Pacific Network Information Centre
ASP	Active Server Page
ASTI	Advanced Science and Technology Institute, Philippines
BGP	Border Gateway Protocol
CAM	Customer Account Manager
CCLF	Centre for Conscious Living Foundation, Philippines
ccTLD	Country Code Top-Level Domain
CD	Compact Disk
CDMA	Code Division Multiple Access
CeC	Community e-Centre
CED	Centre for Environment and Development, India
CEO	Chief Executive Officer
CHC	Community Health Centre
CHITS	Community Health Information Tracking System
CICT	Commission on Information and Communications Technology, Philippines
CRULP	Centre for Research in Urdu Language Processing, Pakistan
CVISNET	Central Visayas Information Sharing Network
DHF	Dengue Haemorrhagic Fever
DNS	Domain Name System
DOST	Department of Science and Technology, Philippines
DOTC	Department of Transportation and Communication, Philippines
DSS	Decision Support System
DWMA	Distributed Work Management Application
ECG	Electrocardiogram
EWB	Engineers Without Borders
FOSS	Free and Open Source Software
GEM	Generic Engine for Modules
GIS	Geographic Information System
GPK	Grameena Patana Kendram
GPRS	General Packet Radio Service

GPS	Global Positioning System
GSM	Global System for Mobile Communications
GSML	Grid Service Mark-Up Language
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
HKH	Hindu Kush-Himalayan Region
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communications Technology
ICT4D	Information and Communications Technology for Development
IDRC	International Development Research Centre, Canada
IIT	Indian Institute of Technology
IITC	Information Technology Centre, India
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISP	Internet Service Provider
IT	Information Technology
ITB	Institut Teknologi Bandung, Indonesia
ITES	Information Technology Enabled Services
IX	Internet Exchange
IXP	Internet Exchange Point
KVK	Krishi Vigyan Kendra, India
LGU	Local Government Unit
LOGOSHARE	Local Government Knowledge Sharing Network, Philippines
LPDO	Local Planning and Development Officer
MIR	Medical Information Repository
MIS	Management Information System
MoU	Memorandum of Understanding
MSU-IIT	Mindanao State University – Iligan Institute of Technology, Philippines
MT	Machine Translation
NCC	National Computer Centre, Philippines
NECTEC	National Electronics and Computer Technology Center, Thailand
NGO	Non-Governmental Organization
NpIX	Nepal Internet Exchange
OJS	Open Journal System
ORC	Online Resource Centre
OSPF	Open Shortest Path First
OTF	Open Type Font
P2P	Peer-to-Peer

PA	Protected Area
PC	Personal Computer
PCHRD	Philippine Council for Health Research and Development
PDA	Personal Digital Assistant
PDF	Portable Document Format
PFnet	People First Network
PhD	Doctor of Philosophy
PhilRice	Philippine Rice Research Institute
PKP	Public Knowledge Project
PREGINET	Philippine Research Education and Government Information Network
PSDN	Philippine Sustainable Development Network
PSL	Pakistani Sign Language
R&D	Research and Development
RDF	Resource Description Framework
SAATHII	Solidarity and Action Against the HIV Infection in India
SARS	Severe Acute Respiratory Syndrome
SHG	Self-Help Group
SIP	Session Initiation Protocol
SIRDI	Satpura Integrated Rural Development Institution, India
SME	Small- and Medium-Sized Enterprise
SMITES	Small- and Medium-Sized Information Technology Enterprises
SMS	Short Message Service
SOA	Service Oriented Architecture
SQL	Structured Query Language
SRCW	Seethalakshmi Ramaswamy College for Women, India
TESDA	Technical Education and Skills Development Authority, Philippines
TTS	Text-to-Speech
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UP-EEE	Electrical and Electronics Engineering Department of the University of the Philippines
UPS	Uninterrupted Power Supply
USP	University of the South Pacific
VAST	Vietnamese Academy of Science and Technology
VSAT	Very Small Aperture Terminal
WiFi	Wireless Fidelity (IEEE 802.11b wireless networking)
WIPO	World Intellectual Property Organization
WSIS	World Summit on the Information Society
XML	eXtensible Markup Language
XSL	eXtensible Stylesheet Language

Foreword

This book is a review of 56 projects funded by the Pan-Asia ICT R&D Grants Programme for Asia-Pacific from 2002-2005. The aim of this book is to examine trends within these particular information and communications technology (ICT) projects in order to determine factors for success, and, common challenges. The underlying goal is to understand which projects have a lasting impact and can be replicated on a larger scale.

The Pan-Asia ICT R&D Grants Programme builds institutional research capacity on ICT in the developing countries of the Asia-Pacific region. It is a joint initiative of the *United Nations Development Programme's Asia-Pacific Development Information Programme* (UNDP-APDIP), the *International Development Research Centre* (IDRC), of Canada, and the *Asia Pacific Network Information Centre* (APNIC). The Programme is administered by the *Asian Media Information and Communication Centre* (AMIC) and is overseen by a Committee established by all Programme partners.

We hope this review will facilitate sharing of experiences and knowledge, and foster networking between grant recipients. The material in this book is gleaned from a comprehensive canvassing of all projects, along with an independent evaluation and site visits.

In general, the review and analysis show that projects of particular value are those that increase access to information, improve efficiency, and support participation in civil society and governance initiatives. A key factor of success is projects that embrace participation and include a consultative process in their design, planning and implementation phases. However, the research showed that building partnerships and reaching common understandings throughout the planning of these initiatives was a complex and challenging undertaking.

The importance of dissemination and marketing of project results is a common thread throughout each of the projects in this book. Some projects with successfully completed research objectives could not progress further without substantial promotional efforts. The analysis in this book also points to a range of strategies in which projects can be expanded on a larger scale. For example, project models can grow by moving to new locations thereby gaining momentum elsewhere. They can increase popularity and reach through extension of services within networks, evolution of research and establishment of new lines of inquiry. ICT growth sometimes happens through the often noted but difficult to quantify ripple effect, whereby users take ownership of the medium and adapt it for their own local use.

Networking with related research and development institutions and funding organizations is vital for the sustainability and growth of project work. The private sector also offers an important potential for support through funding, technology and sharing of research work. In turn, private businesses can benefit from the locally appropriate nature of innovations developed by grant recipients. Such partnerships seem to offer potential for the growth and expansion of projects.

This review is qualitative in nature, focused primarily on project experiences. It has been noted that as projects mature, a quantitative study on project impact may be useful. The projects

presented are in various stages of development. Some of them are completed, some are nearly finished and others have just started. This book aims to present what worked and what did not. These are pilot projects involving testing and experimentation, and it is the intention of this book to share these experiences so that we may learn from them and further our knowledge in support of ICT development projects in the Asia-Pacific region.

Hafiz Pasha

UN Assistant Secretary General
UNDP Assistant Administrator and
Regional Director - Regional Bureau for Asia and the Pacific



Photos: Kastam Astami, Richard Labelle, Alvin B. Marcelo, and Joel Umali.

INNOVATION FOR CHANGE: PROGRAMME REVIEW

Innovation for Change: Programme Review

About this Review

This review provides an overview of the 56 projects funded by the Pan-Asia ICT R&D Grants Programme for Asia-Pacific from 2002-2005. The review is divided into two sections. This first section seeks to tease out the general trends within the array of projects and draw conclusions on some of the common factors affecting project success, common challenges that projects faced, and the scope for lasting impact, replication and scaling up. The second section gives a profile of each project, with information on the objectives, research context, target beneficiaries, outputs, research results and outcomes, grant amount awarded, project duration, and contact information. To provide easy access to the projects in this review, the projects are presented in categories by type. Within each category, the projects are ordered by their start date, and numbered sequentially.

In preparing this review, a range of research methodologies were used to provide a comprehensive and balanced presentation of the Programme and the projects funded. This review draws on the work of an outside consultant who performed an internal review of the Programme. The consultant interviewed each of the Programme partner organizations independently and reviewed conclusions and recommendations of all Pan-Asia ICT R&D committee meetings, in effect documenting the progress of the Programme from 2002-2005. In addition, the consultant performed field visits to 13 projects as part of the internal review. Drawing on the internal report has been very beneficial in balancing the other research performed to develop this review.

A wide range of source materials were consulted, including internal reports and external publications produced by the Programme partners – the *United Nations Development Programme's Asia-Pacific Development Information Programme* (UNDP-APDIP), the *International Development Research Centre* (IDRC) of Canada, the *Asia Pacific Network Information Centre* (APNIC) and the *Asian Media Information and Communication Centre* (AMIC). The project profiles themselves drew on the grant recipients' original project proposals, interim and final technical reports, and on a number of research papers grant recipients have produced. In addition, to solicit current insights into the projects, an e-mail questionnaire was sent out to all grant recipients. The responses from recipients were followed up with additional queries; either to clarify information or further explore aspects of the project as was considered useful. Through a number of meetings and dialogue via e-mail, the review also draws upon UNDP-APDIP and AMIC's direct, personal experience with projects.

There are several points regarding this review that should be noted. The projects' start and end dates are provided by the grant recipients and Programme administrators. In some cases, the actual projects started later than expected or progress was delayed for one reason or another. In addition, as this review is primarily a desk study it relies largely on project reports. In many cases, the project profiles directly quote or paraphrase these reports. It should be recognized that, in some cases, the information contained in the project profiles has not been corroborated by independent sources. Although every effort has been made to further our understanding through the process described above, there may be some inconsistencies or errors in reporting. In light of

the above, the project profiles cannot be said to represent the full scope of the project work. Several projects do not have statements on outcomes and impact. This is because the project had just started and did not yet have anything to report, or formal reports were not available at the time of writing. It should also be noted that the grant amount indicated in the project information is the amount disbursed by the Programme. Projects also contributed in-cash or in-kind, which is not represented here. As a number of projects have received awards, a special note of these has been made in the project profiles. Finally, at the time this review was published, all websites included in the project profiles had been confirmed.

About the Programme

The Programme is directed at encouraging original and innovative information and communications technology (ICT) solutions to development problems. Grants for suitable research and development (R&D) projects are awarded to Asia-Pacific-based organizations on a competitive basis. The ICT R&D Grants Programme Committee meets twice a year to review proposals and award grants. The Programme awards two levels of grants: grants up to US\$ 9,000 for a project period of 12 months, and grants up to US\$ 30,000 for a project period of 24 months. During project implementation, specific monitoring and evaluation processes are used. These include regular project progress reports, internal formative evaluation reports, and administrative and financial status reports. From time to time, the Programme also conducts evaluations, reviews, reports and field visits to individual projects.

The results of the awarded projects are transparent and made available publicly on the Programme and partner websites and by other means, as appropriate. In the interest of sharing research results and research experiences, project results, including papers, research data and findings, resources, techniques, and tools are openly available and distributed. Grant recipients agree to free dissemination of their project research results. Copyright for project results resides with the research team and the Programme, as well as with other funding agencies in the case of co-financed projects.

For more information about the ICT R&D Grants Programme, please visit <http://www.apdip.net/projects/ictrnd>

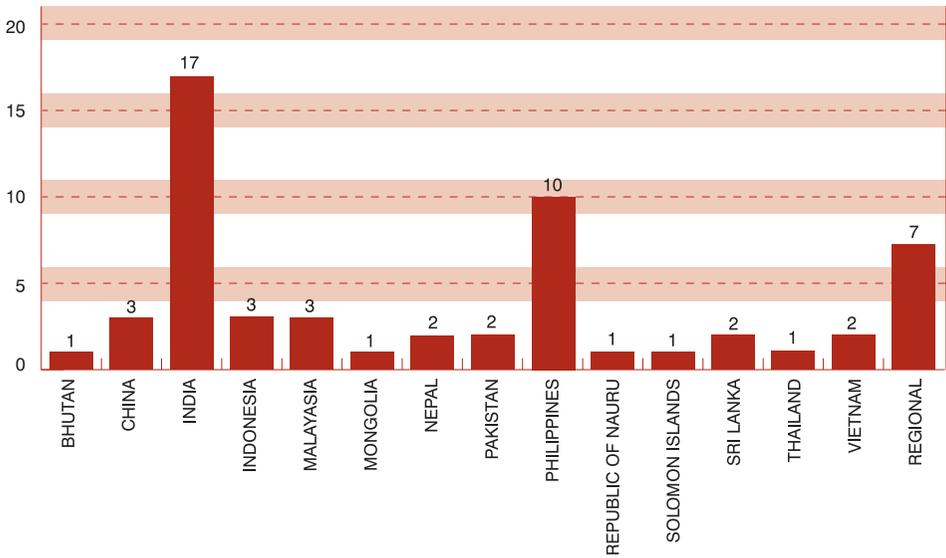
About the Projects

Geographic Scope of the Projects

Between 2002-2005, the Programme received 642 project proposals from 34 countries; 64 projects were funded. Eight were subsequently either delayed or cancelled for a variety of reasons. Of the remaining 56 projects, seven are specifically regional in nature while the others are located or managed in 14 countries in the Asia-Pacific region, namely, Bhutan, China, India, Indonesia, Malaysia, Mongolia, Nepal, Pakistan, the Philippines, Republic of Nauru, Solomon Islands, Sri Lanka, Thailand and Viet Nam. Figure 1 provides a geographic breakdown of the 56 projects included in this review.

Some projects are local-level pilots such as *M-DOK: Mobile Telehealth and Information Resource System for Community Health Workers in the Philippines* (no. 54), which is undertaking its research in a rural community in Lanao del Norte, Philippines. Others are national in scale, such as the *Nepal Internet Exchange* (no. 29), which established a consortium of national Internet Service Providers (ISPs) and created an Internet Exchange to manage local Internet traffic in the country.

FIGURE 1: NUMBER OF PROJECTS BY COUNTRY



Others, while locally-based, have a truly global potential for the application of their work. In this category, the *Nafees Nastalique: Character-Based Nastalique Font for Urdu, Pakistan* (no.26) facilitates Urdu publishing through electronic media and benefits approximately 60 million Urdu readers worldwide.

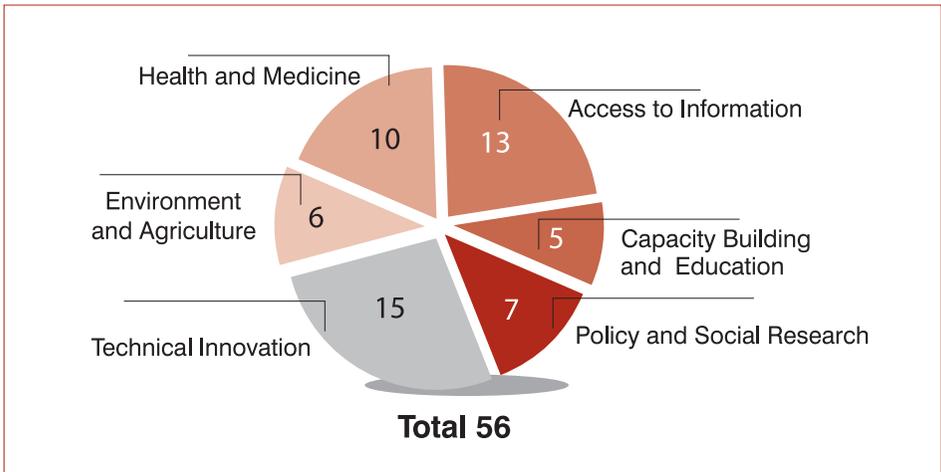
Seven projects included in this review are specifically regional or trans-boundary in scope. The *Effects of ICT on Media Transformation, Education and Training in Cambodia, Lao PDR and Viet Nam* (no. 24) researches how ICTs are currently integrated into the media industry in these three countries. The *Free and Open Source Software Localization Toolkit* (no. 30), although based in Cambodia, has seen regional and global application of its localization work. The *Open Source GIS/ Mapping Solution for the Indian Tsunami Information Resource Centre* (no. 35) serves South India as well as other Southeast Asian tsunami-affected areas. The Thailand-based *Automatic Synchronization and Distribution of Biological Databases over Low-Bandwidth Networks among Development Countries* (no. 36) is using Peer-to-Peer (P2P) technology to develop a next generation automatic biological software, courseware, database distribution and synchronization network for application throughout the Asia-Pacific region. The *Shahmukhi to Gurmukhi Transliteration Solution for Networking, India and Pakistan* (no. 39) is also trans-boundary in nature as its Punjabi Language Transliteration Tool facilitates electronic and written communication between people living in East (Indian) and West (Pakistani) Punjab, as well as Punjabi people living around the world. The *VClass SIP-Based Mobile Classroom* (no. 40) is developing a mobile classroom application for learning institutions in the Asia-Pacific region that uses the Free and Open Source Software (FOSS) VClass. Finally, *Towards a Regional Geographic Information Infrastructure in the Hindu Kush-Himalayan Region* (no.41) combines a Geographic Information System (GIS) with a web-based interface to provide an information sharing solution in the Hindu Kush-Himalayan (HKH) region, covering the countries of Bangladesh, Bhutan and Nepal.

Scope of Projects by Type

The projects are presented in categories by type. The categories are: access to information, capacity building and education, policy and social research, technical innovation, agriculture and environment, and health and medicine. There are, however, three main areas that all of the ICT R&D projects are seen to address. All projects contribute in some way to bridging of the digital divide. All projects use ICTs either as a central focus of their research work or in service of broader development goals. Finally, all projects include a component of supporting community, organizational or national development, or social change initiatives.

It is within this broader programmatic scope that further delineation of the project types is made. These are outlined in Figure 2. It should be noted that almost all of the projects cross several different categories and, in addition, each of the categories includes a diverse range of projects. To provide a deeper understanding of each category, they are treated in detail below, with several exemplary projects.

FIGURE 2: PROJECTS CATEGORIZED BY TYPES



Access to Information

Included in this category are the projects that have a primary objective of increasing access to information and ICTs. Invariably, there is a strong social dimension to these projects. They often deal with 'last mile' initiatives, increasing access and capacity building at a local level, and addressing issues such as culture, gender equity, social equity, sustainable community development and benefits to rural areas. Projects working in this area stress that ICTs are a means to an end, not an end in themselves. To ensure uptake of the solution and achieve lasting impact, it is important to involve local stakeholders throughout the design and implementation process. This was identified by the project *Low-Cost IT Centre for the Philippines* (no. 3), which studied the impact of an existing information technology (IT) centre and created a guide for setting up viable low-cost IT centres. It is also noted that a key to successful interventions is not just access but also the provision, or creation of content that is relevant and meaningful to the local beneficiaries. This was stressed in the project

Piloting Mobile ICT Access Models, Sri Lanka (no. 11) that developed a mobile access solution called an eTUKTUK to bring a range of locally relevant content directly to the village level.

Capacity Building and Education

Capacity building is a key component of all projects in the Programme; however, certain projects specifically focus on ICT capacity building for local communities or on increasing the ICT capacity of educational and learning institutions. Projects working in these areas have commented that contrary to popular belief, local communities are often very willing to experiment with new technologies as in *ICT-Enabled Life Skill and Sexuality Education for Adolescent Girls, India* (no. 17) that uses ICT tools to provide comprehensive sexuality and life skills education to empower adolescent women in Chennai, India. Interventions that will have lasting, sustained effects in these communities, however, require commitment to truly understand the communities' needs and desires and develop relevant curricula to meet them. This is seen as central in the work of *A Distance Learning Application of the Solomon Islands People First Network (PFnet)* (no.14) that pilots a distance learning facility in one of Solomon Islands' rural community high schools.

Policy and Social Research

In this category are projects with a more traditional focus on research and analysis of outcomes and social impacts from specific ICT policies, interventions and applications. In some cases, policy is seen to be lagging behind and hindering ICT development, while in others it can be seen as helping to drive change. Projects in this area have mentioned the need to carefully consider the implications of how people are managing their relationship to ICTs and the role of a wide range of social intermediaries such as work environments, schools, institutions, and informal networks such as family and friends. For example, *Diffusion of ICT in India: Labour Market Implications for Developing Countries* (no. 20) explores the trade-offs between improving productivity and generating employment when deploying ICTs in developing countries. Some challenges of working in this area relate to the research and documentation of processes that are "live" or in a dynamic state of evolution, as is typical in the rapidly developing area of ICTs. This was particularly noted in the work of *Policy, Praxis and the Public Interest: Engendering a Strategic InfoComms Policy Research Programme in the Philippines* (no. 25), which examines critical ICT policy issues with clear public interest implications and seeks to engender a multi-stakeholder approach to policy development.

Technical Innovation

This category represents those projects that have a central focus on technical innovation or deal with the construction of digital systems or strategies that increase the capacity or efficiency of network infrastructures. Many projects in this category build on existing technology or applications and expand their functionality to serve development needs. For example, *Building a Philippine IPv6 Research Network* (no. 28) builds on Internet Protocol version 6 (IPv6) work previously undertaken by the Advanced Science and Technology Institute (ASTI) and expands on it through collaboration with the Philippine Research Education and Government Information Network (PREGINET). A number of projects working in this area also note that the sustainability of such interventions relies on local participation and ownership both at the development and deployment

stages. For example, the success of the *Nepal Internet Exchange* (no. 29) relied heavily on continued active participation and support of the initiative by local ISPs.

Environment and Agriculture

These projects specifically address the design of solutions to meet the complex demands of environmental management or agriculture services such as crop forecasting, disease management and marketing. Projects in this area are often concerned with the value or efficiency that ICTs can contribute to environmental and agriculture management. This is the key contribution of *Development of a Forest Fire Forecasting System for Western Ghats, India, Using Web-Based GIS and Remote Sensing* (no. 43). The project undertakes its work in a biodiversity hotspot in the state of Kerala, India, and uses a web-based GIS and remote sensing system to develop a fire forecasting software called the SWG Fire Mapper. The question of how to integrate the intervention with more traditional modes of environmental or agriculture management also needs to be considered when working in this area. Training and local level management were both cited as critical to ensure the integration of indigenous knowledge with a new technical tool, contributing to the success of the *Web-Based e-Crop Management, China* (no. 45), which uses a web-based crop simulation and nitrogen model to optimize crop and vegetables production.

Health and Medicine

Included in this category are projects that use ICTs to address health issues. Some projects in this area are designing platforms to enhance information management and exchange and others build on existing ones. For example, *Generic Engine for Modules in PrimaCare* (no. 56) builds on existing PrimaCare technology and develops open-source medical software modules that improve the quality of primary health care through better patient, clinical, information and statistical data management. Other projects are field-testing applications, technologies and strategies that deliver health-related services to those who are currently not receiving them. Projects working in this area note that the success of implementing information systems in health care settings are dependent on the institution's organizational readiness and that personnel, workflow, policy and environment should be considered during system development and implementation. This was cited as essential to the *ICT-Based Telemedicine System for Primary Community Health Care in Indonesia* (no. 47), which developed PC-based medical stations and conducted field-testing in a number of locations.

Project Outcomes and Lessons Learned

Overview of Projects Outcomes

One of the key factors in determining the success of projects lies in the articulation of the link between the development goals and the appropriateness of the technological solution. The Programme supports a range of project types, from those that primarily focus on addressing development issues and employ ICT as a component in the effort, to those that create ICT solutions that in turn serve development goals. In all cases, however, it should be acknowledged that, within the context of the Programme, ICTs are not seen as an end in themselves, but rather as tools to be used in the service of larger development initiatives.

When reviewing the various projects, it is important to remember that as a research and development programme, there is a degree of uncertainty at the outset of every project as to whether a project will be successful or not. It is, in fact, overcoming this uncertainty – or discovering the answer to the research question – that lies at the heart of any research and development programme. The following section explores some of the key common challenges projects faced and some of the key factors that can be seen to have influenced their success. This leads to a further discussion of the strategies and opportunities projects have employed for increasing long-term project impact, scaling up and sustainability.

Common Challenges

While projects have faced many discreet challenges that are particular to the context within which they have undertaken their project work, the following challenges have been observed as common across all project reviewed.

Project location and intervention design

Selecting the entry point for an ICT intervention can have wide-ranging implications for the type of project work that is required. In some cases, for example, when working with beneficiaries who have low levels of education, literacy or limited experience with computers or other technology, a greater degree of energy will be spent on building capacity, than actually mobilizing the technological solution proposed. In other cases, the technological infrastructure may be so basic as to seriously limit the potential of an intervention. Often such cases represent the social realities that form an essential barrier to bridging the digital divide. An example of this is the *ICT-Enabled Women's Social Net, India* (no. 6), project, which sought to establish an ICT service centre for women. This project undertook its work in remote rural communities in Marathwada, India, typified by extremely limited infrastructure, low levels of education and a population that is more focused on daily survival than exploring new opportunities for employment or self-realization through ICTs. These issues are exemplary of the kinds of challenges a project can face depending on its location, beneficiary group and technical intervention. Among the more successful projects that have worked in such restricted environments are those that plan appropriate strategies to overcome such technological or social constraints.

Project Findings: Project location and intervention design

- Choose project sites based on the results of market surveys assessing demand (see project 5).
- Ensure target audiences, scope, objectives, etc. of project are clearly spelt out before implementation (see project 6).
- The importance of building trust and confidence at the initiating stage is critical (see project 17).
- It is a challenge to keep up with actual policy processes and make the research relevant to governance realities (see project 25).
- Projects are most successful when there is full involvement and cooperation by stakeholders (see project 29).

- The success of information system implementation is dependent on the institution's organizational readiness. Human resources, workflow environment and policy should be considered throughout system development and implementation (see project 47).

Partnerships and management

The process of partnership building, reaching common understandings, defining roles and responsibilities can be complex and difficult to manage. Several projects noted problems with partner organizations, which impeded the progress of their project. This may take the form of working with a private, for-profit technical partner that will obviously have different motivations than a not-for-profit development partner. An example of a project that experienced difficulties in this area is the project *ICT-Assisted Economic Empowerment: Integrated Tools Development, Malaysia* (no. 4), which had problems with its IT partner, including technical problems that delayed the technical handover, and unforeseen high maintenance costs that had obvious implications for the project's sustainability. In such cases, a well-defined Memorandum of Understanding (MoU) and scope of work have been recommended to avoid problems as the project work proceeds. This strategy has been used by a number projects to successfully manage partnerships with private sector organizations. An alternative suggestion has been to seek technical partnerships with like-minded institutions such as government agencies or educational institutions.

Another management issue that has come up repeatedly relates to project planning and the timing of the release of funds. In some cases, the receipt of funding from foreign donors is restricted by government regulations. There have been some cases where the unexpected late release of funds to the project team hampered project work. While some of these events cannot be planned for, and project teams will often have to think on their feet, solid upfront research into what resources a project requires and how and when they will be delivered is critical to its success.

Project Findings: Partnerships and management

- Pay due attention to selection of appropriate partner (see project 4).
- Ensure terms of reference with partner organizations are in place before the proposal submission stage itself and begin community-based work only after the committed grant amount is transferred into the project account (see project 6).
- Consider use of a MoU between implementing partners to define a clear programme of work and scope of responsibilities (see project 16).
- Project should be prepared to respond to unforeseen political developments and transitions in government (see project 25).
- Projects need advice on Intellectual Property Rights issues and making the agreement more detailed (see project 26).
- Public-private partnerships with governments and NGOs help to improve the quality of services being offered and increase acceptance (see project 52).

The unforeseen event

Work in several projects was hampered by unforeseen events that were beyond the control of the project team. This could be anything as simple as the issue of dust interfering with computer functions or the theft of project equipment. The project, *Leveraging ICT Through Weekly Market Centres for Tribal Communities, India* (no. 1) faced many such difficulties in carrying out its work, with computers being used in very harsh conditions, unreliable Internet access and insufficient electrical supply. Although the project had foreseen some of these events and ultimately was able to overcome them, it required great perseverance and ingenuity on the part of the project team to develop solutions in the field. There have also been other more serious problems such as cases of a national emergency. For example, when the Severe Acute Respiratory Syndrome (SARS) virus hit China, the project team of the *ICT for Agriculture and Rural Development in China* (no. 42), was severely hampered in their movement, resulting in a severe setback to the completion of their project work. The project *Dobhase: English-Nepali Translator* (no. 32) also suffered severe setbacks due to political unrest in Nepal. Just after the project work began, a state of emergency was declared, affecting the transfer of funds to the project team and later project work was impeded by curfews that were in effect. While none of these projects were abandoned, they demonstrate that in the face of such unforeseen events, it is the ability of the project team to respond appropriately, even redefining its objectives if necessary, and regaining project momentum that is the key to overcoming such challenges.

Project Findings: The unforeseen event

- Increased controls on NGOs and tightening of rules for accepting foreign donations (see project 6).
- Premature staff departures (see project 8).
- Delays in obtaining necessary licenses – in this case to broadcast using wireless technologies (see project 11).
- The project found employers were reluctant to allow them to conduct interviews with employees (see project 19).
- Unexpected technical limitations - in this case, Open Type Font specifications (see project 26).
- Project work hampered by political events and technical problems that were beyond its control (see project 32).
- Unexpected restrictions imposed on the project team due to unforeseen events, thereby seriously hampering progress and resulting in a loss of momentum for the project (see project 42).
- Unexpected technical bugs and premature staff departures (see project 44).

Planning for success

A number of projects that were successful in completing their research objectives found that without further and often quite robust efforts regarding dissemination and promotion of research results, their project would not have the maximum impact possible. In many cases, the grant recipients acknowledge that outreach and marketing of the project fell outside the scope of their

work. It should also be considered that the original project team might not always be best suited for marketing and dissemination if it falls beyond their expertise. Initially, this was the case in the *Nafees Nastalique: Character-Based Nastalique Font for Urdu, Pakistan* (no. 26) project. The project team noted in its final technical report, that "...the font has been made, but still many people do not know how to use it." While not envisioned for this project, the team recognized the need for a significant outreach programme to train end-users across the country in order for the project to have its full impact. Although this project has gone on to have wide ranging applications of its work since that time, its initial comments on completion do underscore the importance of planning for a dissemination strategy.

Some projects, particularly those relating to telecentres and Internet kiosks have specifically looked at marketing as a key component of their research. For example, *Robust Networks for Rural Areas in India* (no. 5) noted that service providers were not always the best people to develop services most relevant to rural communities. They stress that it is vital to perform a market survey before starting such a project and then bring in partners such as government institutions, private companies and content providers who will back the content and services. Another project, *Achieving Universal Access: Developing a Philippine Business Model and Government Intervention Strategies for Viable Community Telecentres in Rural Areas* (no. 10) notes that social preparation programmes, awareness workshops and training are indispensable components in operating telecentres, especially in rural areas where people are not comfortable or familiar with technology. Regardless of whether a project is specifically looking at marketing or not, planning for dissemination of successful project work is essential to achieving lasting impact.

Project Findings: Planning for success

- Service providers are not always the best people to develop the kind of online services most relevant to rural communities. It is vital to perform a market survey before starting such a project and then bring in partners such as government institutions, private companies and content providers who will back the content and services (see project 5).
- Social preparation programmes, awareness workshops and training are indispensable components in operating telecentres, especially in rural areas where people are not comfortable or familiar with technology (see project 10).
- It is crucial to identify a local champion who is dedicated to using ICT as a tool for development, improving the telecentre to make it relevant to the community's context, and making its operation sustainable (see project 10).
- In rural communities, a combination of ICTs with motivated individuals is most effective in combating social problems (see project 15).
- Overall impact of the project can be realized fully only with a significant outreach programme to train the end-users (see project 26).
- For optimum utilization of the end product/service, advertising the product/service and training end-users is critical (see project 32).
- Since data-sharing culture is still conservative in the region, a proactive role in convincing partners to actively participate is necessary (see project 41).

Common Success Factors

There are a number of factors that have been observed as common to the more successful projects.

Participatory processes

Projects that embraced a participatory process on some scale had a marked increase in their probability for success. These projects have introduced participatory processes into their research work on a variety of levels and scales, from those that consult beneficiaries through such methods as questionnaires, focus groups and qualitative interviews, to those where beneficiaries are in direct control in decision-making and other strategic design processes. In this light, it can be observed that some projects use participatory methodologies as a means to an end, such as to receive feedback on the appropriateness of an intervention, to those that focus on enabling participation as an end in itself.

