

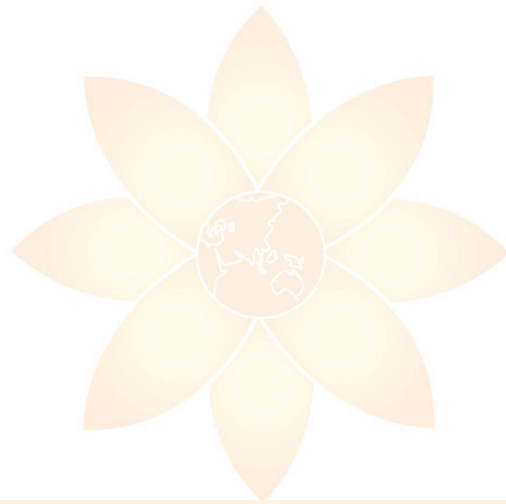


Information and Communications Technology for Development (ICT4D):

An Integrated Approach for Village Communities

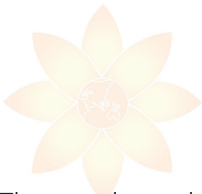
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Introduction

This article explores the role of information and communications technology (ICT) in development, specifically, when and for what purpose should developing communities at a village level invest in ICT taking into account the competing demands from other development priorities including health, education, and infrastructure. For village communities, in particular those that are rebuilding after a war or other disaster, investing in ICT can be seen as a non-necessity. The reason for this is that the payback is long-term and difficult to assess in terms of direct benefits.

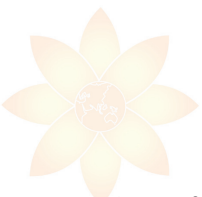
Increasingly, given the cost of ICT, the key determining factor of the value of ICT in development will therefore be the extent to which a community can integrate the applications for the technology so as to make the case for investment on the basis of:

- a) its contribution across a range of development areas; and
- b) improvement in outcomes accruing sooner than would otherwise occur without ICT.

This article attempts to illustrate the potential role of ICT in the overall development of grass-roots village communities, not just in relation to a single use of ICT or a single aspect of development. The rationale is as follows:

- There is a gap between large, complex national e-development initiatives and individual, limited micro projects such as telecentres. This gap exists in the literature, and in practice. Understanding this gap is key to realising the full potential of ICT for development.
- Investment in ICT for development faces an uphill struggle in terms of economic and financial justification, even at a national level, partly because its contribution is difficult to measure and partly because the economics of the ICT sector are geared to developed countries.
- By focusing at a grass-roots level it may be possible to establish a link between ICT and development which, combined with emerging technology and cost trends in the ICT sector, make a compelling case for grass-roots investment.

Based on the above, a framework is proposed for village communities in developing countries to evaluate and plan for ICT enabled development. Villages in the North-East of Sri Lanka are used to illustrate the above approach.



Measuring ICT4D benefits – progress to date

Most analysis of ICT4D to date looks at discrete projects and benefits that have accrued in a single development sector, at ICT diffusion in terms of devices, communications, training, Internet usage, policy, ICT industry development, etc. (Dutta, Lanvin, Pava 2003, Norris 2001), or at ICT itself as an indicator of development (United Nations Development Program – UNDP 2004).

It is only in the last three years that ICT has started to be examined for its potential as a core strategy for development and poverty reduction. The World Bank through the Development Gateway is now promoting e-development, and in particular the mainstreaming by Governments of e-development through national ICT strategies such as e-Srilanka. This signals a shift in the discussion from ICT diffusion as a development outcome in its own right, towards the importance of ICT in overall development. Sub-themes include ICT in education, health, the business of Government, ICT industry policy, and developing a knowledge economy.

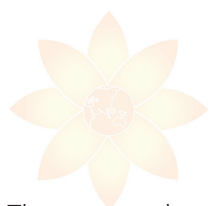
As mentioned, an example of e-development is the e-Srilanka project. This is based on an overarching framework for ICT at a national level that spans micro level telecentre projects through to national industry policy and development. It is a mix of ICT as a production sector in the economy and ICT as an enabler of socio-economic development (Digital Opportunity Initiative - DOI 2001, pp. 19-31).

However there is still very little quantitative data or analysis available to prove the value of ICT as a systemic lever for development. At a micro level, it is possible to identify the ingredients for project success in development terms (Global Knowledge Partnership - GKP 2003, AusAID 2004, bridges.org 2001). From a top down macro perspective it is also possible to identify a set of conditions that are necessary for growth in the access to and use of ICT overall (DOI 2001, UNDP 2004).

The ITU (2003, pp. 78) acknowledges that there is not as yet clear statistical evidence of the contribution of ICT to poverty reduction as defined by the Millennium Development Goals (MDGs) but nevertheless outlines in a qualitative way how ICT can help achieve the MDGs (ITU 2003, pp. 81) and recommends a set of measurable indicators that this is in fact happening (ITU 2003, pp. 78-98). The World Bank (World Bank ICT and MDGs, 2003 pp. 11) also notes a high degree of correlation (above 0.8) between the Human Development Index (HDI) and the Networked Economy Index (NEI) suggesting a link between welfare and use of ICT in developing countries and concludes that economic growth, at macro and micro levels, achieved through ICT is the primary way in which ICT reduces poverty.

Most recently the Asia Pacific Development Information Program (APDIP) in conjunction with the UNDP defined a set of key ICT indicators linked to the MDGs based on the role of ICT in supporting each outcome. The indicators can be used to rank countries on component and aggregate indices (APDIP 2004)¹.

The remainder of this article proposes an approach to planning for ICT4D which sets measurable goals at a community level. In this way it differs from the macro level measurement approaches outlined above.



Village community needs in North-East Sri Lanka

The geographic area selected to illustrate the proposed ICT4D planning approach is the North-East of Sri Lanka. Communities in the North-East have been impacted in a similar way by the twenty year civil conflict which is only now coming to an end. Whilst the entire country has been impacted by the conflict, the situation in the North-East has been compounded by a lack of investment in critical social and physical infrastructure.

The National Human Development Report on Sri Lanka published in 1998 (UNDP 1998) examined regional variations in and drivers of development for all provinces (addressing the North and East at a higher level due to absence of comparable data). The key findings, for the purpose of this study, were that:

- there are significant variations in human development as measured by the UNDP HDI at a district level with a 0.24 gap between the lowest and highest ranking districts; the disparities apply equally within Provinces (pp. 9-10);
- overall, Government policy in relation to social development (education and health) was a positive contributor;
- however, in spite of this, whilst health outcomes were comparable, educational and economic outcomes varied significantly;
- the key driver of variance in educational outcomes between districts was the opportunity cost of education in districts where employment opportunities were higher due to economic prosperity, and the quality of education reflected in GCE pass rates This was attributed to under-resourcing;
- the key drivers of variance in economic activity were distance from the hub (Colombo), lack of physical infrastructure, and dependence on non-industrial income generation activities such as agriculture and tourism which have registered lower growth for several decades. Even so, several districts that had

¹ Sri Lanka ranked 6 out of the 9 countries studied pp. 34 with Malaysia no. 1 and Vietnam no. 9. India is no. 4

experienced rapid growth in the agricultural sector also performed well in economic terms and closed the gap to more affluent districts faster.

