Country ICT Survey for

Sri Lanka

Greenberg ICT Services

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Prepared under contract to

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Table of Contents

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Executive Summary

Background and Objectives: Sida supports a variety of cooperative development projects in Sri Lanka, among them a project supporting ICT infrastructure development and human resources development within Sri Lankan universities. These activities are currently being extended to include assistance in the development of a national ICT policy and strategy framework. As background for future Sida ICT efforts in Sri Lanka, and as a contribution towards the national ICT policy, Sida has commissioned this country survey of ICT. The intent of this report is to provide an analysis focusing on strengths, weaknesses, opportunities and challenges, plus suggested paths to follow as Sri Lanka applies Information and Communications Technologies to the service of national development.

Methodology: The core survey team consisted of foreign experts in ICTs, network & systems development and economic development. A Sri Lankan, familiar with Sri Lanka's ICT sector, and with expertise in ICT policy and legal issues, provided guidance and assistance in addition to local contacts and logistics support. Previous Sri Lanka ICT studies were collected and reviewed, along with a variety of printed and web-based sources which provided background information and socio-economic and ICT indicators.

Interview subjects were selected with major help from the local team member, from references provided by another consultant who had recently done ICT research in Sri Lanka, and by referral from other interview subjects. Interviews spanned a wide range of stakeholders including government, quasi-government (independent groups that report into the government structure), private sector, university, and non-governmental organizations, as well as foreign agencies providing assistance in Sri Lanka. Over 45 stakeholders were interviewed.

Overall Impressions: When it comes to socio-economic development and the uses of technology, Sri Lanka is a country of achievements and contrasts. Its quality-of-life indicators are comparable to those of a country with countries having twice Sri Lanka's real Gross Domestic Product (GDP) per capita. It has a modest but thriving ICT industry, and boasts many state-of-the-art ICT capabilities. At the same time, it is primarily a rural, poor country where a large percentage of the citizens cannot avail themselves of any of these modern capabilities. Access to telephone and electricity is rare for a large part of the population.

Similarly, there are many diverse opinions among ICT-knowledgeable people. A simple question such as "Is the quality of service of phone company lines good?" will yield very different answers from comparably experienced people.

In many areas, one finds juxtaposed leading edge capabilities and policies beside those that determinably hold the country back. There is a very good foundation, but there are many gaps that must be bridged for Sri Lanka to succeed in this area. A new government has recently come into power, and there is a widespread belief that it will address many of the things that are inhibiting ICT growth.

Underlying many issues in Sri Lanka is the 19-year civil war between the Government of Sri Lanka and the Liberation Tigers of Tamil Eelam (LTTE) who have controlled various territories in the northern and eastern parts of the island and have been the source of disruptions in the south. Although the impact is far wider than just ICT, there is no doubt that ICT development has suffered greatly, if only by occupying the attention of the government, diverted public resources away from ICT-based opportunities, and contributed to the exodus of human resources. The existence of this conflict and its resultant impact had been largely ignored, or at least not recorded, by previous reports that were reviewed. The long term military activity coupled with the general downturn in the world economy has put the government into a near-bankrupt position.

Human Resources and the Education Sector: Education has been a priority in Sri Lanka since ancient times, resulting in one of the highest literacy rates in the region. However, for ICT development and growth, general literacy is not sufficient. For success in ICT, a country needs people with three levels of ICT skills: a) people on the ICT supply and demand sides

with professional-class skills; b) people with basic skills to use computers and networks as tools in their workplace or home, and c) a large part of the remainder of the population with an awareness that allows ICT to productively permeate aspects of work and daily life.

Sri Lanka is lacking in all three categories. Moreover, its education and training infrastructure is not sufficiently robust to remedy this problem quickly or easily, as there is a specific shortage of qualified trainers at all levels – primary school through post-graduate tertiary education.

The quality of university-level ICT education seems to be universally high, albeit of insufficient quantity. Recent additions (both in physical facilities and in conceptual ones) have augmented the capacities at this level. A shortage of high-end instructors is a continual and acute problem. On a positive note, there are indicators that universities are beginning to provide ICT exposure to students in non-technology based disciplines.

There is a particular shortage of highly skilled professionals, whose experience-based skills typically require 6-10 years to mature and cannot be “fabricated” quickly.

Once a person possesses ICT skills, the attraction of emigration is often hard to resist and Sri Lanka has lost many of its trained people in this way. The civil unrest has played a large role in this respect. For those who remain in Sri Lanka, moving to an urban area is common.

There are quality problems with the lower-level (mainly private) training institutes. Self-policing has proven inadequate.

The progress on integrating some aspect of ICT (for either ICT-proper training, or for use in other parts of the curriculum) into primary and secondary levels is close to non-existent, with the exception of a few private schools, and the very occasional public school. This is particularly true in rural areas.

As well, the quality of English education is poor. This has a direct impact on later ability to function in a technological world.