An example of the first project type is *Community Health Information Tracking System (CHITS), Philippines* (no. 48). The researchers in this project noted that developing a community-based health information system is a challenging task. However, by paying close attention to health centre events and culture and by employing purposeful immersion in the end-user's way of life, the researchers were able to gain immense insight into their needs and requirements, and then apply these insights into software code - a process they call evolutionary software development. Initially the researchers were leaning towards a technology-centric implementation of an information system. With deeper analysis and understanding of the needs and requirements of end-users, the researchers were able to use technology to serve the genuine needs of community health workers. The *Nepal Internet Exchange* (no. 29) falls in the second project type, focusing on enabling participation as an end in itself. Not only did the project require full cooperation of the ISPs, it also commented that educating the ISPs on how to set up the networks was more valuable in the long run than having experts do it for them – as they are the ones who ultimately will be responsible for it. The project also stressed that trust among the technical team and all local participants was essential to build working relationships.

Whatever the degree of participation that has been embraced by each project, it is seen that cross learning between the project team and beneficiaries enhances the research outcomes in two essential ways. First, by refining the appropriateness of the solution within the context that the projects outcomes are realized and, second, by increasing the level of ownership and equity of beneficiaries in the project. These two factors, more than any other, increase the chances for the project work to continue to evolve and grow beyond the proposed research phase.

Project Findings: Participatory processes

- The project team developed a participatory model that empowered those involved, built capacity and democratized knowledge (see project 7).
- People in rural areas are ready and capable to successfully adopt these new skills and technologies not only for education, but also to improve themselves and their communities (see project 14).

- The project performed a participatory needs assessment to determine the information requirements and the capacity of the users. The results of the assessment formed the basis for the preliminary system design (see project 16).
- It is critical to build trust and confidence at the initiating stages of any community-based work (see project 17).
- The project stresses the value social intermediaries play in bridging the information divide. Institutions such as schools, the workplace, and NGOs offer important access points for individuals. Informal networks of friends and family also play an important role in building awareness and distributing knowledge (see project 19).
- An Internet Exchange can only be successful with the full cooperation of the ISPs. Educating the ISPs about how to set up the networks is more valuable in the long run than having experts do it for them (see project 29).
- In implementing the project, the project saw that it was critical to establish control at the local level through a local coordinator and cooperation units (see project 45).
- The project worked in close cooperation with local government health institutions and personnel who are the primary users of the system (see project 47).

Adaptive research

Another factor that can be seen as a common success factor of applied research projects is their degree of responsiveness to the research environment, and their ability to adapt and change along the way based on their experience and research findings. In this category are projects that embrace, at least to some extent, an action research methodology, involving the following four steps: initiation of an intervention or action, observation of results, reflection, and a refinement of the research question, strategy or intervention. This cyclical process can be repeated throughout the life of the project.

Perhaps the best example of this kind of project is the *Free and Open Source Software Localization Toolkit* (no. 30). Originally the project sought to simply develop a localization toolkit, comprised of a manual and a Compact Disc (CD) that would reduce the necessary research, work and expertise that a country or group would require to undertake a localization project. However, as the project proceeded, it found that the software documentation it was to draw upon was very limited and of poor quality. Therefore, the project had to complete a great deal of work it had not anticipated, including detailed research into FOSS design and, in some cases, resolving technical problems with software. In addition, it came to be seen that the project would have a much more profound impact if it could link the toolkit (through documentation) to other major FOSS projects, such as OpenOffice.org. This evolution in the research has led the project to produce documentation that not only has value for the project itself, but also beyond it, as part of other localization projects.

Clearly, the longer term, two-year projects have more scope to benefit from such a responsive methodology. However, in short-term projects, such a strategy - even if used on a more basic level - can greatly enhance the quality of findings to the research question. Contrary to what one might expect, it has not been observed that projects using such an adaptive process experience deep shifts in the principle project goals. More often, the shifts can be observed in the specific outputs that are considered appropriate, or changes in strategies to meet those goals.

Project Findings: Adaptive research

- Following the analysis of the telecentre after one year of operation, the project defined three additional research principles to improve its model (see project 3).
- Technology is merely a tool; without efforts in marketing, product improvement and other non-ICT related capacity development training, the technology usage will not be maximized (see project 4).
- To prevent information and knowledge gaps from widening, the project suggests integrating traditional models of communication such as community radio, church bells and two-way radios with more modern ICTs (see project 19).
- Through interaction with editors of journals and participants of the workshop, the project identified several features to improve its system (see project 31).
- The rule-based approach was selected over a more sophisticated method because a sufficiently large parallel text corpus for the English-Nepali language pair was not available (see project 32).
- With deeper analysis and understanding of the needs and requirements of end-users, one is able to ensure that technology serves the genuine needs of communities and does not become an end in itself (see project 48).
- By paying close attention to health centre events and culture and by employing purposeful immersion in the end-user's way of life, the researchers were able to gain immense insight into their needs and requirements and apply these insights into software code, a process they call evolutionary software development (see project 48).
- The project was extended by six months to allow for a longer period of data collection and validation, which will ensure proper analysis and interpretation (see project 53).

Common organizational models and patterns

There are several organizational models and patterns that can have a positive affect of the outcome of projects. The strongest models can be found among those projects that have either a specific collaborative agreement or at least inherent synergies with other organizations such as government offices, development organizations or educational institutions. In particular, if the project is in some way building on the work of its partners, either by filling a gap or by extending a particular programme or application, results can be dramatically enhanced. This is most likely because the need has already been clearly established and the project has momentum of its own at the outset. Many projects use this model. Just one example of such collaborative projects is *Impact of Remote Telemedicine in Improving Rural Health, India* (no. 52). In this project, Internet kiosk operator, N-Logue is field-testing a low-cost medical kit, called ReMEDiTM, developed by a partner company Neurosynaptic Communications Pvt. Ltd. The project uses N-Logue's existing rural kiosk network as a platform to provide low-cost medical services to rural communities. This project also notes the importance of creating public-private partnerships with governments, non-governmental organizations (NGOs) and health institutions for remote health delivery to rural areas. They see that such partnerships can improve the quality of services being offered and increase acceptance of it by local people.

The second type of project model that has been successful is those that further an existing initiative within the implementing organization itself. This might involve scaling up an existing service,

exploring a new application within an existing framework, or expanding a particular area of expertise within the organization. The strength of this model lies in the institutional stability, human resources, knowledge and experience and perhaps independent funding sources that larger organizations can bring to projects. An example of such a model is the project *Towards a Regional Geographic Information Infrastructure in the Hindu Kush-Himalayan Region* (no. 41), which builds on and further advances the work of the implementing organization, the International Centre for Integrated Mountain Development (ICIMOD) and its networks of partners. However, it should also be noted that some smaller projects have succeeded without the benefits of these substantive resources. Many of these smaller organizations have overcome profound challenges and succeeded in the realization of their goals because the project is seen as essential to the achievement of greater institutional aspirations. The salient point in this second type of structure is that the project is seen as a part of a larger or longer-term initiative. Thus, it can be argued that the common success factor is not the size of the organization but rather the degree of long-term commitment it brings to the project.

Project Findings: Common organizational models and patterns

- Provide relevant services by partnering with other providers and make each service independently sustainable. Partner with local organizations that can train operators and spread awareness of computers and the Internet (see project 5).
- The project began with a call for participation and selected three partners based on the criteria of technical capability and geographic representation (see project 28).
- Deploying IPv6 has been enhanced through collaboration with schools and universities, ISPs, telecommunications companies and other IPv6 stakeholders (see project 28).
- The Free and Open Source Localization Toolkit is further developing and testing its documentation through a south-south collaboration (Cambodia/South Africa) project called WordForge (see project 30).
- The team has noted the importance of creating public-private partnerships with governments, NGOs and health institutions for remote health delivery to rural areas. They see that such partnerships can improve the quality of services being offered and increase acceptance of it by villagers (see project 52).

Lasting Impact, Continuity and Sustainability¹

To ensure lasting impact, continuity and sustainability, the primary outcome that must be achieved is project success. On a most basic level, this means that the project work established itself as useful to its beneficiaries. It also indicates that the projects have overcome one or more challenges such as those outlined above. Specifically, the entry point and technological solution are appropriate for its intervention, it has been able to manage itself and partnerships effectively, it has overcome any challenges posed by unforeseen events, and it has been able to plan for its own success and establish the next steps that need to be taken to reach its maximum impact.

¹ This section also draws from and expands on the publication *Empowering the Poor: Information and Communications Technology for Governance and Poverty Reduction – A Study of Rural Development Projects in India*, by Harris, Roger and Rajora, Rajesh, UNDP-APDIP, 2006. <http://www.apdip.net/publications/ict4d/EmpoweringThePoor.pdf>

Whether or not it has integrated participatory processes, an adaptive research strategy or one of the organizational models outlined above, is important but less critical. The main point is that the project's value and appropriateness has been clearly established, and any uncertainty in the above areas has been addressed.

Financial sustainability is the next issue that projects will face in efforts to continue their work beyond the grant period – be that simple continuation and development of the project work itself or scaling up to reach wider audiences. Projects have addressed this issue in several ways. First, as mentioned above, a number of projects were conceived of as a component of a larger institutional effort. In some of these cases, the institution can sustain the project after the intensive initial period of establishing capacity or infrastructure is complete, as was the case of ICIMOD's *Towards a Regional Geographic Information Infrastructure in the Hindu Kush-Himalayan Region* (no. 41) mentioned above. Second, several projects have specifically focused on financial sustainability as a key outcome of their research work. For example, the project *Achieving Universal Access: Developing a Philippine Business Model and Government Intervention Strategies for Viable Community Telecentres in Rural Areas* (no. 10) is working on research to identify key principles for a citizen-centric, market-oriented business model for the viable and sustainable operation of telecentres in rural communities. Many projects have similar aspects to their work, and if their research is successful, the project is seen to be financially viable allowing it to proceed directly to scaling up. The third way financial sustainability has been addressed can be seen in those projects

Project Findings: Financial stability

- Services offered by the centre generate enough revenue to cover costs; the project team has identified new services to serve the local community (see project 1).
- The application delivered has quite a high maintenance cost that has obvious implications for the project's sustainability (see project 4).
- To be a viable business, build wide area networks to connect a larger number of potential users over sparsely populated areas (see project 5).
- The key to creating demand and financial viability of the telecentre is to provide information and content that is relevant to the local community. Complementing this is the need to provide programmes aimed at building relevant ICT skills, particularly in rural areas where people are not comfortable or familiar with technology (see project 10).
- To cover its costs and to ensure its financial viability, the centre must charge fees for training programmes, and even when these fees remain low, many people in the area still cannot afford the services (see project 11).
- Preliminary research found that most initiatives are planned with a pilot-based approach. In many cases, these rely on funding and subsidies to make the model a success. None of the initiatives studied were economically sustainable through private enterprise on a large scale (see project 21).
- The project team notes that obtaining the license or acquiring the software from a commercially available GIS is prohibitively expensive. Using free and open source technologies allows users greater access to the significant benefits of powerful GIS applications (see project 35).

that have used their research period to build alliances and connections with complementary organizations or have gone on to seek further funding from other donor organizations.

Assuming a project has established its intervention as successful and that it has provided for ongoing financial sustainability, there are four ways that projects have been observed to continue on and scale up to achieve lasting impact. The simplest way is through a multiplication of the project model. This would involve an expansion of the project work over a larger geographic

Project Findings: Lasting impact, continuity and scaling-up

- Since wireless networking eliminates the process of laying cables to connect villages, the design provides a viable and effective means of bridging the digital divide and bringing low-cost communication to the most needy (see project 2).
- Sustainability of the telecentre requires community participation in telecentre operation and management (see project 10).
- The research findings contributed to the development of a national IT curriculum and the development of e-government (see project 14).
- Those who attend ICT learning programmes further spread the message through word of mouth and other informal channels, creating a ripple effect that is difficult to quantify (see project 15).
- Once the systems have been tested and firmly established in one federation, the project will document its learning and expand the implementation to cover three other federations in the region (see project 18).
- While ICTs enable the creation of new kinds of jobs, they also undermine the need for other kinds of jobs. The net effect depends upon the nature of labour market institutions that facilitate labour to move from vanishing jobs to new ones (see project 20).
- The results are anticipated to be used in the development of a continuing education programme focusing on ICT-assisted reporting techniques for local journalists (see project 24).
- The project built capacity at the Centre and enabled it to develop a partnership with PAN Localization and Microsoft's Language Interface Pack for Urdu (see project 26).
- The project foresees that once the most challenging aspects of the project development process are completed, the infrastructure framework can then be used to build many different kinds of resource sharing systems (see project 33).
- Once project team reaches its desired result, it is planning discussions with the Ministry of Education and Culture to investigate further cooperation in distributing the text-to-speech system (see project 34).
- The forest fire forecasting system can be adopted and replicated in other geographical areas with necessary modifications in the ranks and weights, based on the specific characteristics of the local area (see project 43).
- Additional research activities evolved from this project (see project 47).
- The project has seen a number of opportunities for further development and replication (see project 48).
- M-DOK is designed to be easily scalable and low-maintenance. The application is expected to be most useful for countries where SMS messaging is prevalent (see project 54).

area, or serving a larger beneficiary group. An example of this kind of project is the Beijing-based project *Developing a New Resource Sharing System and a New Tool to Use Electronic Materials in Multimedia Format Based on Grid Technology, China* (no. 33). This project has potential to achieve substantial scaling up through the introduction of its system throughout the many universities and educational institutions in China. The second way that scaling up has been observed is through intensification of the project within the network infrastructure that has been created, serving the same or similar beneficiary groups with the delivery of additional services or applications. The *Impact of Remote Telemedicine in Improving Rural Health, India* (no. 52) project by N-Logue described above is a good example of introducing new services through existing networks. The third way a project can scale up is through an evolution of the project work where the results of the project work itself lead to a new line of inquiry or exploration. This may have emerged from the intervention itself, or is made evident by the project work. In such cases, scaling up may be observed through the project taking on a new direction. In the projects reviewed, the best example of this type of scaling is represented by the *Free and Open Source Software Localization Toolkit* (no. 30), which continues to grow and evolve with the FOSS movement at large.

The final way that scaling up has been observed is less direct, but nevertheless can have dramatic impact on initial target beneficiaries and extend to larger local and regional communities. This model of scaling can be seen in the ripple effects created by a project intervention. That is, once a community of users has been exposed to the value that a new technology can offer them, and has overcome any barriers to its use, such as physical access, language and skills, they will tend to take the initiative themselves to further build on their own capacities to find new and innovative uses and applications of the ICT medium. At this point, the users have established the value of the medium and adapted it for their own uses, which implies a kind of personal ownership or equity stake in the medium. It can be observed that every project in the Programme, regardless of its degree of success or scalability, has contributed to this kind of ripple effect. On the most macro level, it is this effect that will continue to contribute to the creation of new communities of users and, in turn, creators of information and knowledge that will further shape and evolve the use and application of the ICT medium.

Conclusion

In the following pages is a compilation of 56 projects funded by the Pan-Asia ICT R&D Grants Programme between 2002-2005. It is hoped that this review will be useful for existing projects to better understand how their work fits into the overarching scope of the Programme and to related efforts in the Asia-Pacific region, while also providing new projects, potential projects and other interested parties, both within and beyond the scope of the Programme, to benefit from this vast body of working knowledge, practical experience, research and insight. Further, it is the hoped that, with this tool, new contacts will be made, new collaborations initiated and new solutions discovered.



Photos: Centre for Women's Development and Research, India; Tapan S. Parikh; Praveen, Project Team Member of Unsung Among Us; and Wireless Internet Post Office.

PAN-ASIA ICT R&D GRANTS PROGRAMME: PROJECT REVIEW

Access to Information



Photo: Wireless Internet Post Office

1. Leveraging ICT Through Weekly Market Centres for Tribal Communities, India
2. Wireless Internet Post Office, India
3. Low-Cost IT Centre for the Philippines
4. ICT-Assisted Economic Empowerment: Integrated Tools Development, Malaysia
5. Robust Networks for Rural Areas in India
6. ICT-Enabled Women's Social Net, India
7. Unsung Among Us, India
8. Bhutan 200: Lowering the Cost of Local Internet Access
9. Community Mesh Network for Mahavilachchiya, Sri Lanka
10. Achieving Universal Access: Developing a Philippine Business Model and Government Intervention Strategies for Viable Community Telecentres in Rural Areas
11. Piloting Mobile ICT Access Models, Sri Lanka
12. Implementation of Wireless Last Mile Telephony Solution for Information Sharing and Disaster Mitigation in the Rural Philippine Setting
13. Maximizing the Use of Traditional, Digital and Satellite-Based Radio Services for Education and Development in the Republic of Nauru

1. Leveraging ICT Through Weekly Market Centres for Tribal Communities, India

Grant Amount: US\$ 29,904

Keywords: INTERNET, TELECENTRE, EMPLOYMENT, COMMUNITY, EMPOWERMENT, INDIA

Geographical Coverage: India

Objective

The objective of this project is to promote the use of ICT tools among selected tribal communities in central India.

Research Context

The project was implemented in a remote, rural area of central India where about 70 percent of the population lives below the poverty line. The project leverages access by basing itself in a weekly village market that is regularly visited by the population of about 68 villages. The project offers e-mail, Internet and computers for local people to access information on government, health, employment, marketing and trading, agri-forest produce, and agriculture diseases. The project extends these services and identifies new areas in which Internet and other ICTs can help poor villagers in tribal and rural areas.

Target Beneficiaries

The beneficiaries of the project include the rural village and tribal population, particularly women and those depending on agriculture or wage labour.

Outputs

- Test how and where the Internet can be brought to remote communities;
- Assess whether weekly markets can provide a platform to increase access to the Internet;
- Address infrastructure problems that effect the use of Internet technology such as

electricity, technology and phone lines;

- Identify complimentary technologies that can be used to increase the project's effectiveness;
- Understand how the government responds to the use of the technology; and
- Assess the social and economic impact of the use of the Internet in a tribal community, including the social and psychological factors that influence use or non-use.

Research Results and Outcomes

In its efforts to test its method for bringing ICTs to remote communities, Satpura Integrated Rural Development Institution (SIRDI) established a Multi Facility Centre at a weekly market place in Sawalmendha. Thousands of people from the surrounding 68 villages visit the market every week to purchase essential products and conduct routine work. SIRDI set up similar nodes at Taluka Town, Bhainsdehi and the District Town of Betul, and established a communication network between these villages and Sawalmendha.

The project addressed both technical and social issues. From a technical perspective, the main issues were to test how ICTs can be made to work in remote areas with limited infrastructure. Computers and other instruments were tested in harsh conditions and did not break down. Telephone lines were unreliable and it took several months to get the Internet connection activated. In addition, the power supply in the state of Madhya Pradesh was limited. Electricity was available between four to eight hours per

day, which was insufficient to charge the batteries of the uninterrupted power supply (UPS) and inverters. Hence the generator backup planned in the project proved useful.

From a social perspective, the project sought to test whether weekly markets can provide a “door-step” for access to ICTs, to assess the impact of use of ICTs on tribal communities and understand the social and psychological factors that influence use or non-use of ICTs. The project noted that because of the beneficiary’s low literacy rate and general lack of awareness about ICTs, the community could not really benefit on a large scale during the short project period. It was also noted that response from the villages was much healthier in those villages where SIRD I had already been working and had social workers based. During the later stages of the project, local youth started taking interest in the activities of the centre and in learning Internet technology skills. The percentage of requests for help submitted by women remained consistent throughout the project period at about 35 percent.

To build awareness, the project carried out various activities such as an Agricultural Camp for farmers, a Quiz Competition for students, an Eye Camp for visually-impaired people, and the production of CDs with documents and forms for various government projects. It also offered services such as photocopy, scanning, printing and lamination, and providing students’ school results over the Internet at a low cost. A unique aspect of the project was its development of a network of “Saathins” (meaning women friend) who became leaders of the information initiative. The project selected two Saathins from villages in the project area and provided a two-day training at the Sawalmendha ICT Centre. In total, 108 Saathins from about 60 project villages were trained to work as catalysts. The project also formed a federation of Saathins, using the money collected through photocopy and lamination

charges and through charging for the students’ results on the Internet. This money was deposited in a separate bank account and used to sustain the project economically. Today, the women’s group that started as Saathins has grown into 140 self-help groups (SHGs), with about 2,000 women and their own executive and administrative bodies.

A remote place like Sawalmendha, which could not have otherwise had access to ICTs, now has an ICT facility and a network of users. It was one of the objectives of the project that it should become economically viable over a period of time. The initial period of one year was quite difficult, considering the technical obstacles, low literacy rate and lack of awareness about ICTs in the project region. Now that steps for revenue generation have been taken, the project team sees many economic opportunities for sustaining this project. Looking ahead SIRD I’s SHGs are exploring ICT-enabled initiatives to support organic agriculture produce marketing, customized design and printing of hand woven fabric and clothing, telemedicine and Internet-based education in the local language.

Project Duration

Start Date: September 2002

End Date: August 2003

Total Duration: 12 Months

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2. Wireless Internet Post Office, India

Grant Amount: US\$ 30,000

Keywords: ACCESS, RURAL, WIRELESS, EMPLOYMENT, INDIA

Geographical Coverage: India

Objective

The objective of this project is to couple advances in consumer electronics with an entrepreneurial model, to foster the deployment of text-based digital communication.

Research Context

This project addresses infrastructure- and technology-related connectivity problems by coupling advances in consumer electronics with an entrepreneurial model to create a Wireless Internet Post Office (WIPO). The WIPO is capable of delivering text-based messaging services to remote villages through a network of solar-powered wireless repeater stations. Using off-the-shelf components, operating in the international license-free band and using directional antennas to provide inexpensive long-range wireless networking, minimize the systems cost and complexity. Users synchronize a low-cost Personal Digital Assistant (PDA) at wireless repeater stations, much like dropping off and picking up mail at a post office.

Target Beneficiaries

This research project designed a complete communication system from the Internet gateway to the end-user. Ultimately, it is the end-users who are served by WIPO: villagers who want to contact relatives in distant locations, farmers who want information on prices, access to markets, and advice on disease and pest control, small businesses who want access to trade information, educators who

want teaching materials, and medical and aid workers who require information in their respective fields. WIPO also benefits people involved in the wireless network. It creates an entrepreneurial opportunity for PDA owners to become micro-businesses by providing services such as scribing, data collection, crop pricing, and matching buyers with sellers.

Outputs

The project created a website to disseminate information on how to build and deploy a WIPO system. The website is maintained to provide complete specification documents for the system design, serve as a focal point for discussion, and provide links to similar work, supporting material and other follow-up activities.

Research Results and Outcomes

The design of the WIPO system was completed and a working prototype has been set up at the Indian Institute of Technology (IIT) Delhi. The set-up comprises three relay nodes spread over the IIT campus communicating over 802.11b network using long-range antennas. The set-up uses three parabolic and three Yagi antennae. The system has been used to validate the design and to carry out performance tests.

The major research problems faced in the application was how to design a network that uses low-cost commodity hardware components, is resilient to node failures due to likely power interruptions in the application

environment, is easy to deploy and configure, uses public domain software, and does not rely on any specific equipment model or manufacturers. Most of these problems were addressed and the validated system has been tested. The technical design for the project consists of: the Internet gateway station, application modules for handheld devices, wireless network architecture including the wireless communication protocols, and wireless relay stations.

Initially, the project team faced issues in implementing the system due to interference, communication over multiple links originating from the same node, and in sourcing the necessary antenna and cabling. The project team solved the technical and system design issues inherent in the WIPO and provided digital access to the widest possible population at the lowest usage and capital cost. Since wireless networking eliminates the process of laying cables to connect villages, the design provides a viable and effective means of bridging the digital divide and bringing low-cost communication to the most needy.

The project website (see <http://genie.iitd.ernet.in/wipo/>) has been updated to include the final integrated designs, information on the current set-up and the results obtained. The site provides complete information on the WIPO solution, the technologies used, hardware and software

modules and a complete list of 'how tos' on setting up and implementing a WIPO system. A complete software package, including installer scripts, is also available from the website.

The project team believes that the WIPO technology can form a basis for a wide range of low-cost wireless business services in remote areas. The team from this project is now equipped to provide technical support to an implementation agency interested in deploying a commercial network in a remote area.

Project Duration

Start Date: March 2002

End Date: April 2004

Total Duration: 25 Months

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3. Low-Cost IT Centre for the Philippines

Grant Amount: US\$ 9,000

Keywords: CAPACITY BUILDING, EMPLOYMENT, INTERNET, TELECENTRE, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to help bring low-cost IT and services to communities throughout the Philippines.

Research Context

In the Philippines, many IT centres offering computer literacy courses and other services are emerging in urban areas. However, these are often unaffordable for poor Filipinos, and inaccessible for rural Filipinos. In 2001, the Technical Education and Skills Development Authority (TESDA) Lingayen approached Engineers Without Borders (EWB) to seek support in setting up a low-cost IT centre that would offer affordable IT training to local residents. The centre was completed in August 2002. This project follows on the success of that initiative by studying its impact, replicating it in three additional locations, and by creating a guide on how to set up a low-cost IT centre.

Target Beneficiaries

The three IT centres can provide IT training for approximately 1,500 people over three years. The research findings and training components benefit TESDA, EWB, the province of Sarangani and other partners, thus enabling the project to progress to Phase III and provide low-cost access to IT training for thousands of poor Filipinos.

Outputs

- Three new IT centres serving the rural poor in Sarangani Province, Mindanao;
- New programming for the Lingayen and Sarangani Province IT centres, based on a research paper evaluating the IT training centre and training methodology implemented in Lingayen in 2002;
- A research paper evaluating the impact of increased availability of low-cost IT training on members of a local community, particularly those marginalized in society;
- A guide to setting up a low-cost IT centre and running low-cost training programmes;
- A policy paper on the role of western NGOs in facilitating the set up of low-cost IT centres and training programmes;
- A set of training programmes in English for basic computer literacy;
- A series of technical appendixes on computer/LAN set-up; and
- A plan for Phase III of the project to help less well-off Filipinos gain access to technology that can help them improve their lives.

Research Results and Outcomes

In the process of implementation, the project approach to setting up a low-cost IT centre evolved. The evolution was based on the findings of studies on the Lingayen IT centre. Initially the project established three principles that would ensure positive development outcomes, sustainability and replication. These three principles are: low initial cost borne by the centre, so the centre is not forced to charge high

fees to recoup the capital investment; innovative programming that offers targeted services for the local community based on a pay-what-you-can principle; and building of local skills to maintain and repair the IT centre after the implementing organization has departed.

Following the analysis of the Lingayen centre after one year of operation, the project defined three additional research principles to improve its model. These are: monitoring to allow efficient follow-up and ensure the stability of the centres; impact assessment to help target the programming and follow the centres' development; and last, a holistic approach that addresses the social and employment needs of target beneficiaries. The project therefore shifted its focus slightly to develop the tools, training programmes and structures to embrace these new principles.

The project went on to develop a model that incorporated the needs and socio-economic reality of underprivileged communities in the Philippines. The new model and research findings were then applied to the development and successful implementation in four IT centres. Overall, the most significant research finding is the new definition of the model. Based on the experience of the four IT centres, the project created a scalable, low-cost, appropriate and sustainable IT resource centre solution. With changes to the model and programming, the IT centres from the first two phases of this project – 45 computers in all – offered training to over 500 beneficiaries

including 'out-of-school' youth and persons with disabilities. The project accomplished this for less than US\$ 35,000. Based on the investment of time, effort and funding, the project was considered to be successful in improving the model for the development of IT resource centres and integrated IT training for the Philippines.

Awards

This project was recognized by the Global Knowledge Partnership Youth Award 2003, which aims to reward and bring international recognition to the outstanding work of young people who have used ICT for the promotion of development around the world. See: <http://www.globalknowledge.org>

Project Duration

Start Date: May 2003
End Date: November 2003
Total Duration: 7 Months

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4. ICT-Assisted Economic Empowerment: Integrated Tools Development, Malaysia

Grant Amount: US\$ 29,947

Keywords: GENDER, EMPOWERMENT, EMPLOYMENT, MARKETING, MALAYSIA

Geographical Coverage: Malaysia

Objective

The objective of this project is to assist disadvantaged women who are confined to their homes due to disabilities and other circumstances.

Research Context

This project targets disadvantaged women who, due to disabilities and other circumstances, are confined to their homes and as a result are economically constrained. The project explores the possibility of developing an integrated system of ICT tools such as computers, the Internet, telephone, Short Message System (SMS), facsimile and others to free the women from the confines of their homes. Through utilization of tools already available to them, or supplied through this project, the women can provide products and services to the external market.

Target Beneficiaries

The beneficiaries of this project are 50 women who were short-listed from a group of 200 women.

Outputs

First, the project explored the feasibility, adaptability and effectiveness of using a combination of ICT tools as opposed to over-dependence on one mode such as the Internet. Second, a core group of economically-empowered women was formed as role models

for others in similar circumstances. Finally, the project sought to expose the Malaysian corporate sector to the use of decentralized skills and talents.

Research Results and Outcomes

This project focused its efforts on developing technical supply chain and marketing solutions and capacity building of women to offer marketable skills. It did run into several difficulties, in particular it noted some serious problems related to its IT partner. Due to financial constraints, the project selected the partner based on the lowest price quoted, not the best technology. This led to technical problems, which delayed the handover of the application until six months after the project period was over. The project also mentioned that the application delivered has quite a high maintenance cost, which has obvious implications for the project's sustainability. Reflecting on this, eHomemakers concluded that working with a commercial entity was problematic and that a better partner would have been a university or a non-profit research institution, although none was available at the project design period.

Despite this, the project set up an English-language marketing website (<http://www.justmarketing.info>). The project also developed a Distributed Work Management Application (DWMA) using mobile telephones. The necessary server hardware, interconnectivity cables and mobile handsets were purchased for the DWMA application. System integration between the mobile handset and the server was

conducted and basic SMS sending and receiving functions were tested to support a large number of recipients. Business logic functions are still pending and will commence once the applications have been migrated to the production server.

The DWMA system uses Malay language and a numeric code system for replies. It is designed to cater to multiple products and services, requires minimal typing and includes a distress system for unexpected incidents. Using its beta DWMA system, the project developed and conducted two training sessions, one in Ipoh and one in Klang Valley. The project reported that the system was positively received and is confident that it is applicable to the women's needs. The project stresses that technology is only a tool and without complementary efforts in ICT and non-ICT related capacity development training, marketing and continual product development, technology use will not be maximized.

By using an integrated platform to manage a supply chain through a not-for-profit entity like eHomemakers, a model for poverty reduction using entrepreneurial principles and ICTs was created. Poor urban women are now linked through the platform to group market their products, thus earning income for the household and reducing reliance on aid. The project envisions that this ICT platform will grow further to allow women to participate in eHomemakers' gender governance framework where women own and manage the information network for and by themselves.

Since project completion, the user network has expanded beyond the original 50 subjects to include 200 women of different races and with a range of skills. The project was presented as a best practice model to Thailand and Indonesia during a press launch. Due to the media attention received, interest was seeded in the Malaysian government to use such an integrated

platform to address poverty reduction. The impact from the project was presented to policy makers to demonstrate that the pilot effort was fruitful and can be replicated.

Awards

eHomemakers was chosen as a runner-up in the Gender and ICT Awards (<http://www.genderawards.net>) sponsored by the Association for Progressive Communications Women's Networking Support Programme (<http://www.apcwomen.org>) and the Global Knowledge Partnership (<http://www.globalknowledge.org>). The Award recognizes the project for being able to "...provide choices and opportunities for women, provide strong encouragement for women to fulfil their potential, and enable women to acquire the voice and capability to counter their lack of socio-economic-political power in the community."

Project Duration

Start Date: April 2004

End Date: April 2005

Total Duration: 13 Months

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5. Robust Networks for Rural Areas in India

Grant Amount: US\$ 25,579

Keywords: INTERNET, NETWORK DEVELOPMENT, WIRELESS, RURAL, INDIA

Geographical Coverage: India

Objective

The objective of this project is to disseminate information to users in a resource-constrained environment.

Research Context

This project addresses the dissemination of information to users in resource-constrained environments. To undertake its work, the project created a partnership between an academic institution, an NGO and private sector organizations. The project studied technical and service issues in kiosk projects in rural parts of Maharashtra. Based on its findings, the project developed a connectivity solution using a point-to-point wireless link. It also created a service model for the local agricultural community, comprised of a unique online and offline question and answer service. The two solutions were deployed in a network of rural Internet kiosks. The project combines technical solutions, business service models and strategic partnerships to ensure further deployment and growth.