An assessment of the situation in the North-East revealed that in the period 1990-1995 the economy of the Northern province shrank on average 6.2% vs an average growth for the rest of the country of 5.5% and growth of 5% per annum average in the Eastern province. Health and infrastructure have suffered due to the conflict both in terms of damage and reduced investment. Whilst educational investment has been sustained, this has not been adequate to overcome the damage done by the conflict.



Figure 1 : Map of Sri Lanka with District Boundaries

The primary development driver for village communities is the preservation of the village community as a sustainable social unit without incurring any social marginalisation (Centre for Poverty Analysis - CEPA 2001 pp. xx). To achieve this goal, in the context of the UNDP assessment (1998), the village communities need:

- access to education especially at a vocational / tertiary level to allow choice of employment; In the North-East, the most critical issues for education are the severe teacher shortages due to recruitment delays (more than 35% or greater than 4000 approved positions were unfilled as at 1 November)²; teacher shortages in

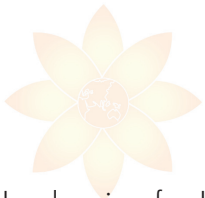
² Regaining Sri Lanka (2003, pp. 28) also estimates the Tamil teacher shortage in the North-East at 4,650, Sinhala at 240, and 40% of vacancies still unfilled (primarily Primary and English teachers) with the highest vacancy level being in Killinochchi and Mullaitivu. This estimate is against a backdrop of expected growth in enrolments to 2007 of 6% average per year.

key vocational subjects (information technology, maths, science, English); lack of student materials in Tamil, the predominant language in the North-East; lack of facilities including electricity and libraries; inadequacy of, and miss-match to, actual needs in courses for teacher training; insufficient administrative and engineering staff for school maintenance; and lack of appropriate Tertiary education options in the Province (especially given travel restrictions beyond the provincial boundaries);

- employment opportunities for those who wish to remain within the community;
- social infrastructure to support all members of the community regardless of age or gender; This includes: adequate and consistent food supply, affordable health services and medicine, welfare assistance (especially for the aged, disabled, sick, and widows largely as a result of the conflict), and security. All of these areas are affected by the level of destruction caused by the conflict, lack of transparency (e.g. in the supply of medicines), and lack of access (e.g. for widows in the South vs war widows in the North-East in terms of welfare assistance – ADB 2004, pp. 64);
- physical infrastructure to enable the requisite level of economic activity to fund the above; Infrastructure deprivation extends to access to adequate water and sanitation, roads, electricity, and school buildings (destroyed during the conflict);
- removal of the restrictions on movement of people and goods, restrictions on market access, and lack of freedom as a result of the conflict related circumstances of the Province (CEPA 2001 pp. xvi). The conflict itself, even though there has been a cease-fire in place for over two years now, continues to constrain development at a village level in a myriad of ways. The CEPA assessment (2001), although conducted over three years ago, is still largely applicable today as the country remains divided:

“The overwhelming cause of poverty in the Trincomalee district was perceived to be the armed conflict. Poor people have been most affected by the disruption and/or destruction of their livelihoods and the lack of security and mobility. The pass system and restriction of movement along the border, as well as in and out of the major towns, severely inhibit access to markets. The depth of poverty and vulnerability in the uncleared areas is due to the military ban on the transport of basic construction items and restrictions on essential food items, as well as the Liberation Tamil Tigers Eelam (LTTE) taxation system. All of the people interviewed in five divisions had been displaced at some point in the last 10 years. In Trincomalee district, given the long-term nature of the conflict and displacement, poverty alleviation has been based on a relief approach. Income generation is a risky business when the military and paramilitary groups control the movement of persons and goods via a shadow economy. As poverty is closely linked to conflict and violence, there is a need to incorporate approaches to deal with psychological trauma and peace building.” (CEPA 2001 pp. xvi)

- sufficient control over their own destiny to mitigate the effects of the vagaries of political processes and aid project reach and effectiveness.



Setting goals for ICT4D at a village level

In planning for ICT, village communities must first have clear goals for ICT that link to their specific needs. For example:

Education

There are three key requirements from the needs identified above which can be met substantially through ICT : streamlined administration, teacher training augmented by electronically delivered courses, and computer-based classroom resources. Investment in these solutions would also act as an incentive to attract teachers to the profession and the Province, and stimulate growth and therefore employment in the local ICT sector. It may also reduce the student dropout rate estimated to be 15% in the North-East (Regaining Sri Lanka 2003, pp. 27).

Employment

The CEPA poverty consultations (2001, pp. 3-4) identified that access to markets, the ability to attract investment in the district, and opportunities for self-employment at a local level and other income generation means would enable communities to rebuild in a self-sustaining way. Education, and in particular ICT education, is key to addressing these needs in so far as it builds a skill base that attracts investment and enhances the general capacity of the community for development and growth.

ICT skills on their own are by no means a guarantee of employment. Oneworld International (2003) in a review of ICT for development case studies world-wide found that ICT employment depends on being close to the job itself. It is critical therefore that the villages attract ICT based business to their area.

Social infrastructure

ICT can make only an indirect contribution to social infrastructure needs as it enables the community to communicate their needs in a timely manner and the central administration to prioritise allocation of resources to areas of greatest need. It can also enable, although not create, a much higher degree of transparency in the way resources are allocated and used. Potential applications for ICT in local government might therefore include streamlining administrative processes (planning, program management, provisioning and delivery of services), enabling better analysis and prioritisation, and increasing transparency in allocation.

Physical infrastructure

The CEPA poverty consultations (2001, pp. 3-4) carried out in four of the poorer districts in Sri Lanka, found that lack of access to affordable infrastructure was perceived by the poor to be the result of neglect. The lack of infrastructure was further seen to be at the heart of other dimensions of poverty such as poor education, health, and employment / income generation opportunities.

Given the rebuilding that is required in the post-conflict period in the North-East, resources will be stretched to the limit and prioritisation will inevitably exclude some groups. The challenge therefore for these groups is first to ensure that they are properly represented in this process and second that any infrastructure provided is geared to their needs for self-sustainability.

ICT can assist at both ends of the planning and provisioning process – village and central administration – by enabling a full profile and justification to be built for investment based on a macro and micro view.

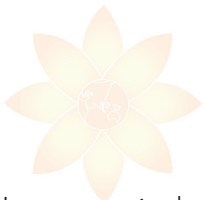
Conflict related constraints

The constraints on communities resulting from the conflict, as described above, highlight the importance of self-sustainability at a community level but also the importance of communities working together to maximise available resources. ICT is key to this integration in that it enables physical boundaries to be overcome through virtual connections.