Telecommunications: Telecommunications is the cornerstone of the current technological revolution. Although Sri Lanka has taken positive steps to allow competition in its formerly monopolistic environment, there are still significant roadblocks to further development. The traditional telephone monopoly, Sri Lanka Telecom (SLT) is now partially owned and managed by the Japanese NTT. In areas where competition has been allowed, SLT and its competitors have been innovative and aggressive, and have provided a wide range of services at competitive prices. But the services and prices still lag in the areas where the SLT monopoly has been preserved. Also, Sri Lanka’s Telecommunications Regulatory Commission has not met expectations as an impartial and independent policy overseer.

Overall, with the licensing of wireless, fixed telephone suppliers, the huge growth in mobile telephones, and the re-orientation of SLT resulting in a radical decrease in telephone installation backlogs, the number of telephones in Sri Lanka quadrupled from 300,000 in 1996 to 1,200,000 in 2000.

Internet access is growing, but not at the rate that one would expect. There are almost 20 licensed operating ISPs. Dialup access is moderately priced and competitive, but the accompanying high per-minute cost of voice telephone usage is a significant inhibitor.

There are strong indicators that the current government in Sri Lanka will address these factors that are holding back the telecommunications sector, and thus the entire ICT sector.

Electricity: Electrical power availability and distribution is and will continue to be a problem in Sri Lanka. 76% of power is generated by hydroelectric facilities, and there has been a drought for several years. Almost all of the rest of the power is generated using fossil fuels, all of which must be imported. There are daily rotating power outages, with power typically being cut for about 6 hours per day. This has severe implications on ICT facilities.

ICT Industry: The software and telecom sectors of Sri Lanka's ICT industry, despite many problems and a relatively small size, are thriving. There are nonetheless a number of significant problems facing the industry. They include lack of transparency in government acquisitions (the largest prospective client), lack of moderately priced international bandwidth, lack of trained ICT professionals and a management-class knowledgeable about ICT and a tax structure that does not reward local sales.

In recent years, USAID has funded a number of projects aimed at increasing the competitiveness of various industries in Sri Lanka, and ICT is one of their prime focal points. Their ICT sector studies are well done, and their recommendations, if followed, will help guide the industry. There is some danger that they may widen their scope to include the application of ICT in peripheral areas, and as a result dilute their resources and no longer focus on their original crucial targets.

The use of ICT in the commercial sector in general is irregular. Some financial institutions have invested heavily in ICT, and as a result are country leaders in the use of technology. Other sectors are far behind and their use of ICT is spotty at best. Even those companies that have invested in ICT often do so in restricted ways that are poorly integrated into their businesses. The same is true of the use of the Internet. In part of this is related to the small percentage of Sri Lankans with access to the Internet, but the prime reason is, no doubt, the low level of managerial knowledge about the ICT capabilities in their business area.

Heath Care: The largely publicly funded Sri Lankan health care system is remarkably good given the economic resources of the country. The latest in medical technology is present although it is in short supply. However, outside of its use in integrated medical equipment, the use of ICT in the health sector is virtually non-existent, except for billing systems in some private hospitals. In many other countries ICT is viewed as a vehicle to enhance access to, and reduce the costs of, health care. Even Sri Lanka's well-regarded medical schools tend to be behind in the use of ICT. Telemedicine applications are virtually unknown. Current efforts for the use of ICT in the health care system are limited to the installation of computers and local networks in health ministry offices, and eventually in regional heath care centres.

Government: Government has a dual relationship with ICT. On the one hand, it has the responsibility for creating an environment that will both promote the ICT sector, and allow the entire country to use and benefit from ICT. On the other hand, government is a major client of the ICT sector.

There is a clear requirement to address both the long-standing issues facing Sri Lanka's ICT sector, and the challenge of raising Sri Lanka's ICT "absorption capacity" across the rest of the economy. This is not a new situation, and there have been repeated attempts to address it. Initial actions and statements of the newly elected government have generated considerable optimism that the perceived leadership void will be filled. It is clear that government needs an internal ICT "champion" who can quell the competing ministry and departmental rivalries, and fight for sufficient funding to get the work done. And past experience in this area underscores the need to do this in an open and transparent manner. Government also needs to be an exemplary ICT client.

The government already uses computers in a modest way. Much of this is for traditional stand-alone workstation applications, or for applications within a single department. There is little coordination or cross-unit planning. As a result, the applications do not sufficiently yield productivity, effectiveness gains or enhanced service to the public.

Given the government's financial situation and its history not delivering innovative applications, ICT implementations within the government will need to be carefully selected to ensure effective payback and demonstrably improved levels of service.

Operating relatively independently, but within the structure of the government are two organizations worthy of note. The first is CINTEC, a body created with great vision in 1984 to oversee government ICT policy and to coordinate a variety of tasks jointly with the private and

education sectors. Although very effective in its early years, recently it had been marginalized by governments and as a result, its ability to effect change was radically reduced. It needs to be revitalized, or perhaps reinvented in some new form, since its original mandate is more important than ever. The other organization, the Board of Investment (BOI) is charged with generating external investment in Sri Lanka. In the ICT area, with some notable exceptions, it has acted more as a marketing body for existing local firms. If the ICT sector blossoms as is hoped, the BOI will be a critical player in bringing in foreign investment to help fund this growth.