Target Beneficiaries

The beneficiaries of this project are the owners and users of 26 computer kiosks in and around Pabal, Maharashtra. A reliable Internet connection is provided to Vigyan Ashram, a rural vocational education NGO. Local youth gain experience in surveying and deploying Internet kiosk-based services.

Other ICT interventions that face problems of low bandwidth and unreliable network connections can learn from the published work.

Outputs

- Report on a field study of Pabal's network;
- Operational long distance Wireless Fidelity (WiFi) link between Rajgurunagar and Pabal;
- Localized website for market price information;
- Content pages for the villages in the Pabal region;
- Online multilingual question and answer forum called *Almost All Questions Answered* (aAQUA); and
- A report on kiosk services before and after deployment.

Research Results and Outcomes

This project was facilitated by a partnership between Media Lab Asia, IIT Bombay, Vigyan Ashram, and Krishi Vigyan Kendra (KVK), Baramati. The partnership has combined an inter-disciplinary approach and an action research methodology to drive its development process.

The project conducted field research on the existing network at Vigyan Ashram and found that the leased line was the weakest link in the delivery of data from the Internet. To address this, the project devised a point-to-point wireless network solution that could

pick up Internet traffic when the leased line was down. It built prototypes, deployed test versions and finalized the solution. This was largely successful, although the project found that there was still some downtime between the two services. In response to this, the project sought to develop applications that can function with an intermittent connection to the Internet.

Service delivery was studied by MBA students at IIT. Their study involved planning objectives, a literature review, interviews, questionnaires, field visits, data collection, data interpretation and presentation of results. This inter-disciplinary research was used to analyze the local kiosk market, prioritize use of resources and develop tools that had scalability and high “pull-factor” from the community.

The key service the project developed is an online multilingual question and answer forum called aAQUA (<http://www.aaqua.org>). aAQUA was deployed in a network of kiosks covering about 30 villages around the Pabal area. Kiosk operators charge farmers a low per query fee for consultancy. Farmers use aAQUA to have questions answered on crop and animal disease, farming techniques and marketing information. Most questions are answered in the local language, Marathi. aAQUA is complemented by a Digital Library allowing users to browse the aAQUA portal offline and synchronize the content with the server when connectivity is available.

The project has made the following recommendations on successful Internet service deployments in rural areas. To be a viable business:

- Build wide area networks to connect a larger number of potential users over sparsely populated areas;
- Address security and maintenance of equipment in remote areas;

- Ensure that vendors of equipment adhere to their maintenance contracts;
- Choose project sites based on the results of market surveys assessing demand;
- Provide relevant services by partnering with other providers and make each service independently sustainable;
- Partner with local organizations that can train operators and spread awareness of computers and the Internet; and
- In the case of e-governance services, ensure that the kiosk operator has the necessary statutory powers.

The project has actively developed a range of strategic partnerships with relevant institutions to scale up and expand aAQUA-related services across India. Further growth is strengthened by the business revenue models developed by the project. Content from aAQUA and the Digital Library projects have been integrated in the curriculum of KVK Baramati’s BSc and MSc (Agriculture) degrees and Vigyan Ashram’s degree in Rural Technology. The knowledge and experience gained from the project is disseminated through the project website.

Awards

aAQUA was honoured with the Manthan Gold Medal Award in July 2005, for “India’s best e-Content Practices” under the e-Inclusion category. This award is given for measures supporting integration of least developed states of India into the information society. It is also given for reducing the digital divide and content gap between technology-empowered and technology-excluded communities and groups, such as rural areas and women, and for bridging society through multimedia.

See: <http://www.manthanaward.com>

Project Duration

Start Date: March 2004

End Date: May 2006

Total Duration: 26 Months

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<http://www.manthanaward.com>

6. ICT-Enabled Women's Social Net, India

Grant Amount: US\$ 9,000

Keywords: GENDER, EQUITY, EMPOWERMENT, PRODUCTIVITY, CAPACITY BUILDING, INDIA

Geographical Coverage: India

Objective

The objective of this project is to establish an ICT Service Centre that caters exclusively to women.

Research Context

This project explored the use of ICTs as an empowerment tool for women in India through the establishment of an ICT Seva Kendra (service centre). The Seva Kendra caters exclusively to women, in an effort to encourage participation, build capacity and support their work towards social transformation. ICT Seva Kendra focused on leveraging ICTs like e-mail, word processing and database management to redress the problems faced by self-employed women, SHG members and elected women representatives of local self-government bodies. Thus, the centre sought to catalyze and support the building of ICT-enabled women's social networks.

Target Beneficiaries

This project benefits self-employed women, members of SHGs and elected women representatives of local government bodies.

Outputs

- Effective use of ICTs to advance women's lives through awareness of information;
- Generation of content and software that respond to the practical and strategic needs of the target constituency;

- Increased economic benefit, sharing of resources and reduced costs;
- Support for women to demand entitlements, counter stereotyping, take action against neglect; and
- Empowerment of women to play an active role in decision-making and collective action at a regional level to advance their lives.

Research Results and Outcomes

While this project failed to achieve some of its proposed outputs, it has had some important outcomes and offers valuable lessons learned. In addition, it should be noted that the grant recipients are continuing their work in this area, beyond the scope of the original proposal.

The main challenge faced by the project was problems with its partner organization, the Maharashtra Foundation. Its unwillingness to advance funds is the main reason the project has remained incomplete. Two lessons the project learnt from this experience were: one, to ensure terms of reference with partner organizations are in place before the proposal submission stage itself and, two, to begin community-based work only after the committed grant amount is transferred into the project account. The team also notes that the Indian government is increasing controls on NGOs and tightening rules for accepting foreign donations. They suggest there is an urgent need for grant agencies to develop strategies that will ensure that the support they provide can be accessed by small organizations like this one.

The project researched data of the villages in Tuljapur Taluka, and selected two remote villages, Savargoan and Kemwadi. The conditions in the villages were highly constrained. Infrastructure, such as transport, water supply, sanitation and drainage, was insufficient. According to a government school worker, children in the villages were malnourished. People in the villages had no opportunities for higher education and limited options for employment. Many young girls are forced to quit school, regardless of their performance, either to work in the fields or to be married. Most young girls and women work as farm labour and were not involved in community decision-making processes. The villages were not being served by any other NGOs.

The project team spent a great deal of time in the field and gained first hand experience of the realities of life in rural Marathwada. Based on this experience, they saw the challenge as three-fold. First, to demonstrate the value that ICTs could offer women; second, to connect this value with the realities women faced in daily life; and third, to build women's confidence in mastering and using technology.

To meet these challenges, the project team undertook a number of initiatives. They produced a poster-based campaign on the value of ICTs. They held numerous meetings and focus groups in both villages covering a variety of subjects such as ICT literacy, financial mechanisms of SHGs, nutrition, health, and political participation. The project noted that

these engagements did have positive effects on the empowerment of women. This was demonstrated by a variety of new initiatives undertaken by the women in the villages themselves. For example, women started a community-managed library. Local women also volunteered to create a literacy programme. Women formed health committees that developed and collected daily activity charts documenting the health status and nutritional patterns in the village.

Marathmoli's work in the field was progressing satisfactory until October 2004, when it had to be scaled down due to the lack of funds. Although the project suffered from financial problems and instability, the project represents the small but crucial steps that need to be taken to realize the vision of using ICTs to empower women and young girls, especially from marginalized communities.

Project Duration

Start Date: March 2004

End Date: February 2005

Total Duration: 12 Months

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7. Unsung Among Us, India

Grant Amount: US\$ 20,211

Keywords: CULTURE, EQUITY, DISSEMINATION, INDIA

Geographical Coverage: India

Objective

The objective of this project is to use ICT tools for preserving the cultural heritage of small and marginalized communities.

Research Context

The project team conceptualized Unsung Among Us with the vision to collect, document and disseminate indigenous knowledge through the creation of digital film and media. The project was started as part of the People's Plan Programme in 1997 under the leadership of Karakulam Grama Panchayath, in Kerala. Unsung Among Us evolved into an organized centre focused on rural development through ICTs and human resource development such as self-help and employment training.

Target Beneficiaries

The direct beneficiaries are the indigenous people of Kerala whose culture and knowledge is showcased to the global community through ICT-based content creation and distribution. Cultural heritage and indigenous knowledge is a valuable resource for all and thus, humanity as a whole benefits from their preservation.

Outputs

- Multimedia CDs containing audio, video and animation;
- A multimedia website with space for

- ongoing development of the project; and
- A project report.

Research Results and Outcomes

The project goal to identify, familiarize and document those who are living but 'Unsung Among Us' was successful. The project team developed a participatory model to document indigenous knowledge of Kerala and noted that this process demonstrated local strengths, empowered those involved, built capacity and democratized knowledge.

To implement this project, the Unsung team worked with an organization called Adikala as the local associate. With the partnership and participation of Adikala volunteers, the team was able to undertake the entire filmmaking process, from the discussion of goals and objectives, through development of scripts and stories, into filming and editing and finally disseminating the completed work. The project team provided training in cinematography, sound recording and editing, held a workshop on the development of scripts and conducted seminars to brainstorm with interested groups, discuss characters and manage group forums. The team has also implemented pilot film projects in Thiruvananthapuram and Pathanamthitta Districts.

The completed films cover folklore and folk drama, ritualistic art forms, linguistics, music, martial arts, Dalit² culture, indigenous

² In India's caste system, a Dalit is a person of the lower sections of the 'shudra' class: the lowest of the four castes. Source: [http://en.wikipedia.org/wiki/Dalit_\(outcaste\)](http://en.wikipedia.org/wiki/Dalit_(outcaste))

technology and indigenous medicine. The project team also produced a number of related media outputs such as: an anti-epidemic awareness film; a handbook on health, sanitation and environmental management; a book on management development mechanisms; and periodicals on rural employment, women empowerment and public participation.

The team established an office facility at the Information Technology Centre (IITC) at Grameena Patana Kendram (GPK). The studio provides technological know-how and quality control to the project. The project team has employed a group of professionals from IITC/ GPK for post-production. Members of the team acquired knowledge related to documentary filmmaking, helping them to facilitate more creative contributions from the community stakeholders in the future.

Project Duration

Start Date: January 2004
End Date: December 2004
Total Duration: 12 Months

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8. Bhutan 200: Lowering the Cost of Local Internet Access

Grant Amount: US\$ 9,000

Keywords: INTERNET, ACCESS, BANDWIDTH, RURAL, GOVERNANCE, BHUTAN

Geographical Coverage: Bhutan

Objective

The objective of this project is to research ways of reducing Internet access costs in Bhutan.

Research Context

Many studies on Internet use in Bhutan have identified the high cost of access, low international bandwidth and lack of relevant local content as the main barriers to adoption of Internet-based technologies. As a consequence, citizens are missing out on the efficient dissemination of information and services and the beneficial 'network effect' of increasing the number of citizens online. The project aims to research alternative approaches and propose technical and business solutions that can be deployed by Bhutan's ISPs to increase domestic Internet traffic. The project will evaluate the use of an alternative dial-up Internet access number (200), to access Bhutanese hosted content.

Target Beneficiaries

The beneficiaries of the project are the citizens of Bhutan, who can benefit from lower Internet access charges for domestic Internet traffic. Other beneficiaries include ISPs and the local ICT industry that benefit from increased demand for local content and locally hosted applications.

Outputs

The research outputs are a technical feasibility report that distinguishes between local and international Internet traffic, and a *how-to* business guide for current and future ISPs in Bhutan. These results are relevant to any country in the Asia-Pacific interested in increasing local web content and reducing Internet access prices for citizens to access local content.

Research Results and Outcomes

At the time of writing this project remained technically incomplete. Some reasons for delays are that the project manager left the organization and that additional funding was being sought from other sources to meet the total amount required to complete the project.

The project is outsourced to Druknet, Bhutan Telecom Ltd., a local service provider. Druknet carried out a technical feasibility study to identify the equipment required to restrict Internet traffic within Bhutan and performed testing on the introduction of Intranet services in the country. A local firm has been identified for establishing the national intranet. The project has been granted an extension.

Project Duration

Start Date: February 2005

End Date: September 2006

Total Duration: 19 Months

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9. Community Mesh Network for Mahavilachchiya, Sri Lanka

Grant Amount: US\$ 27,656

Keywords: INTERNET, ACCESS, COMMUNITY, WIRELESS, NETWORK DEVELOPMENT, SRI LANKA

Geographical Coverage: Sri Lanka

Objective

The objective of this project is to develop a low-cost wireless broadband architecture for providing high-speed Internet access services in Mahavilachchiya, Sri Lanka.

Research Context

High capital and operating costs have limited Internet access in rural Sri Lanka. Innovative integrated strategies, based on existing technology and rural social structures, could help overcome a variety of barriers and ultimately help large numbers of rural people access the Internet. This project aims to design and develop a low-cost wireless broadband architecture using Mesh technology to provide high-speed Internet access services in Mahavilachchiya, and identify key success factors for sustainable services.

Target Beneficiaries

This project benefits the entire population of Mahavilachchiya. Special beneficiaries within this large group are the agriculture community, educational institutes, small businesses, credit societies and people seeking employment. Increased Internet access can stimulate economic growth by creating new commercial opportunities and increasing productivity. In general, access to information can help increase participation in civil society and foster social cohesion and inclusion.

Outputs

This pilot project aims to create a wireless Mesh network to provide villagers with access to information available on the Internet.

Research Results and Outcomes

The project experienced delays beginning its work because of legal issues. Initial funding was not disbursed to the project until July 2005. At the time of writing, reports on the project's progress were not yet available.

Project Duration

Start Date: December 2004

End Date: June 2006

Total Duration: 18 Months

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10. Achieving Universal Access: Developing a Philippine Business Model and Government Intervention Strategies for Viable Community Telecentres in Rural Areas

Grant Amount: US\$ 29,974

Keywords: TELECENTRE, DATABASE, RURAL, ECONOMIC, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to develop a viable and self-sustaining Philippine telecentre business model, leading to wider access to information in marginalized communities.

Research Context

Convergence in ICT tools offers new cost-effective means for the achievement of universal access. This project develops a model for community telecentres that integrates development goals and business objectives. The model expands marketing and distribution channels, lowers transactions costs, aggregates demand and buying power, and provides access to ICTs for isolated communities. The project aims to recommend government intervention strategies in support of telecentre development and contribute to learning about ICT for development (ICT4D) initiatives by documenting various efforts and partnerships among the government, private sector, NGOs and donor agencies that promote telecentres in the Philippines.

Target Beneficiaries

The survey and analysis of community needs, identification of relevant technologies and applications and development of a sustainable telecentre business model are

expected to benefit a wide range of public and private sector telecentre operators. Results can be used by government agencies such as the National Computer Centre (NCC) and ASTI of the Department of Science and Technology (DOST). The database, policy recommendations and analysis of ICT4D programmes can benefit government agencies by providing an enabling environment to achieve universal access through deployment of community telecentres. This includes the Department of Transportation and Communication (DOTC), the Commission on Information and Communications Technology (CICT), the NCC, the Telecommunications Office, the National Telecommunications Commission, and Local Government Units (LGUs). Finally, rural end-users benefit from the proliferation and enhanced services of community telecentres.

Outputs

- Recommendations on government intervention strategies and policies for the creation of an investment climate that is favourable to the establishment and operation of telecentres in rural areas;
- A business model for a viable and self-sustaining telecentre in rural areas;
- A database of existing telecentres and similar efforts to achieve universal access, such as projects using ICT as a development tool; and
- Presentation of survey results.

Research Results and Outcomes

To date the project completed a comprehensive overview of past and existing telecentre initiatives in the country and conducted an analysis to identify the main features of a successful telecentre.

The Philippine Government began establishing telecentres called *public calling offices* in 1989. In 2002, a policy promoting private sector participation was issued. In 2003, the CICT developed the concept of Community e-Centres (CeCs). In the 2005 National Budget, each Congressional district was allotted PHP 1 million for the establishment of CeCs. As of December 2005, the e-Government Fund had helped set up about 60 CeC sites nationwide and provided equipment to 39 CeCs. Additional telecentres around the country are funded by NGOs, international donor agencies and LGUs. Private sector participation includes contribution of equipment and connectivity solutions from organizations such as Microsoft, Intel, Smart Communication, Globe Telecom, Bitsop and CVISNet. While many of these projects are in their pilot stages, project research shows that the lack of sustainable plans for training, maintenance and economic viability has caused a number of them to fail. These efforts are often disaggregated and do not adhere to an overarching national development programme. Although, the objectives of providing convenient access to information and communications services are clear, the overall direction and sustainability plan varies, if present at all.

The research team has undertaken study tours to four telecentres located in the three major regions of the country and conducted client exit surveys and interviews with key stakeholders. The team also conducted a study tour to a successful learning centre in Baan Samkha, Lampang in Thailand that uses ICT

applications in support of community development programmes. From these results, the project concludes that the most salient features of successful telecentres that can be applied in the local context are as follows.

The key to create demand and financial viability of the telecentre is to provide information and content that is relevant to the local community. Complementing this is the need to provide programmes aimed at building relevant ICT skills, particularly in rural areas where people are not comfortable or familiar with technology.

The project also found that it is useful to identify a local champion (such as a farmer, teacher, or out-of-school youth) who is dedicated to promoting the centre and developing services that are relevant in the community context.

The sustainability of the centre requires community participation in telecentre operation and management. The project recognizes that many initiatives are in different stages of development and have different needs at different times. To address this, the project recommends that an incremental approach to introducing the interventions mentioned above may be most appropriate.

The project has made progress in developing its recommendations on government intervention strategies and policy options that address "information poverty", expand universal access and bridge the digital gap. The team developed an initial draft of the database of ICT and telecentre projects in the Philippines. The database is being regularly updated and will include a matrix of projects initiated by the government, NGOs, international funding agencies and the private sector. Finally, the project is working to complete a citizen-centric, market-oriented business model for the viable and sustainable operation of telecentres in rural communities

with the end goal of achieving universal access, bridging the digital divide, enhancing economic development and improving the welfare of the community.

Project Duration

Start Date: January 2005

End Date: August 2006

Total Duration: 19 Months

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11. Piloting Mobile ICT Access Models, Sri Lanka

Grant Amount: US\$ 18,940

Keywords: COMMUNITY, ACCESS, RADIO, MULTIMEDIA, TELECENTRE, SRI LANKA

Geographical Coverage: : Sri Lanka

Objective

The objective of this project is to explore new models of access, creation and dissemination of a range of locally relevant content.

Research Context

This pilot project provides a framework for extending community radio and multimedia to incorporate a mobile ICT unit that delivers cost-effective access to relevant information and knowledge that can help reduce poverty and isolation in remote communities of the developing world. The Kothmale Community Radio website will be extended by incorporating a web-based community information, communications and knowledge management system. In order to effectively address poverty, software tools provide a gateway allowing communities to access knowledge sources and services that are tailored to their own information and communication needs.

Target Beneficiaries

The mobile design of the project provides access to information in remote areas of the Kothmale region that can help improve the lives and livelihoods of all members of the community, including its 17 schools, numerous businesses and other organizations. Project partners, governments and NGOs can use the results to understand the potential of mobile ICT solutions and to explore new models of access to locally relevant content.

Outputs

- A working model for a mobile multipurpose community telecentre and radio unit;
- An increase in social capital, skills and capacity; and
- A localized information and knowledge-sharing portal.

Research Results and Outcomes

This project explores methods for extending the role of community radio and telecentres to deliver ICT content directly at the village level. Ethnographic Action Research that preceded the development of the mobile prototype identified a variety of factors that hinder the ability to access the Kothmale Community Telecentre facilities. Limited local transport and an unreliable and overcrowded bus system were highlighted as the major factors that limit accessibility to the centre. The cost of training programmes is also problematic. To cover its costs and to ensure its financial viability, the centre must charge fees for training programmes; even when these fees remain low, many people in the area still cannot afford the services. The survey also revealed that community members questioned the relevance of technology to the community. Contributing to this perhaps is the fact that the amount of Internet content available in Sinhalese is very low and what is available is tailored to the urban elite in Colombo.

In response to research results, the project concentrated on the development of an

appropriate model for mobile distribution of content – the eTUKTUK. This is a self-contained mobile telecentre and radio broadcasting unit housed within a Tuk-Tuk, or three-wheeled motorcycle, a favoured form of transport common throughout South Asia. A laptop computer is located inside the vehicle, as is a battery-operated printer, camera, telephone and scanner. Internet connectivity is provided via a Code Division Multiple Access (CDMA)-enabled wireless connection and electricity is provided via a generator, which in turn charges a battery that is used to provide additional power for short periods of time. A roof rack allows the vehicle to carry other equipment such as the Kothmale Community Radio Station's mobile broadcasting unit. Narrowcasting of radio programmes is achieved via two loud speakers mounted to the roof rack. This system is used to announce the telecentre's presence when it arrives in a village or designated location. The weekly route of the eTUKTUK is broadcast over the radio to inform the listeners about the location and the time that it will arrive in their community.

The project faced a number of early setbacks relating to the acquisition of a license to broadcast using wireless technologies. While this application is still pending, the project has successfully adapted to CDMA technology. This is not ideal, as the community does not own the network; however an agreement has been signed with a commercial telecommunications company to provide access to their network free of charge.

With the e-TUKTUK complete and a broadcasting solution in place, project

operations have turned to focus on capacity building of the Kothmale Community Multimedia Centre facilities and staff. A number of content production workshops and training sessions have been held and more are planned for the future. Partnerships have been formed with the Sri Lankan government's ICT Agency. Researchers and staff of the telecentre have participated in several regional conferences where they have shared their experiences and gained knowledge and skills from their counterparts in UNESCO-supported Community Multimedia and Learning Centres throughout South and South East Asia. The project recently joined a UNESCO-supported three-year research project entitled 'Finding a Voice'. The project has received substantial press attention both locally and globally.

Project Duration

Start Date: October 2005

End Date: January 2008

Total Duration: 27 Months

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12. Implementation of Wireless Last Mile Telephony Solution for Information Sharing and Disaster Mitigation in the Rural Philippine Setting

Grant Amount: US\$ 8,925

Keywords: WIRELESS, DISASTER, INFORMATION MANAGEMENT, EARLY WARNING SYSTEMS, PHILIPPINES

Geographical Coverage: The Philippines

Objectives

The objectives are to pilot a wireless connectivity solution for rural communities in the Philippines and develop technical and procedural guidelines.

Research Context

This project addresses the lack of access to ICT tools in marginalized sectors of society through the development of a wireless 'last mile' solution that provides low-cost connectivity to rural communities in the Philippines. As the solution is unconstrained by traditional cable capacity, it offers the higher bandwidth needed for efficient distribution of information and services to rural communities. This pilot project researches and identifies relevant technologies, develops technical and procedural guidelines, and forms strategies and recommendations for the government and private sector on the establishment and operation of wireless connected communities. Rural communities benefit from efficient distribution of ICT-based information and services.

Target Beneficiaries

- Investors and operators include the DOTC, public telecommunications entities, small- and medium-sized information technology enterprises (SMITES) and other private firms;

- ASTI of DOST benefits from the identification and recommendation of different technologies available;
- CICT benefits from the technical and procedural guidelines formed by the project; and
- Rural communities in identified locations benefit from the inexpensive services the wireless facilities provide.

Outputs

- Development of technical and procedural guidelines for the establishment of an economically and technically feasible wireless 'last mile' connectivity solution for a rural setting;
- Establishment of a pilot wireless connected community;
- Formulation of strategies for the establishment and continued operation of wireless connected communities for the government and private sector; and
- Presentation of the results and recommendations from the pilot programme.

Project Duration

Start Date: January 2006

End Date: June 2006

Total Duration: 6 Months

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13. Maximizing the Use of Traditional, Digital and Satellite-Based Radio Services for Education and Development in the Republic of Nauru

Grant Amount: US\$ 26,562

Keywords: INTERNET, CAPACITY BUILDING, RADIO, GOVERNANCE, REPUBLIC OF NAURU

Geographical Coverage: Republic of Nauru

Objective

The objective of this project is to adapt existing traditional digital and satellite radio communication resources to serve the education and development needs of the students and people of the Republic of Nauru.

Research Context

The Republic of Nauru suffers severely from environmental degradation due to now exhausted phosphate mining activities. Poor fiscal management has led to massive unemployment, unreliable energy and environmental infrastructure, lack of food and water, low life expectancy, declining education rates, reliance on foreign aid subsidies and political instability. This project aims to combine existing satellite-communication networks at the University of the South Pacific (USP), a regional leader in distance education, with proven radio technology, so students and the general public can receive educational materials and community development information. The radio project can serve as a model for similar initiatives in other countries.

Target Beneficiaries

- Students of the USP based in Nauru;
- The general public residing in Nauru, including primary and secondary school students and teachers; and
- Regional NGOs which benefit from a new communications outlet for dissemination of information on community development, health, youth and micro enterprise.

Outputs

- Creation of a broadcast vehicle to deliver academic programmes from the USP to students in Nauru (secondary and tertiary levels) and their teachers (for in-service training);
- Creation of a community radio station for Nauru;
- Training of community residents to oversee operation and management of the radio station; and
- Dissemination of community-developed information on business, health and environmental issues.

Project Duration

Start Date: March 2006

End Date: February 2008

Total Duration: 23 Months

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Capacity Building and Education



Photo: Tapan S. Parikh

14. A Distance Learning Application of the Solomon Islands People First Network (PFnet)
15. IT-Mediated Rural Women Education and Dissemination of Health Information: A Pilot in Tamil Nadu, India
16. Local Government Knowledge Sharing Network (LOGOSHARE), Philippines
17. ICT-Enabled Life Skill and Sexuality Education for Adolescent Girls, India
18. MISSION: A Secure and Easy-to-Use MIS Framework for Self-Help Groups and Other Community-Based Financial Institutions, India

14. A Distance Learning Application of the Solomon Islands People First Network (PFnet)

Grant Amount: US\$ 8,994

Keywords: INTERNET, CAPACITY BUILDING, COMMUNITY, TELECENTRE, SOLOMON ISLANDS

Geographical Coverage: Solomon Islands

Objective

The objective of this project is to pilot a distance learning facility in one of Solomon Islands' rural community high schools.

Research Context

This project used an existing rural Internet connection through the rural development and peace ICT initiative, The People First Network (PFnet), to pilot a distance learning facility in one of Solomon Islands' rural community high schools. The project entailed the design and application of a distance learning programme that was configured to integrate with existing PFnet facilities. It studies the impact of an e-mail station on the wider community, focusing on particularly vulnerable groups such as women and young people. In doing so, this project provides an example of a PFnet application, as well as valuable baseline data for the further expansion of PFnet to all rural areas of the country.

Target Beneficiaries

Beneficiaries of this project are the remote rural communities that suffer most from deficient transportation and communication networks. The project enables professional and commercial linkages, economic activities, civil society participation and government services. Indirectly, PFnet benefits organizations working in rural development, allowing them to improve their operations through better logistics and

information exchange, while improving the living conditions of their staff in remote locations.

Outputs

- Distance Learning ICT Centre established in a rural area as a model application for the national PFnet programme;
- The USP Distance Learning Programme adapted and optimized for PFnet, including field-testing using an established PFnet community e-mail facility and confirming that it can be successfully expanded to other rural areas with the growth of PFnet;
- Increased understanding of the impact of ICTs on rural populations;
- Outreach to vulnerable groups who are not accessing the services;
- Baseline data for expansion of the network;
- The ICT capacity of teachers and students of Sasamunga Community Schools built; and
- Continuous project monitoring.

Research Results and Outcomes

This pilot project used a participatory process throughout its implementation. Stakeholders were consulted through focus interviews, evaluations and workshops. Based on their input the project developed a practical model of how ICTs benefit the education sector. The project results provide valuable baseline data on the impacts of the distance learning centre and the general impact of the e-mail facility

on the wider community. Education providers, such as the Solomon Islands College of Higher Education and PFnet as well as USP, can use these results to further develop the model and expand distance education at the national level.

The success of the project is illustrated by the fact that the 19 students who directly took part in the three-month training are now confident computer and e-mail users. Of the students who responded to the questionnaires, 68 percent said they would like to study further. As foreseen, the project also had a number of benefits to the wider community as it provided easy and affordable communication to individuals, local businesses and organizations. The e-mail station improved access to medical services for the people of Sasamunga by enhancing communication and coordination between the local hospital and other health providers. Local businesses actively use the e-mail station to contact their suppliers, place orders, check prices and for basic banking. Finally, it was noted that the centres improved communication between rural people and their relatives and friends within the country and abroad. These results demonstrate what may be the most important outcome of the project, that people in rural areas are ready and capable to successfully adopt these new skills and technologies not only for education, but also to improve themselves and their communities.

The successful completion of the distance learning trials and research findings culminated in a series of summits and workshops between the stakeholders to find ways to improve and maintain the distance learning model. These events provided collective and in-depth inputs useful for further expansion of the programme. For example, the need for additional research to collect first-hand information that could

inform more effective planning and implementation of policies aimed at reaching and improving the lives of the rural population was identified. It was also noted that for rural people in the Solomon Islands, access to funds to meet school fees is a common problem. While during the project implementation, student enrolment fees were supported by the national parliament, it was suggested that a broader scholarship scheme be put in place so that interested students from rural areas could continue to study through distance learning programmes. Minor problems were also identified, particularly with the distance learning trials. The project saw that these issues could be resolved by developing a standardized approach with the distance education provider and PFnet. A number of more detailed recommendations for improvements in the programme were made, primarily relating to continued build up of technical capabilities and expanding the range of training areas for users and tutors.

The project promises positive ongoing results for rural communities throughout the Solomon Islands. Based on its findings, a national Distance Learning Centre project was designed and is being implemented for the Ministry of Education with funding from the European Union (<http://www.schoolnet.net.sb>). The results of the research also made it possible for a Very Small Aperture Terminal (VSAT) system to be set up in a community high school in each of the nine provinces of Solomon Islands. The system allows schoolteachers, students and community members to have full Internet access for studies, research and distance learning. Finally, the research findings contributed to the development of a national IT curriculum and the development of e-government in Honiara through the Ministry of Finance.

Project Duration

Start Date: February 2002

End Date: June 2002

Total Duration: 5 Months

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15. IT-Mediated Rural Women Education and Dissemination of Health Information: A Pilot in Tamil Nadu, India

Grant Amount: US\$ 10,250

Keywords: GENDER, EQUITY, HEALTH, CAPACITY BUILDING, HIV/AIDS, INDIA

Geographical Coverage: India

Objective

The objective of this project is to design and evaluate a web-based education and health information tool targeting rural women in Tamil Nadu, India.

Research Context

This project addresses the United Nations charter for improving the health and social welfare of women in developing countries through education. The project designed, tested and implemented an IT-based women education and health information dissemination pilot targeting rural women in the Tiruchirapalli District of Tamil Nadu, India. The project uses existing education infrastructure to demonstrate the economic viability and the social benefits of such a programme in a developing country with complex social and religious interrelationships. A charitable educational institution, the Seethalakshmi Ramaswamy College for Women (SRCW), Tiruchirapalli served as a focal point to educate and disseminate information to rural women.

Target Beneficiaries

The beneficiaries of this project are rural women of Tamil Nadu, India, ten rural schools and ten government schools run by the Tiruchirapalli Corporation.

Outputs

- A research report on social, health and education issues facing the target population and alternative strategies for solutions;
- A health information website operating through SRCW to disseminate relevant information to participants and other interested parties;
- A practical training module for disseminating information to participants; and
- A network of volunteers and social service organizations to provide ongoing support.

Research Results and Outcomes

This project was carried out in three phases. The first phase involved a survey in 25 villages and five private schools to assess the level of awareness of health issues such as prenatal care, postnatal care, HIV/AIDS, and the importance of school education for students in the target area. Using this information the project developed IT tools for dissemination of information and tested them in the villages and schools. In the second phase the IT tools were modified based on feedback received in phase one. Using the tools, information was disseminated to women and children in about 25 villages that had high school dropout rates and low health awareness, and to young women from two different colleges. The final phase involved coordination with the government for project sustainability.