Control of one's own destiny

The prospect of the above set of needs being addressed in any systematic or systemic way from the top down is remote at best. According to CEPA (2001, pp. 6) communities have therefore adopted a range of strategies to deal with the situation including political activism and working abroad often involving family separation. Others simply accept the situation as beyond their control. The key question is to what extent can ICT provide some measure of control, at a village or district level, over the current situation which is likely to prevail for some years to come?

Applications designed specifically for the communities to assess, prioritise, and manage their own development including their participation in programs launched by NGOs, the donor community, and the Government would be an appropriate goal. This is consistent with the World Bank view as expressed in the World Development Report 2004 Chapter 4 where it discusses the need for a move to a more equal client / producer relationship in development aid and service provision.



Making the case for village investment in ICT4D

Investment in the application areas identified above would need to be made on the basis of measurable outcomes. These would include the following:

Degree of penetration and quality of education

For the educational authorities to invest in ICT for education at a grass-roots level they must be able to link the investment to an accelerated reduction in teacher vacancies and school absenteeism in these communities relative to current trends, and reduced dependence on central processes (e.g. curriculum development and resources, teacher training and recruitment, etc.). In addition there should be a flow through benefit to the rest of the education system (from primary to secondary and tertiary). For example, use of computers to assist in learning English in Primary Grades can utilise not only English language software but also cross-curriculum software in English. This will enhance the children's learning not only in primary grades but beyond. It will also enhance the teachers' skills and knowledge (English and computers in education).

Effectiveness of local government in resource allocation and management

At a grass-roots level in the conflict affected North-East districts, the processes for allocation of resources at a local government level are a mix of mainstream Government processes, security driven processes which affect funding priorities as well as movement of goods and services, donor community imposed aid distribution processes, and NGO program processes. This complexity exists to a far lesser extent elsewhere in the country. The goal for ICT should therefore be to integrate these processes and ensure decisions are made taking into account multi-level needs and impacts down to and including the community level. For example, systems to administer these processes should be centred on communities and their needs rather than a particular funding source, and mask the complexity of the latter from the communities. This would enable communities to more easily access resources without having to navigate the complexity of the donor and public sector funding system.

Range of capabilities for income generation

The key question from an ICT investment perspective here is whether ICT based income generation capabilities will deliver a greater return than current income generating activities which include agriculture, fishing, crafts, and small business providing services to the local communities. New income could be generated in these communities from activities such as community telecentres / kiosks, small business services (accounting, admin), web marketing and distribution for local products, software development (e.g. educational tools for local use), and training services to the local communities. Activities which depend on local buyers will be less likely to succeed in the short term than those which access an external / remote market. The investment decision will therefore hinge on the ability to educate the community in the potential for the new activities and incent diversification of their current income base to include these activities.

Time to access development resources from a wider base of sources

Community level ICT will only enable faster access to development resources beyond the physical boundaries that constrain their access today, if the community has the capability to use the ICT resource effectively. This is not just about ICT skills but also commercial, project management, community development, and networking skills. The decision to invest in these skills will need to be made based on the resources that will become available to the community that they would not otherwise have access to. For example, access to online or downloadable educational material requires Internet navigation skills. However, the sheer volume of free educational resources available on the web, contrasted with the poverty of resources in the village schools, would more than justify an investment in such skills for lead teachers at least.

Time to remove barriers to development in particular physical and social infrastructure

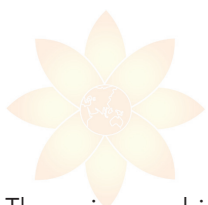
For a community to make the case that it be given some priority in provision of low cost enabling infrastructure, such as electricity and wireless communications, it must be able to demonstrate a social or economic development benefit greater than would accrue if the investment were diverted elsewhere. This is more likely to be the case where it can demonstrate a plan to exploit the infrastructure in ways similar to the above, so as to become self-sustainable and less dependent on welfare or aid. For example, a village which proposes to become a hub for other villages in accessing development resources online is likely to represent a better investment than an individual village or a district with no plans for horizontal or vertical integration.

Scope and pace of community capacity building for development

Community capacity building involves building knowledge and expertise in the community about development solutions for their needs, be they environmental, health related, education related, or other factor key to sustainability. The case for using ICT to build community capacity for development would depend on its ability to not only accelerate their capacity building through access to knowledge, training and remote support but to accelerate development itself. The investment should also be an effective substitute for other less effective and/or more costly and/or less sustainable forms of capacity building such as dependence on external expertise being brought into the community.

Leadership and commitment

Finally, in environments where awareness, access, and use of ICT is low or non-existent, as is the case in the target villages in the North-East, the key cultural requirement is the presence of a champion for use of ICT in education, as well as in the community (Greenberg 2002, pp. 9, 27). This is a seed capability, which would likely take the form of ICT literate teachers who can integrate ICT into the classroom and stimulate adoption by youth, as well as take the initiative and lead the community. Alternatively, the village leader may team with the teacher to champion the initiative. First hand experience in establishing such a champion amongst Primary Teachers in twenty-four villages in the North-East has shown that these villages are well positioned in this respect with a strong educational base to leverage off and a social structure in villages which clearly identifies leaders.



Suitability and affordability of ICT4D for village communities

The primary driver for ICT solutions for development is to minimise the dependence on high cost physical infrastructure for enabling access to services by poor communities, be they urban or rural. As a result, the most common solutions are for communications (phone, fax, email, and increasingly wireless communication), e-learning and distance education, telemedicine, e-commerce and m-commerce, and information services.

These solutions are delivered through a variety of structures such as community telecentres, telephone and Internet kiosks, mobile services (e.g. mobile Banks, mobile telecentres, mobile medical staff with hand-held device solutions), and even community networks. Wherever the services are offered they will often be packaged with some form of community skills development and support.

A common feature of such solutions, in the context of the types of communities which are the subject of this study, is that they tend to be only financially viable on a community, rather than household or individual basis or else they are financed by NGOs or the donor community as a pilot scheme. This is due to the cost and scale of the technology platforms which are typically the same platforms as used in the developed Countries and communities. Ultimately the pilots must transition to a user-pays model and this is the point at which many fail.

Whilst the rate of penetration of ICT solutions for development is growing at a steady pace, two key factors will be critical in accelerating this process and enabling applications as distinct from simply spreading technology: wireless communications combined with low cost and purpose specific (social and cultural context as well as application specific) devices.

This requires the ICT industry to rethink its product strategy so that the architectural foundations can support products for developed and developing communities which are economically sustainable for the manufacturer and the buyer. This in turn means that:

- from an ICT industry perspective there exists a market for the solution at a price which will recover costs and deliver an acceptable margin;
- from a buyer's perspective, the solutions must be fit for purpose and scaleable so as to meet the needs of a village, zone, district or beyond.