In virtually all countries, law reform is necessary to accommodate ICT issues. In Sri Lanka, such reform started early, but is somewhat stalled at the moment. Here too there is hope that the new government will address this area with renewed vigor.

Colombo and the Rest of Sri Lanka: At all levels of aggregation, statistics about any aspect of ICT in Sri Lanka are highly misleading and can be deceptive when used for policy purposes. Virtually all ICT activity is centred in Colombo, with small pockets in the Galle and Kandy areas. There is clearly a desire to spread ICT development over a wider geographic area than just Colombo, but it appears that it is not going to be an easy task.

The regions outside of the urban areas are particularly poorly served with respect to electricity and telecommunications. Moreover, the rural areas do not provide the level of comforts and conveniences often (but not always) expected by people with the high-end technical and managerial skills needed to drive this sector. Lastly, the supply of lower level technical skills is substantially lower in these regions. The shortage of knowledgeable teachers and trainers willing to work in rural areas compounds and propagates the problem.

The regions currently under LTTE control or in dispute are a special case. They are subject to the above problems, but there are also opportunities should the peace process be successful. The areas will need massive rebuilding of infrastructure. If this rebuilding is done intelligently, the new 21st century infrastructure will be a model to which other areas, and in fact countries, will aspire.

The telecentre movement is in its infancy in Sri Lanka. Telecentres are community-based points of access to telecom and digital services. In many countries, telecentres have provided the focal point for introducing technology into rural areas, and in fact to disadvantaged groups in urban settings. The concept shows up in many reports and plans, but despite this, there are very few active telecentres. Of more concern is that the groups that are developing telecentre plans are doing this in isolation from each other, and from the worldwide community that has a rich body of knowledge on what works and what does not.

Donor Issues and other External Relations: Sri Lanka is a country that depends on the support of developed countries and international agencies. Although this support is greatly appreciated, at times the donor agencies invest in ways that are, at best, uncoordinated, and a poor use of scarce foreign funding and scarce domestic human and organizational resources. The support needs to be better integrated within national planning and priority setting exercises.

Sri Lanka tends to look exclusively towards countries such as India and Singapore for its models and alliances. Cooperative opportunities from other areas, and particularly those related to the British Commonwealth or the United Nations seem to be particularly ignored, despite their potentially beneficial nature.

Issues related to the war: Lastly, it is appropriate to reference the current optimism around the peace initiatives. In the over 450 pages of reports that were read during this project, there was just one sentence referring to the ongoing war and the impact it might be having on the Sri Lankan ICT industry and on the economy in general. The war has in fact had a major impact. Many believe that the current peace initiative has a real chance of succeeding. Indeed, the Prime Minister has pleaded that it is the country's last chance for peace. Much of the potential for success in the ICT areas described in this document depends on success in this area.

1. Background and Objectives

Sida supports the rapid integration of Information and Communications Technology (ICT) in developing countries in order to improve communications and the exchange of information. Major Sida activities include support to ICT infrastructure development and human resources development within Sri Lankan universities. These activities are currently being extended to include assistance in the development of a national ICT policy and strategy framework.

Multiple sectors and stakeholders within Sri Lanka have come to understand that the ICT sector is more than just another sector. They understand that ICT infrastructure and human resources can become a "built" national resource. As such the nature and extent of Information and Communications Technologies (ICTs) is important for Sri Lanka's development strategy, well above and beyond the sector's direct contributions to output, income and employment. Since ICT has been identified as an important component of modern economic development, the government of Sri Lanka is planning to develop a National ICT Policy, and has requested that Sida support this policy formulation exercise.

This Country ICT Survey for Sri Lanka will provide embassies and units within Sida, as well as stakeholders in Sri Lanka, with comprehensive information and assessment of the ICT situation for the planning of future ICT related projects. The Country ICT Survey is also a contribution to the Sri Lankan national ICT policy process.

The intent and format of this report are designed to go beyond a dry recounting of statistics, and steer clear of writing an in depth or learned treatise on particular aspects of Sri Lanka's ICT environment. Rather, it is a subjective analysis of strengths, weaknesses, opportunities and challenges, followed by suggested paths to follow as Sri Lanka applies Information and Communications Technologies to the service of national development.

2. Methodology

The core team for this research consisted of a foreign expert in ICTs and network & systems development and a foreign expert in ICTs and economic development. A Sri Lankan familiar with Sri Lanka's ICT sector and with expertise in ICT policy and legal issues provided invaluable guidance and assistance in addition to local contacts and logistics support.

The team members used various web and print-based sources to obtain background socio-economic and ICT information related to Sri Lanka. This information was augmented with additional (or more current) information obtained on site. To compare Sri Lanka's position to that of other countries, selected data from three other countries is presented.

- India: due to the proximity, and the relative (localized) success in ICT, India is often used as the measure to which Sri Lanka aspires;
- Poland: often considered one of the countries on the dividing point between a developing and developed country;
- Sweden: a technology-abundant, developed country.

Where the data was available and it made sense, data from multiple years is presented, with recent growth rates shown. The data is tabulated in Appendix 1.