The pilot has been successful in meeting and surpassing its objectives of raising IT awareness among young female students in target areas. The project targeted a population in excess of 50,000 in 39 villages and two suburbs of Trichy town. Over 1,000 women from 25 villages participated in various stages of the programme. SRCW trained a group of approximately 200 rural girl students. These results indicate a high, intangible return on investment although the project does note that it is difficult to quantify the impact it has had. The impact can be qualitatively assessed from the response of the participants, which show the project is having a significant impact on raising the awareness of women in these villages. The project notes that those who attend such programmes further spread the message through word of mouth and other informal channels creating a ripple effect that is difficult to quantify.

The project gave the researchers and students insight into where ITs will work and where they will not. The project notes that women's ability to access health information is impeded by poverty, lack of education, lack of knowledge and resources, social systems, religious beliefs and a variety of other social, economic and political factors. The project sees that the solution to this problem is beyond what a small IT-based project (such as this one) can solve. IT

tools can however play a significant role in distilling information and disseminating it at a reasonable cost, thus providing an effective tool for combating social problems in rural communities. The project felt that a micro-system with local community ownership could be a forerunner to similar ones in other parts of India. Subsequent to this project, the researchers proposed to communicate these findings to State Government authorities and to discuss strategies for further implementation. The researchers note that one year was probably too short a time to make a substantial impact.

Project Duration

Start Date: July 2003

End Date: July 2004

Total Duration: 13 Months

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16. Local Government Knowledge Sharing Network (LOGOSHARE), Philippines

Grant Amount: US\$ 30,000

Keywords: GOVERNANCE, KNOWLEDGE MANAGEMENT, INFORMATION MANAGEMENT, DATABASE, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to test an ICT-mediated mechanism for knowledge sharing among LGUs.

Research Context

The Philippine e-Commerce Law of 2000 mandated all government agencies develop e-governance capabilities. LGUs have since started a range of databases, knowledge bases and websites. LGU staff is receiving ICT training and is learning from one another's efforts. As such, a wealth of technical and practical knowledge useful for local development planning and management has been accumulated in the Philippine government and NGOs. This project aims to inventory and classify this knowledge, to define and test best practices, and create systems for sharing and integrating innovative strategies and practices at the national and local level.

Target Beneficiaries

Philippine LGUs and national government agencies.

Outputs

- Inventory of existing local governance practices and development of a knowledge base;
- Design of a classification system and an e-directory of existing expertise;

- Action research and piloting of an e-group among local planning and development officers (LPDOs), to define priority knowledge needs and promote a knowledge sharing culture;
- Development of a bottom-up system allowing LPDOs to design and maintain a knowledge base system;
- Development of a top-down 'Help Desk' where experts on various technical areas of local governance and development contribute their expertise through online consultation; and
- Launch of LOGOSHARE, including the above components.

Research Results and Outcomes

The project is being implemented on a co-management and partnership basis between the Galing Pook Foundation, Philippine Sustainable Development Network (PSDN) and the Centre for Conscious Living Foundation (CCLF). Galing Pook Foundation serves as the repository of best practices in good local governance. Much of the expertise and best practices are drawn from Galing Pook's chest of awarded programmes. The PSDN is tasked to undertake all ICT-related activities, including the creation of an experts' directory, design and execution of a web-based knowledge database, the development of a portal and help desk, and the corresponding workshops and training that the initial users of the network require. CCLF provides advisory services to the partner organizations in the areas of knowledge

management and organizational learning. The implementing partners used an MoU to define a clear programme of work and scope of responsibilities.

So far 15 LGUs have signified their willingness and commitment to enter into partnership on the ICT-enabled knowledge sharing project. Of these, 11 have consistently participated in project activities. The project performed a participatory LGU needs assessment to determine the information requirements and the capacity of the users. The results of the assessment formed the basis for the preliminary system design. The project also consulted the LGUs to facilitate the process of identifying priority areas of knowledge that would be most helpful to the LPDOs.

Two major workshops were held. The first was LOGOSHARE Consultation Workshop held on 8 September 2004, at the NCC, University of the Philippines in Diliman, Quezon City. This workshop organized a core group of users composed of selected LPDOs that would help define the LOGOSHARE ICT infrastructure contents and protocols. Results from this meeting helped determine the information requirements and define the capacity of users. The second workshop was the LOGOSHARE Project ICT Training Workshop, held on 3-4 November 2004 at the NCC. A follow-up workshop was held on 28 March 2005 at the NCC to test run the portal and LOGOSHARE website (<http://www.logoshare.ph>).

Based on interim reports the remaining months of the project were devoted to completing the technical aspects of the project, developing a

sustainability plan and strengthening the network. The following components were in progress: a knowledge base of best practices in local governance and development called the *e-Kaban Galing* ("Kaban" means storage chest), an e-directory of expertise in local governance and development, pilot of an e-group among LPDOs, set up of the bottom-up portal, design and testing of an LGU Help Desk, and launch of LOGOSHARE.

The project notes that the establishment of the physical infrastructure (website), although an end in itself, is more appropriately understood as a means to reach the desired outcome; a core group of people able to identify and resolve local governance issues aided by a network of practitioners providing knowledge and expertise.

Project Duration

Start Date: February 2004

End Date: March 2006

Total Duration: 26 Months

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17. ICT-Enabled Life Skill and Sexuality Education for Adolescent Girls, India

Grant Amount: US\$ 8,911

Keywords: GENDER, EQUITY, LIFE SKILLS, SEXUALITY, CAPACITY BUILDING, INTERNET, INDIA

Geographical Coverage: India

Objective

The objective of this project use ICT tools to provide comprehensive sexuality and life skills education that empower adolescent women in Chennai, India.

Research Context

In India, there are approximately 10 million pregnant adolescents and adolescent mothers at any given time. Unfortunately, education, health and family welfare programmes are not adequately addressing the special needs of these women. This project uses ICTs to provide comprehensive sexuality education and life skills training for young women to develop relevant skills needed to plan their career and life. The project employs computers, Internet and digital cameras to educate, organize and empower these adolescent women. The project targets adolescent women in urban and rural areas in Chennai, India

Target Beneficiaries

The project targets adolescent women, including Dalits from Othiyur village of Eddaikazhinadu town, Panchayath, Kancheepuram District, and from the slums of Thiruvanmiyur, Chennai. Adolescent women attending school and working are beneficiaries.

Outputs

With beneficiaries' participation, the project proposed to create profiles of families in village and slum areas for use in education and planning. It proposed to develop interactive learning materials and design an interactive ICT-based information dissemination system for use among rural and urban adolescent women.

Research Results and Outcomes

The project began by holding focus group meetings with adolescent women to assess general knowledge and beliefs about sexuality and sexual health, as well as to understand the socio-cultural context that contributes to these beliefs. Based on the results, the project developed modules for sexuality education curriculum. They include: Growing Up (including puberty), Sex and Sexuality, Sexual Violence, Abuse and Decision-Making (including counselling and legal resources), Sexually Transmitted Diseases, and Knowledge Assessment and Feedback.

The results of the focus group revealed that many of the adolescent women had never been spoken to about these subjects before. In response to this, the project sought to devise culturally-sensitive ways of approaching the topic of sexuality education, and general women's health issues, without alienating or distressing the young women in the process. The strategy employed was to gradually build rapport with the young women through training in computer technology skills.

In the slums of Thiruvanniyur the project networked and disseminated information about the centre and the computer lessons that they offer. This resulted in approximately 100 adolescent women attending the lessons at the centre. The project reports that the young women have been taught basic computer skills, program applications and use of the Internet and in general have gained confidence in using the computers. After some issues with electricity and phone connections, the project was able to set up a computer in Othiyur village and began computer lessons for the girls in a manner similar to those in the Thiruvanniyur centre.

At the interim point in the project, it surveyed 98 out of 109 girls using the centre. Of the respondents, 71 percent were introduced to computers at the centre and began using them there for the first time. 78 percent of the girls reported coming to the centre several times a week to use the computers, 65 percent reported they came everyday. 98 percent reported feeling comfortable using the computer at the time of the survey, however, much less - 31 percent of the girls - reported an interest in learning about personal health from the computer, with a greater number of girls wanting to learn vocation-related skills, such as typing. The project observed that the girls seemed to identify more with learning tangible skills that can be gained from computer use. Thus the project saw the need to focus on ways to convey ICTs potential for accessing educational information, primarily through training sessions with young women that come to the centre.

At the six-month point, the project reported that the following had been completed: a

growing database of family and community profiles, a portion of the sexuality curriculum, data on adolescent women's proficiency and comfort with computer use, and the formation of women's club, or "Snehidhi", with a corresponding newsletter and website (<http://www.snehidhi.org>).

The project is of the view that its main strength lies in its commitment to truly understand the communities it is working with and develop curricula and relationships that will have lasting, sustained effects in these communities. The project anticipated that the coming six months would produce more quantifiable outcomes although they stress the importance of building trust and confidence at the initiating stage in this type of community-based work.

Project Duration

Start Date: August 2004

End Date: July 2005

Total Duration: 12 Months

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18. MISSION: A Secure and Easy-to-Use MIS Framework for Self-Help Groups and Other Community-Based Financial Institutions, India

Grant Amount: US\$ 30,000

Keywords: ECONOMIC, PRODUCTIVITY, SELF-HELP GROUPS, INFORMATION MANAGEMENT, INDIA

Geographical Coverage: India

Objective

The objective of this project is to develop a Management Information System (MIS) for SHG operations.

Research Context

SHGs, federations and other community-based financial institutions have proven to be effective empowering agents for local communities to achieve sustainable livelihoods and rural development. One of the main limitations for their continued growth and sustainability is the lack of management capacity. The MISSION project is a secure, extensible and easy-to-use MIS to improve financial performance, sustainability and growth of these institutions. Recognizing that such institutions have infinitely varying requirements, this project develops a modular tool-based framework for MIS systems with components that can be used together or separately. The modular system can serve the needs of a wide range of SHGs, from small local institutions all the way to large multi-state networks.

Target Beneficiaries

This project benefits thousands of community-based financial institutions that have difficulty collating, analyzing and reporting data collected from the field. The project provides a standard set of tools to carry out tasks, ultimately

contributing to the competitiveness of these organizations in the formal capital market.

Outputs

The project output is a detailed and comprehensive project report that includes: a description of the software design for replication, descriptions of the testing methodology and implementation strategy, observations from training and testing phases, and an analysis of the project results. When complete, detailed hardware and software designs will be made publicly available at no charge.

Research Results and Outcomes

SHGs are cooperative community-based financial institutions, owned and managed by the members themselves. SHGs can group themselves into structures of 20-25 groups called clusters, which are further grouped into larger structures called federations. Federations can legally be registered as non-profit, for-profit or as cooperative entities.

As SHGs mature, they often start to provide financial services to their members such as insurance, savings accounts, fixed-term deposits, and brokering financial agreements with formal entities in the capital market. These require proper accounting standards and financial management tools that produce information acceptable to external regulatory agencies and

funding organizations. This can prove to be unmanageable for most SHGs due to the high volume of transactions, remote location of members, and limited capacity of staff to maintain records, produce reports, or use computer systems.

MISSION is a distributed yet integrated top-to-bottom MIS for SHG operations that requires minimum investment in local resources or capacity. It allows SHGs to 'outsource' most of the data processing and management tasks to more capable remote staff, while maintaining the overall ownership and management of their institution and the ability to access accurate financial data. The model is conceived on three levels, a paper-based MIS for accounting in the field, a mobile phone-based application to store and transmit data, and a web-based MIS to process and store data.

The project commenced with a detailed contextual study of the existing documentation practices at the SHG, cluster and federation levels. Based on this study, a paper-based MIS 'flap-book' was designed as an easy-to-use ledger for recording and processing of financial and non-financial information. The flap book removes redundancies, streamlines information flows and fills information gaps. The flap-book was piloted for three months with 50 SHGs and later implemented in about 500 SHGs.

The second step was the development of a Customer Account Manager (CAM) framework that provides a way to aggregate data from paper-based records in the field using mobile phones. The driving element of the CAM architecture is a mobile phone application called the CAMBrowser. Users enter information by capturing barcodes using the mobile phone camera, or by entering numbers. The CAMBrowser downloads the information and executes accounting processes in XML-based applications. When a wireless connection is not available, information is cached in the phone's outgoing SMS message queue and automatically sent when the phone is connected.

Data is synchronized using get-and-put functions. The third component is a web-based MIS processing and storage centre. It consists of a database and a set of PHP scripts that allow for data entry and comprehensive financial report generation. The system can be deployed as software in a federation office or as an online server accessible from any Internet access point. If connected by a GSM modem transactions can be sent to the software using a mobile phone.

The project has conducted quantitative and qualitative usability testing. The next step is a pilot implementation in one SHG federation (approximately 100 groups). The web-based MIS will be deployed to provide users with the opportunity to gain familiarity with the computerized records and reports. Once the systems have been tested and firmly established in one federation, the project will document its learning and expand the implementation to cover three other federations in the region. Finally software, documentation and associated tools will be released as free and open source for use by institutions facing similar challenges.

Project Duration

Start Date: March 2005

End Date: March 2007

Total duration: 25 Months

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Policy and Social Research



Photo: Roger Harris

19. Evaluating the Impact of Universal Access Models, Strategies and Policies in ICT on Poor Communities in the Philippines
20. Diffusion of ICT in India: Labour Market Implications for Developing Countries
21. Policy for Integration of ICT Initiatives Across Rural Karnataka, India
22. Policy and Measures to Promote ICT Application and Deployment for Business Development in Rural Areas in Viet Nam
23. Roadmap for Process Re-Engineering for Extending e-Governance to the Disadvantaged, India
24. Effects of ICT on Media Transformation, Education and Training in Cambodia, Lao PDR and Viet Nam
25. Policy, Praxis and the Public Interest: Engendering a Strategic InfoComms Policy Research Programme in the Philippines

19. Evaluating the Impact of Universal Access Models, Strategies and Policies in ICT on Poor Communities in the Philippines

Grant Amount: US\$ 9,646.88

Keywords: ACCESS, POLICY, RURAL, URBAN, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to assess the relevance and impact of public policy and private strategy on access to ICT tools within poor communities in the Philippines.

Research Context

Access to information through ICTs can make an important contribution to sustaining and developing the lives of the urban and rural poor. While many ICT programmes are shaped by government policies and private sector strategies, empirical evidence on the nature and effects of these policies and strategies is lacking. This project addresses this problem by exploring the diffusion of ICTs to poor communities in the Philippines. The project assesses the relevance and impact of ICT diffusion by focusing on the gaps between policy and strategy and the livelihood needs of poor communities.

Target Beneficiaries

The beneficiaries of this project are poor communities who are in need of access to ICTs, government regulatory officials and policy makers working on improving universal access to ICTs, corporate strategic planners who want to tap potential markets in marginalized communities, and LGUs and community organizations who want to use ICTs in development projects.

Output

The project output is a handbook for use by government policy makers, advisers, advocacy groups and private sector entities.

Research Results and Outcomes

This research project investigated the extent to which people have access to ICTs, the characteristics of people who use ICTs, and how and for what ends ICTs are used. The project conducted household surveys in urban and rural *barangays*³ in Puerto Princesa City. The research defined key demographic traits in the communities and how they influenced ICT use. Although the survey areas were different in terms of infrastructure, size, topography and economy, demographics such as income, gender, education level and age were fairly consistent. Corresponding to this, findings were similar in both survey areas.

The study showed that awareness of ICT benefits was the primary factor effecting ICT use. The move from knowledge of an application, such as e-mail and the Internet, to actually trying them was seen to be effected by the level of education. The study clearly showed that people with higher education tend to use and value ICTs more. There was also a significant relationship between education level and the perceived need for services that use ICTs, particularly in the areas of work and study.

³ A *barangay* is a village, district or ward.

Of those people surveyed who knew how to use a computer, many did not possess a computer of their own. This suggests that the majority of users have access to computers through schools, offices, public Internet cafes or computer rental shops. Furthermore, of the respondents who had e-mail accounts, 64 percent said their office or school provided their account. The remainder had a free Internet-based account. This indicates the important role organizations (e.g. schools, workplaces, community organizations) play in providing access to ICTs. The study shows that household ownership of an ICT tool such as a personal computer did not necessarily indicate that everyone in the household knew how to operate it, although they were more likely to learn compared to those who do not have a PC in the house.

Findings from the survey did not indicate significant differences between females and males in ICT use, with the exception that more women use ICTs such as mobile phones and e-mail. This was found to be consistent with other studies.

The study highlights that policy makers need to consider the different ways by which people manage their limitations to access and the implications of how people send and retrieve information. To prevent information and knowledge-gaps from widening, the project suggests integrating traditional models of communication such as community radio, church bells and two-way radios with more modern ICTs like the Internet and cellular

technologies. The project also stresses the value of social intermediaries in bridging the information divide. Institutions such as schools, the workplace and NGOs offer important access points for individuals. Informal networks of friends and family also play an important role in building awareness and distributing knowledge.

The project produced a handbook entitled *Bridging the Information Divide: A Philippine Guidebook on ICTs for Development* (<http://www.apdip.net/documents/policy/misc/ph/bridging-info.pdf>) and disseminated it to policy makers, NGOs and public administration students working on information and knowledge management.

Project Duration

Start Date: March 2002

End Date: July 2003

Total Duration: 17 Months

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20. Diffusion of ICT in India: Labour Market Implications for Developing Countries

Grant Amount: US\$ 8,400

Keywords: ECONOMIC, EMPLOYMENT, PRODUCTIVITY, GENDER, INDIA

Geographical Coverage: India

Objective

The objective of this project is to examine how different modes of ICT use impact labour markets in developing countries.

Research Context

This project examines how different modes of ICT use impact labour markets where policy makers have encouraged ICT-based industrialization to simultaneously generate employment and improve economic productivity. While the emergence of a new ICT industry promises to generate employment, deploying ICTs to automate and rationalize existing industries also threatens to cause job loss and skill redundancies. The findings of this study provide policy makers in developing countries with insights into the trade-offs between improving productivity and employment generation when deploying ICTs.

Target Beneficiaries

The results of the study benefit various agents seeking to ensure work and employment standards in developing countries such as policy makers and labour representatives, particularly those representing women workers. The findings of this research have contributed to the field of labour economy theory through advancing the understanding of the impacts of ICT diffusion in developing economies.

Outputs

The primary output of the project is an analytical report on the impact of ICTs on the labour market in India and its significance for other developing countries. The report is freely available to download at http://www.idrc.ca/panasia/ev-70651-201-1-DO_TOPIC.html. A limited number of hard copies are also available for free distribution to those who request them. In addition to the analytical report, the project also generated at least 300 hours of interviews on the effects of ICT-based industrialization. The interviews are archived and preserved by the project coordinator, Dr M. Vijayabaskar, and are available to other researchers.

Research Results and Outcomes

While successfully completed, the project noted that it encountered several difficulties in conducting its research work. The first obstacle was the lack of an official database on labour conditions in the Indian IT and Information Technology Enabled Services (ITES) sectors. The second more substantial difficulty was that the project found employers were reluctant to allow them to conduct interviews with employees. The project recommends that the State should provide a mandate compelling firms to allow researchers to conduct fieldwork, at least from government-recognized research institutions.

Despite these setbacks, the research followed its planned course of development with some minor modifications. The research study began with a detailed review of the literature to locate the issue in larger theoretical debates on the impact of ICTs on labour markets. Subsequent to this exercise, the automobile and ITES sectors in India were selected for the focus of the research study. Secondary data pertaining to these two sectors was collected and used to stress the relevance of the choice and to delineate their key characteristics. The project went on to develop questionnaires and conduct interviews in each industry, modifying its approach due to the access issues mentioned above. Based on the findings of the research, one paper has been published and at the time writing, another one was in the process of production. Papers based on this study have been presented in two AMIC conferences and at three conferences in India.

The study results offer a detailed analysis of how the new organizational shift towards a more global, flexible mode relies heavily on deployment of ICTs to coordinate decentralized production and distribution. The study focuses on the impact this trend has had on the generation of quality employment, especially for women, and it covers such areas as skill polarization, de-skilling, disintermediation, gender neutrality, labour market flexibility and autonomy at work.

The study indicates that deployment of ICTs does increase employment opportunities for women. The ability of women to access such employment opportunities however depends upon first, access to skills and, second, a strong household-based care economy that allows them to move into high intensity paid

employment. In addition, while ICTs may enable more employment opportunities for women, that does not imply improved gender equity. Many jobs remain highly gendered and the fluidity of the gendering process also allows re-gendering, whereby men occupy jobs traditionally seen as 'feminine'.

The study stresses that the effects of introducing ICTs into the workplace depends on a wide range of technical, social and market factors. It does not, however, see a clear correspondence between diffusion of ICTs and employment generation and quality of work. While ICTs enable the creation of new kinds of jobs they also undermine the need for other kinds of jobs. The net effect depends upon the nature of labour market institutions that facilitate labour to move from vanishing jobs to new ones. The study demonstrates that public policy plays a critical role in ensuring positive outcomes.

Project Duration

Start Date: April 2002

End Date: May 2003

Total Duration: 13 Months

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21. Policy for Integration of ICT Initiatives Across Rural Karnataka, India

Grant Amount: US\$ 15,019

Keywords: INTERNET, GOVERNANCE, POLICY, RURAL, INDIA

Geographical Coverage: India

Objective

The objective of this project is to develop strategies and policy recommendations for the integration of ICT interventions in rural Karnataka, India.

Research Context

The Karnataka Government has initiated a range of e-governance initiatives for enhancing rural development. The implementation of these initiatives, however, has not had the expected impact for the rural population due to insufficient inter-departmental coordination and lack of integration with private sector organizations working on similar initiatives. This research project develops strategies and policy recommendations for the integration of ICT interventions in rural Karnataka, encompassing available infrastructure, applications, information and human resources with the aim to accelerate rural development through leveraging ICT interventions.

Target Beneficiaries

The integration of ICT interventions benefits the rural community of Karnataka, the local government and the private sector.

Outputs

- An interim research report that analyzes preliminary findings of the research; and
- A final report with research findings, policy recommendations and a practical implementation methodology for the effective integration of ICTs in rural Karnataka.

Research Results and Outcomes

At the time of writing, no final report was available on this project. At the time of the interim report, much of the proposed research on the provider side had been completed and a number of conclusions had been reached. However, the final goals of proposing systems that could provide the rural population of Karnataka with ICT-based multi-sector advantages and initiating private entrepreneurship models that could make the ICT schemes sustainable, had not been reached.

The project began by examining the existing infrastructure, services and human resources provided by government authorities, non-profit organizations and the private sector. The project produced a compilation of ICT initiatives across the state that profiled 36 organizations. Government departments were profiled in the sectors of public administration, communication, energy, agriculture, commerce, financing, taxation, education, health and family welfare. Also profiled were private sector companies that manufacture ICT

equipment and provide ICT services for rural communities, a nationalized bank providing microcredit services in Karnataka, and a number of NGOs working on rural ICT initiatives. This compilation was regularly updated during the course of the project as more information became available.

Preliminary research found that most initiatives are planned with a pilot-based approach and, in many cases, rely on funding and subsidies to make the model a success. None of the initiatives studied were economically sustainable through private enterprise on a large scale. The researchers found little integration either within sectors or across sectors. Although service providers indicated they understood the relevance of collaborating with others, concern over the dilution of their distinct mandate resulted in a lack of action. The potential for collaboration is further hampered by the lack of an apex body that is analyzing the needs of the community in relation to the services being offered. Thus the larger context in which the various sectors function has not been presented.

Two technical issues were revealed in the review. First, nearly every service provider identified the power situation in the state as being a major bottleneck to ICT initiatives. Many pilot projects have addressed this issue through the provision of power supply equipment such as UPS units and diesel generator sets, but these were not considered adequate in the long run. Renewable energy

devices have been considered, but the high capital investments made them prohibitive. The second obstacle is that connectivity was found to be unreliable across rural Karnataka, although the project noted that efforts using a variety of technologies were being undertaken to address this problem.

At the time of the interim report, the researchers had yet to map the needs of the villagers and cross-reference these with the services that are being provided. The mapping is intended to draw on surveys conducted in two villages where ICT initiatives are operational. Since to date, no reports were available on the project's assessment of community needs, it is difficult to assess the use, effect and impact of services being offered to the rural public using ICTs.

Project Duration

Start Date: December 2003

End Date: July 2004

Total Duration: 8 Months

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22. Policy and Measures to Promote ICT Application and Deployment for Business Development in Rural Areas in Viet Nam

Grant Amount: US\$ 29,500

Keywords: INTERNET, GOVERNANCE, POLICY, RURAL, VIET NAM

Geographical Coverage: Viet Nam

Objective

The objective of this project is to prepare policy recommendations to increase the use of ICT tools in rural business.

Research Context

The rapid development of ICTs in Viet Nam has created opportunities and challenges for socio-economic development in rural areas. This project focuses on the shift to new modes of economic activity influenced by the application of ICTs by investigating the policy environment and the experiences of grassroots organizations, businesses, and households in rural areas. The project aims to produce recommendations for policy-making that can be used by government authorities and businesses to increase ICT development in rural areas.

Target Beneficiaries

The project contributes to the formulation of strategy, policy and master plans that promote ICT development in rural areas of Viet Nam. Government bodies, donor agencies, researchers, companies and local communities in rural areas can use the study for funding plans, input for further research, awareness raising campaigns or education and training.

Outputs

- Recommendations on policy measures;
- Report on policy affecting deployment of ICTs in rural areas of Viet Nam;
- Report assessing ICT application for business development in rural areas in Viet Nam;
- Report on experiences from other countries on ICT deployment in rural areas; and
- A final project report.

Research Results and Outcomes

At the time of writing, no final report was available for this project although it had completed a number of its stated objectives and outputs as outlined below.

The project held an inception workshop on ICT development in Viet Nam. Among the more than 70 participants in this workshop were ICT experts, researchers, policy makers, officers from ministries, government organizations, NGOs, ICT software and hardware developers, service providers, ICT training centres and universities, small- and medium-sized enterprises (SMEs), and households from villages in the Red River Delta and Northern Viet Nam.

The project completed an assessment of the current state policies and strategies on ICT development in Viet Nam. The assessment covered a review of legal documents and included a series of interviews with

government officials from provinces and ministries on the current situation and future vision for ICT development in rural areas.

The project completed the compilation of foreign experiences on challenges in ICT deployments in rural areas, their social and economic impacts, common policy frameworks, and common strategies for successful initiatives.

The project is conducting a national survey of business enterprises in rural areas. The survey will be used to assess the impact of ICTs on business development, and analyze the difficulties, needs and readiness of businesses. The survey will also consider how the ICT policy environment affects businesses.

Recommendations of the researchers have contributed to the development of government ICT policy and strategy documents. Among the most notable of these are the *National Strategy for ICT Development to 2010*, *ICT Orientation to 2020* and the *National Master Plan for Telecommunications and Internet Development to 2010*. ICT for rural areas and business development has been highlighted in these documents.

Some research results have also been utilized in other research projects such as e-Commerce Development in Viet Nam, Development of Traditional Villages in Viet Nam, Measures to Provide Science and Technology Information to Rural and Remote Areas, and FOSS for ICT Development. Completed work to date, related documents and materials are available from the project office.

Project Duration

Start Date: August 2004

End Date: May 2006

Total Duration: 22 Months

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23. Roadmap for Process Re-Engineering for Extending e-Governance to the Disadvantaged, India

Grant Amount: US\$ 8,888

Keywords: INTERNET, GOVERNANCE, POLICY, COMMUNITY, INDIA

Geographical Coverage: India

Objective

The objective of this project is to explore ways of using ICT tools for integrated delivery of government services to Indian citizens, in particular disadvantaged groups.

Research Context

Many state and local level governments in India are in the process of developing ICT solutions to provide integrated delivery of services to citizens. Attempts however, have not delivered on services that require complex organizational processes, such as cross-referencing, discretion, evaluation and judgment. These types of processes are often essential to serve disadvantaged sections of society. This research project aims to study six initiatives in India, and combine its findings with the experience of Centrelink (<http://www.centrelink.gov.au>), a community service department of the Government of Australia. The project goal is to develop a roadmap for process re-engineering and integrated service delivery. The outcomes of the research are policy briefs for governments and guidelines setting up front-end agencies for e-governance services.

Target Beneficiaries

The direct beneficiaries are the state governments involved in e-governance initiatives and administrative reforms in India. The ultimate beneficiaries are the citizens of India themselves, particularly the disadvantaged.

Outputs

The output of the research study is a document that will serve as a policy brief for the government and provide guidelines for implementing officials. It includes detailed documentation of issues and solutions for developing an e-governance front-end agency and a road map from the present *ad hoc* arrangements to a full-fledged institutionalized agency or department with appropriate outreach components.

Research Results and Outcomes

This project was still in progress at the time of writing, however interim reports indicate that government online services in India are still at a developmental level. The project sees the most critical issue is that many ICT initiatives have not motivated any fundamental changes in the way government works or in the way public services are provided. Several issues have been identified as cause of this, such as a lack of ownership at the ministerial level or that ministries consider e-governance to be an IT issue, not one of changing the way government works. The result, however, is that little structural change is underway in the Indian administration, change that is necessary for e-government services to evolve.

The project will compare and contrast the situation in India with the experience of Australia's CentreLink, the front-end

department for all other departments. This online service provides 60-70 percent of all welfare services delivered and is recognized as an independent ministry. The project will compare this with six initiatives undertaken by different states in India, representing different models at various stages of maturity. One example given was in Kerala, where the IT Ministry has initiated a programme called Akshaya – a large multi-stakeholder wireless network used to devolve responsibilities to the local level.

The results of the comparative analysis will be used to develop policy briefs for the Indian government and a series of guidelines on setting up front-end agencies for e-governance services. The briefs will be used to make policy recommendations to government departments throughout India.

Project Duration

Start Date: April 2006

End Date: September 2006

Total Duration: 6 Months

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24. Effects of ICT on Media Transformation, Education and Training in Cambodia, Lao PDR and Viet Nam

Grant Amount: US\$ 19,269

Keywords: MEDIA, INTERNET, ACCESS, CAPACITY BUILDING, CAMBODIA, LAO PDR, VIET NAM

Geographical Coverage: Cambodia, Lao PDR, Viet Nam

Objective

The objective of this project is to survey the extent to which ICT tools have been integrated into the media industry.

Research Context

While the Internet is widely used in Cambodia, Lao PDR and Viet Nam, the systematic integration of ICTs into the news industry is not evident. This limits the industry's accessibility to global information resources, connectivity among journalists and its contribution to participatory politics through dissemination of public interest news. This project responds to the lack of research on ICTs in Cambodia, Lao PDR and Viet Nam media by surveying how ICTs are currently integrated into the industry. It aims to identify the strategic application of ICTs for reporting public interest issues in a state-controlled media environment. Based on its assessment, the project will produce a range of reports and learning tools to increase integration of ICTs into the local media industry.

Target Beneficiaries

The immediate beneficiaries are journalists and media educators in Cambodia, Lao PDR and Viet Nam. At the regional level, aid agencies, government organization and "think tanks" focused on the development of ICTs in the region can benefit from the analysis and reports. At the global level, the academic community and media-research funding organizations benefit

from a better understanding of how ICTs are being applied to journalism in a region that is relatively undocumented.

Outputs

- An assessment of ICT application needs by journalists in Cambodia, Lao PDR and Viet Nam;
- A profile of the journalists' strengths, limitations and opportunities for ICT applications;
- An industry report on existing ICT support systems for journalists;
- A regional training and education model for ICT-assisted journalism;
- A learning resource manual; and
- A 45-minute digital video recording of interviews with journalists and government representatives.

Research Results and Outcomes

To date, this research project has gathered relevant empirical data on ICT issues and training needs for newspaper journalists in Ha Noi, Phnom Penh and Vientiane. The project has found that, contrary to general assumptions, the Internet has not brought about a significant transformation in the way that journalism is practiced or produced. This is due to software limitations, high cost of Internet connections and inadequate infrastructure support within the media organizations. Political factors were not perceived to be critical impediments in the wider use of Internet by journalists.

The project research methodology combines primary literature reviews, policy studies, empirical surveys, personal interviews with newspaper editors and government officials, and an ICT needs and inventory study based on a structured questionnaire. The questionnaire was piloted with 65 journalists in Ha Noi in December 2005. Based on the results of the pilot the questionnaire was refined.