Mainstream industry trends and directions

The traditional larger players in the industry are approaching these challenges in two ways: first they are developing programs which focus on 'bridging the digital divide' by supporting the use of subsidising and donating their mainstream products and platforms (e.g. Hewlett Packard E-Inclusion Program, Microsoft Partners In Learning Program and Microsoft Approved Refurbishers program, IBM Kidsmart Program); and second, they are making existing commercial products available at reduced cost in return for commitment by Governments to adopt proprietary platforms as their strategic direction (e.g. Microsoft Education licensing program which charges only a nominal license fee for volume purchase by Government). This latter strategy is also a response to the threat of open platforms such as Linux and related application software, which are establishing a foothold in developing countries.

These strategies, while welcome and beneficial to the extent of their reach, are inherently limited in their potential reach as they are not founded on a sustainable economic or business model from the perspective of the suppliers, that is, costs cannot be lowered sufficiently to achieve the required level of penetration of technology. This is due in part to the fact that the products were initially based on a business case that holds only for developed markets. A further compounding factor is what Norris (2001, pp. 68-92) identifies as a dynamic at work in developed as well as developing countries, that is, the social divide, defined by economic disparity, racial and ethnic groupings, age, occupation, education and gender. The social divide inhibits diffusion of ICT which in turn inhibits development as ICT and related skills become essential to participation in the global and local economy. Norris concludes that even if diffusion reaches 85%-90% of the population there will still be grades of access that will inhibit development such as access from home vs access from school or kiosk only.

A further limiting factor for penetration of mainstream solutions is the globalisation, deregulation and privatisation of information and telecommunication services which limits the ability of National Governments to control the cost of accessing information through appropriate policy (Hamelink 1999). This trend also allows global, higher cost operators to bypass local operators (especially in the wireless / satellite market) thereby reducing their revenue and sustainability.

An emerging counter to this trend in telecommunications is the emergence of low-cost wireless solutions (including broadband) which, when linked to the potential in developing country markets³, have the potential to open up a new avenue of growth for operators (Convergys 2003). This opportunity is however as yet untested and Governments are still subsidising operators in remote, rural areas.

Emerging trends and directions - technology

An alternative strategy is emerging in which private sector organisations first evaluate the future commercial market potential of developing communities, and then develop products targeted specifically at this market. This approach is based on a view of developing communities as an opportunity rather than a problem for Government, aid agencies, and philanthropists to address (Pralhad, Hammond 2002, pp. 4).

“The key, as with conventional markets, is to provide a product that meets customer needs, not only in price but in packaging, distribution methods, and payment schemes, while being innovative in how to achieve what are often radically lower cost structures.” (Pralhad, Hammond... pp.9)

Pralhad and Hammond propose a fundamentally different economic model for companies serving these new markets, which has the potential to be effective in traditional markets as well. The new economic model is based on pay per use rather than ownership so as to increase usage (basis for charging) and deliver a better return on capital for the supplier and the customer. This model delivers low margins but high volume, high capital efficiency, and high return on investment (ROI).

Some examples of ICT solutions that have resulted from strategies such as the above are:

- Massachusetts Institute of Technology (MIT) Media Lab and the Indian government have developed a low cost device using voice over IP (VoIP) without keyboards and in multiple languages (Dutta, Lanvin, Pava 2003, pp. 80);
- The Sim-computer (Simputer) is another simple, hand-held computer using Wintel architecture and Linux with low power consumption, touch screen and simple user interface. The cost is approximately AUS\$300 at large volumes. This is still relatively expensive⁴ but as demand increases and R&D costs are recovered it should decrease further;
- The VillagePDA was designed in 2001 by a Sri Lankan company, MediaSolv. It is the World’s first Bluetooth enabled PDA. The cost is approximately AUS\$75. The device costs between US\$25 and \$50;
- In India a telemedicine project used the Palm platform and Linux to develop an application for the hand-held device for mobile health workers to collect and access medical records for patients. It is planned to migrate to Simputer;
- MIT is reportedly developing a search engine for people with slow Internet connection which uses a store and forward submission / response protocol;
- A similar delayed response approach has been used in Cambodia where a mobile wi-fi hotspot with a small computer travels the country-side like a mailman collecting and distributing email for villages;
- Other mobile solutions include the following documented by AusAID (2001): “A MITE (Modular Interactive Telecommunications Environment) is an Australian designed telecentre originally developed to assist delivery of education for Aborigines. The standard MITE contains a six terminal multimedia computer room, a two-way videoconferencing facility with computer interface and a satellite TV viewing area. Within Australia, they are housed in transportable buildings. For delivery to other countries, a shipping container

³ Regaining Sri Lanka (2003, pp. 45) forecasts 27% growth per annum in teledensity in the North-East over five years at an estimated cost of US\$350M. Private sector operators were not allowed to provide services in LTE areas up until 2002 however this is now being relaxed.

⁴ A refurbished desktop computer can be bought for AUS\$500 in Colombo.

version has been developed. A MIU is a Mobile Internet Unit, developed in Malaysia. The MIU is a bus fitted out with multimedia PCs, printers, scanners and digital cameras. The purpose of the MIU is to visit rural schools to bring ICT awareness to children.” (AusAID 2001, pp 6);

- CorDECT wireless local loop technology is emerging as a low cost wireless solution to connect remote locations into the main backbone network (wireline, VSAT, or microwave)⁵ for voice and data communications. This option has been evaluated for Sri Lankan rural communities and found to be feasible (Davis 2003). It is currently being used as part of the n-Logue project for rural India (Gaspary, O’Connor 2003, pp. 18). While it is not a full broadband solution it does offer higher speed than standard wi-fi connectivity. Sarvodaya in Sri Lanka is extending its Telecentre pilot with the aid of wireless networking to establish a network within a village, that is, a “virtual village” (IDRC, 2004).
- The issue with connectivity infrastructure is increasingly one of funding rather than technology however community based telco’s may provide a useful model for Sri Lanka (Garcia, Gorentlo 1998) and under e-Srilanka the Government is planning to fund the development of Regional Telecommunication Networks (RTNs) in areas which are most in need.
- Open Source software provides the opportunity for low cost, local development of tailored applications which also contributes to building the local ICT industry and reduces the flow of capital outside the country.
- Cost effective electricity solutions are also key. Two approaches are being taken: one focuses on reducing the energy consumption of the devices (including extended battery life) and the other on developing low cost power solutions such as Solar. In the interim, fuel-powered generators are the most common solution. In the North-East of Sri Lanka, one Killinochchi district education authorities are evaluating investing in a mobile generator to be shared between a number of schools for computers.

Emerging trends and directions - applications

When combined with innovative shared infrastructure / franchise / micro-enterprise business models at a community level ⁶, these technologies can provide an affordable basic platform for a range of applications including some but not all of those that have been identified earlier. However, it is the applications rather than the technology, which are the key ingredient for enhancing development outcomes.

“many telecentres providing computers and connections in rural locations do not become self-sustaining because local people do not use their services – often they have failed to address the role of the centre in the local economy or the need for locally relevant content. There is a need for a holistic approach to cover the range of issues to create effective and sustainable uses for technology that are integrated into local society... Real access requires training, relevant content in local language, a supportive political environment, and a sustainable local economy.” (bridges.org 2001, pp.45)

The five priority application areas identified for the target Sri Lankan communities are being partially addressed in a development context.