Previous Sri Lanka ICT studies were collected and reviewed. A significant number of additional studies were made available to the team during the course of its work in Sri Lanka. With the exception of a small number of reports that were provided to the team in confidence, these reports are listed in Appendix 2. The reports were invaluable in exposing the team to a range of perspectives by a variety of stakeholders on the technical, social and political issues related to ICT in Sri Lanka.

An interview list was drawn up, with significant help from the local team member, as well as another consultant who had recently done a more focused ICT review in Sri Lanka. The interviews spanned a wide range of stakeholders including government, quasi-government (reasonably independent groups that report into the government structure), private sector, university, and non-governmental organizations, as well as foreign government agencies providing development assistance in Sri Lanka. The list was adjusted and augmented, based on availability and referrals, during the course of the project.

The project team reviewed several e-readiness[1] and ICT evaluation tools to insure that relevant issues, as well as relevant sectors, players and stakeholders were identified and queried, and as an aid to the formulation of questions. However, no one particular e-readiness tool dominated in shaping this survey of the ICT situation in Sri Lanka.

The two party survey team, usually accompanied by its local team member, interviewed over 45 stakeholders across the above listed groups. Interviews typically lasted one or more hours, and focused on the specific area of interest and expertise of the interviewee. However, interviews also encouraged the identification of what the interviewee felt were the important issues related to the success or failure of the widespread deployment of ICT in Sri Lanka. The list of interview subjects is presented in Appendix 3.

3. Overall Impressions

3.1 Current situation

Underlying most issues in Sri Lanka is the 19-year civil unrest and conflict between the Government of Sri Lanka and the Liberation Tigers of Tamil Eelam (LTTE) which has controlled various territories in the northern and eastern parts of the island and been the source of various disruptions in the south. Although the impact is far wider than just ICT, there is no doubt that ICT development has suffered greatly.

When it comes to socio-economic development and the uses of technology Sri Lanka is a country of achievements and contrasts.

It has achieved levels of life expectancy, education and health on a par with countries having twice Sri Lanka's real Gross Domestic Product (GDP) per capita. It has maintained and improved that performance while having to deal with domestic political problems which saw a major increase in military expenditures during the 1990's and an over five-fold increase in persons in the military between 1985 and 1995. With the current promise of peace in the northeast there is potential for a substantial "peace dividend" to be devoted to socio-economic development, as well as renewed interest by overseas development assistance agencies.

Sri Lanka remains a mainly rural country while facing increasing urbanisation with an expected one-third of its population residing in urban areas by the year 2015.

Nowhere are the achievements, contrasts and challenges more apparent than in the deployment of technology across the regions of Sri Lanka and the sectors of the Sri Lanka's economy.

The country has achieved a United Nations Development Program Human Development Index that is impressive relative to its GDP per capita. Its health care system includes the latest technologies, open-heart surgery, CT and MRI scans

[1] *e-readiness* is a measure of how prepared, able and willing a country (or other entity) is to integrate ICT-based services into its infrastructure.

(although access to some of these in public hospitals is limited), while at the same time relying on patient record systems from the 1800s, or no patient records at all.

The southwest, and the Colombo area in particular, have fibre-optic networks running along roads where carts are pulled by bullocks. Universities teach advanced computer science programs, but the entire administration of the university, including these students' academic records is based on paper and manual operations. Bank employees, who earn perhaps US$60 per month (equal to the per capita income of the poorest of developing countries), work for financial institutions that also provide Internet banking.

The government of Sri Lanka began to focus on ICT issues in the mid-1980's. However, today, in 2002, it is still trying to adjust several crucial policies to allow the unimpeded development of ICT in the public and private sectors.

It is important to note that the contrasts are both in measurable achievements and in the perceptions of stakeholders. In several really crucial areas related to ICTs and telecommunications in particular, stakeholders held widely diverse views of what is, as well as the understandable diversity around what should be. Examples related to telecommunications will serve to show the divisions. A number of ICT questions were answered with a definitive "Yes" by some stakeholders, and with a definitive "No" by others. The telecom questions included:

- Is there sufficient bandwidth into the country?
- Are the services offered by Sri Lanka Telecom (SLT) well-priced?
- Is the quality of service of SLT lines good?
- Does SLT adhere to regulatory rules?
- Are non-SLT carriers allowed to carry voice embedded in data transmissions?

This diversity is revealing, and disturbing, in light of the fact that all parties expect (and to a large extent believe) that there will be major changes forthcoming in the regulatory environment and thus in service delivery. It is natural for stakeholders to have different self-interests, different assessments, and different expectations with regard to the outcomes of change. However, orderly policy and change require some level of agreement on how to read the evidence. They require some consensus about what exists and how the major players (telecom companies, regulatory agencies, etc.) are positioning themselves.

3.2 The Future

Overall, Sri Lanka has maintained impressive progress in terms of its human and socio-economic development given its resource constraints and the unfortunate challenges of civil unrest, the associated diversion of government resources for military purposes, and the resulting human and economic dislocations.

Likewise, Sri Lanka has a marvellous potential for using ICT to help the country with its overall development, and help it to thrive in all respects. In many cases, the bits and pieces of the foundations have been laid, and substantial chunks of the necessary technical and institutional infrastructure already in place.