With the background research complete, the researchers traveled to Ha Noi, Phnom Penh and Vientiane to meet with the country researchers and provide on-site training in questionnaire administration, data coding, and how to conduct the interviews. Country researchers arranged interviews with journalists, editors and relevant government representatives. All interviews were recorded by a digital video camera. The project devoted significant time to observing operations in the local newsrooms and examining journalist's access to Internet connectivity and the availability of computers and telecommunications services. Cultural issues such as the use of different Asian languages on the Internet were also examined, along with the problems of displaying languages that do not use the Roman alphabet on the Internet.

The strength in this project lies in the corroboration of data from the questionnaire survey with the on-camera interviews with editors and policy makers. The utilitarian focus of the project takes the discussion of Internet usage in the newsroom beyond academic inquiry. The project's weakness, perhaps, may lie in the fact that the questionnaires were translated into Vietnamese, Lao and Khmer by the country researchers. Every effort, however, was made to ensure that the translations were correct by vetting the translated questionnaire

by a second reader. The inventory check of infrastructure support in the media organizations was less than satisfactory as the respondents had difficulties in providing accurate figures of, for instance, how many office computers were connected to the Internet.

The project focuses on pragmatic issues such as the journalist's access to technological infrastructure support facilities, economics and work routines. Results point to varied levels of language, economic, hardware and software constraints that the journalists face in their use of the Internet in the newsroom. The empirical data obtained from the survey are anticipated to be of use to foreign agencies that plan to deploy media training programmes in the target areas. The project report will provide a basis for formulating policies to facilitate full integration of Internet technology into the daily operations of news organizations. The results are anticipated to be used in the development of a continuing education programme focusing on ICT-assisted reporting techniques for local journalists. The project anticipates that this training and education model will be its primary contribution to journalism in Cambodia, Lao PDR and Viet Nam.

Project Duration

Start Date: August 2005

End Date: December 2006

Total Duration: 17 Months

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25. Policy, Praxis and the Public Interest: Engendering a Strategic InfoComms Policy Research Programme in the Philippines

Grant Amount: US\$ 26,477

Keywords: GOVERNANCE, INFORMATION MANAGEMENT, POLICY, PHILIPPINES

Geographical Coverage: The Philippines

Objectives

The objectives of this project are to examine critical ICT policy issues with clear public interest implications in the Philippines and to engender a multi-stakeholder approach to policy development.

Research Context

This project aims to support and strengthen the recently set up Philippine CICT by examining critical ICT policy areas with clear public interest implications. It targets issues where it is seen that public policy is underdeveloped and where civil society can make a positive contribution. The project aims to develop seven research papers on strategic policy areas, using a multi-stakeholder approach during production and validation. Roundtable discussions and validation workshops will complement the research process and produce outputs that benefit the national and regional community with sound information and communications policies. This process is seen to strengthen a public interest multi-stakeholder constituency that will actively engage in the implementation and oversight of each policy area studied.

Target Beneficiaries

The direct beneficiary is the grant recipient's project partner, CICT, to which the outputs of this project will be turned over. Indirect beneficiaries are other policy stakeholders in

the Philippines, policy communities in other countries of the Asia-Pacific region, and ultimately the people of the Philippines.

Outputs

The production of research papers in seven areas of information and communications policy that correspond to Philippine national priorities for policy development. For each policy research area, the project will conduct roundtable discussions and research validation workshops involving strategic stakeholders in Philippine information and communications policy development (with CICT and attached agencies, academe, key IT associations, NGOs and other civil society organizations). The project will publish the papers, including relevant outputs of the related roundtable discussions and validation workshops, in monograph form or as a single volume in online and offline (CD) versions. The policy research papers include:

- Internet Governance for the Administration of Country Code Top-Level Domains (ccTLDs);
- Internet Governance and Policy Implications for Emerging Technologies and Universal Access Programmes;
- The Question of Agency in InfoComms Policy Development: An evaluative history of Philippine ICT governance from an institutional standpoint;
- FOSS: Evolving a policy framework and action plan for the Philippines;

- WSIS@PH: An assessment of Philippine participation in international spaces, national processes;
- Locating the Digital Divide in the Philippines; and
- Mainstreaming Gender Issues in ICT Policy Development.

Research Results and Outcomes

This project seeks to engender a new way of developing policy that relies on the research capacities of different stakeholders and the balancing of quantitative and qualitative indicators and methods. To achieve this, a multi-stakeholder approach is embedded into the project. This collaborative research methodology ensures participation of various stakeholders from different sectors throughout the project development process. Thematic roundtable discussions provide input before the research papers are prepared, and research validation workshops provide further input after the drafts are finished. The project also places emphasis on a knowledge sharing framework. Most of the papers consult existing state-of-the-art research and, similarly, outputs will be widely disseminated internationally. It is foreseen that these processes can form the basis of ongoing knowledge networking with governments and NGOs in other developing countries.

The thematic areas covered by the project involve a broad array of information and communications concerns which cut across sectors and issues, such as FOSS, ccTLD administration, digital divide indicators, gender, emerging access technologies, participation in international forums, and policy institutions. Research agendas for each thematic area necessitate different methodologies that cut across various disciplines - both on the level of theory and praxis. Some of the research areas also suggest new data sets that may be important for the government to consider in its

statistical systems. Each thematic area will be used to pinpoint and mobilize a multi-stakeholder community based on practice and interest within civil society and with government agencies. This broad-based process is seen to adhere to the principles of inclusion, participation and knowledge networking. The policy development focus of the project is a key component of sound, multi-stakeholder governance in the area of information and communications. Hopefully, governance mechanisms will be improved, as the project will seek to demonstrate the value of multi-stakeholder policy development.

The project has noted several factors that effected progress. First, a number of the researchers could not be mobilized according to the original timetable for a variety of reasons. This caused some delay, as some of themes being explored are specialized areas, and it was difficult to find alternatives. The project notes, however, that to date all of the seven papers are in various stages of production. In addition, some of the thematic areas are "live" - meaning, these are current areas of actual policy debate. The project noted that it was a challenge to keep up with policy processes and make the research relevant to governance realities. The project also notes that since a primary beneficiary and partner is CICT, there has been a need to be flexible in response to political developments and transitions in that government agency.

It is envisioned that all of the research outputs will be integrated to make concrete submissions to the Philippine ICT Strategic Roadmap of the CICT. The research process also seeks to empower non-government actors such as NGOs, academe, activists and gender advocates to continually engage in policy development for the public interest. Broad dissemination of the results will facilitate sharing of this knowledge internationally with similarly placed civil societies.

Project Duration

Start Date: June 2005

End Date: December 2006

Total Duration: 19 Months

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Technical Innovation

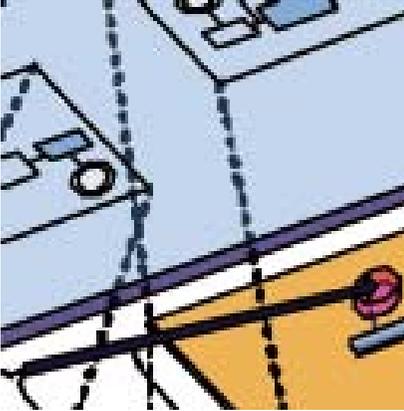


Image: Beijing Earthview Environment Education and Research Center

26. Nafees Nastalique: Character-Based Nastalique Font for Urdu, Pakistan
27. ICT-Assisted Learning Tool for the Deaf in Pakistan
28. Building a Philippine IPv6 Research Network
29. Nepal Internet Exchange
30. Free and Open Source Software Localization Toolkit
31. Scientific Journal Publishing in India: Indexing and Online Management
32. Dobhase: English-Nepali Translator
33. Developing a New Resource Sharing System and a New Tool to Use Electronic Materials in Multimedia Format Based on Grid Technology, China
34. Mongolian Text-to-Speech Conversion Tool
35. Open Source GIS/Mapping Solution for the Indian Tsunami Information Resource Centre
36. Automatic Synchronization and Distribution of Biological Databases Over Low-Bandwidth Networks Among Developing Countries
37. Development of a Real-Time and Mobile Integrated Water Quality Monitoring System Based on ICT: A Study Case in Ha Long Bay, Viet Nam
38. IPv6 Tunnel Broker: A Key for Using Next Generation Internet in Developing Countries, Thailand
39. Shahmukhi to Gurmukhi Transliteration Solution for Networking, India and Pakistan
40. VClass SIP-Based Mobile Classroom

26. Nafees Nastalique: Character-Based Nastalique Font for Urdu, Pakistan

Grant Amount: US\$ 29,833

Keywords: LOCALIZATION, OPEN TYPE FONTS, URDU, PAKISTAN

Geographical Coverage: Pakistan, Global

Objectives

The objective of this project is to develop a Nastalique font for Urdu.

Research Context

Urdu is written in Nastalique script, which is cursive and has a complex and context-sensitive structure. Its application for computers and the Internet have been limited by a lack of quantitative detail on its rules and the mathematical inability of traditional fonts such as True Type to model its complexity. Recent advances in font technology such as Open Type Font (OTF) now enable the modeling of complex scripts like Nastalique. This project performed a quantitative analysis of Nastalique rules and modeled them using OTF. The project results provide the facility for users to disseminate information in Urdu language through electronic media. As OTF is a formal standard, no specialized software is required to read and render this font.

Target Beneficiaries

Definition and free disbursement of Nastalique font for Urdu accelerates Urdu publishing through electronic media and benefits the 60 million readers of Urdu across the world. In this group, those who do not understand a second language (e.g. English) are able to publish and access web pages, e-mail, chat and a variety of other computer applications.

Outputs

The output of this project is a character-based Nastalique font for Urdu. The project also produced research papers quantifying Nastalique rules with significant detail and analyzed methods for modeling and rendering complex fonts.

Research Results and Outcomes

In its effort to model a Nastalique font, the project sought to understand the font's underlying principles, including the calligrapher's intuition. Through a series of lectures on Nastalique, in-depth discussions with calligraphers and the analysis of handwritten books, the project matured its perception of Nastalique's inherent architecture and enhanced the knowledge base of its writing style. At the end of this research, the project succeeded in consolidating Nastalique and producing its logical model. Major research results include: capturing context-sensitive substitution grammar of Nastalique, formulating its cursive positioning rules, deriving optimized Nuqta (marks on alphabet) placement rules, and implementing kerning rules where necessary. These results also have the benefit of preserving the rich cultural heritage of Nastalique calligraphy.

Towards the end of its effort, the project faced unexpected limitations in OTF specifications. Within these limitations the project sought the optimal solutions. The project work tested existing OTF technology for font development,

identified its limitations (with reference to Nastalique font) and indicated areas where enhancements are needed. The project team notes that the OTF font model is now being extended, allowing greater capacity to realize more complex fonts such as Nastalique. Regardless of this, the project met its objectives and target outputs and the Nafees Nastalique font was released. This font is freely downloadable at <http://www.crupl.org>

The project team credits the hard work of students at the Centre for Research in Urdu Language Processing (CRULP) and the calligraphers who worked with a great deal of understanding and patience with the team of computer scientists. The project built capacity at CRULP to develop fonts and this capacity is now being shared with other organizations. The project has enabled CRULP to develop a partnership with PAN Localization, Microsoft's Language Interface Pack for Urdu (<http://www.PANL10n.net>). CRULP also won a grant from the Government of Pakistan to develop a software system for machine translation.

The results have provided 60 million Urdu users with an essential tool to develop and publish web pages as well as to access Urdu content on the Internet. On project completion, the project team felt that the overall impact of the project could not be fully realized without a significant outreach programme to train the end-users across the country. Since that time, however, over 25,000 downloads of the font have been made from the project website, indicating that a significant number of people are using the font for development of Urdu documents online in standard Unicode format.

An additional issue that came up was whether it is in the best interest of the font to be free and open source as required by the grant. The main issue is that the font can be freely manipulated and, if this is done poorly, its aesthetic and functional properties could be degraded. Also related to this matter are the commercialization opportunities inherent in the development of such products. For example, the project was contacted by BBC UK who wanted to purchase rights for the font so that they could modify it for the BBC Urdu website. The project team recommends that administering agencies should look into advising and guiding their partners in relevant intellectual property rights issues and making the agreement more detailed in this area.

Project Duration

Start Date: March 2002

End Date: August 2003

Total Duration: 18 Months

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27. ICT-Assisted Learning Tool for the Deaf in Pakistan

Grant Amount: US\$ 28,500

Keywords: HEALTH, HEARING IMPAIRED, CAPACITY BUILDING, URDU, PAKISTAN

Geographical Coverage: Pakistan

Objective

The objective of this project is to use emerging ICT tools to develop an Urdu Pakistani Sign Language (PSL) learning model.

Research Context

New ICTs offer a flexible medium for hearing impaired people to communicate. This research project focused on practical and replicable learning solutions for the deaf in Pakistan. The solution was modeled using online and CD technologies. The CD is comprised of easy-to-understand lesson plans and assessment tests, graphically illustrated using PSL. Selected data sets from the exercises are also made available online through the Internet as a freeware for download by the hearing impaired community. The product can be adapted across the country to increase the integration of the deaf and hearing impaired into society.

Target Beneficiaries

The beneficiaries are Pakistani deaf and hearing impaired individuals and academic staff in education institutions.

Outputs

The project website (<http://www.special.net.pk>) and CD include the following components:

- An Urdu PSL compendium dictionary of 500 words;
- 50 new environmental terms in PSL;

- Font conversion utility; and
- Sign alphabets, basic Urdu PSL grammar and traffic signs.

Research Results and Outcomes

PSL is the main form of communication for Pakistan's hearing impaired people. PSL presently contains approximately 4,000 different gestures with diverse dialects. The project started with a multi-purpose aim of coming up with a selected set of usable Pakistani sign language gestures and introducing ICT-based education tools for the community. ICT as a communication medium and learning instrument were used to enhance access to PSL, facilitate uniformity and improve literacy of the hearing impaired.

The project's first phase explored and developed the PSL symbol set. The project completed a literature review of available PSL resources and documentation detailing the methodology for compiling a representative set of new and existing PSL. These results from the study formed the basis for evolving technological education variants under the second phase of work. This phase involved developing software for converting Urdu alphabets to PSL, defining the PSL font structure, and modeling PSL for CD packs and the web. A unique aspect of the project was to infuse an awareness of environmental concerns into the hearing impaired curriculum through the development and introduction of PSL environmental terms.

The last two phases of the project focused on research to evaluate multiple learning approaches using ICTs and exploring the various options of online and offline instruction techniques for the hearing impaired. Thus, the research resulted in the development of a CD-based learning tool for the hearing impaired. The CD is distributed through the Pakistan Association of the Deaf and the contents are available for download from the project website (<http://www.special.net.pk>). The launching of the CD received coverage in the most widely distributed English language publication of Pakistan (see: <http://www.dawn.com/2004/03/08/local10.htm>).

The project noted several challenges it faced in carrying out its work. In particular, it cited difficulties working within the somewhat fragmented and complex political dynamics of the special education sector. It also noted that the perception of ICTs as a tool of the elite was a hindrance to adoption of the new tools, although with continued integration of computers and ICTs into schools this was seen to be less of a problem in the future. In addition, the project approach, which was to promote the use of ICTs for sustainable development, was something new in Pakistan's special sector.

The main challenge lies in the dissemination of the CD to relevant institutions and target beneficiaries. As the project has ended and the team members of the project are working in other organizations, the overall dissemination of the product has suffered after the project's completion. The project recommends that the Pan-Asia ICT R&D Grants Programme further support dissemination and showcasing of the project work.

Project Duration

Start Date: December 2002

End Date: November 2003

Total Duration: 12 Months

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Reference Websites

<http://www.special.net.pk>

<http://www.dawn.com/2004/03/08/local10.htm>

28. Building a Philippine IPv6 Research Network

Grant Amount: US\$ 8,990

Keywords: INTERNET PROTOCOL, IPV6, NETWORK DEVELOPMENT, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to initiate IPv6 use by the PREGINET infrastructure.

- Online documentation of technical details and creation of *how-to guides*; and
- Final research report on the project experience and recommendations on universal access strategies and policies.

Research Context

While the Philippines has experienced a rapid rate of adoption of the Internet since 1993, it has been slow to adopt IPv6, the new IP standard that increases the address size to 128 bits and solves address availability problems. Considering high level of Internet use in the Philippines, this project recognized the need to start building internal capability and a knowledge base on IPv6. The education institutions involved in the project used a test-bed to explore transition mechanisms and pursue in-depth research on the protocol. The project is sustained by PREGINET.

Target Beneficiaries

The direct beneficiaries in this project are the participating educational institutes. This includes the faculty that builds the test-bed (an added research component in their laboratories) and the students who use it to conduct research on IPv6. The project benefits members of the academe, government institutions, and the IT industry that participated in seminars, trainings and workshops organized by the project. Philippine Internet users in general benefit through the diffusion of IPv6.

Outputs

- Papers outlining research findings delivered to at least two conferences or meetings;

Research Results and Outcomes

ASTI initiated IPv6 research in the Philippines through the Asian Internet Interconnection Initiatives Project (AI3). ASTI drew on that experience for this project.

The project began with a call for participation and selected three partners based on the criteria of technical capability and geographic representation of the three major island clusters in the Philippines. The partners selected were the Electrical and Electronics Engineering Department of the University of the Philippines (UP-EEE) in Diliman, Quezon City, the Mindanao State University – Iligan Institute of Technology (MSU-IIT) in Iligan City and the Central Visayas Information Sharing Network (CVISNET) in Cebu City. The project team experienced some difficulties during the initial implementation due to a lack of experience with the intricacies of IPv6 among some of the institutions involved. There were also challenges relating to the fact that CVISNET and MSU-IIT are remote sites although the ultimately successful partnership demonstrates that distance is not necessarily a hindrance in achieving collaborative research.

The project has had a wide range of outputs beyond those outlined in the original proposal. It conducted a number of workshops on IPv6

routing, domain name system (DNS) servers, web servers, web proxies, e-mail and IPv6-enabled applications for faculty, students, government staff and project managers. It organized an IPv6 Forum on applications, operations and business models that companies can use when adopting IPv6. The project deployed hardware to the three project sites, including computers, routers and application servers. It also connected several non-partner institutions to the test-bed. CVISNET, UP-EEE and MSU-IIT were able to establish IPv6 connectivity to ASTI, and to other international IPv6 networks through ASTI and AI3.

The project developed a number of presentations and materials. It produced a paper for the IPv6 Promotion Council Retreat entitled *Hurdles and issues in advancing IPv6 deployment in the Philippines* presented in the IPv6 Summer Retreat in Seoul, Korea on 23 August 2003. The project supported two Asia-Pacific College undergraduate students who developed Macromedia tutorials and an award-winning project by the students from MSU-IIT called *Dynamic DNS Solution for a Campus Network*. It made technical presentations on IPv6 to the Philippine Internet Services Organization. The project attended the APAN Conference held in Fukuoka, Japan, 22-24 January 2003 and PREGINET attended the first Asia-Pacific Global IPv6 Summit, APRICOT 2003 Conference in Taipei, Taiwan. The project provided research assistance to an undergraduate thesis entitled *Internet Protocol Version 6 (IPv6) Implementation for the AMD Net 186 Demonstration Boar*. Finally, the project provided technical support to the first Philippines IPv6 mailing list. The list supports research and deployment of IPv6 in the Philippines through the exchange of theoretical and practical information.

ASTI's aim of deploying IPv6 in the Philippines has been enhanced through collaboration with

schools and universities, ISPs, telecommunications companies, and other IPv6 stakeholders. The range of seminars, workshops and reports developed by the project has increased awareness and appreciation of IPv6 within the government and the network engineering community of the Philippines, and contributes to the global IPv6 research and development community and related advocacy efforts. The IPv6 network developed through this project continues to be used by faculty, researchers and students of participating institutions as a test-bed for the design, development and testing of IPv6 applications. ASTI continues to conduct research and development in IPv6.

Awards

Dynamic DNS Solution for a Campus Network project of the students from MSU-IIT was among the top 20 Grand Prize Winners of the 2004 Linux Scholars Challenge.

Project Duration

Start Date: November 2002

End Date: September 2003

Total Duration: 11 Months

Contact Information

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<http://www.ai3.net>

29. Nepal Internet Exchange

Grant Amount: US\$ 9,000

Keywords: INTERNET EXCHANGE, INTERNET SERVER PROVIDER, INFORMATION MANAGEMENT, NEPAL

Geographical Coverage: Nepal

Objective

The objective of this project is to address the problems associated with local Internet traffic routing within Nepal.

Research Context

Many ISPs in Nepal have their own international gateway. Since there is no way to separate local from international traffic, local traffic must traverse the global Internet backbone before reaching the ISP in the next block. The formation of a local Internet Exchange (IX) facilitates the exchange of local traffic while reducing the load on global gateways. The research importance of the Nepal Internet Exchange (NpIX) continues to increase as the size of the Internet community in Nepal grows. A joint NpIX working group, with participation from all stakeholders, did much of the preliminary work and a sustainable operational modality for the NpIX was established. An NpIX board with representation from all relevant bodies oversaw the entire project, including development of appropriate procedures and processes for the operation of the IX.

Target Beneficiaries

The project beneficiaries are ISPs and users who benefit through preservation of bandwidth and Internet access. The NpIX also provides a “looking glass” facility for researchers to ascertain the size of the Internet infrastructure in Nepal.

Outputs

The project documented the procedures and processes required for the establishment and operation of an IX. Other countries can study the results as they consider establishing their respective IX.

Research Results and Outcomes

At the time the project was implemented, there were about 15 companies providing commercial Internet services in Kathmandu, some of which also had a presence outside the Kathmandu Valley. More than half of these had their own international gateways and several had international connections through satellite links. As there was no way to separate international traffic and local traffic, all traffic would have to pass through the international gateways before reaching the ISP next door, resulting in extra expenditure, slower Internet access and hindering broadband deployment. Additionally, almost all ISPs in Nepal were using static routing in their respective IP networks. This created constraints in network management and did not provide automatic switchover if the network link went down.

The NpIX was established following the London IX standards. Its goal was to enable the exchange of local traffic between the ISPs, content providers and network operators in Nepal. To evaluate the significance of the IX, the project team collected data from the ISPs and peering partners using statistical analysis,

questionnaires and interviews. Internet use patterns and data flow directions was established through data collected at the IX and in cooperation with the ISPs. This research enabled the establishment of an online data exchange facility that provided aggregated data on the total traffic flowing through the Internet Exchange Points (IXPs). A detailed analysis based on information provided by the ISPs was published every three months.

The project held training workshops every three months to provide ISPs with the necessary skills to use the IX. Training focused on Border Gateway Protocol (BGP) peering technology. All the ISPs successfully upgraded to dynamic routing with Open Shortest Path First (OSPF) and BGP. The IX is now stable, so if one of the peers or the IX fails, all the peer traffic is now automatically routed through the Internet gateways of the respective ISPs.

With the introduction of the NpIX, ISPs are now able to separate international traffic and local traffic. The IX facilitates the exchange of local traffic. This has benefited the ISPs directly through preservation of bandwidth and a 10 percent increase in cost effectiveness. The NpIX project also provides a "looking glass" facility for researchers to ascertain the size of Internet infrastructure in Nepal. The government has benefited as the IX is the platform that hosts the government portal, including the content generated under its e-government programme. Finally, users experience faster and more reliable connections. The results from NpIX provide a convincing set of economic reasons for policy makers in developing countries to form an IX.

The project team achieved its objectives and is actively working to improve and expand the

exchange facility by enrolling more ISPs, universities, educational institutes and corporate networks. NpIX is conducting continuous research, for as the Internet infrastructure grows such research will continue to help solve IP issues, routing and other problems.

The establishment of an IX in any country or region helps foster the growth of the local IT and Internet industry. However, the project team notes that an IX can only be successful with the full cooperation of the ISPs. Educating the ISPs about how to set up the networks is more valuable in the long run than having experts do it for them. In addition, the core team must consist of people who possess a good understanding of the Internet routing system and have the trust of all the local participants. Based on the findings of the project, the team recommends giving the participants in the IX full control over their network routing infrastructure.

Project Duration

Start Date: January 2003

End Date: October 2003

Total Duration: 10 Months

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30. Free and Open Source Software Localization Toolkit

Grant Amount: US\$ 29,732

Keywords: FREE AND OPEN SOURCE, SOFTWARE, LOCALIZATION, CAMBODIA, ASIA-PACIFIC

Geographical Coverage: Cambodia, Asia-Pacific

Objective

The objective of this project is to reduce the necessary research, work and expertise that a country or group needs to undertake a localization project.

Research Context

This project addresses the localization of software for countries in the Asia-Pacific region that lack the human and technical resources required to undertake these complex projects. The project is developing a toolkit in layman's language to allow countries to develop localization projects without the need of specialized help. The toolkit is being developed over a two-year period, with preliminary releases made public during that time.

Target Beneficiaries

The project benefits all countries in the Asia-Pacific region, particularly small countries and national minorities that use their own script but do not have the necessary expertise and knowledge to undertake a localization project.

Outputs

The development of a FOSS Localization Toolkit, including a manual and a CD. The manual consists of a series of *how-to* sub-manuals that include everything a prospective localizer needs to learn: from management issues such as "how to decide what you need" and "how to write up a localization project" to more

technical issues, including installation of translation tools, finding and processing the files that need to be translated and finally building applications in a local language.

Research Results and Outcomes

For countries or regions that do not have any computer programs in their own language, FOSS can be translated and localized (adjusted for local standards) making it possible to create a complete set of free programs in a local language. The main barrier localized software removes for local people is the requirement of learning a new language such as English, prior to learning to use computer applications.

The problem is that the FOSS community is sometimes highly technical and the procedures to be followed to localize text are not well documented. Gathering the necessary information to start a complete localization project, understanding the procedures, evaluating the necessary resources and preparing a plan can take up to six months for a trained computer technician. To address this, the project was first conceived as an umbrella project that would gather information about different FOSS projects and document their localization methods and integration.

Once the project work began, however, initial findings made a change in methodology necessary. Either little or no localization information was available for key programs, or they were highly technical, which was not appropriate for the toolkit. In many cases, the

tools for easy technology-independent translation of FOSS did not exist, or were not defined. Finally, the researches found there was little written on how to develop a localization program. In response to these findings, the project considered that it could best reach its goals by defining a translation system for FOSS, thus simplifying the process and helping small economies reach their localization goals much faster.

The project found that coordinated localization projects could be improved by using the same programs and the same format. The South Africa-based Translate Toolkit project does this by converting the files that need to be translated into a standard format and converts them back to the application's format once the translation is done. However, the project felt that the Translate Toolkit had insufficient documentation. Thus, developing reference documentation of the Translate Toolkit software became the first technical task completed by the project.

As a follow up to this, it was necessary to link (through documentation) the Translate Toolkit to other major FOSS projects. The OpenOffice.org project started using the Translate Toolkit and the localization documentation developed by the FOSS Localization Toolkit. This has simplified the localization procedure for this product.

The FOSS Localization Toolkit is further developing and testing its documentation through a south-south collaboration (Cambodia/South Africa) project called WordForge (<http://www.wordforge.org>). The goal of WordForge is to use the latest computer-

assisted translation technology to produce the best possible localization tools for FOSS. Where the FOSS Localization Toolkit has worked on documentation to facilitate the work, WordForge goes one step further to create easy-to-use tools that continue the work of facilitating localization. Translators that are not highly skilled can use these tools.

A key document produced by the project is a detailed manual on how to plan and write a localization project for a given country and language. It covers all aspects of the project, from defining its social goals to understanding the workload and preparing a plan and a budget. Documentation from the project is already being used by localization projects in Asia (Bhutan, Lao PDR, Nepal).

Project Duration

Start Date: August 2004

End Date: July 2006

Total Duration: 24 Months

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31. Scientific Journal Publishing in India: Indexing and Online Management

Grant Amount: US\$ 28,000

Keywords: OPEN ACCESS, PUBLISHING, KNOWLEDGE MANAGEMENT, INDIA

Geographical Coverage: India

Objective

The objective of this project is to improve accessibility to scientific literature published in Indian journals by introducing an indexing system.

Research Context

This project aims to improve accessibility to research and scientific literature published in Indian journals by introducing an indexing system with the ability to generate metadata for each article. This collaborative project builds on the Public Knowledge Project's (PKP) Open Journals Systems (OJS), which manages and publishes peer-reviewed journals. The proposed system is self-sustaining under the existing infrastructure for Indian scientific journals and academic publishing. The project contributes to the research capacities of India as well as other nations in the process of utilizing new technologies to improve their knowledge infrastructure.

Target Beneficiaries

This project benefits Indian researchers and journal publishers through improved visibility and impact of their work locally and globally, creating opportunities to expand contacts and undertake collaborative research, and by facilitating the launch of online journals in topical research areas.

Outputs

- Web accessible indexing and search system for Indian Academy of Sciences journals;
- Web accessible indexing portal for Open Archives Initiative compliant Indian journals;
- Online journal publishing system for Journals of the Indian Institute of Science;
- Enhancements to PKP OJS and Harvester system software; and
- A national level workshop on open access journal publishing and indexing.

Research Results and Outcomes

This project is still underway and has requested an extension. The central issue the project addresses is that, although a number of Indian journals have adopted Open Access publishing, most of them are not compliant to the Open Archives Initiative Protocol for Metadata Harvesting, the emerging standard for indexing or searching online research databases and archives. The aim of the project is to set up prototype journal websites using PKP's OJS. So far the project has developed web accessible indexing, search and publishing systems prototypes for 13 existing journals.

These have been demonstrated to editors of various journals to showcase the advantages of good metadata and how to use the Journal Management System. The key benefits are that the system simplifies publishers' work, improves content indexing and enhances web presence by making the information easier to access by search engines. Several publishers have taken

the initiative to install and start experimenting with the Journal Management System. The project acknowledges that publishing office staff requires training, guidance and assistance from the project team to understand the system interfaces and use them.

Through interaction with editors of journals and participants of the workshop, the project identified several features to improve OJS. Some of these are specifically beneficial to Indian publishers and some may be useful to publishers worldwide. These include a Hindi language interface, latex code to render special characters like mathematical and astronomical symbols commonly found in physical sciences research literature, and a subject classification scheme for documents in particular domains such as the Physics and Astronomy Classification Scheme numbers. The project intends to add these features to the OJS software during the extension period of the project.

The project conducted a workshop on 10-11 February 2006 for which it received about 60 applications for participation. Due to limitations in resources, however, only 20 participants could be accommodated. All the training material and reports of the workshop are available online at the workshop website (<http://www.ncsi.iisc.ernet.in/ojs-workshop>). To facilitate discussion amongst the workshop participants, a mailing list to discuss issues in Indian journal publishing has been started (<http://ncsi.iisc.ernet.in/mailman/listinfo/oajp>). The project plans to conduct another workshop to popularize the concept of publishing using standard protocols and open access.

The PKP is committed to produce upgrades for OJS that support publishing efforts in India. It will also continue to work with the National Centre for Science Information to ensure that indexing modules and other components of the systems developed collaboratively continue to benefit from the international community's contribution to the PKP's free and open source projects. In this way the results contribute not only to the research capacities of India, but also to other nations in the process of using new technologies to improve their knowledge infrastructure.

Project Duration

Start Date: October 2004

End Date: March 2006

Total Duration: 18 Months

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<http://www.openarchives.org/>

<http://pkp.sfu.ca/>

<http://www.ncsi.iisc.ernet.in/ojs-workshop/>

<http://ncsi.iisc.ernet.in/mailman/listinfo/oajp/>

32. Dobhase: English-Nepali Translator

Grant Amount: US\$ 29,990

Keywords: ENGLISH-NEPALI, INTERNET, LOCALIZATION, NEPAL

Geographical Coverage: Nepal

Objective

The objective of this project is to develop a web-based engine that can provide a “gist translation” of general English source text into corresponding Nepali target text.

Research Context

The number of Internet users in Nepal is growing rapidly but only a small portion of the population can read and understand English, thus limiting access to global Internet content. The project addresses this problem through the development of an English-to-Nepali Machine Translation (MT) system. The MT project aims to create a web-based engine that can translate general English texts to Nepali on demand. A transfer-based approach is used to develop the main translation engine, with server side scripting and Hypertext Markup Language (HTML) used to integrate the engine with a web server.