Computer based education for students and teachers has been a priority for ICT in development investment globally since the mid-1990s. Major sponsors include the World Bank, USAID, UNESCO, the Commonwealth of Learning (COL), and in the Asia Pacific Region - Australia through the Virtual Colombo Plan. The primary focus of these initiatives is distance learning for teacher education, tertiary and some upper secondary levels and primarily in larger urban centres.

The greatest return on investment in ICT for education will be achieved if computer literacy is taught from primary grades and up. Greater investment is needed if this aspect of the student’s education is neglected until secondary

⁵ A key obstacle in developing countries is the lack of available infrastructure in rural areas due to inability of suppliers to recover costs. The Sri Lankan government policy requires all licensed operators to comply with the directive for universal access and the Government will also setup a Telecommunications Development Fund to assist in achieving universal access. (ref CRC paper)

⁶ Gaspary and O’Connor (2003) examines the key issues around rural connectivity (remoteness, low population density, lack of human capital and earning capacity) and concludes that models such as the Graeme Rural Phone project in Bangladesh, telecentres, and n-Logue Multi-tiered Franchise Model in India are more likely to succeed where access is shared, purchasing power is aggregated at multiple levels, and wireless technology can be exploited.

grades as a digital divide in learning and education will already have been opened. Most donor and NGO projects for schools in Sri Lanka are focused on secondary grades and acquisition of vocational skills rather than use of computers to assist in learning across multiple curriculum areas. Integrated cross-curriculum models do exist in other developing countries (bridges.org 2001, pp. 55).

The target Sri Lankan villages require, in the short-term at least, standalone solutions due to lack of connectivity infrastructure⁷. An equally important requirement that has yet to be addressed is bi-lingual educational software for schools (in Sinhala and Tamil, with English)⁸ and culturally appropriate educational content (most educational software is in English and designed for a developed country social and cultural context). This will have to be developed locally and this will in turn depend on availability of ICT skills⁹.

e-government solutions are also now widely available however it is important to distinguish between sites which provide information (such as the North-East Provincial Council website) and sites which enable citizens to do business with Government as is common in developed countries including Australia. However Norris (2001, pp 112-131) notes that the further stage of "e-governance" involving citizen feedback and interaction with government in relation to policy and decision making has yet to be achieved. It is this latter requirement that is a priority for the target communities, with transactions and information second and third requirements respectively .

Business models for *income generation using ICT skills* tend to be limited to Telecentre type operations. However, the identified need for the target villages is to source income from outside the village, as well as from within the village. New business models will need to be designed for this purpose. In the more populated areas of all three districts being studied, there are a few examples of small IT training businesses being established although the quality of these has not been assessed.

Out of a group of thirty teachers interviewed from remote rural village schools in the North-East, fewer than 25% had any IT training and this was primarily in Microsoft Office. In addition they had to travel some distance to major centres (Jaffna or Vavuniya) to obtain this training.

Providing *online access to development resources* is the primary focus of the Development Gateway Foundation which also sponsors country development portals including the Sri Lanka Development Gateway. The latter even includes a Jaffna Regional sub-portal. At a more micro level, the UNESCO eNRICH project is developing software which enables poor communities to develop their own community portal and share information with other communities. Tarahaat.com is a good example of a multi-faceted approach providing both a community portal for rural Indian communities combined with a network of franchised community access points.

Finally *tools to assist in the local management of development projects* for the community would probably be based on standard productivity tools such as the Microsoft Office suite and a simple user interface (web-based) would also need to be developed. However, it is important that this application also be the basis for creating and sharing local knowledge and content relating to local development needs and solutions. The Development Gateway concept could be applied to this requirement.

The implication for the target village communities in Jaffna, Killinochchi, and Trincomalee in planning for ICT in the short-term is that, while low cost platforms are emerging and some applications can be readily accessed, the investment will still be substantial relative to income. The entire community and as much as possible other communities must support the program and work to attract private sector as well as public sector sponsorship and participation.

7 This can be done in a way which simulates the web such solutions have been developed using a web interface but running off CD-ROM.

8 However, in Sri Lanka where English as a second language is now a major focus in schools, educational software in English can provide a form of immersion for students of all ages.

9 The ITrain project provides tools and training for educators in developing countries to develop their own training materials.



A vision of the future

For the target communities in the North-East of Sri Lanka, the goal of development, as articulated above, is the preservation of the village community as a sustainable social unit without incurring any social marginalisation. The following scenario, based on an actual village in the North-East in the Jaffna district, is intended to illustrate how this goal can be achieved sooner through a multi-pronged approach to ICT, even allowing for initial setup costs.

The village in question has been largely destroyed by the conflict. Some houses are no more than shells of the original, some have been completely destroyed, some are partially rebuilt and some families have completed rebuilding and moved back. The village primary school, which was completely destroyed and the school yard mined, has also been rebuilt (and de-mined) with assistance from the UN, however it is very small and poorly equipped for a school of less than 100 students (no electricity, inadequate furniture for students, no teaching resources to speak of, a Principal and two teachers, one of whom is a volunteer with limited teacher training).

The village school is participating in a limited pilot (24 schools in total) of a new curriculum for ESL and Computer Literacy for grade 1 and 2 children which is being run by an Australian NGO, Partners in Micro-development Inc. (PIMD). Two of the teachers at the school, including the volunteer teacher, have now been trained in the curriculum and the school is being equipped, through the pilot, with three computers and donated commercial educational software for trial. The community is providing a generator and a secure room for the computers.

The community has achieved all this by pro-actively lobbying for and taking advantage of resources available from the NGO and ex-pat community, and at the same time seeking approval from local authorities. In so doing they have overcome the administrative, logistical and poverty related constraints of their situation to provide an advantage to the children and the teachers. Their only external communication channel has been postal mail.

If the village community had been asked to pay for the computers and the teacher training, they may not have participated in the pilot project as the community may not have been able to justify the initial cost, let alone the ongoing maintenance and support based on the benefits to a single small school and its students (Potsahnik, Adkins 1996). If, however a broader range of needs were taken into account a case might be made on the following basis

- The enhanced opportunity for the students offered by the school would encourage families to return to the village.
- The computers could be used to develop a profile of the village and its needs, forecasted into the future as the rebuilding process continues and the village grows. This profile could then be used to build a case for enhanced services to be provided by the Government and/or donors sooner than would otherwise occur.
- In particular this village would have a stronger case for some form of telecommunications service to be provided. This would in turn enable them to access any and all information that they require and further accelerate their development.
- The village could potentially then become a hub for other nearby villages. As demand grows for its capabilities, there may well be sufficient demand for a small business providing basic computer training (using the school's facilities out of hours, thereby generating income for the school).
- The planning application developed by the community might be commercialised or alternatively offered as a fee-service to other communities, that is, as a form of outsourced community development and planning service.
- The village may, as result of its initiative, attract other aid programs (donor, NGO) which will further compound the benefit from the initial investment.