There are several crucial areas that must be addressed. On many fronts the ICT picture that emerges for Sri Lanka is that of a patchwork quilt, or a crossword puzzle, with many of the squares blank and unconnected. Significant and state-of-the-art bits and pieces of the technology are in place. Bits and pieces of the necessary organizational structures in the public, private, academic, government and non-governmental sectors are in place. Bits and pieces of policy and regulatory process are in place.

What appears lacking is how these pieces are knitted together through collaboration and the application of appropriate overall policies, political will, and market signals. To

do this will take significant political determination on the part of the central government and a significant "buy-in" by domestic stakeholders. This cannot be achieved solely by the marketing of "good ideas" nor can it be imposed by fiat from above by the central government. Domestic stakeholder buy-in is, of course, the outcome of a domestic process of consultation and consensus building.

There also appears to be a risk of excess reliance on the belief that ICT development in Sri Lanka can be driven by external forces, be they software export markets, the export of ICT services (call centres, etc.), or the import of foreign capital.

In the following sections this survey will focus on those particular aspects of the ICT environment that present both challenges and opportunities for ICT development in Sri Lanka.

4. Human Resources and the Education Sector

Education has been a priority in Sri Lanka since ancient times, and continues to be to this day, resulting in one of the highest literacy rates in the area. However, for ICT development and growth, general literacy is not sufficient.

An adequate supply of skilled ICT professionals, as well as workers and citizens trained in computer uses, and a population "literate" in the use and uses of computers and telecommunications are clearly required in Sri Lanka. They are required both for Sri Lanka's success in the development and application of an ICT sector, and for enlisting ICT in Sri Lanka's overall development.

At the moment, adequate supplies of all three forms of ICT-literate human resources are problematic. There are serious supply constraints in the provision of skilled ICT professionals. The level of worker and citizen training in computer use is low. General ICT literacy is low, particularly in the rural sector. It is notably low or spotty in many areas of government, a sector that in many countries leads the others in the use of ICT.

The following section will discuss the education sector itself, and the following sections will address its "products" – trained people.

4.1 Education Sector

The educational sector has multiple and special roles to play in assisting ICT in the development of the nation. Consider the post-secondary (university) sector. It is a producer of ICT inputs in the forms of skills ICT workers and, where successful, a producer of new inventions and ideas.

It is a major source of skilled labour, and leadership material, for the other sectors in the economy. It thus has a duty to equip those graduates with the tools and knowledge to use ICTs in their daily work. It also has a duty to help both students and the community understand the social, economic and organizational issues surrounding ICT policy and deployment at all levels in society.

It is (or should be) a consumer of ICTs in the execution of its duties as an educational sector. In developed countries, along with the health sector, and social services (pensions, welfare, etc.) it has a major demand for information management systems (MIS) to track "product" (transcripts, courses, facilities, staff, etc.). In reality, in Sri Lanka, the entire operation of most universities (with the possible exception of payroll) is performed manually. The Norwegian Agency for Development Cooperation (NORAD) is currently working with several universities to install automated student record systems.

Beyond its MIS demands education is *expected* to experience major benefits from the use of ICT for technology-enhanced-learning (TEL). TEL includes everything from

electronic/digital support for distance education, to technology-enhanced classrooms, and virtual laboratories. Networked access is also seen as an efficient response to binding constraints in terms of trained instructors and classroom facilities. For example, at the moment instructors from Colombo have to journey to Ruhuna to teach courses that could be taught at considerable savings in time and travel costs by using a digital video link between Colombo and Ruhuna. Moreover, with such a link, instructors that cannot be convinced to make the trip could still teach at Ruhuna[2].

The word "expected" is in italics in the previous paragraph, because all too often, these expectations are not met. Where this has been attempted elsewhere without some degree of planning and forethought the costs have been high and the benefits low. There is a considerable body of lessons learned and evidence about what works and what doesn't. Despite the evidence, ICT educational initiatives are frequently rushed forward because of supplier pressure (companies or donor agencies eager to close the deal or start the project). They are frequently started without planning because of internal competition for IT resources (groups will take what they can get with little concern for an implementation strategy, or the costs associated with the one time grant of equipment).

The necessary planning processes here are neither difficult nor unique to the sector. There needs to be a planning process that identifies priorities through stakeholder participation, since the stakeholders will have to execute the plan. There has to be, as always, senior level buy-in, best in the form of identified champions responsible for keeping the process moving. There needs to be a wise blend of central policy and local autonomy so that implementation can respond to local conditions. None of this has happened elsewhere without some degree of coordinated planning. Specific care has to be taken when the process includes resources provided by external donors. That creates the risk of rushed and poorly thought out project formation as stakeholders compete for funding

Within the education profession, and as we confirmed, among stakeholders in Sri Lanka, there is general agreement that ICTs have a role to play in primary and secondary education. There is less agreement as to how to implement strategy to achieve the objectives of computers in education at these levels.

Given the current state of education in Sri Lanka, and the budget constraints facing any deployment of computers in the classroom, careful thought has to be given for where to start and what to do first.