Target Beneficiaries

The free online distribution of the software package benefits Nepali speaking Internet users. The MT also benefits a wide range of organizations that require translation of web content, manuals and documents from English to Nepali. Experience in MT and local language computing benefits students and faculty at Kathmandu University. The project work also furthers research related to language computing.

Outputs

- Bilingual English-Nepali Dictionary;
- English morphological analyzer;
- English parser;
- Nepali morphological analyzer;
- Nepali generator;
- Transfer rules;
- Web interface; and
- An integrated MT engine.

Research Results and Outcomes

This project work was hampered by political events and technical problems that were beyond its control. Just after the project work began, a state of emergency was declared in Nepal, affecting the transfer of funds to the project team. The project also faced setbacks due to a drought that limited hydroelectric power supply. Finally, project work was impeded by curfews that were in effect during the recent political unrest. Despite these setbacks, the project team has noted that these problems are past and continued its work.

The project can be viewed as a two-step process. The first step consists of the analysis, design of the system architecture and implementation of the MT system, Dobhase. The second step consists of making the Dobhase system available over the Internet. This requires the design of user interfaces, choice of appropriate web locations for the system and popularization of the system in the community that can benefit from its use.

The project followed an evolutionary approach to system development. Prototypes were placed online to allow end-users from different backgrounds to offer feedback and suggestions on the quality of translation. The project goals, design and implementation were presented in conferences, seminars and workshops. On the basis of the feedback received from both of these sources, the system has been continually refined and upgraded.

The Dobhase MT system uses a transfer-based approach that first analyzes the source language and then generates a representation called a parse tree. Transfer rules are then applied to this representation and generate the syntax of the target language. Finally, morphology generation rules are applied to each terminal (lexical items) of the parse tree. The system has a pipeline architecture. Each module has an input, which is the output of another module. Output from the system is guaranteed even if the input English sentence is grammatically incorrect. In the worst cases, the system is able to produce word-to-word translation.

The rule-based approach was selected over a more sophisticated method because a sufficiently large parallel text corpus for the English-Nepali language pair was not available. The system being developed is enough to provide a gist translation, however it may require post editing for the quality of translation to be acceptable for publications and formal writing. Looking at other initiatives in Nepal, it is likely that in a couple of year's time there may be a sufficiently large parallel corpus which could be used to modify the current system and incorporate hybrid modules (statistic/example-based) with greater

accuracy, thus, improving the quality of the translated data.

The system is now online and available to everyone who has access to the Internet. The project team notes that the full realization of the project requires further advertising of the product and training of users, which is beyond the scope of the present initiative. Nevertheless, the Dobhase MT project has designed and implemented a "rule-based" MT system that can be further developed and enhanced. The project has produced a number of by-products, which enhance the linguistic resources of Nepali language in general, such as the bilingual dictionary and grammar rules, among others. The project results and outputs have been widely disseminated through referred conferences, journal publications and presentations.

Project Duration

Start Date: January 2005

End Date: June 2006

Total Duration: 18 Months

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33. Developing a New Resource Sharing System and a New Tool to Use Electronic Materials in Multimedia Format Based on Grid Technology, China

Grant Amount: US\$ 30,000

Keywords: INTERNET, MULTIMEDIA, LIBRARY, CAPACITY BUILDING, CHINA

Geographical Coverage: China

Objective

The objective of this project is to use grid technology to build multimedia knowledge repositories for universities in China.

Research Context

Many universities and schools in China have their own computer servers to store multimedia content and other educational resources. The efficiency of these systems, however, is limited by a lack of integration and inability for users to revise and store materials. This project aims to develop a new system based on grid technology that will help institutions build integrated multimedia knowledge repositories and allow teachers and students to publish their work for sharing, modification and use in classes. The system and tools created by this project can be applied to fit a variety of institutional circumstances so that a universal application is possible.

Target Beneficiaries

The project benefits teachers and students at universities and schools that use a computer server with information stored in different formats. The project also benefits designers of these knowledge repositories. The project's scalability ensures that the end-users can use basic services such as searching and browsing the flyweight resources even if high bandwidth infrastructure is not available.

Outputs

- Display modules of multi-type media (text, image, audio, video), embedded in a Grid Service Mark-Up Language (GSML) browser;
- Authoring tool for composing multi-type media;
- Standard searching service with a unified resource information exchange between knowledge repositories;
- Standard indexing service to distil metadata from resources and automatically enter them into the repositories;
- Standard service for users to publish their work into the repositories; and
- A running sample system based on the resources of Earthview Environmental Education Digital Library.

Research Results and Outcomes

At the time of writing, the project team had completed the analysis of requirements and the system design. The project noted that the most technically challenging aspect of the project was defining the common requirements of the resource sharing system and forming the infrastructure framework using grid technology. The project has finished the development and testing of several display modules that work with popular media formats. Future work remains for sample system deployment, field-testing, assessment and

refinement. It is anticipated that the project will be successfully completed by the proposed deadline.

The results reported on to date can be summarized in three parts: system design, integration of metadata resources and development of a multimedia browser.

In the design of the resource sharing system, grid technology is used in combination with Service Oriented Architecture (SOA) to integrate distributed heterogeneous environments with non-trivial qualities of services, export interfaces based on open standards and provide a uniform access point for end-users. The system has three layers: a lower model layer for heterogeneous databases, a control layer that handles objects from the lower layer and provides functionality to the upper layer, and an upper view layer, which is the user interface. The architecture provides for a traditional web-style portal and a new powerful, operable user-side client.

To describe the basic information of the resources, the author must supply metadata information. The most common metadata standards include: Dublin Core Metadata Initiative, Machine-Readable Cataloguing Standard and the Format for Bibliographic Records. The system uses Resource Description Framework (RDF) to achieve the interoperability between different standards. The RDF works like a market where resource providers using different standards can publish and exchange their own metadata.

A resource in the system can be in a variety of different media formats (text, image, audio,

video). To access these, the project developed a corresponding display plug-in for the user-side GSML browser supporting most popular media formats. There is also an authoring tool in the resource sharing system. Using a visual editor, the GSML composer, authors can drag and drop plug-ins at any place they want and then modify the event route to obtain synchronization.

The project foresees that once the most challenging aspects of the project development process are completed, the infrastructure framework can then be used to build many different kinds of resource sharing systems. Though the project is still underway, many Earthview Environment Education Digital Library users have shown strong interest in the project and have cited its strengths in organization, interactive facilities and interface presentation.

Project Duration

Start Date: February 2005

End Date: December 2006

Total Duration: 23 Months

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34. Mongolian Text-to-Speech Conversion Tool

Grant Amount: US\$ 29,790

Keywords: TEXT-TO-SPEECH, VISUALLY IMPAIRED, MONGOLIA

Geographical Coverage: Mongolia

Objective

The objective of this project is to develop a Mongolian text-to-speech (TTS) converter and a simple human computer interface that is suitable for visually impaired people.

Research Context

TTS conversion tools offer visually impaired people the ability to access and use personal computers and software. Currently, there is no TTS software for visually impaired people in Mongolia. This project aims to develop a TTS converter tool with a simple computer interface in local language that meets the needs of visually impaired people and provides a foundation for further development of TTS applications.

Target Beneficiaries

This project benefits visually impaired people, general users of computer systems, students and researchers and Mongolian IT companies. The Mongolian TTS synthesizer will be available online and released under a General Public License.

Outputs

- Mongolian TTS converter;
- Mongolian character recognition tool;
- TTS converter software package for visually impaired people; and
- A user manual in Mongolian.

Research Results and Outcomes

Developing the Mongolian TTS system requires expertise in ICT and research into Mongolian language and related theories. During research on the technical aspects of the project, the team identified key work on research and development of TTS by the MBROLA project (<http://tcts.fpms.ac.be/synthesis/mbrola.html>) and Festvox project (<http://www.festvox.org>). The MBROLA project concentrates on academic research for speech synthesis, particularly on prosody generation, known as one of the biggest challenges for developers of TTS synthesizers, and the Festvox project provides technical tools for TTS. The work of these projects was cited as useful to the development of the Mongolian TTS system, although the project does not simply replicate them.

The project also undertook research to further its understanding of Mongolian language, which is a branch of Altaic and has different phonetics, structure and grammar than western languages. The project conducted relative studies on existing Mongolian language theories and held consultations and formal meetings with leading linguistic theorists in Mongolia, in particular with members of the Department of Stage Speech Art of the Mongolian University of Arts and Culture. The objective was to identify potential conflicts and discuss possible solutions regarding existing language theories and their practical use in TTS. Two main theories for pronouncing Mongolian words (developed by Sh. Lavsanvandan, D.Sc and M. Bazarragchaa D.Sc) are being used to

obtain consistent and practical approach in developing Mongolian TTS converter. The grammar theory of Ts. Damdinsuren was also found to be useful. In this theory, words are split into syllables. To process syllables into TTS, research was performed on how to form words and program correct pronunciation. This involved defining rules for tones, unpronounced syllables and characters and over 700 frequently used abbreviations. In addition, 400 commonly used foreign words were identified and are being integrated into the system.

At the time of writing, the necessary linguistic research activities for the development of Mongolian TTS converter were complete. The team had developed a software package for identifying the different syllables that occur in Mongolian lexis and storing them in a database. An additional software package was developed for collecting abbreviations. The alpha version of the Mongolian TTS converter engine has been developed and is able to read those words and syllables registered and recorded in the database. The sound and mouse click driven interface of the Mongolian TTS converter tool has been designed. The database is being populated with recorded sounds, syllables, abbreviations and foreign words.

The following activities have been conducted to promote the activities and results of the project. The project's website (<http://www.infocon.mn/tts>) has been developed and is being regularly updated with the results from the Mongolian TTS converter

tool project, its source code and other relevant outputs and information. Plans are underway to cooperate with OpenMN (<http://www.openmn.org>) and the Mongolian Unix User Group (<http://www.mnbsd.org>) for wider dissemination of project outputs after completion. The project will distribute the TTS converter package on CDs and through free download from the project website. Once the project team reaches the desired result, it is planning discussions with the Ministry of Education and Culture to investigate further cooperation in distributing the TTS system.

Project Duration

Start Date: September 2005

End Date: September 2006

Total Duration: 13 Months

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<http://www.openmn.org>

<http://www.mnbsd.org>

35. Open Source GIS/Mapping Solution for the Indian Tsunami Information Resource Centre

Grant Amount: US\$ 8,902

Keywords: FREE AND OPEN SOURCE, GEOGRAPHIC INFORMATION SYSTEM, CAPACITY BUILDING, INDIA, ASIA-PACIFIC

Geographical Coverage: India, Asia-Pacific

Objective

The objective of this project is to develop a free and open source GIS mapping solution for the Indian Tsunami Information Resource Centre.

Research Context

In the aftermath of the Southeast Asia tsunami, a large and diverse array of organizations worked collectively on relief efforts over a large geographical area. This created a huge demand to coordinate complex activities and location data. This project aims to add a free and open source GIS/mapping solution into the existing Indian Tsunami Information Resource Centre. It will train organizations on how to collect GIS data, how to enter data into the system and how to use the system to visualize the data. The free and open source GIS/mapping solution can be used by any organization to GIS-enable their data.

Target Beneficiaries

The beneficiaries of this project are NGOs, non-profit organizations, volunteers, donors and grant making bodies who are contributing to the tsunami relief and rehabilitation work in South India and other tsunami-affected areas.

Outputs

- A free and open source GIS/mapping solution integrated into the existing Indian

Tsunami Information Resource Centre;

- Interface with the agencies collecting tsunami data, training them on collection of GIS data required by the system, how to enter their data into the system and how to use the system to visualize the data; and
- Release free and open source GIS/mapping solution as independent software that can be used by any organization to GIS-enable their data, including training modules for software developers to GIS-enable their tools using the system.

Research Results and Outcomes

At the time of writing, no final report on this project was available although significant progress had been documented.

A key research contribution this project makes is the development of a free and open source GIS solution. The project team notes that obtaining the license or acquiring the software from a commercially available GIS system such as those produced by companies such as ESRI (<http://www.esri.com>) is prohibitively expensive. Using free and open source technologies combined with tools developed by Janastu (the Pantoto toolkit) allows users greater access to the significant benefits of powerful GIS applications.

The project is developing the Pantoto platform environment to allow mapping of a database to a geo-referenced data set. Since geo-

referenced data are not available in India, activists collect their own data using Global Positioning System (GPS) and other tools. Existing geo-referenced data sets from US sources are being used to assist with this process.

Work on developing the training modules is ongoing. NGOs and community groups have been trained in data entry and the use of GPS devices for entering geo-referenced data. The project seeks to train 50 NGOs in affected coastal villages over the coming months. The project noted it is waiting for the release of funds to undertake this training component.

The project sees potential for local communities to use geospatial-planning tools for community development. To this end, it has established a working relationship with villagers directly impacted by the tsunami and is planning to train villagers to use the GIS mapping system for planning purposes. The project foresees that the visual documentation of environmental and human impact on their surroundings will empower villagers to make claims with support of visual evidence.

The project team has developed the <http://www.mapunity.org> site. The site is equipped with features to allow users to add their own bookmarks to the database and maps. Janastu is working with others on the content and to build a community of users and practitioners around this website.

Project Duration

Start Date: June 2005

End Date: February 2006

Total Duration: 9 Months

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36. Automatic Synchronization and Distribution of Biological Databases Over Low-Bandwidth Networks Among Developing Countries

Grant Amount: US\$ 29,800

Keywords: NETWORK DEVELOPMENT, INFORMATION MANAGEMENT, THAILAND, ASIA-PACIFIC

Geographical Coverage: Thailand, Asia-Pacific

Objectives

The objectives of this project are to research, implement and test a next generation automatic biological software, courseware, database distribution, and synchronization network based on P2P technology for countries in the Asia-Pacific region with low-bandwidth Internet links.

Research Context

Many countries in the Asia-Pacific region are moving into the field of bioinformatics, involving the collection, organization and analysis of large amounts of biological data through computer networks. For many, however, progress is impeded by the computational infrastructure and network bandwidths. This project addresses the problem of low bandwidth and reliability through the introduction of third generation P2P protocols that use the computing power of the entire network and allows file transfers to continue in the case of a disconnection. P2P promises to help facilitate the distribution and synchronization of biological databases across the Asia-Pacific region.

Target Beneficiaries

The major beneficiaries are research and educational institutes in countries such as China, India, Indonesia, the Philippines and

Thailand that are just moving into bioinformatics but do not have the necessary Internet bandwidth.

Outputs

- Free and open source client software based on third generation P2P technology, for automatic downloading and synchronization of biological software, to be made available free of charge through the Asia-Pacific Bioinformatics Network (APBioNET); and
- Reports on performance of the test-bed will be published in relevant journals and conferences, and will be made available through the APBioNet website (<http://www.apbionet.org>).

Project Duration

Start Date: February 2006

End Date: June 2007

Total Duration: 17 Months

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37. Development of a Real-Time and Mobile Integrated Water Quality Monitoring System Based on ICT: A Study Case in Ha Long Bay, Viet Nam

Grant Amount: US\$ 30,000

Keywords: ENVIRONMENT, INFORMATION MANAGEMENT, GOVERNANCE, VIET NAM

Geographical Coverage: Viet Nam

Objective

To develop a real-time integrated water quality monitoring system in Viet Nam

Research Context

This project addresses the complexity and costs associated with managing Viet Nam's abundant coastal and fresh water resources. The project aims to extend the Computerized Water Quality Measurement System developed by the Institute of Chemistry at the Vietnamese Academy of Science and Technology (VAST). The system uses a GPS and water quality monitoring combined with data acquisition, transmission and web-based information sharing. In the system, local data are transmitted by radio to a nearby centre. After preliminary treatment, the information is transmitted to the main server by an Uplink connection for sharing in the community.

Target Beneficiaries

The water quality monitoring system benefits research, forecasting and decision-making by water management personnel, environmentalists and academics. The data can also be used for community awareness and education campaigns on environmental protection.

Outputs

The project output is a complete system for water quality measurement consisting of:

- Three sets of water quality sensors, electronic devices, data acquisition, data transmission, a server for web-based information sharing and related software;
- Data sets for water quality parameters such as pH, dissolved oxygen, salinity, conductivity, temperature and oxidation reduction potential;
- Completion of communication and web-based information sharing system;
- Confirmation of the system's long-term operational performance;
- Reliability of the system's replication for other locations in Viet Nam; and
- A project report.

Project Duration

Start Date: February 2006

End Date: February 2008

Total Duration: 25 Months

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38. IPv6 Tunnel Broker: A Key for Using Next Generation Internet in Developing Countries, Thailand

Grant Amount: US\$ 9,000

Keywords: INTERNET PROTOCOL, IPV4, IPV6, NETWORK DEVELOPMENT, INFORMATION MANAGEMENT, THAILAND

Geographical Coverage: Thailand

Objective

The objective of this project is to develop an IPv6 tunnel broker configuration system allowing Internet Protocol version 4 (IPv4) users to connect to IPv6 networks.

Research Context

The shortage of IP addresses is a problem facing all Internet users in developing countries. IPv6, with its 128-bit addresses, is expected to alleviate this shortage. Several mechanisms are available for connecting users to global IPv6 networks. One popular mechanism is an IPv6-over-IPv4 tunnel where IPv6 packets are encapsulated inside IPv4 packets and are transmitted over IPv4 networks. Many types of tunnel mechanisms exist, but most are far too complex for general Internet users. This project aims to develop a semi-automatic IPv6 tunnel configuration system that will connect end-users to IPv6 networks in a simple, convenient manner. The proposed IPv6 tunnel broker system will also provide a secure authentication process and support a variety of client platforms.

Target Beneficiaries

This project benefits all Internet users who want to get on the IPv6 network quickly without having to wait for IPv6 service from their ISPs. The proposed IPv6 tunnel broker benefits

Internet users in Thailand and other developing countries without IPv6 connections.

Outputs

This project aims to produce a commercial-level prototype IPv6 tunnel broker system with hardware and software components and deploy it on the Thailand IPv6 test-bed network. Specific outputs are:

- A hardware component consisting of a web server that acts as a tunnel broker, IPv6 tunnel servers and a DNS server;
- A software component consisting of a tunnel broker administrator and database that runs on the web server, and the client software that runs on the end-user's computer;
- Two versions of the client software, one for Windows XP platform and one for Linux;
- Deployment of the IPv6 tunnel broker service through the National Electronics and Computer Technology Center (NECTEC) IPv6; and
- Test-bed website. Users can download client software and configuration manual from the website (<http://www.ipv6.nectec.or.th>).

Project Duration

Start Date: February 2006

End Date: February 2007

Total Duration: 13 Months

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39. Shahmukhi to Gurmukhi Transliteration Solution for Networking, India and Pakistan

Grant Amount: US\$ 29,865

Keywords: LOCALIZATION, SOFTWARE, SHAMUKHI, GURMUKHI, INDIA, PAKISTAN

Geographical Coverage: Punjab, India and Punjab, Pakistan

Objective

The objective of this project is to develop a software package facilitating transliteration from Shahmukhi to Gurmukhi languages and enabling web-based networking between East and West Punjab.

Research Context

This project is a culmination of 10 years of academic research and literacy development in the United Kingdom, Pakistan and India. The aim of the project is to facilitate electronic and written communication between people in East (Indian) and West (Pakistani) Punjab through the development of a Punjabi Language Transliteration Tool. The intellectual background to this work has already been completed through a grant from the European Union, Asia-ITC programme. The project expands on a Gurmukhi to Shahmukhi Transliteration software developed by the Punjabi University at Patiala and aims to develop a complementary Shamukhi to Gurmukhi processor to facilitate use of these technologies on the web and enhance networking between India and Pakistan.

Target Beneficiaries

The general beneficiaries of this project are the Punjabi community, and in particular media organizations, schools, colleges, literacy promotional organizations, writers and NGOs involved in dissemination activities.

Outputs

- Online Shahmukhi-Gurmukhi transliteration utility to transliterate Punjabi text in Shahmukhi script to Gurmukhi script;
- An offline Windows-based software to transliterate Punjabi text in Shahmukhi script encoded in popular formats such as Inpage or Unicode to Gurmukhi script in any of the popular Gurmukhi fonts or Unicode;
- Shahmukhi-Gurmukhi direct transliteration dictionary with 25,000 entries;
- A morphological analyzer and synthesizer tool for Shahmukhi text;
- Documentation for usage of transliteration tool; and
- Training materials for usage of transliteration software.

Project Duration

Start Date: March 2006

End Date: February 2008

Total Duration: 24 Months

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40. VClass SIP-Based Mobile Classroom

Grant Amount: US\$ 30,000

Keywords: INTERNET, CAPACITY BUILDING, FREE AND OPEN SOURCE, THAILAND, ASIA-PACIFIC

Geographical Coverage: Thailand, Asia-Pacific

Objective

The objective of this project is to develop mobile classroom facilities using Session Initiation Protocol (SIP) technology.

Research Context

This project addresses problems associated with mobility in e-learning platforms. Mobility allows teachers to design and conduct meaningful interactive courses by reaching students at their PDAs, personal computers or laptops. The project integrates SIP with a free and open source e-learning platform called VClass, to create an easy and effective way to reach students during a class and to extract learning objects from mobile resources. The project aims to produce a mobility-enhanced VClass e-learning platform called a Mobile Classroom that provides greater flexibility for learning environments.

Target Beneficiaries

The primary target beneficiaries of the new functionality offered by the VClass SIP-based Mobile Classroom are the many learning institutions in the Asia-Pacific region who use the FOSS VClass to power online, web-enhanced and hybrid education programmes. Other institutions interested in e-learning may also benefit from the results of this project.

Outputs

The project output is a mobility-enhanced VClass e-learning platform. The mobile classroom will be available both as a web accessible Java application and for installation on mobile and stationary computing devices. Courseware on cultural studies will be archived and made public to researchers and students.

Project Duration

Start Date: January 2006

End Date: December 2006

Total Duration: 12 Months

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Environment and Agriculture



Image: International Centre for Integrated Mountain Development

41. Towards a Regional Geographic Information Infrastructure in the Hindu Kush-Himalayan Region
42. ICT for Agriculture and Rural Development in China
43. Development of a Forest Fire Forecasting System for Western Ghats, India Using Web-Based GIS and Remote Sensing
44. Development of an SMS-Based Rice Seed Stock Inventory System for Rice Farmers, Philippines
45. Web-Based e-Crop Management, China
46. Crop Disease Forecasting System and Expert Crop-Advisory to Farmers Over Information Kiosk Networks in India

41. Towards a Regional Geographic Information Infrastructure in the Hindu Kush-Himalayan Region

Grant Amount: US\$ 29,816

Keywords: GEOGRAPHIC INFORMATION SYSTEM, INFORMATION MANAGEMENT, HINDU KUSH-HIMALAYAS

Geographical Coverage: Bangladesh, Bhutan, Nepal, Hindu Kush-Himalayan region

Objectives

The objectives of this project are to increase the availability and accessibility of relevant geographic data and to enhance the exchange of geographic information within the HKH region.

Research Context

Decision-making in the HKH region requires systematic generation and access to data to make a realistic assessment of natural resources and socio-economic conditions. Many spatial databases in the region have been developed in isolation from one another and thus information is dispersed, heterogeneous, inaccessible, or not relevant due to their continuity, reliability or nature of parameters. In response, this project worked with partners from Bangladesh, Bhutan and Nepal and used Internet mapping technology such as ARCIMS (<http://www.esri.com>) and a Structured Query Language (SQL) server to develop an Internet-based GIS metadata system. The system adheres to international standards for compatibility with other regional and global partners. It provides an integrated regional platform to increase the availability and accessibility of relevant geographic data and enhances the exchange of geographic information.

Target Beneficiaries

Researchers, development projects and agencies working with GIS in the region are the direct beneficiaries of the project. The adoption of standardized formats for database queries, information sharing and consistent presentation across multiple participating organizations facilitates the development of more realistic policy planning and action plans, ultimately benefiting the mountain community at large.

Outputs

The major outputs of the project are:

- An Internet-based mapping system for publishing geographic data and information; and
- A metadata system based on international standards for documentation of existing spatial databases to facilitate Internet-based searches and encourage data sharing in the region.

Research Results and Outcomes

In the initial phase of the project, a conceptual framework was developed to share GIS resources and services. The main GIS resources identified were database and metadata resources, map resources, applications and training resources. A concept of the portal system was developed to provide a common platform to access and share information and

knowledge about GIS technology and its applications in mountain environments.

A comprehensive underlying structure for the portal was developed based on ESRI's g.net architecture. The portal was designed to be a virtual platform for sharing data and information among users in the region. The portal was named the Mountain GIS Portal and can be accessed at <http://www.icimod-gis.net>. It provides a number of web-based GIS services and resources such as metadata, maps, applications and training resources. Similarly, users can submit their own data, metadata, maps or application case studies. The system administrator manages these materials and posts them as appropriate. In this way, a user is also a provider of the resources.

The main software packages used to build the Mountain GIS Portal are ArcGIS, ArcIMS and IIS Hypertext Transfer Protocol (HTTP) server. eXtensible Markup Language (XML) provides the underlying database for metadata and its administration. The system is tied together through a combination of eXtensible Stylesheet Language (XSL), Active Server Page (ASP), JavaScript programs and various web pages.

Based on the conceptual design, the following systems were developed for the implementation of the portal: a metadata system with search capabilities; online data services to view and query data, and to create online maps; a map catalogue to serve the published maps on the Internet; and a website (<http://menris.icimod.net>) and web pages integrating the systems in a common framework. Other features included in the portal are a discussion forum, news and events, and numerous links to GIS resources on the Internet. A moderated e-mail list was established to further strengthen collaboration and communication. ICIMOD has partnered with Food and Agriculture Organization of the United Nations and United Nations Environment Programme to implement the GeoNetwork metadata system in a free and open source

environment with data harvesting technology. Further, in partnership with the European Space Agency, a special page has been created for space technology applications for mountain environments.

The implementation of the Mountain GIS Portal has helped in organizing, documenting and disseminating ICIMOD's and its partners' own geographic data and information. With the framework in place, the effort is now focused on encouraging more partners to join and publish their metadata and spatial databases using the system. The application has the potential to be extended to other regional and national institutions of the HKH, an important step towards realizing the vision of a Regional Geographic Information Infrastructure. Since the data-sharing culture is still conservative in the region, ICIMOD has to play a proactive role in convincing more of its partners to actively participate in the framework. The project continues to grow through additional information inputs and by extension to other countries and institutions.

Project Duration

Start Date: March 2002

End Date: April 2004

Total Duration: 26 Months

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42. ICT for Agriculture and Rural Development in China

Grant Amount: US\$ 9,000

Keywords: AGRICULTURE, ECONOMIC, PRODUCTIVITY, GOVERNANCE, CHINA

Geographical Coverage: China

Objective

The objective of this project is to assist farmers in marketing activities using ICT tools.

Research Context

This project constructed a prototype ICT service for agriculture marketing in Cangzhou, located in the southeast of Hebei province, China. The core Internet technology is based on a hierarchical model of four levels including region, county, towns and villages. The project meets farmers' needs by creating an "all-round ICT service" using web-based information systems combined with call centres and training components. The project uses a participatory strategy to develop its information services and mobilize stakeholders.

Target Beneficiaries

This project benefits the municipal government of Qingdao, farmers, companies and traders in the target area.

Outputs

The project outputs include the AgCangzhou system, a key component of Cangzhou's e-government facility, an e-extension service on agricultural research and technologies, an e-commerce system for marketing of agricultural products and a call centre serving farmers.

Research Results and Outcomes

The project began by defining criteria to select the project area. Factors included geographic location, sufficient ICT infrastructure, the willingness of the local farming community to try the new technology and a local government that would support the application of ICT for agriculture and farming. Based on these conditions, the project selected Cangzhou as the county to implement the prototype project.

The project began its work with the local government in March 2003 and had gained support from local officials and organizations. At this stage the project encountered a major setback. The SARS epidemic broke out in mid-April 2003 and travel restrictions imposed on the project team seriously hampered progress of the project for almost a year. The loss of time resulted in a loss of momentum for the project. Finally the project team was able to redefine the project and move to Hebei province.

To forge the prototype of an "all-round ICT service" for agriculture and rural development, the project created a hierarchical model of four levels, consisting of region, county, town and village. This project framework was applied in Hebei province as follows: Cangzhou represents the regional level, Qingxian the county level, Mumendianzhen the town level, and Doyaoxinzhuang and Dongpaozhuang the village level. Using ICTs to create "information villages" and link them across all of these levels is the core concept of the AgCangzhou system.

The project developed a number ICT driven solutions towards the creation of the “information villages”. Due to government programmes intended to increase access to communications, almost every house in mainland China has a telephone, making technical consultancy through telephone and mobile phone feasible. Building on this infrastructure, the project set up a range of telephone consulting services. These include the 121 Hotline Service that provides answers to frequently asked questions from farmers. This was further enhanced with an expert hotline system to bridge the knowledge gap between farmers and experts in Qingxian. The project notes that more than 30,000 farmers have used the service since the system was founded. An additional service was the creation of an Agriculture and Rural Development (A&RD) Ambulance that is dispatched to villages to consult on pests, diseases or to bring medicine, pesticides and seeds to farmers.

The project also set up a range of web-based tools and applications. The project developed two multimedia systems on fruit diseases and pest control. It integrated its work with an A&RD website (<http://www.qxkjj.com>), to develop modules on News on Agricultural Science and Technology, a Farmer School, the Garden of Agricultural Science and Technology and an Agricultural Expert System. The website also features information on policy, law and links to related websites. In a separate initiative, the project integrated several websites to form a national web-based service system at <http://www.agri.com.cn/>. The branch websites cover more than 700 counties in 26 provinces with over 120,000 clients, and continues to expand.

The team worked with the Qingxian Bureau of Science and Technology to found the Centre for Productivity Promoting. During the first year, the Centre provided local communities with more than 2,000 items of information and

trained about 10,000 farmers on the introduction of new crops farming techniques. The project is seen to have contributed to substantially improved production yields in the target area. The total area of fruit trees is 0.8 million hectares and is comprised primarily of dates, pears and apples. In these areas the project has seen some remarkable increase in yields. The increase of yield per hectare is 2.25 tonnes for dates, 90 tonnes for pear and 52.5 tonnes for apples. Together, the increased yields indicate an increase in production value of RMB 330.28 million.

Awards

The project was awarded with the Prize of Progress in Science and Technology, conferred successively by Cangzhou government and Hebei provincial government in 2003 and 2004 respectively.

Project Duration

Start Date: March 2003

End Date: May 2005

Total Duration: 27 Months

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Reference Websites

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43. Development of a Forest Fire Forecasting System for Western Ghats, India, Using Web-Based GIS and Remote Sensing

Grant Amount: US\$ 30,000

Keywords: ENVIRONMENT, FOREST FIRE, GEOGRAPHIC INFORMATION SYSTEM, INDIA

Geographical Coverage: India

Objective

The objective of this project is to develop a forest fire forecasting system using GIS and Remote Sensing to help reduce the degradation and loss of biodiversity in Kerala State, India.

Research Context

Western Ghats, a biodiversity hotspot and essential environmental resource for the state of Kerala, is under severe threat due to the recurrence of forest fires. Between 1991 and 2003, fires destroyed more than 25,000 hectares of forests in Kerala. This project aims to develop an effective method for forest fire forecasting by using GIS and Remote Sensing to create a forest fire hazard index. The system developed by this project can be used by the Forest Department to manage and conserve the fire-prone areas more efficiently. The forecasting and prevention of forest fires also benefits the local communities residing in and around the forest whose livelihood depends on natural resources.

Target Beneficiaries

The Forest Department can use the fire forecasting system to manage and conserve the fire-prone areas more efficiently. This benefits local communities in the area, helps to reduce degradation and loss of biodiversity of the area,

and contributes to the wise use of the mountains of Western Ghats.

Outputs

- Forest Fire Risk Area Map of Southern Western Ghats;
- Forest Fire Forecasting System;
- Project report on forest fire, its causes, consequences and solutions;
- Presentation of the Fire Forecasting System on the Centre for Environment and Development (CED) website (<http://www.cedindia.org>) that can be freely used by stakeholders;
- A network of local organizations and people; and
- Skills development of Forest Department personnel and local people.