Before proceeding too far down this path the village should seek advice on the appropriate long term technology platform for these applications, in particular the choice between proprietary platforms and Open Source.

The alternative path for this village would be a prolonged period of rebuilding with people returning to their homes

at a much slower pace (in the absence of any other incentive) and some possibly moving elsewhere.

Integration is essential to the success of the model. It is a counter to the potential marginalisation and exclusion that can still occur even with strategies such as those illustrated above. Castells (1999), describes the risks of failing to network and integrate:

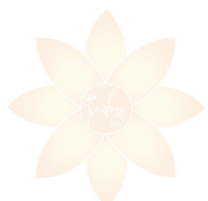
“this new world, centred around multinational corporations, global financial markets and a highly concentrated system of technological research and development. allows it to link up everything that is valuable according to dominant values and interests, while disconnecting everything that is not valuable, or becomes devalued. This simultaneous capacity to include and exclude people, territories and activities is based upon a capacity to network.....Networks change relentlessly: they move along, form and re-form, in endless variation. Those who remain inside have the opportunity to share and, over time, to increase their chances. Those who drop out, or become switched off, will see their chances vanish. ” (Castells, 1999 pp. IV)

Integration or networking will quickly become imperative rather than an option for villages such as the one described above. Their strategies should therefore include an element of resource sharing with nearby villages as well as networking (physical and virtual) to increase their purchasing power in the private sector and influence with Government. This “participatory process” of horizontal networks further empowers communities (Moetsabi 1998).

Government provided resources will be distributed according to the in place administrative hierarchy (vertical network). For this reason, villages should network within this boundary both at a peer level and through the hierarchy of zones, districts and provinces.

Other resources, such as donor and NGO projects, may not be so closely aligned to administrative boundaries. Villages should therefore seek to understand the priorities of these organisations and pro-actively form a network – horizontal or vertical – that would attract these resources. The PIMD project for example spans four zones which are in the same province but not the same district and two of the four are at quite a distance from the others. Even within one zone, the four schools / villages represented are at quite a distance from each other. These villages have all been selected because of their isolation and poverty. They are now part of a virtual network which is being supported remotely from Australia.

Networking is therefore not just about accessing resources that are generally available. It is also important for communities to put themselves on the map in local, regional, national, and global knowledge communities to ensure that development solutions are designed for their specific needs rather than a one-size fits all model being imposed (Afele, 2003 pp. 45).



5 steps to develop a village ICT4D plan

Lahiru Perera (OECD 2001, pp. 183) advocates “starting with people and enabling them to achieve sustainable livelihoods by building their own technical and organisational capacities, achieving technology choice and adapting and improving technologies”. The purpose of this article is to arrive at a framework that village communities can use to do precisely this. It has been developed in the context of villages in the North-East of Sri Lanka with a goal to rebuild and remain economically and socially sustainable.

There are six elements in the framework:

1. Defining requirements
2. Building the case for change
3. Creating conditions for success
4. Accessing resources
5. Networking and integration

1. Defining Requirements

The three steps for communities in defining requirements are as follows:

- Articulate a clear objective in relation to sustainability, for example preservation of the community as a social unit.
- Identify the critical success factors (needs) to achieve this objective, e.g. access to vocational education which supports the community's economic development.
- Translate these needs into requirements for ICT, bearing in mind that ICT may only be a part of the solution and any co-requisites must also be identified and addressed. Requirements should be articulated in terms of what will change (e.g. enhanced teaching capabilities) as well as the specific ICT application (e.g. electronically delivered courses and classroom resources).

2. Building the Case for Change

The five steps for communities in building the case for change are as follows:

- Identify development indicators and outcomes to be impacted.
- Define clear, and if possible, quantifiable goals for improvement.
- Establish in broad terms the cost and timeframe to achieve the same level of outcome without ICT investment.
- Set targets for achieving outcomes sooner and at reduced cost (net of ICT investment cost).
- If possible, identify in broad terms the additional benefit that will flow to other communities from aid or welfare that is freed up by your community.

3. Creating Conditions for Success

The two steps for communities in creating the conditions for success are as follows :

- Identify and enroll two champions for ICT – a teacher and a village leader – who will mobilise the community and advocate for external support.
- Build an integrated plan for ICT, working with other villages if possible and the administrative hierarchy to gain buyin and support.

4. Accessing Resources

The six steps for communities in accessing resources, given the current state of play, are :

- Present your case in a way which aligns with macro level programs.
- Demonstrate the systemic, long term value of your initiative at a community and if possible zone or district level.
- Reach out to all possible sources of investment, using ICT (Internet).
- Choose cost effective solutions taking into account the total cost of ownership.
- Continue to validate your technology platform and choice of solutions in the light of trends in the industry.

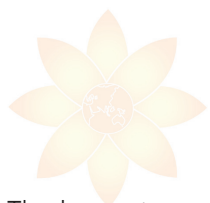
5. Networking and integration

The three phases in the networking and integration process:

- Identify other communities with similar or synergistic needs.
- Extend your plan to encompass these communities.
- Exploit the network to influence the development sector agenda in your District, Province, Country and even beyond.

A top-down planning approach which complements the grass-roots framework described in this article would seek to prioritise investments on the basis of the difference that can be made to people's lives today as well as future generations. The key elements of the top-down planning framework would be:

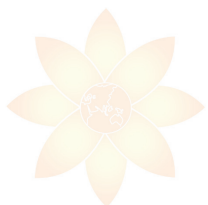
- Establish a comprehensive program approach for the country for ICT along the lines of the e-Srilanka program. This will identify the key areas of investment from an application perspective (governance, education, industry, etc.) as well as from an enablers perspective (knowledge, infrastructure, quality, affordability – ITU 2003). There will need to be alignment between this and other macro programs such as regaining Sri Lanka and donor funding programs.
- Identify those communities who will deliver the greatest return on investment in terms of development outcomes for the current and future generation relative to their baseline starting point, as measured by the communities themselves. Fund these communities as a priority. For example, providing computers to a large secondary school where the benefit is incremental both from an educational and community economic perspective vs developing / providing standalone e-learning material for teachers and students in remote villages where the long term, inter-generational benefits to the community could be a fundamental shift in the economic sustainability of the community. The objective is not to in all cases prioritise grass-roots over broader based initiatives but rather to adjust the balance in a material way.
- Manage the available funding and resources at all levels of the aid food-chain from multi-lateral donors down to NGOs in such a way as to channel their contributions to the identified target communities.



Conclusion

The key points to take away from this article are:

- The time has come for aid agencies, governments, NGOs, community based organisations (CBOs), and communities themselves, to rethink programs and objectives in the light of the contribution which ICT can make to enhanced outcomes when communities are empowered through ICT to control and manage their own development.
- Development outcomes and programs should be approached in an integrated way, rather than focusing on individual areas such as health, education, economic development, using ICT to create a compounding effect in terms of gains made.
- ICT solutions for development are increasing and becoming more scaleable, as the ICT industry views these communities not just as an opportunity for philanthropy but a potential new market.
- ICT is a key enabler for accelerated development at a grass-roots level that will ultimately accelerate development at all levels as horizontal and vertical integration occurs in parallel with top-down macro programs.