There is considerable scope for learning from others on this front. The education world is littered with successes and failures, large and small. There is evidence that the existing efforts are taking place in near isolation. One lesson learned, and relearned all too often, is that simply placing computers in classrooms is a recipe for failure. Another lesson learned, and not imitated widely enough, is that using computers to train and upgrade teachers can have a high payoff. It not only increases the supply and quality of teachers, it produces teachers able to introduce computers into the curriculum in ways that work.

This is an area where the Ministry responsible for primary and secondary education can take the lead, not only in setting policy and implementation, but also in drawing together that consortium of stakeholders whose wisdom and support will be necessary to make things work. Formulating where to start this process should be one result of a Ministry participation in a national ICT planning process. Recent reports indicate that the Ministry of Education will be seriously addressing the issue of technology in schools. One hopes that this will be done both with due haste and with due caution.

[2] As the final draft of this report is being completed, a video link is now operational and is beginning to be used.

4.2 Skilled ICT Professionals

The lack of sufficient, trained ICT professional has been a recurring focus in ICT studies and reports in Sri Lanka. There seems to be four main drivers for this shortage:

- Sri Lanka produces only a small number of ICT-trained university graduates (albeit high quality) each year[3]. The number of positions in the state-funded universities is severely limited. This is part of a bigger problem. Sri Lanka has a good record for primary and secondary education but admits to university only about 6% of successful secondary school leaves (12,000 out of 200,000).
- Sri Lanka loses many ICT graduates soon after graduating. Their ICT skills demand far higher salaries abroad. As well, the ongoing civil unrest has been a contributing factor.
- Sri Lanka has a number of state-supported, commercial and quasi-private technical training institutes. However, the quality of training is highly variable.
- Sri Lanka faces a serious shortage of *experienced* ICT professionals – senior people with 6-10 years experience in:
    - software design;
    - project management;
    - network design and management.

  This shortage is felt both in industry and as a shortage of qualified teachers of higher level ICT curriculum.

4.2.1 University-level training

The problem of insufficient ICT graduates has several dimensions, some of which are being addressed on multiple fronts:

- All 13 state-funded universities provide some measure of ICT education. However, in the majority of them, it is just some computer science or information management courses within a general BSc degree. Humanities students may not even benefit from this level of training.
- Several fee-levying institutes (arms of foreign universities) offer Computer Science programs, but the prices tend to be above what most of the population can afford.
- State-funded university ICT training is being increased, a recent example being the new Faculty of Information Technology at the University of Moratuwa. However, this effort is tightly constrained by the limited supply of senior instructors.
- The University of Colombo has recently begun an innovative 3-year program called the *External Degree of Bachelor of Information Technology,* called BIT for short. Under this program, the university sets the curriculum and the exams. Student can prepare for examinations through self-study, or they can go to one of about 40 “fee-for-service” institutes that provide training and/or tutoring. To promote the quality of such sources of training, the university will publish on its web site, student success rates by institution attended. The BIT program is designed to allow students to stop with a Certificate of Information Technology after year 1, an Advanced Certificate of Information Technology after year 2, or a full Degree Certificate after completion of year 3 and other degree requirements. This strategy produces three levels of ICT skills. Some students can take gainful

[3] As with many things, the exact number is the subject of debate, perhaps revolving around the definition of exactly what we are counting. A Sri Lanka Board of Investment document states that there were 675 IT-skilled BSc graduates in 1999 (including BSc Physical Science). An ICT Cluster strategy document cites at recent JICA study estimating that annually there were 200 graduates in computer science, electronics and engineering. While these numbers vary considerably, even the larger number is small in terms of Sri Lanka’s ICT needs.

employment after 1 year or 2 years of study. Others can work while completing their degree.

- The Sri Lanka Institute of Information Technology (SLIIT) was recently created under the auspices of the government of Sri Lanka as a joint venture Ministries of Education and Higher Education, Internal and International Commerce and Food and Finance and Planning. It comes under the Ministry of Technology and its operation is funded primarily from student fees. As it only started operations less than two years ago, it is premature to gauge its potential impact. Many of its instructors come from existing universities and one can assume its curriculum will be appropriate to meet industry needs.

A core problem in expanding the number of graduates is the extreme shortage of qualified university-level instructors, particularly at the more senior levels. This is caused by the overall shortage of skilled professionals, coupled with the low salaries paid to university staff. The problem is even worse for rural schools, as described in section 11.1. Some schools have found clever ways to augment salaries, but this is a stopgap measure at best. In the Colombo area where there are several schools, there is the additional threat of "poaching" between schools as well as the more traditional loss to industry.

4.2.2 Professionals leaving the country

Discussions with Sri Lankan software companies and educational institutions indicate that a typical salary for an ICT university-graduate is approximately US$200-300/month. In private industry this may typically rise to as high as US$1,000/month after several years, depending on individual skills and business conditions.

These salaries do not compete with overseas salaries if the person has an interest in leaving Sri Lanka. While there are non-pecuniary attractions for individuals to remain in Sri Lanka (family, life style), the salary differential is a factor that cannot easily be changed. Some leading software firms pay as high as $1,750/month for their best staff. At that level, retention rates rise significantly. The promise of an end to the civil conflict is another positive factor currently at play.