Research Results and Outcomes

This project was still in process at the time of this report. However, the project has submitted two interim reports and is well on its way to completing its final results.

From the beginning, the project adopted a participatory and multi-disciplinary approach. The participatory approach is considered crucial as local stakeholders such as forest department personnel and local people best know the cause and effect of forest fires. During the project implementation experts

from the following organizations were consulted: Kerala Forests and Wildlife Department; College of Forestry, Kerala Agricultural University, Vellanikkara; Kerala Forest Research Institute, Peechi, Thrissur; Ashoka Trust for Research in Ecology and Environment, Bangalore; Environmental Systems Research Institute, Bangalore; and the Department of Statistics, University College, Thiruvananthapuram.

The project's multi-disciplinary approach employs a variety of research tools and techniques such as participatory resource appraisal, remote sensing tools to provide data for vegetation maps, GIS for spatial data analysis, statistical techniques for development of the model, and programming tools like Visual Basic for developing the automated system.

Primary and secondary data were collected from 10 protected areas (PAs) and used to develop a forest fire-prone area prioritization model that combines information from a series of maps and tables. Vegetation maps were prepared using remote sensing data through Digital Image Processing. Staff further classified this information and the results were subsequently verified during field visits. Other thematic base maps were prepared from survey of India topographic sheets, including drainage, land use, contour, settlements, roads and trek paths. The different parameters that influence forest fires were identified and ranks (intra parameter) and weights (inter parameter) have been assigned for each parameter through knowledge-based and logistic regression approaches. These were used in the overlay analysis to generate fire risk area maps. The data output is in the form of maps (spatial) and tables (non-spatial) to create the fire forecasting system.

At present the team has designed the Forest Fire Forecasting System (SWG Fire Mapper 1.0),

which takes into consideration a variety of parameters that effect the initiation and spread of wildfires. The weights and ranks need to be finalized and input into the SWG Fire Mapper 1.0 to get acceptable results for fire prediction maps of the PAs. The website of CED (<http://www.cedindia.org>) is proposed to be the platform for the web-based Fire Prediction System.

The project plans to hold a series of training, capacity building and awareness programmes. These include training programmes for Forest Department officials and decision makers and awareness programmes on the causes and spread of forest fires for local communities in selected areas.

Although this project is still underway, it has already developed a model for the prediction of forest fires. The approach can be adopted and replicated in other geographical areas with necessary modifications in the ranks and weights, based on the specific characteristics of the local area. The design, construction, deployment, data collection and data analysis is a pioneering effort and can be taken as a baseline study by other researchers.

Project Duration

Start Date: August 2004

End Date: August 2006

Total Duration: 25 Months

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44. Development of an SMS-Based Rice Seed Stock Inventory System for Rice Farmers, Philippines

Grant Amount: US\$ 30,000

Keywords: AGRICULTURE, ECONOMIC, PRODUCTIVITY, INFORMATION MANAGEMENT, SMS, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to enable seed growers and seed centres to link together and share a real-time seed stock inventory system.

- Enable farmers to query seed stock through SMS; and
- Link breeding centres, SeedNet and commercial seed growers.

Research Context

In 1994, the Philippine Rice Research Institute created a national seed network called “SeedNet” with 100 seed centres that multiply foundation seeds from local farmers and sell them to commercial seed growers for further multiplication. As the network has been limited by lack of connectivity and real-time exchange of information, this project aims to develop an SMS-based Rice Seed Stock Inventory System using mobile phones that will enable seed growers and seed centres to link together and share information using a real-time seed stock inventory system. The system will have an SMS server to handle incoming data and queries and a database to process data and generate reports.

Research Results and Outcomes

To date, project work has focused on devising an appropriate technology solution. The solution has gone through several evolutions since the project began. First, ASTI of DOST provided a GSM modem linked to a Microsoft Windows-based user interface that allowed an operator to read and reply to text messages. The project then subscribed to a line account from a cellular company (SMART Communications) offering SMS. However the system proved to be unstable due to bugs in the coding and had limitations in the number of text messages the system could handle. Another setback at this point was the resignation of the programmer who left the project without completing the database.

Target Beneficiaries

Key beneficiaries are considered to be the 100 accredited SeedNet members, 35,000 seed growers and about one million rice farmers nationwide in the Philippines.

In response to these setbacks, the project decided to acquire a new system called GIVE ME Unlimited SMS from M2M company. The service is an SMS-based customer support software, much like a call centre that can be accessed from the Internet. The new system proved more stable. It allowed the project team to create keywords and assign them to content providers (breeders, seed personnel, sales office, SeedNet managers) and has a database to store names, phone numbers and addresses.

Outputs

- Develop a real-time seed stock inventory system;

This was deployed in a Farmers' Call Centre. By March 2006, the project was receiving more than 600 text queries per month. In a further evolution, the project negotiated with a commercial Telco to provide a web-based SMS platform that could handle over 1,000 users and transfer the cost of the text queries to users. In November 2005, the project joined with SMART Communications Inc. to provide a web-based customer support system via text, and in December it launched the SMART 700RICE SMS service.

At this point, the project signed MoUs with two farmer cooperatives in Davao, Del Sur, Mindanao that agreed to test the services. These are the Magsaysay Farmers MultiPurpose Cooperative, Inc. and the Hagonoy Farmers' Cooperative. Under the agreement, Philippine Rice Research Institute (PhilRice) will work with the cooperatives to test the web portal services, farmers' call centre and online payment. PhilRice provided the cooperatives with a wireless Internet connection installed in a desktop computer. Using this system, the cooperatives will explore selling hybrid and organic rice products to areas outside of Mindanao.

Since that time the project has launched its web portal at (<http://www.openacademy.ph>). The

project is currently developing its database, and when completed, it will be tested in the SeedNet Organization. The test will involve reporting of production data from members and compiling the inventory lists at PhilRice and then having members inquire about the availability of seed stocks. The working system will then be deployed in the cooperatives already identified by the project. The project is also looking at other features to enhance its service such as online payment and marketing tools.

Project Duration

Start Date: January 2005

End Date: January 2007

Total Duration: 25 Months

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45. Web-Based e-Crop Management, China

Grant Amount: US\$ 9,000

Keywords: INTERNET, AGRICULTURE, RURAL, PRODUCTIVITY, CHINA

Geographical Coverage: China

Objective

The objective of this project is to use a web-based crop simulation and nitrogen model to optimize crop and vegetables production.

Research Context

This project aims to develop an “e-Farm” system that provides dynamic web-based crop information and simulation services. The system supports decision-making on agriculture production for farmers and small cooperative agencies in Fuyang, Anji County, Zhejiang Province of China. The crop simulation models combine nitrogen and water modules, economic analysis and decision-making tools to provide users with methods for optimizing crop and vegetable production.

Target Beneficiaries

The e-Farm web-based application tools developed in this project benefit county e-government facilities, farmers, companies and produce traders.

Outputs

- The e-Crop Management SimuSystem for crop management at the field level, and also partially as e-extension of agricultural science and technologies at the institutional level;
- Performance tests of the e-Crop Management SimuSystem model;
- Training for users of the system; and

- Project report on system and training modules.

Research Results and Outcomes

At the time of writing, this project remained incomplete although it had achieved many of its proposed objectives. The project team noted that the proposed project duration of 12 months was probably insufficient to cover assessment and feedback from the farmers on the use of the technology, as it would take at least one year to see the results from using the e-Crop management tools.

The project website provides crop management and dynamic decision-making support for farmers by combining information on soil, weather, labour, economics, and water and nitrogen inputs. The system is designed to increase economic benefit and reduce environmental degradation associated with nitrogen fertilizers. The main software tools used are SQL, ASP and the simulation program. The project selected Fuyang, Anji County in Zhejiang Province of China to implement its prototype.

The project has three levels of users - local farmers, local government and the educational institute. The success of the project relies on farmer's ability to advance production skills by combining this new technology tool with traditional agriculture production techniques. Thus a critical aspect of the project is a user-friendly interface combined with training on the use of the system. For local governments,

the project provides information on social, economic and environmental issues related to agricultural production that can be used to enhance policy and decision-making. The educational institute plays an important role, as it is responsible for the transfer of appropriate technology to local communities. Thus the project builds the educational institute's capacity to develop technology solutions that are directly tied to real world issues, as in the case of crop management.

In implementing the project, the project saw that it was critical to establish control at the local level through local coordinator and cooperation units in Fuyang and Anji County. The definition of needs, issues and recommendations generated at the field level were passed to the teams at the Agro-ecology Institute at Zhejiang University who provided administrative and technical support. The project team noted that this presented some challenges, particularly relating to technical problems in coordinating the work with the established government-guided e-Service information provider in the county. Through the design, implementation and utilization stages, 80 farmers, producers and technicians from the towns and county attended training courses on the e-Crop management system. Training

involved investigative exercises, field experiments and modules on working with the software. The results of using the software have been a 30 percent reduction in nitrogen application in rice production, representing substantial savings in labour and fertilizer costs.

The project is sharing its results with the Agro-ecology Institute of Zhejiang University to compile training materials and demonstrate the institute's research activities on Internet applications for public and community use in other sites of Zhejiang province.

Project Duration

Start Date: February 2005

End Date: December 2005

Total Duration: 11 Months

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46. Crop Disease Forecasting System and Expert Crop-Advisory to Farmers Over Information Kiosk Networks in India

Grant Amount: US\$ 30,000

Keywords: AGRICULTURE, INFORMATION MANAGEMENT, TELECENTRE, INDIA

Geographical Coverage: India

Objective

The objectives of this project are to disseminate crop advisory and disease forecasting services to farmers in a resource-constrained environment.

Research Context

aAQUA farmer clubs and KVK Baramati use online information kiosks to provide crop advisory and disease forecasting services to farmers. The usefulness of the predictions, however, is limited due to the nature of the input parameters, which change from place to place. This project plans to enhance the accuracy of forecasts to farmers by placing more sensors in surrounding regions. The project uses existing kiosks and mobile networks to distribute the information. To benefit a wider number of farmers, the project also provides content to a local community radio station, hosted by KVK Baramati. The disease forecasting services model can be replicated across the country using the network of KVKs.

Target Beneficiaries

The main beneficiaries are farmers in Pune district and kiosk operators in Pabal and Baramati. KVK experts also benefit by learning to use new ICT tools for disease forecasting. Others who are implementing agri-extension services can use results from the project to establish disease-forecasting centres.

Outputs

- Documentation of the model for expert crop assistance using remote sensors;
- Information on diseases presented in user-friendly interfaces;
- Alerts and recommendations for farmer clubs; and
- Feedback from agri-experts and farmer clubs.

Research Results and Outcomes

The start-up for this project was delayed due to legal problems and, at the time of writing, reports on project progress were not yet due. The project team has communicated that, to date, it had defined the tasks to be undertaken by various partners, selected the field sites for the pilot and identified several methods for dissemination of project results.

KVK Baramati and Developmental Informatics Lab of IIT Bombay will be responsible for assessment of sensors and design input. KVK Baramati farmer clubs and possibly, Godrej Agrovet will undertake the task of interpreting sensor information to predict crop diseases. Vigyan Ashram will host field staff and provide security of equipment. Students from IIT Bombay will participate in the project development through site visits and assessment studies.

A site survey was conducted and six locations have been identified of which four will be selected for the pilot. Good agricultural practices will be documented and disseminated in the local language. These will include recommendations on organic and chemical-based production methods. The project intends to submit publications in leading technical and ICT conferences. In addition, the project foresees that some of its results can be applied to the development of a Masters level course offered at IIT Bombay titled *ICT for Socio-Economic Development*.

Project Duration

Start Date: September 2005

End Date: May 2007

Total Duration: 21 Months

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Health and Medicine



Photo: Richard Labelle

47. ICT-Based Telemedicine System for Primary Community Health Care in Indonesia
48. Community Health Information Tracking System (CHITS), Philippines
49. Telemedicine in Nepal
50. Web-Based Integrated Dengue Haemorrhagic Fever Surveillance System in Indonesia
51. Using ICT to Build Capacities of HIV/AIDS Service Providers in India
52. Impact of Remote Telemedicine in Improving Rural Health, India
53. Development of a Web-Based Medical Information Repository Integrated with an Artificial Intelligence-Based Medical Decision Support System, Malaysia
54. M-DOK: Mobile Telehealth and Information Resource System for Community Health Workers in the Philippines
55. Development of ICT-Based Mobile Telemedicine System with Multi-Communication Links for Urban and Rural Areas in Indonesia
56. Generic Engine for Modules in PrimaCare

47. ICT-Based Telemedicine System for Primary Community Health Care in Indonesia

Grant Amount: US\$ 26,992

Keywords: TELEHEALTH, PRIMARY HEALTH CARE, POLICY, INDONESIA

Geographical Coverage: Indonesia

Objectives

The objectives of this project are to develop PC-based medical stations and conduct field-testing in at least eight locations.

Research Context

This project involved the development of a pilot Internet and communication technology-based telemedicine system for primary community health care in urban and rural areas of Indonesia. The project used existing Internet technology to enhance PC-based medical stations and performed field-testing. The pilot telemedicine network consists of six stations for community health centres and a station for referral hospitals, a health office and test laboratory. The project includes software development and network integration. The resulting system can be expanded to cover a larger number of stations.

Target Beneficiaries

- Users of telemedicine for primary community health care;
- Under-served communities in rural and urban areas, especially mothers and children; and
- Providers of primary community health care in Indonesia including health care providers, primary community health centres (Puskesmas), referral health offices and hospitals.

Outputs

- White Paper containing practical recommendations for ICT policy reform regarding social and community use of the Internet in Indonesia;
- A generic Internet-based telemedicine system and software modules for primary community health care in community healthcentres;
- Dissemination activities (seminars, meetings, mailing lists, websites) to promote the application of the ICT -based telemedicine systems; and
- Use of the system by community health centres, through the Research Group on Biomedical Engineering, Institut Teknologi Bandung (ITB).

Research Results and Outcomes

The project successfully completed its objectives within the proposed timeframe. In the first few months of implementation, the project faced unforeseen difficulties in initiating collaboration with various target institutions, namely, the Bandung Health Office, referral hospitals and the 70 existing community health centres in the Bandung area. Although unavoidable delays occurred on certain aspects, the project achieved its objectives and even surpassed them, as the number of community health centres joining the telemedicine system was double the project's target.

The project integrated the fields of community health care, ICT and biomedical engineering to develop and implement a community health care telemedicine system. The system is comprised of a health office, a referral maternity hospital and a number of selected community health centres. Associated telemedicine software modules developed include: medicine data recording and reporting, patient data recording and reporting; telecoordination, community health education and teleconsultation. The project integrated ICT training for medical personnel on the use of computers for daily health care. It also undertook efforts to improve the quality of maternal health care delivery, and developed a web-based community health care information system to provide public access to a range of health care facilities and related information.

The project worked in close cooperation with local government health institutions and personnel, especially the personnel of community health centres in Bandung, who are the primary users of the system. More than 70 percent of the medical doctors and administrative staff involved in the project are women. Local health institutions and personnel participated in the project at two key stages. The first stage involved the collection of information, definition of system requirements and the system design. The second stage involved deployment and integration of the system into daily health care delivery activities at the selected community health centres.

Significant improvements were noted in the provision of daily health care services at community health centres. The software packages that were particularly useful were *Medicine Data Recording and Reporting* and *Patient Data Recording and Reporting*. However, the project found that human resource training, in particular familiarization and socialization with computer use and telemedicine in general, required significantly more time than expected. Thus the project has shown the significant role

that human resource development plays in the sustainable implementation of ICT-based telemedicine systems. This implies that the success of telemedicine and other information system implementation in health care settings is dependent on the institution's organizational readiness. The project recommends that personnel, workflow, policy and environment should be considered throughout system development and implementation. At a macro scale the support of government and implementing institutions is vital for the success of programmes. Support should not be limited to recommendations, but should also include policy change and financial allocations for health care institutions to implement ICT-related health care solutions.

Additional research activities that evolved from this project include: *Development of ICT-Based Mobile Telemedicine System with Multi-Communication Links for Urban and Rural Areas in Indonesia* - also receiving a Pan-Asia ICT R&D Grant (no. 55), *Development of SMS-based Telemedicine System for Communicable Disease Monitoring and Outbreak Management*, and *Development of an Integrated ICT-Based Telemedicine/Telecentre System for Application in Rural Areas of Indonesia*.

Project Duration

Start Date: November 2002

End Date: June 2004

Total Duration: 20 Months

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48. Community Health Information Tracking System (CHITS), Philippines

Grant Amount: US\$ 22,642

Keywords: TELEHEALTH, PRIMARY HEALTH CARE, INTERNET, SMS, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to improve injury prevention programmes through an injury registry.

Research Context

In this study free and open source tools from the Linux community combined with participatory people-centric strategies were employed to enable implementation of an injury surveillance system by health workers. The project has three main components: SMS for reporting injuries, training of health workers on injury surveillance and a web-based system for the graphic presentation of injury data used by decision makers. The pilot project was implemented in a poor urban village of the Philippines. SMS was selected because of its widespread penetration in the Philippines and its wireless capabilities.

Target Beneficiaries

The beneficiaries of this project are community health workers in Pasay City, Metro Manila, Philippines. Other beneficiaries are local government officials who can use the health reports generated by the system for community and local level decision-making.

Outputs

- Rapid prototyping of injury codes, SMS and landline phone submission formats and

protocols, and community health worker surveillance kits;

- Data modelling for the surveillance system;
- Development of applications to receive data and generate reports, including bug fixes and enhancements;
- Training on the system including preparing related content such as manuals, exams and certificates;
- Pilot testing and evaluation of the system; and
- Deployment of the system with actual submissions of data.

Research Results and Outcomes

The project's initial aim was to create a data collection system using SMS over mobile phones, called the Community-Based Child Injury Surveillance System. After preliminary investigations, however, the researchers discovered several constraints associated with the original strategy. These related to the cost of sending messages and public health policies that only allowed official government health centres to submit health data.

The project responded to these factors by shifting strategies and creating a computer-based information system that served, primarily, the needs of the health centre facility and, secondarily, of the national public health system. The project was renamed CHITS.

By employing a combination of methods, including community immersion, systems analysis, joint rapid application development, onsite technical assistance and grassroots-oriented training, CHITS was piloted in two of 13 health centres in Pasay City. The pilots had two major components: first, an extensible and customizable software engine for health facilities and, second, a training programme for health data collectors, such as health centre staff and community health workers.

The researchers note that developing a community-based health information system is a challenging task, closely approximating the level of difficulty found in the development of hospital and clinical information systems. By paying close attention to health centre events and culture, and by employing purposeful immersion in the end-user's way of life, the researchers were able to gain immense insight into their needs and requirements and apply these insights into software code, a process called "evolutionary software development". The researchers were originally leaning towards a technology-centric implementation of an information system. With deeper analysis and understanding of the needs and requirements of end-users, the researchers were able to put technology in its place to serve the genuine needs of community health workers.

The CHITS project has seen a number of opportunities for further development and replication. A blood bank and a national surgical registry are already using the CHITS generic software engine. CHITS also attracted the attention of the Department of Health and the

CHITS Tuberculosis module has been presented to tuberculosis control programme managers in the private health sector who are considering the system for adoption. There are also plans for citywide implementation of CHITS in the cities of Pasay and Marikina. Inquiries from three other municipalities have also been made.

Awards

CHITS was selected as a finalist in the 2006 Stockholm Challenge under the health category. To learn more see: <http://event.stockholmchallenge.se/finalists.php>

Project Duration

Start Date: January 2004
End Date: December 2004
Total Duration: 12 Months

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49. Telemedicine in Nepal

Grant Amount: US\$ 30,000

Keywords: TELEHEALTH, SOCIAL SERVICES, CONNECTIVITY, ACCESS, NEPAL

Geographical Coverage: Nepal

Objective

The objective of this project is to test the potential of telemedicine for pathology, dermatology and radiology in rural Nepal.

Research Context

Nepal has an acute shortage of doctors with a ratio of approximately 6,000 people per doctor. In addition to this, health workers in rural areas, who serve the majority of the population, are isolated from specialist support and current information. This project sees the advent of ICT tools as offering new opportunities to address this situation and support the delivery of health services. This pilot project intends to gain experience in this area, emphasizing the use of technologies such as imaging, low-cost connectivity techniques, and training of local health care workers who will take the lead in developing and operating telemedicine projects. In its implementation the project will consider local technical and cultural conditions, the appropriateness of solutions, and address sustainability issues to ensure continuity of the system.

Target Beneficiaries

The project benefits under-served communities in the rural and urban areas of Butwal, Jhapa and Bhaktapur and the primary health care project of Bhutanese refugees in Jhapa in Morang District. Health workers at Siddhi Memorial Foundation, Bhaktapur, Siddhartha Children and Women Hospital, Butwal and AMDA-Hospital, Damak will also benefit from the project work.

Outputs

- Develop a telemedicine system based on a store and forward principle suitable for Nepal;
- Create a pool of health professionals at HealthNet Nepal who are trained in the use of digital cameras and related equipment for diagnosis and management of cases;
- Plan a potential collaboration with the Ministry of Health to implement the telemedicine system in remote areas;
- Make the imaging technology for diagnosis and management of health cases available to other organizations in Nepal; and
- Use FOSS in telemedicine in remote areas.

Research Results and Outcomes

At the time of writing no reports were available on the progress of this project.

Project Duration

Start Date: August 2004

End Date: December 2006

Total Duration: 29 Months

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50. Web-Based Integrated Dengue Haemorrhagic Fever Surveillance System in Indonesia

Grant Amount: US\$ 24,877

Keywords: HEALTH, FREE AND OPEN SOURCE, GEOGRAPHIC INFORMATION SYSTEM, INDONESIA

Geographical Coverage: Indonesia

Objectives

The objectives of this project are to improve the detection and management of Dengue Haemorrhagic Fever (DHF) cases and help control dengue transmission in the community.

Research Context

DHF is the leading cause of hospitalization and death among children in Indonesia and in other endemic areas in the developing world. The ability to prevent and manage DHF outbreaks is often limited by poor disease detection, surveillance and management systems and a corresponding lack of coordination among community-based control efforts. This action research project aims to involve the local government, community members and health care personnel in the development of an integrated, web-based GIS on DHF outbreaks. The system is expected to improve the detection and management of DHF cases in the community and become a model for DHF control in other endemic areas. It may also be applied to other communicable diseases.

Target Beneficiaries

The direct beneficiaries of the project are communities who live in urban and suburban areas, where the incidence of DHF is highest. The health sector can use data from the system to plan, mobilize resources, advocate and implement coordinated DHF control efforts.

Outputs

The project aims to integrate DHF surveillance and control activities among health care personnel and public health administrators through a web-based geographic information and decision support system, so that hospitals, community health centres and health offices are able to monitor the incidence and time-space clustering of DHF cases and fatalities. To achieve this, the project will:

- Develop guidelines for the mobilization of resources to minimize DHF morbidity and mortality, especially in the form of web-based interactive programs;
- Enhance learning on the successes and failures of DHF case management and control in the community; and
- Report on the effectiveness of the web-based DHF surveillance system published on the website and in a peer-reviewed journal.

Research Results and Outcomes

At the time of writing, formal reports from this project were not available. The project, however, has communicated the following progress. The intended project site was originally only one district (Sleman). After initial project socialization, the administrators of nearby Yogyakarta Municipality, which shares contiguous DHF risk areas, also requested to participate in the project. As the Yogyakarta

Municipal Government was willing to pay field workers to monitor *Aedes* larvae in the community, no additional resources from the ICT R&D Grants Programme were required for this project expansion. At the time of writing the government had committed to funding the project for an additional year.

The networked surveillance system is a tool to utilize data that are systematically collected, processed and presented in an electronic virtual map. The map can be used to inform strategies to control the spread of DHF. The surveillance system has covered the project areas and was used to generate spatial clusters of DHF cases. The information on the location and increase in the number of cases is monitored by two local health officials who inform hospitals admitting DHF cases, allowing them to improve early diagnosis and case management. The incidence of cases in Sleman District from 2003 to 2005 has been 552, 732 and 316, respectively. Up until May 2006, there have been 176 cases.

The project is now mapping vector densities (percentage of houses with *Aedes* larvae) in Yogyakarta Municipality. After this is complete, the DHF control programme will focus on preventing dengue transmission in two highly endemic villages, Caturtunggal and Condongcatur. Ovitrap will be used to monitor vector density in the two villages, and then the project will map the results for surveillance purposes.

The project is collaborating with social scientists to develop ways to use evidence generated by the mapping system to influence policy-

making and promote community behaviour changes campaigns that can help control DHF outbreaks. Social scientists in the Department of Public Health, Faculty of Medicine at Gadjah Mada University are conducting research on behaviour change relating to dengue vector elimination and intend to publish key messages and a summary of their findings on the project website (under construction).

The project developed training modules on GIS for disease surveillance. Health staff responsible for infectious disease control in South Kalimantan, East Java and Yogyakarta provinces has attended the training. Four seminar papers in Indonesian have been produced and two articles were submitted to the *American Journal of Tropical Medicine and Hygiene* and *Tropical Medicine and International Health*.

Project Duration

Start Date: January 2005

End Date: September 2006

Total Duration: 21 Months

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51. Using ICT to Build Capacities of HIV/AIDS Service Providers in India

Grant Amount: US\$ 29,786

Keywords: HEALTH, HIV/AIDS, INTERNET, CAPACITY BUILDING, INDIA

Geographical Coverage: India

Objectives

The objective of this project is to develop an Online Resource Centre (ORC) on HIV/AIDS with e-Training programmes, e-Forums and e-Support.

Research Context

India accounts for 60 percent of the HIV/AIDS epidemic in South Asia, with an estimated 5.1 million people infected in 2004. A nationwide needs assessment survey conducted by the Solidarity and Action Against the HIV Infection in India (SAATHII) indicate that while over 1,200 agencies are attempting to respond to the crisis, delivering quality services has been impeded by a lack of ICT capacity building programmes, lack of digital forums for networking, sharing of knowledge and best practices, and inadequate access to relevant electronic resources. In this project SAATHII aims to develop an ORC on HIV/AIDS in India. The centre provides HIV/AIDS e-Training programmes, interactive e-Forums and e-Support tailored to different organization's needs. The project intends to assess these programmes using both quantitative and qualitative analyses, the results of which will constitute core determinants of an enhanced response to the fight against HIV/AIDS in India.

Target Beneficiaries

The project focuses on four categories of stakeholders involved in the fight against HIV/AIDS in India: non-profit HIV/AIDS service-provider organizations in rural and semi-urban

areas who have access to the Internet; physicians, counsellors, and social workers involved in offering prevention, treatment, care and support services; HIV/AIDS positive people; and members of the public seeking current information on HIV/AIDS-related issues ranging from prevention to treatment to policy.

Outputs

An integrated ORC for HIV/AIDS in India consisting of:

- Training modules with interactive components delivered via dedicated web pages on the <http://www.saathii.org> website;
- An e-Forum for general use beyond the project period, that will be consolidated into Frequently Asked Questions and Best Practices documents for wider dissemination on the website;
- Research papers and reports based on analyses of the e-Training, e-Forum and e-Support components, comparisons with offline training and support programmes, and quantitative and qualitative analyses of the capacity building of programme participants; and
- A model of capacity building through ICTs that can be tested and adapted to other resource-constrained environments.

Research Results and Outcomes

All the specific objectives proposed by SAATHII (e-Training, e-Forums and e-Support) have the common goal of facilitating knowledge

transfer, information and exchange. After exploring various methods of implementation, it was decided that all these objectives could be addressed by the development of a comprehensive information and communications management system that would host the ORC.

The ORC system took four months to develop and involved a close collaboration between SAATHII and Janastu, a non-profit IT agency in Bangalore. The ORC provides a simple web interface to collect data combined with a directory and database structure to collate context-specific data. The ORC is a cost-effective and highly flexible software built from Pantoto, an online community model that uses free and open source technologies such as Java, MySQL and WebMacro.

Modules for e-Training have been designed using ICT-based instruction to reach a large number of geographically-dispersed HIV/AIDS organizations. A total of 15 modules were proposed, each intended to reach about 50 participants at a time. Three of these modules will be piloted during the project period. The modules cover topics in prevention and treatment that are relevant to service providers. These include Biostatistics and Research Methods, Monitoring and Evaluation, and HIV/AIDS and Nutrition. The project has already launched the online training programme in Biostatistics and Research Methods. The course has enrolled 80 students from 11 states in India, and uses a combination of lecture notes, online chat sessions and a mailing list for discussion of scientific articles.

The project designed e-Forums to facilitate and enhance collaboration, information exchange and sharing of best practices, and strengthen

technical capacity among stakeholders in India through electronic bulletin-board forums. The e-Forums have been structured to the needs of communities of practice covering such areas as anti-retroviral therapy, counselling, nutrition, infected-affected-vulnerable children, prevention and home-based care.

The project is in the process of developing e-Support to provide focused support services and referrals to organizations with specific resource needs. The assessment of needs is determined during the course of field visits and through the e-Trainings and e-Forums. Twelve organizations will be selected to receive e-Support during the project period.

The project has also launched an e-Library that hosts a growing collection (currently over 360) of India-related HIV/AIDS articles, toolkits and best practices documentation, covering science, policy, education, training, media coverage and case studies. The interactive nature of this library allows users to share their own documents and reports in addition to retrieving materials. Additionally, the e-Library contains sub-databases of conferences, training workshops, grants and job vacancy announcements.

The components and services available under this project have been publicized on the SAATHII listserv (with membership of 2,800), through a print brochure describing the ORC and its components, and through site visits by researchers and staff from NGOs. SAATHII's experience with development of the ORC has been shared at an ICT panel organized by UNAIDS-India at the India HIV/AIDS conference held in Chennai in 2005. Additionally, an abstract *ICT for HIV/AIDS Capacity Building* has been accepted by the International AIDS conference held in Toronto in August 2006.

Project Duration

Start Date: March 2005

End Date: September 2006

Total Duration: 19 months

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52. Impact of Remote Telemedicine in Improving Rural Health, India

Grant Amount: US\$ 29,313

Keywords: HEALTH, TELEHEALTH, SOCIAL SERVICES, INDIA

Geographical Coverage: India

Objective

The objective of this project is to study the impact of remote telemedicine in selected villages in India.

Research Context

Internet kiosk operator, N-Logue, currently offers rural people access to doctors from its Internet kiosks using video-conferencing. The service has been limited because vital medical information of patients is not available. This project aims to field test a low-cost medical kit, called ReMEDiTM, developed by a partner company Neurosynaptic Communications Pvt. Ltd. that works in conjunction with a rural kiosk and transmits data to a doctor in a town. The data sets that can be captured are electrocardiogram (ECG), blood pressure, temperature and heart rate. The project expects to study the impact of this product in the selected villages over a 24-month period.

Target Beneficiaries

Through this deployment N-Logue seeks to increase the rural population's access to adequate and timely health care services. The project monitors the direct economic benefits to villagers and the indirect benefits associated with timely medical support.

Outputs

- Identification of test-site locations;
- Implementation of the remote diagnostic solution;

- Monitoring of the project; and
- Compilation of information and preparation of a final report.

Research Results and Outcomes

This project is still in process at the time of writing and was proceeding well towards meeting its stated goals and objectives. The project had selected the kiosks to test its programme, it has trained kiosk operators in the use of the ReMEDiTM, has secured a partnering doctor, and begun conducting field tests of the system.

The selection of kiosks was based on criteria defining their readiness to take on the ReMEDiTM kit. The criteria took into account such factors as distance from the nearest hospital, location of the nearest pharmacy, gender of users, location and age of the kiosk, and available space to set up the system. The project selected villages of Sivagangai District in rural Tamil Nadu. In the Sivagangai District medical facilities of one type or another are available in 163 villages, which constitute 33.54 percent of the total number of inhabited villages. N-Logue has set up the project with the Access Centre at Tirupattur and five Internet kiosks in the villages around it. The partnering doctor is based at a hospital in Tirupattur about 25 km radius away from the selected villages. Consultation hours are 5 pm to 7 pm daily.