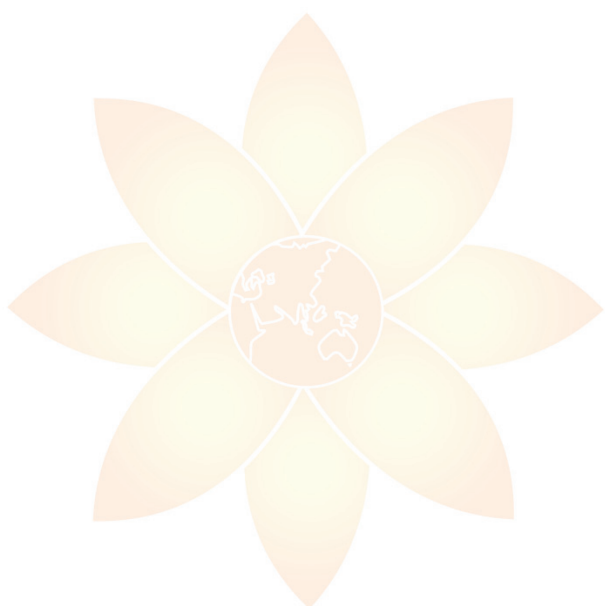
References

- ADB 2003, Sri Lanka Country Strategy and Program Update 2004-2008 [online] <http://www.adb.org/Documents/CSPs/SRI/2003/default.asp> [Accessed 23 June 2004]
- Afele, J.S. C 2003, Digital Bridges: Developing Countries in the Knowledge Economy, Idea Group, Hershey PA USA, 2003
- Asia Pacific Development Information Program (APDIP) 2004, Regional Human Development Report - Promoting ICT for Human Development in Asia 2004: Realising the Millennium Development Goals – Summary, Elsevier, New Delhi 2004 for UNDP [online] <http://www.apdip.net/projects/rhdr/resources/summary08012004.pdf> [Accessed 29 October 2004]
- AusAID 2004, ASSESSMENT TOOL: ICT & development - help or hindrance? [online] <http://www.developmentgateway.com.au/ict/assesstool/index.html> [Accessed 21 June 2004]
- AusAID 2001 , ICTs – Going the last kilometre [online] http://www.developmentgateway.com.au/pdf/ict/ICTs_Going_the-last-kilometre.pdf [Accessed 21 June 2004]
- Bridges.org, ICT Enabled Development Case Studies [online] http://www.bridges.org/iicd_casestudies/index.html [Accessed 12 March 2003]
- bridges.org 2001, Spanning the Digital Divide – Understanding and Tackling the Issues, [bridges.org](http://www.bridges.org) 2001 [online] <http://www.bridges.org/spanning/index.html> [Accessed 21 June 2004]
- Castells M. 1999, Information Technology, Globalisation and Social Development, UNRISD Discussion Paper No. 114, September 1999, [online] <http://www.unrisd.org/unrisd/website/document.nsf/%28httpPublications%29/F270E0C066F3DE7780256B67005B728C?OpenDocument> [Accessed 23 June 2004]
- Centre for Poverty Analysis 2001, Perceptions of the Poor – Poverty Consultations in Four Districts in Sri Lanka, ADB 2001, [online] http://www.adb.org/Documents/Reports/Perceptions_Poor/default.asp#contents [Accessed 21 June 2004]
- Commonwealth of Learning (COL), <http://www.col.org>
- Convergys Corporation 2003, The Potential of Wireless Broadband Technologies in the Developing World, Convergys Office of Web Technology 2003 [Online] <http://www.convergys.com/pdf/whitepapers/wifi.pdf> [Accessed 23 June 2004]
- Curtain, R. 2004, Information and Communications Technologies and Development: Help or Hindrance?, Curtain Consulting, 13 January 2004 [online] <http://www.developmentgateway.com.au/pdf/ict/CurtainICT4DJan04.pdf> [Accessed 22 June 2004]
- Davis C., 2003, Options for the greater use of Wi-fi and other unregulated applications – A Study for The Ministry of Economic Reform, Science and Technology Sri Lanka, DJ Consulting & Quotient Associates, March 2003 [Online] <http://www.trc.gov.lk/wifi.htm> [Accessed 23 June 2004]
- Development Gateway [online] <http://topics.developmentgateway.org/ict> [Accessed 28 February 2003]
- Digital Opportunity Initiative 2001, Creating a Development Dynamic, Accenture, Markle Foundation, UNDP 2001 [online] <http://www.opt-init.org/framework.html> [Accessed 31 October 2004]
- Dutta, S., Lanvin, B., Paua, F., 2003, The Global Information Technology Report 2002-2003: Readiness for the Networked World, World Economic Forum, Oxford University Press, New York
- e-Srilanka <http://www.esrilanka.lk>
- Garcia D., Gorentlo N. 1998, Rural Networking Co-operatives : Lessons for International Development and Aid Strategies, in The First Mile of Connectivity, Richardson D. & Paisley L. (eds) FAO 1998 [online] <http://www.fao.org/docrep/x0295e/x0295e00.htm> [Accessed 23 June 2004]
- Gasparly G., O'Connor D. 2003, Providing Low Cost Information technology Access to Rural Communities in Developing

Countries : What works ? What pays ?, OECD Development Centre Working Paper No. 229, December 2003 [online] <http://www.oecd.org/dataoecd/13/52/7112502.pdf> [Accessed 23 June 2004]