There are some attempts to repatriate overseas Sri Lankan ICT professionals back to Sri Lanka. This has been more successful in recent times with the end of the over-heated overseas market for ICT skills during the so-called "dotcom" boom. This is probably only a lull in foreign demand since the history of technology always sees a slow but steady post-bust increase in demand ultimately exceeding the levels achieved prior to the "bust".

Two skills retention strategies that seem to be underdeveloped in Sri Lanka are the virtual repatriation of the skills of expatriates[4], and the retention of ICT professionals by linking them on-line to education, research and work abroad. Some Latin-American countries, for example, resort to the Internet to repatriate the skills of overseas nationals, for use in education, research and development, industry, and for civil society activities. Such efforts are low cost and in many cases they are organised by the expatriates themselves. Other countries, Ghana for example, have used the Internet to retain local skills, for example by linking local medical researchers to overseas research networks.

4.2.3 Quality of technical institutes

The combination of ICT skills demand and limited access to post-secondary education in Sri Lanka has fuelled the growth of a large number of ICT-related technical training facilities in Sri Lanka. This rapid and unregulated growth has

[4] "Virtual repatriation" means to use the skills of expatriates, even though they are still living outside of Sri Lanka. Often this means subcontracting work to them, or using them to market products or services on behalf of Sri Lankan companies. There are a few companies that are starting to do this now, but in general it is an untapped resource.

produced serious problems of quality assurance. There are stories of parents investing their life savings to pay for training for a child, only to find out that the "graduate" had not received sufficient training to make them employable.

The twin problems of how to increase both the supply and the quality of training, across a number of skills areas and skills levels, are problems that should be addressed in a collaboration across the relevant stakeholders, including the training institutes. Sri Lanka is not in a position to simply institute various levels of formal certification of ICT training facilities. There can be schemes such as the University of Colombo external BIT plan that certify skills. As well, publishing student performance by training institute will allow students, and their families, to identify quality, and influence training quality. Publishing statistics on how many graduates obtain employment utilizing their new skills will also provide a measure of success, but one must be careful that these statistics are honestly presented.[5]

Also to address this, there are discussions going on at a number of levels to institute formal certification of ICT professionals. Certification not only labels the prospective employee, but the type of certification will provide guidance to employers who do not themselves have the skills to identify good employees. The relevant stakeholders, including the training institutes, should consider a mix of "guard dog" and "guide dog"[6] strategies to improve ICT skills and the performance of ITC training institutes. The objective is to expand the supply of quality ICT skills, not to restrict supply just to those that currently produce quality ICT skills.

4.2.4 High-end staff shortage

All of the programs described in section 4.2.1and 4.2.3 will go a long way to addressing the need for basic ICT skills. There remains a serious obstacle to a rapid ramp up of ICT activity in the software sector, and the large-scale application of ICT to organizations. While it is possible to quickly expand the supply of entry-level ICT personnel, it is not possible to immediately produce high-level professionals, especially when that includes 6-10 years of proven experience in software design, project/implementation management, and network management.

Some of this demand could be met by the virtual repatriation of the senior skills of expatriate Sri Lankans abroad. Again, an end to the civil unrest will also help, both in the potential for full-time repatriation of ICT skills, and for the short term return work stints of expatriates whose ICT skills are being repatriated on-line the rest of the time. It remains to be seen as to who might organise such efforts.

One interesting and successful way to circumvent this problem has been to sub-contract high-end tasks to the Computing Services Centre (CSC), a group within the Institute of Computer Technology (ICT) of the University of Colombo. ICT is one of the few really concentrated centres of technological expertise in the country, and the CSC has been involved in many successful projects. These have included feasibility studies, project specification and design, tender evaluation, network design and implementation, as well as overall system development. This group has been involved in some of the most strategic projects involving both government and private enterprise. As a side-benefit, this also serves to give staff members an additional source of income, partially alleviating the low academic salaries.

[5] There is a perhaps apocryphal story that some Canadian schools surveyed their students to see how many were employed. 10% said they were employed, 10% said they were not, and 80% did not reply. The schools "assumed" that the 80% who did not reply were too busy working to reply, and published that 90% of their students found employment.

[6] That is, not only provide negative feedback in the case of non-compliance with rules or standards, but to work with the stakeholders to improve quality.

However to a large extent, this shortage is one of the real constraints to rapid growth in the Sri Lankan ICT industry and a rapid deployment of ICT to sectors in the Sri Lankan economy.

4.3 Trained Computer Users

For the application of ICT across the non-ICT sectors of Sri Lanka (government, health, primary/secondary education, small and medium enterprise (SME), the rural sector) far more people will need to be computer literate and computer trained.

There are many user-training programs in place, but as in the case of more technical training, the quality of the training programs is uneven and erratic. The institution of the so-called *Computer Driver's License* will be effective in helping to manage and measure the growth in computer literacy, and to give employers a measure of confidence in hiring staff. A strategy of ranking training facilities in terms of testing results, as used by the BIT program, would also help here.