A kiosk operator training methodology was developed and implemented in three parts. First, Neurosynaptic Communications Pvt. Ltd.

trained the operator on the use of the ReMEDiTM. Training covered kit operations, maintenance, troubleshooting, and Dos and Don'ts. The second part involved training by a doctor on how to attend to a patient and administer the tests. Topics included how to deal with a patient, what kind of cases can be handled by the kiosk operator, what kind of cases must not be handled under any circumstances, instructions on the customer waiver form and training on using the various tools – where to place the stethoscope, thermometer and so forth. The third part of the training was provided by N-Logue and covered the business model and service promotion. The training included cost and revenues, rates for various tests and consultations, features, advantages and benefits of the telemedicine service, and how to communicate these to the villagers.

The project promoted the service through conducting a Health Camp where all visitors were given free blood pressure and ECG tests. To gain the support of the District Administration for the effort and to increase the acceptability of the service in the village, the project held an inauguration of the service with the District Collector, who is the highest-ranking administrative official in the district.

Immediately after the launch of the service, a spike in visitors to the kiosk was observed. Subsequently, the number has dropped to a few regular, repeat visitors. A survey instrument was designed to analyze the reasons for the drop in the consultations. Some of the possible reasons being analyzed are: kiosk operator's

inability to administer the kit properly, unacceptability by the villagers, poor identification of the kiosk as a place where medical care is dispensed, lack of awareness of the service, the distance of the doctor from the village, and the availability of competing services such as registered Indian medical practitioners, primary health centres and local doctors. Based on feedback, the service is being refined.

While the project is still underway and final results have not been reached, the project team has noted the importance of creating public-private partnerships with governments, NGOs and health institutions for remote health delivery to rural areas. They see that such partnerships can improve the quality of services being offered and increase acceptance of it by villagers.

Project Duration

Start Date: January 2005
End Date: October 2006
Total Duration: 22 Months

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53. Development of a Web-Based Medical Information Repository Integrated with an Artificial Intelligence-Based Medical Decision Support System, Malaysia

Grant Amount: US\$ 9,000

Keywords: HEALTH, INFORMATION MANAGEMENT, ARTIFICIAL INTELLIGENCE, MALAYSIA

Geographical Coverage: Malaysia

Objective

The objective of this project is to provide advanced, quality health care information and services through the use of ICT tools and Artificial Intelligence (AI).

Research Context

The aim of this project is to provide quality health care information and services for the Malaysian people, especially those in rural communities. The project employs ICTs and AI to develop and implement a web-based medical information repository (MIR) integrated with a medical decision support system (DSS). The novelty of the project lies in the inclusion of an AI-based DSS into the MIR. The system is able to learn incrementally in real-time, non-stationary environments with minimum intervention. With this autonomous learning capability, medical practitioners are able to train and fine-tune the DSS, and to assume ownership of the system.

Target Beneficiaries

The project serves as a prototype system to demonstrate the significance of information sharing through a web-based repository to synergize activities in medical practice, training, and research using ICT and AI methodologies. It is envisaged that medical practitioners and researchers will be able to access anonymous medical records with heuristic diagnostic rules

from the MIR through the Internet. The information obtained helps clinicians apply the most effective curative and rehabilitative regimes to enhance quality of health care of patients, especially for those in poor and remote areas where infrastructure and medical expertise are scarce. The MIR and DSS can be used as a resource, which contains up-to-date health care procedures and information, for continuing education and training of clinicians and medical practitioners. In addition, the project can be integrated into the telemedicine flagship application under the Multimedia Super Corridor project spearheaded by the Malaysian government.

Outputs

The main output of the project is a web-based MIR and DSS software comprising:

- Anonymous medical records of patients useful for medical practitioners and researchers including physical symptoms, family history and bio-chemical test results;
- Heuristic prognostic and diagnostic rules useful for junior and inexperienced clinicians elicited from medical specialists and the DSS; and
- Disease statistics and facts useful for health care administrators and policy makers.

Research Results and Outcomes

The project involves collection of anonymous patient data from participating hospitals and development of an AI-based decision support tool to assist medical practitioners in making accurate and timely diagnostic decisions. It is anticipated that medical doctors and health care workers, especially those in remote areas where specialized medical knowledge (e.g. stroke diagnosis) is difficult to come by, will use the system for validation of patient information as well as consultation for medical decision-making.

To date, the algorithm of the DSS has been developed using AI methodologies. Rigorous lab-based testing and evaluation of the algorithms has been conducted. A database of more than 1,000 anonymous patient records on acute stroke diagnosis has been collected for analysis. Currently the process of data cleansing to remove “noise” and missing information is being conducted. The project is working with a consultant neurologist who provides feedback and information on the important symptoms of a disease and details on how to interpret the relevant diagnoses. Students at the postgraduate level (Master’s and PhD) are being trained in the development of the DSS. A specific focus of this training relates to algorithm deployment and state-of-the-art methodologies in AI, particularly in the areas of artificial neural networks and fuzzy systems.

The greatest challenge the project faced relates to the establishment of the medical information repository. The project has insisted on using real (anonymous) patient records. However, the

medical data collected was often incomplete, making the analysis difficult and time-consuming. Therefore, the project was extended by six months to allow for a longer period of data collection and validation, which will ensure proper analysis and interpretation. This process is important, as the AI-based decision will be “trained” to recognize disease symptoms autonomously by using the database. Thus, a good quality medical database is a crucial factor in determining the effectiveness of the resulting DSS.

After the project team conducts a systematic evaluation of the performance of the AI-based algorithm, medical doctors will be enlisted to further evaluate the system. Suggestions and feedback received will be taken into consideration to improve the effectiveness of the system and finally a web-based implementation of the DSS will be conducted.

Project Duration

Start Date: February 2005

End Date: July 2006

Total Duration: 18 Months

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54. M-DOK: Mobile Telehealth and Information Resource System for Community Health Workers in the Philippines

Grant Amount: US\$ 29,784

Keywords: TELEHEALTH, TELEPHONY, SMS, SOCIAL SERVICES, PHILIPPINES

Geographical Coverage: The Philippines

Objective

The objective of this project is to transmit store and forward diagnosis and treatment data from the community health worker to a remote physician.

Research Context

Delivery of health care services and information at the rural level can be improved with the use of innovative ICT tools. This project aims to develop a user-friendly graphic interface for a mobile phone telehealth information system using SMS to deliver pertinent health information for rural users. This project employs a Java-enabled mobile phone to transmit, store and forward diagnosis and treatment data from the community health worker at the point of care to a remote physician. Deployment of the technology developed in this project is thus applicable to developing countries that require cost-effective hardware platforms and have little or no General Packet Radio Service (GPRS).

Target Beneficiaries

The main beneficiary of this project is a rural community in Lanao del Norte where the project partner, the Philippine Council for Health Research and Development (PCHRD), has an established initiative for an Internet multipurpose community telecentre. Other beneficiaries include technology partners

involved in the development of the mobile telehealth system with SMS, and LGUs working to increase health services for their constituents.

Outputs

The project seeks to deliver a mobile electronic patient record system using Java over SMS with relevant health information stored on a multimedia card.

Research Results and Outcomes

The M-DOK project thus far has fulfilled the following objectives: development of an end-to-end mobile telehealth system composed of a mobile Java application and a Windows-based receiver application; health information modules stored offline on the mobile phone; a mobile electronic patient record; and a lightweight mobile encryption algorithm. Windows was initially chosen instead of Linux because of its greater potential for adoption and ease of installation. A Linux version of the system is planned to be developed.

Health information modules were developed using simple Portable Document Format (PDF) and graphics. By clicking on the pertinent file, the Adobe Acrobat Reader installed on the mobile phone will launch and view the contents of the HTML file. The project will also develop a version that uses another phone to

receive SMS messages (instead of a computer as it is currently configured).

Its only remaining deliverable is the development of a network of community health workers and referral physicians for the system. The project has already coordinated this with the PCHRD who has agreed to deploy the application in one of their multipurpose community telecentres in Lanao. This represents an opportunity to compare the Internet-based telehealth system and the mobile telehealth system. Deployment is scheduled to begin with a test run. The application will be revised based on the response from these tests.

Unlike Internet telehealth applications, or more complex mobile telehealth applications, M-DOK is designed to be easily scalable and low-maintenance. The health information modules will be made freely available, with translation shouldered by the downloading party. The application is expected to augment

the delivery of health care in communities where the primary health workers are community health workers and not tertiary care physicians. It is also expected to be most useful for countries where SMS messaging is prevalent, allowing for greater dissemination and use.

Project Duration

Start Date: July 2005

End Date: June 2006

Total Duration: 12 Months

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55. Development of ICT-Based Mobile Telemedicine System with Multi-Communication Links for Urban and Rural Areas in Indonesia

Grant Amount: US\$ 29,479

Keywords: TELEHEALTH, SOCIAL SERVICES, RURAL, URBAN, INDONESIA

Geographical Coverage: Indonesia

Objective

The objective of this project is to develop a tested, working mobile telemedicine system prototype.

Research Context

This project aims to develop an ICT-based mobile telemedicine system with multi-communication links for urban and rural areas in Indonesia. The project uses existing Internet communication technology to develop a prototype telemedicine system that can be easily moved from one place to another. The telemedicine application is focused on diagnostics, consultation, and recording and reporting patient's information. The system can also be used for other health care service applications and is considered to be particularly useful in many remote areas in Indonesia.

Target Beneficiaries

Patients who live far away from a hospital can be given a routine check-up using a mobile phone. Local hospitals with limited human resources benefit as the system provides a faster response to critical medical care and contact with specialists in spite of geographic barriers. The programme for reducing maternal mortality rate and improving mother and child health benefits local authorities that provide these services.

Outputs

A tested, working model of an ICT-based mobile telemedicine system. The system is expected to be used for community health care and can be implemented easily in emergency situations.

Research Results and Outcomes

The project began by conducting several field surveys in the implementation area of Sukabumi, West Java. The target area covers about 4,248 sq km and has a population of about 2.3 million people. The altitude varies within the range of from sea level to nearly 3,000 m. The topography consists of highlands, hills and coasts. Three hospitals and 71 community health centres serve the local population. The project has also completed field surveys on the quality of the existing communication signals in about 35 locations in Sukabumi area. The main challenge that the project identified for its implementation is the difficult topography and availability of communication infrastructure.

Based on the results of these surveys, the project has moved forward with system design, and a number of protocols, applications, software and hardware components have been completed. These include: the protocol design of the teleconsultation and telediagnosis applications; preliminary software design and

schematic communication links selection; the first prototype of the medical information concentrator display software; and the hardware design and implementation of a blood pressure and foetal heart rate pilot interface. A number of activities are currently in progress including: the development of an ECG interface; the improvement of the communication links selection software; improvements on patient and hospital information systems; and the telediagnosis and teleconsultation software.

The team notes that the project is challenging. The system is relatively complex as it involves combining a number of technologies and disciplines, such as communications, computers, sensors, instrumentation, medical, electronics and other resources.

The project has a highly participatory development structure. Participants include the Director and staff of R.S. Samsuddin, 56 community health centres (CHCs) in the Sukabumi area, Sukabumi Health Office, Local Authority Development of Sukabumi, and the Information and Communication Department of Sukabumi. Health care personnel from R.S. Samsuddin and the CHCs will participate as users of the system during test periods and after the project has completed. Some staff from R.S. Samsuddin is also participating in the project design and implementation. The project

involves graduates students in the Research Group on Biomedical Engineering at ITB. Sukabumi Health Office is involved in management policy for health services in the area. The Local Authority Development is expected to support the project sustainability.

To date, the results of the project research activities have been presented in two national seminars, the National Biomedical Engineering Seminar, Yogyakarta, 25 February 2006 and the Symposium on Development of Emergency and Disaster Communication and Information Systems, Jakarta, 7 March 2006.

Project Duration

Start Date: July 2005

End Date: June 2007

Total Duration: 24 Months

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56. Generic Engine for Modules in PrimaCare

Grant Amount: US\$ 30,000

Keywords: PRIMARY HEALTH CARE, FREE AND OPEN SOURCE, MALAYSIA

Geographical Coverage: : Malaysia

Objectives

The objectives of this project are to develop free and open source medical software modules in PrimaCare to improve the quality of primary health care through better patient clinical information and statistical data management.

Research Context

Primary health care provides the first line of preventive and curative medical services to the individual, the family and the community. Poor clinical information and weak statistical data management, however, often hinder primary health care's effectiveness. This project aims to enhance the existing PrimaCare with free and open source medical software for clinical and operational aspects of primary medical practice. The project aims to develop a Generic Engine for Modules (GEM) with specialized modules for general paediatrics, general women's health and basic epidemiology. The GEM will empower medical practitioner developers to build or expand their own modules based on their needs, thus providing an important tool to extend the impact of PrimaCare beyond primary health care.

Target Beneficiaries

- Patients of primary health care in Malaysia and other developing countries;
- Primary health care doctors and clinics in Malaysia and other developing countries; and
- The development team of PrimaCare.

Outputs

- Generic engine through which specialized modules can be developed;
- Free and open source medical software for general primary health care, including modules for Paediatrics, Women's Health and Epidemiology;
- Test of the GEM by a quality assurance team;
- Field test of the specialized modules by local primary health care doctors;
- Evaluation and monitoring results of the GEM and specialized modules;
- Regional dissemination to participating countries through international conferences and workshops; and
- Technical and user manuals in English.

Project Duration

Start Date: February 2006

End Date: February 2007

Total duration: 13 Months

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Annex 1

Assembling this Publication: Research Process and Consolidated Findings

This Annex seeks to highlight the research context and process undertaken to develop *Exploring New Modalities* and share some reflections on its outcomes. It is offered to provide some additional background into the document itself and to make general notes on what was involved in carrying out the analysis. The Annex is divided into four sections. The first is a brief discussion of broader ICT4D issues that contextualize the Pan-Asia ICT R&D Grants Programme and the research approach. The second describes the research question and approach. The third explains the research methodology and its outcomes. Finally, it reflects briefly on the strengths and limitations of this study.

The Programme Context

While it is beyond the scope here to enter into a thorough analysis of how the ICT R&D Grants Programme fits into the overall debate of ICT4D, there are several areas that can be explored to the extent that they might shed light on the project findings.

The most relevant development issue that the Programme addresses is that of globalization and the digital divide. Castells (1996, 1997, 1998, 2001) argues throughout his work on ICTs in society that recent developments across all social sectors – government, business, education, science, health, the environment and so on – have been propelled by innovations in ICTs. Castells is careful to state that ICTs are not in themselves development, but that rather it is use of ICTs tools – the ability of networked systems to process complex information into useful knowledge combined with vast efficiencies offered by inexpensive global communication and the corresponding transfer of symbolic narratives – that has been one of the defining characteristics of social and institutional change over the past several decades. ICTs central role across all development sectors and the importance of bridging the digital divide is similarly treated in the text of the 2005 Tunis Commitment of the World Summit on the Information Society (WSIS). The argument of the digital divide centres around the proposition that the global information network is such a dominant and powerful feature of contemporary society and institutions that to be outside of it is in itself tantamount to marginalization (Castells, 2000, p.405). Those outside the system not only do not benefit from these technologies but in fact are increasingly excluded, marginalized and finally made irrelevant. It must be acknowledged that while ICT use is growing rapidly worldwide, a relatively small percentage of people have access to these promising technologies and most of these are in developed societies. The greatest barriers to entry into the network society are infrastructure, education and cost.

In general, many of these arguments are supported by the project findings. The project works illustrate a wide range of practical benefits that can be derived from using ICTs to address local development concerns. The relevance of ICT4D is demonstrated by the willingness and capacity of local communities to engage with new technologies and adapt them for their own purposes. The broad range of project categories in the Programme (access to information, capacity building and education, policy and social research, technical innovation, environment and agriculture, and

health and medicine) clearly cross development, social and institutional sectors. This supports the argument that ICT4D should not be seen as a stand alone effort, but rather as integral to all development areas as emphasized in the 2005 WSIS Tunis Commitment. It should be noted that not all interventions we reviewed have been successful, and there remain many complex challenges to overcome the barriers of infrastructure, education and cost. These can be daunting and several projects came right up against these barriers and failed to overcome them. Yet, there are some highly innovative solutions that have been developed and a range of strategies emerged for further growth of such initiatives.

But the discussion of the digital divide should not be seen as solely related to physical technology. The deeper issue relates to what people do with technology. As Rao states “the information society is not just about passively using ‘black box’ technologies, but about actively creating and shaping the underlying technical information and service infrastructure” (Rao, 2005, p.275). The implication here, as it relates to the digital divide, is that we need to look at the local relevance of technological interventions. Without considering this dimension, ‘bridging the gap’ might be seen to relate primarily to the simple diffusion of physical technology. The importance of local relevance is treated by Granqvist, who argues that the use of the term digital divide in itself implies that “in the typical ICT-for-development case, non Western communities are conceived of as ‘know-nots’, underdeveloped, and in need of Western structures and infrastructures” (Granqvist, 2005, p.292). Granqvist’s critique underscores the importance of participatory methodologies in interventions that acknowledge “...the right of inhabitants of these regions to define their own solutions (and problems for that matter) instead of having ready-made models and accompanying technologies forced upon them” (Granqvist, 2005. p.293).

The statement that the information society is not about technology, but rather what people do with it, is supported by the projects and can even be said to be embedded at the programmatic level. Each project funded represents a very unique example of an interaction taking place between new technologies and a local application. In fact the success of the projects was often seen to relate specifically to how this interaction evolved. Correspondingly, the local relevance of interventions is seen to be probably the most critical factor effecting project success. It is clear that the projects that embraced participatory, consultative processes in their design, planning and implementation phases had a marked increase in their probability to achieve their objectives. The benefits of participatory processes were further enhanced in those projects that used these interactions to inform, adapt and modify their intervention as this was seen to influence the quality and relevance of the projects outcomes. Therefore, Granqvist’s call for participatory intervention strategies is seen to be strongly supported by the research.

On the other hand, Granqvist’s argument that “in the typical ICT-for-development case, non Western communities are conceived of as ‘know-nots’” (Granqvist, 2005. p.292) is not supported, at least within the context of this research. The majority of the projects in the Programme are locally led, demonstrating a high degree of local capacity to conceptualize and manage both the technical and social aspects of these interventions. While one still might argue that these projects are led by an educated and privileged ‘elite’ the fact remains that a first-world third-world model is seen to have little relevance here. Further blurring these boundaries are the many cases where projects have engaged in collaborative processes and partnerships with a range of local, regional and global institutions and actors. It should be noted that these ‘partnerships’ were not always easy to forge; a number of projects noted problems in managing these sometimes complex

relationships. Operating in such a terrain of blurred boundaries and multiple perspectives implies that there can be no single solution to development issues, but rather *solutions*. These solutions as they relate to ICT4D are perhaps best framed as processes of interaction between local concerns, global options and a range of actors operating in many different social spheres.

Considered in this light, we can entertain a refined understanding of geography. The logic of networked systems does not necessarily follow the traditional geography of developed and underdeveloped countries or regions. Castells notes that “Internet use is diffusing fast, but this diffusion follows a spatial pattern that fragments its geography according to wealth, technology and power: it is the new geography of development” (Castells, 2001, p.212). This is paralleled in the discussion by Hemer and Tufte in which the notion of development is re-conceptualized under the concept of ‘world development’. This model recognizes that the “entire world is in ‘transition’” (Hemer & Tufte, 2005, p.15) and thus the logic of first and third worlds lose their relevance, and development is seen as a project in which we are all engaged in – for better or for worse – across cultures, geographic boundaries and ideological positions.

The underlying logic here is supported by the projects. The most successful are those that have shown the sensitivity and ability to network at the local, regional and global level. They have been able to articulate the link between the local development goals and the appropriateness of the technological solution. They demonstrate technical proficiency, a commitment to overcome any challenges, and the imagination to innovate and develop solutions.

The Research Question and Approach

The central question the study addresses is “what works and what does not”. It is easy to say yes, ICT with all their exceptional efficiencies and inexpensive access to global networks of information is surely beneficial to development. Such an answer, however, does not take into account the many complexities of the local situation. It is this question of local relevance that is central to the study.

To answer this question one must look at the intervention in context. This includes not only the context of the project’s objectives, beneficiaries and outputs, but also the financial, social and institutional context in which the project was undertaken and perhaps most critically, the context that the project creates. To answer this question one must try to really understand these issues. What are these people telling us? How does that relate to what other people are telling us? What can we learn from them individually and as a group? As the researcher, we found ourselves faced with the task of attempting to explore and understand these projects through reviewing and transcribing documents, by asking questions and responding to feedback, and finally by using writing as a reflexive process to distill the information and draw conclusions.

Research Methodology and Results

Overview of research methodology

The research methodology combined a desktop study of project reports and other internal documents, an e-mail questionnaire that was sent out to all grant recipients, and a feedback

mechanism comprised of sending out the text developed to recipients and partners for comment. This section describes the process UNDP-APDIP had undertaken to develop the case studies, the analysis and other compositional elements, and highlights some of the main issues that came up along the way.

Developing the case studies

The primary source of information on the projects was derived from project reports. By contract each project is required to submit interim progress reports and a final report on completion. Many of these are publicly available on the UNDP-APDIP website (<http://www.apdip.net/projects/ictrnd/recipients>), although a number of new project reports were sourced directly from AMIC, the programme administrator.

Our secondary source of information was comprised of feedback from grant recipients. It was seen quite early on that we could not rely completely on the project reports for our information. Most importantly, as a key goal of the book was to provide a networking tool for recipients and other interested parties it was seen as crucial that we had updated contact information for the projects. In addition, we recognized that there may be weaknesses in the reporting or that the reports did not fully represent the project work. To address this we developed an e-mail questionnaire and sent it out to all grant recipients. The purpose of the e-mail questionnaire was to update project information, solicit additional comments on the project work and if possible to get images that could be used in the final publication.

The questionnaire was sent out to all 56 projects. We initially thought that the response rate would not be high as some people may have moved on and of course people are busy and may simply not have had time to answer. In the end, we were surprised as a total of 46 projects did respond either in full or in part to the questionnaire. The information provided was then used to update the project profiles. It should be noted that although the response rate was quite high, the quality of feedback was somewhat mixed, with the exception of the updated contact information which was very useful. There were many cases where we found that the answers to the questions we asked were simply cut and pasted out of the reports we had already reviewed. But this was not always the case and some projects did offer fresh insights that were incorporated into the final report. Photographs in general, as one would expect, were mixed. Many were below print quality, although there were some real gems. Several of these were used in the final layout of the book.

After the project case studies were complete, we sent out our write-up to the grant recipients and project partners for feedback. In some cases we also posed specific questions either to clarify discrepancies in the reporting or to get more information on various aspects of the project. Overall, there were about 850 e-mails exchanged during the course of the research and writing of the document. While managing all this information was a significant effort, it was seen as useful to strengthen the integrity of the final document.

The main task, however, was to review the project documents and compose a short review on each project in a consistent format. This included project name, keywords, location, amount awarded, objectives, research context, target beneficiaries, outputs, project dates and contact information. For those projects that were either complete or at midway point (judged by the presence of an interim report or final report) a section on research results and outcomes was also

developed. A total of 63 projects had been funded between 2002 and 2005, of which eight had been closed or put on hold due to problems in undertaking the project work. This left a total of 56 projects to report on. Obviously, all of these projects had a project proposal from which to draw basic project information. Of the 56 projects nine were new or delayed and did not have interim or final reports, leaving 47 projects that were in some state of progress that could be reported on. This represented a large volume of information that had to be reviewed, digested and written up. We estimate that these project reports probably totaled somewhere around 2,500 pages of text. The project reports were also enhanced or at least cross-referenced with other internal documents, such as the internal programme review that included 14 site visits, as well as a range of documents produced by the programme and grant recipients. This body of information represented another several hundred pages of text.

An important point to make regarding the case studies is that in many cases they directly quote or paraphrase the project reports. This strategy had the benefit of keeping the text as close as possible to the grant recipients' presentation of their work. On the other hand however, it was challenging to pair down what was in some cases 60 or more pages of text into a three-page statement. The project reports were very diverse in the way they presented material. Some were very well-organized and written and provided a clear picture of the project in its totality. Others focused mostly on technical development and were difficult to understand without specific expertise in the relevant field. Still, others focused on the social process undertaken and in some cases read almost like a personal diary, exploring the emotional aspects of their work as it unfolded. In addition to the variety of report writing approaches taken, language was certainly an issue. Of course many of the project reports were written by people for whom English was not a first language, nor were their strengths necessarily in report writing. Considering all of these factors, it should be acknowledged that it was sometimes a challenge to ascertain the meaning of the text, and correspondingly the project work. We felt it was important to keep in mind that just because a report was not clear, it did not necessarily indicate that the project was not a good one. This required some discipline and sensitivity when reviewing these documents. The process had many benefits, but it should be acknowledged that one overall result of this process is that the case studies are sometimes rather awkwardly written.

Another area that required particular focus was locating the projects in time. Grant recipients project work can take place between less than a year and up to two years. Due, however, to the realities of implementing the projects, some started late, or took more time to complete than was originally anticipated. In addition, some projects we reported on were complete, some were at various stages of progress and others were either just beginning or had not yet started. As mentioned above, we did not have all project reports available from the beginning and a number came in during the writing period. This not only meant that the case study needed to be updated with the new information, but the tense (past, present, future) also had to be changed throughout to reflect the projects status. This reporting on 'live' projects constituted something of a challenge. Compounding this was the factor that many of the projects were part of some larger organizational effort, and the project teams did not see their work as complete when the grant period ended. For example in one case when we asked for a completion date the project responded "not applicable".

Related to this somewhat technical task of locating the projects in time is the question of capturing process. At the beginning we approached the case studies from the perspective of proposal and

results (e.g. did they write the three papers they said they would write?). Of course these are important indicators of the projects success and we did document them. As time went on however, we realized the most valuable information the project reports captured was the research process that was undertaken. They were about how the project implemented their ideas, how they responded to challenges, how their intervention evolved along the way. This seemed to be the richest terrain for learning and therefore the most valuable aspect that we could communicate to others who were undertaking similar work. This represented a conceptual shift from a quantitative research approach to a qualitative one.

The final note on the case studies is that there was simply a lot of plain legwork involved in verifying the practical information. A great deal of time was spent confirming addresses, project dates, websites and other information presented in the case studies.

Development of the analysis and lessons learned

The analysis and lessons learned section has three functions. The first is to introduce the document itself, the second is to provide an overview of the projects and the third is to elucidate common lessons learned that might be useful to others. The primary source of the conclusions emerged from the case studies themselves. As such, the basic strategy for developing this section was to only make statements that could be backed up by references to the specific projects.

To provide an overview of the projects we undertook two exercises. The first was a rather straightforward process of defining the projects by geographic area. The second exercise was to group the projects by category. This was done by taking all the development categories from our questionnaire, combining them with other categories previously applied to the projects (this had been done in a variety of ways in different Programme documents) and finally narrowing them down, removing redundancies and generalizing. This can be seen as somewhat superficial as many projects could fit in more than one category. However it does have the benefit of offering an overview and more importantly providing a structure for the document. We defined each category by consolidating project information in each area and then pulling out key issues projects in the category faced. Specific projects were used as references.

The lessons learned were also derived from the case studies. Since we knew from the beginning that we would present lessons learned, as we went through the project reports we were always on the lookout for specific comments the projects made relating to what they learned or other areas where they noted problems encountered and how they were solved. To develop the section we went through the document and highlighted these, pulled them out and grouped them into common areas. These were tied together with general summary statements and corresponding references to the projects. This was complemented with a second exercise to go through and pull out the lessons learned and present them as simple bullet points in boxes. What is nice about this is it provides space to those comments and notes from projects that do not fall neatly into the broader categories.

Other compositional elements

There are three other compositional components of the document that should be briefly noted. These are the keywords, acronyms and use of new language. To develop the keywords, we

compiled a list for each project. These were integrated with keywords provided by grant recipients and subsequently rationalized through a process of standardization, eliminating redundancies and grouping similar concepts. Acronyms were also used frequently for both organizations and technical terms. It should also be noted that keeping acronyms consistent across the document was a challenge, as they were used by different projects in different formats. Somewhat related to this, was the use of new language to define the ICT aspect of traditional social services. For example, there were many variations on e-governance, e-health, telemedicine, telecentres and so on. An effort was made to make these consistent as well.

Conclusion

By way of a conclusion, we will briefly reflect on some of the strengths and limitations of this study. As might be expected they are integral to one another and emerge out of the assumption that to answer the question of what works and what does not, we have to try to understand the projects within the context they are working, at least to the extent possible given the materials and access available. The strength of this approach is obvious; claims are validated by the project reports. There does however, remain the underlying issue of relying on project reports as the primary source of information, and the question of whether they can provide the means to fully comprehend the project work. To address this issue, efforts were made within the limitations of time and budget to seek direct feedback from the projects themselves. These efforts however, had mixed results. The result of these limitations is that the case studies are sometimes less revealing than might be desirable. While this may detract somewhat from the overall document, it does not undermine the essential value of the work – that is to share experiences.

The document's greatest strength lies in its consolidation of around over 3,000 pages of project reports, feedback from proponents and other programme documentation into a more digestible 200-page report. In order to provide an overview it is useful to present the information in a common format, and base conclusions on "common" issues. It should be recognized that the consolidation process limits the full representation of each project's diversity. This was mitigated by the use of the bullet point boxes in the analysis section and, of course, the project-specific information such as references to websites does provide additional access points for those who seek further information. The value of undertaking this work is to make the project experiences and findings more accessible to, first and foremost, the researchers involved in undertaking this research as well as to other interested parties, hopefully generating additional opportunities for networking, collaboration and the implementation of new solutions. In addition, by exploring the question of what works, new projects can benefit from the experiences of others, avoiding common pitfalls and using strategies that have been demonstrated as successful.

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Annex 2

Questionnaire to Grantees

PART 1 – CONFIRM PROJECT INFORMATION

1.1 Project title:	
1.2 Project Duration (if project has not started or is not completed please provide expected start and end dates)	
Start Date:	
End Date:	
Total (months):	
1.3 Project keywords: List 5-10 words describing the project (e.g. e-government, free/open source software, e-health, information management system, poverty reduction, etc.)	
1.4 Contact Information	
Implementing organization:	
Project leader name & title:	
Mailing address:	
Telephone:	
Fax:	
Email:	
Website:	<i>(project website or implementing organization website)</i>

PART 2 - PROJECT ASSESSMENT

2.1 Participatory Indicators: If applicable, describe how people other than the beneficiaries have participated or will participate in the project at design, implementation, result and utilization stages (100 words or less).

2.2 Interdisciplinary aspects of project: Briefly describe what other fields of study / activities the project involves apart from the one proposed (e.g. cultural preservation, disaster risk reduction, education, gender mainstreaming, rural development, etc.) Include any comments on how the disciplines / activities were or are intended to be integrated (100 words or less).

2.3 Development Impact: Use the list below to select which areas the project had or can be reasonably expected to have a significant, positive development impact. Use the comments column to briefly describe the impacts (50 words or less each).

Development Areas:	Comments:
Utilization of Results	
Technology Development and Management	
Social Services	
Public Policy	
Public Health and Safety	
National Research System Capacity	
International Cooperation	
Information Management	
Household Economy	
Governance	
Gender Equity	
Ethnic Equity	
Environment & Resource Management	
Employment Generation	
Economic Productivity	
Community Process/Networking	
Others	

2.4 Project outputs

Please indicate what activities (e.g. conference, training) and products (publication, multimedia CD, seminar paper) planned or completed by the project to share and/or disseminate research results widely.

2.5 Suggested improvements and lessons learned

Reflect on any obstacles the project either has or may encounter and describe how they either were or will be addressed. Please offer any suggestions for areas of improvement that might have help address these problems (100 words or less).

2.6 Other remarks

Please provide other comments you consider necessary for a full and proper understanding of the project implementation processes and impact (100 words or less).

PART 3 – IMAGE DETAILS

Each project may submit up to 3 images, no smaller than 1050 X 1400 pixels in any standard file format. Please name the picture with your project name and a number (example: projectname1.jpg). Also include a brief description and credit for photographer in the space provided below.

Image file name:**Caption:****Credit:**

Index of Keywords

ACCESS	26, 39, 41, 45, 64, 74, 126
AGRICULTURE	110, 114, 116, 118
ARTIFICIAL INTELLIGENCE	134
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BANDWIDTH	39
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GENDER	30, 35, 55, 59, 66
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GOVERNANCE	39, 49, 57, 68, 70, 72, 76, 101, 110
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