- Global Knowledge Partnership (GKP) 2003, Digital Dividends for the Poor - ICT for Poverty Reduction in Asia, GKP Malaysia 2003 [online] <http://www.globalknowledge.org/> [Accessed 23 June 2004]
- Greenberg A., Lanfranco S., Fernando J. 2002, Country ICT Survey for Sri Lanka, Greenberg ICT Services, Canada 2002 for SIDA [online] <http://www.sida.se/Sida/articles/9400-9499/9481/srilanka.pdf> [Accessed 23 June 2004]
- Hamelink, C.J. 1999 , ICTs and Social Development : The Global Policy Context, UNRISD Discussion Paper No. 116 October 1999, UNRISD Geneva 1999 [online] [http://www.unrisd.org/unrisd/website/document.nsf/\(httpPublications\)/974A47FC0E41674580256B67005B73A9?OpenDocument](http://www.unrisd.org/unrisd/website/document.nsf/(httpPublications)/974A47FC0E41674580256B67005B73A9?OpenDocument) [Accessed 23 June 2004]
- Hewlett Packard e-inclusion <http://www.hp.com/e-inclusion/en/index.html>
- IBM Kidsmart <http://www.kidsmartearlylearning.org/>
- Integrated Food Security Program (IFSP) Trincomalee 2003, Village Data Sheets 2003- Trincomalee District Vulnerability – Poverty Profile, Technical Paper 35 November 2003, GTZ, NEPC, BMZ [online] http://www.ifsp-srilanka.org/html/tp35_vds_2003_170_villages.html [Accessed 23 June 2004]
- Integrated Food Security Program (IFSP) Trincomalee 2003, Monitoring Vulnerability and Poverty: Review of 47 Core Villages, Technical Paper 37 December 2003, GTZ, NEPC, BMZ [online] http://www.ifsp-srilanka.org/html/tp37_vds_2003_47_villages.html#tp37graphic [Accessed 23 June 2004]
- Integrated Food Security Program (IFSP), Community Mobilisation Principles and Practices, IFSP [online] <http://www.ifsp-srilanka.org/doc-CM-korf.pdf> [Accessed 23 June 2004]
- International Development Research Centre (IDRC) 2004, Sri Lanka Virtual Village: A Socio-anthropological and Technology Study on the “Last Mile”; IDRC 2004 [online] http://web.idrc.ca/en/ev-63219-201-1-DO_TOPIC.html [Accessed 2 November 2004]
- International Telecommunication Union (ITU) 2003, World Telecommunication Development Report 2003 – Access Indicators for the Information Society, ITU, Geneva, Switzerland 2003 [online] http://www.itu.int/ITU-D/ict/publications/wtdr_03/ [Accessed 25 May 2004]
- ITrain <http://www.bellanet.org/itrain/>
- Learnlink Digital tools for development <http://learnlink.aed.org/index.html>
- Microsoft Partners in Learning (PIL) <http://www.microsoft.com/Education/PartnersinLearning.aspx>
- Midas Communication Technologies 2000, CorDECT Wireless Access System, Midas India [online] <http://www.midascomm.com/products/cordect.htm> [Accessed 26 April 2004]
- Millenium Development Goals <http://www.developmentgoals.org>
- Moetsabi T. 1998, Participatory Approaches for Promoting Rural Connectivity, in The First Mile of Connectivity, Richardson D. & Paisley L. 1998 (eds) FAO 1998 [online] <http://www.fao.org/docrep/x0295e/x0295e00.htm> [Accessed 23 June 2004]
- Norris, P. 2001, Digital Divide: Civic Engagement, Information Poverty, and the Internet Worldwide, Cambridge University Press, Cambridge 2001
- North East Provincial Council (NEPC) <http://www.nepc.lk/>
- Oneworld International / Building Digital Opportunities (BDO) 2003, ICT for Development Case Studies – Synthesis Report, oneworld.net and BDO 2003 [online] <http://www.bellanet.org/leap/docs/BDOsynthesis.pdf?OutsideInServer=no> [Accessed 22 June 2004]

- Organisation for Economic Co-operation and Development (OECD) and ADB 2001, Technology and Poverty Reduction in Asia and the Pacific, Seventh International Forum on Asian Perspectives, June 2001 [online] http://www.adb.org/Documents/Conference/Technology_Poverty_AP/ [Accessed 22 June 2004]
- Partners in Micro-development Inc. <http://www.microdevpartners.org>
- Potsahnik, M. & Adkins, D. 1996, Cost Analysis of Information Technology Projects in Education: Experiences from Developing Countries, World Bank Human Development Department Education Group - Education and Technology Series, Vol. 1 No. 3 1996 [online] [http://wbln0018.worldbank.org/HDNet/HDdocs.nsf/C11FBFF6C1B77F9985256686006DC949/167A6E81A893851B8525675500681C7E/\\$FILE/v1n3.pdf](http://wbln0018.worldbank.org/HDNet/HDdocs.nsf/C11FBFF6C1B77F9985256686006DC949/167A6E81A893851B8525675500681C7E/$FILE/v1n3.pdf) [Accessed 1 March 2003]
- Poverty Action Lab www.povertyactionlab.com
- Pralahad C.K. & Hammond A. 2002, What works : serving the poor profitably – A private Sector Strategy for Global Digital Opportunity, Markle Foundation and World Resources Institute [online] http://www.digitaldividend.org/pdf/serving_profitably.pdf [Accessed 23 June 2004]
- Regaining Sri Lanka 2003, Sri Lanka – Assessment of Needs in the Conflict Affected Areas – Districts of Jaffna, Killinochchi, Mullaitivu, Mannar, Vavuniya, Trincomalee, Batticaloa, and Ampara, [online] <http://www.regainingsrilanka.org/documents/AssessmentofNeeds1.pdf> [Accessed 29 October 2004]
- Simputer, www.simputer.org
- Sri Lanka Development Gateway <http://www.developmentgateway.org/node/171482/>
- Tarahaat <http://www.tarahaat.com/tara/home>
- Telecommunications Regulatory Commission, 2002, Proposed National Communications Policy, Sri Lanka Ministry of Mass Communication 2002 [online] <http://www.trc.gov.lk/pdf/ncpn.pdf> [Accessed 23 June 2004]
- United Nations Development Program (UNDP) – Information and Communication Technologies for Development (ICT4D) , <http://www.sdn.undp.org/it4dev/> [Accessed 2 November 2004]
- United Nations Development Program (UNDP) 1998, National Human Development Report 1998 Regional Dimensions of Human Development : Sri Lanka, UNDP Colombo 1998 [online] <http://www.undp.org/rbap/NHDR/Srilanka98.PDF> [Accessed 22 June 2004]
- United Nations Educational, Scientific and Cultural Organisation (UNESCO) 2003, eNRICH. New Software for Knowledge Management, UNESCO New Delhi, 15 April 2003 [online] http://portal.unesco.org/ci/en/ev.php-URL_ID=9091&URL_DO=DO_TOPIC&URL_SECTION=201.html [Accessed 2 November 2004]
- World Bank 2003, Country Assistance Strategy of the World Bank group for the Democratic Socialist Republic of Sri Lanka, April 23, 2003, World Bank Group [online] <http://www.worldbank.org/srilankacas> [Accessed 11 June 2003]
- World Bank 2003, ICT and MDGs – A World Bank Group Perspective, Global ICT Department - The World Bank Group December 2003, [online] http://info.worldbank.org/ict/assets/docs/mdg_Complete.pdf [Accessed 22 June 2004]
- World Bank 2004, Chapter 4 Clients and providers, in World Development Report 2004 : Making Services Work for Poor People, World Bank Group 2004 [online] <http://econ.worldbank.org/wdr/wdr2004/text-30023/> [Accessed 14 August 2004]
- World Bank 2004, Sri Lanka: Connecting the Unconnected: World Bank to Support E-Sri Lanka, News Release No: 2005/95/SAR, World Bank Group, October 2004 [online] <http://www.worldbank.lk/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/SRILANKAEXTN/0,,contentMDK:20260271~isCURL:Y~menuPK:232812~pagePK:141137~piPK:141127~print:Y~theSitePK:233047,00.html> [Accessed 22 September 2004]



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