Two important focuses are primary/secondary school-based "computers in schools" programs discussed in the next section, and various community based "telecentre" programs discussed in section 11.3.1.

4.4 Computer-aware Population and Primary/Secondary/Tertiary Education

As ICT becomes more a part of everyday life, it will be increasingly necessary for all citizens to have some basic familiarity with computers. Technology revolutions are complete when such skills are taken for granted and the technology seems to have disappeared into the background.

It is easy to say "using them in primary and secondary schools will help". It is more difficult to say what this means in actual practice. It can mean using computers to increase the efficiency of administration and management of the schools. It can mean using them to produce more and better teachers. It can mean using them to deliver better curriculum and a better learning experience. It can mean teaching students basic computer skills as the first step toward either *Computer Driver's License* proficiency, or as a start toward an ICT career.

For any of these to work it is necessary to (a) be clear as to what the actual goals are, (b) have an evidence-supported strategy for getting there, and (c) engage in a planning process in which both stakeholders and champions are brought on side. A recent draft plan produced by the Ministry of Education seems be making aggressive moves in this direction. At this time the aggressive moves should be seen as a declaration of intent and a willingness to champion efforts. It is essential that the other steps take place, steps that wed strategy to resources, or Sri Lanka will run the risk of reproducing the shortcomings of similar efforts elsewhere.

The main shortcoming is the tendency to substitute the provision of technology for a proper implementation strategy. It is better to deploy one half, or one-quarter, the number of computers to successful uses, both for the deliverables and the transferable lessons learned, than it is to engage in a "technology intense" role-out of more computers and be met by failure. One challenge is helping donor agencies understand the issues here, both with regard to computers in the school and computers in the community. A method that has been successful elsewhere is to only provide technology to a school if there is a local "champion" and if the school management really wants this project to succeed. A champion could be a staff member at the school, or a local company that will provide help and guidance. The essential characteristic of a champion is that they passionately care that the computers will be used, and will do whatever is necessary to ensure that outcome. When coupled with local management that wants success (and will thus not arbitrarily

get in the way), the outcome is invariably good. A success in a school with a local champion tends to spread to nearby schools with a ripple effect.

It is also noteworthy that, to date, the technology has not been used in support of other educational goals, specifically those related to English and other language training. It has been found that exposure to the still largely English-dominated computer and Internet world does wonders to increase functional English language skills. And the poor quality of English language education, particularly in rural areas, was highlighted as a major problem by several interviewees.

The prognosis for entry-level ICT professional training at the tertiary level is promising, as described in preceding sections. However, there has been too little progress in introducing computers, computer skills and computer-based tools to university students who are not enrolled in technology-related disciplines. It is common for an Arts graduate to never use a computer in his/her studies. This handicaps both the student and the organization where that student will work. The graduate has neither the computer skills nor an overview of how computers fit into the organizational structure and processes surrounding their work.

This issue needs to be addressed. For starters, all university students should receive, or have the opportunity to acquire, basic computer literacy training. Some universities are already doing this, but it is not universal. In some cases this involves formal classes or short-term training programs. In other cases this can be accomplished by giving students email accounts and access to a computer drop in centre. Twenty-five years ago students in industrial countries took formal courses to learn to type. Today they learn their "typing literacy" *en passant* as they learn to use email and the Internet. Optimally, a combination of "drop in centres" and carefully thought-out integration of technology in academic courses will be used.

A major impediment to the use of computers in schools at all levels is the lack of teachers with computer skills. This points back to the need for a planning process that clarifies goals, involves stakeholders and identifies champions who will support implementation.

The team was told that there is a massive World Bank project to provide computers in primary and secondary schools, and to provide teacher training, but full details were not available at the time.

4.5 Prognosis for the Future

Sri Lankans have proved themselves eminently "educable" and this has been duly recognized in global comparisons. So the prognosis for the outcomes of future effort in this area is good. To ensure this, there will have to be a deliberate focus not only on tertiary education, but the use of computers in primary and secondary schools, and on the introduction of computer-training for instructors, at all levels. In recent years the education budget has been compromised by the military demands from the civil unrest. There is the possibility of deploying a "peace dividend" and renewed foreign donor assistance to an expanded program of ICT supported education and curriculum reform.

Other countries with much lower GDP per capita than Sri Lanka have managed to ramp up their production of ICT professionals and in parallel insured that all university graduates are ICT-literate. Sri Lanka must do the same.

5. Telecommunications

Telecommunications is the cornerstone of the current technological revolution. The convergence of voice, data and full-motion images in a single data transmission technology has revolutionized many processes and businesses. In particular, the ability to use the TCP/IP data transmission mechanism to economically move voice

traffic is damaging most of our traditional views of what a "telephone company" does, and how they do it. The fact that this digitized voice (called Voice-over-IP – VoIP) can then be effectively moved using wireless technology virtually kills these already damaged views[7].

There are national telecom issues that will have to be addressed, and addressed soon. On the one hand there is increased competitive pressure for access to VoIP and for more competitive access to international backbones. On the other hand, and equally important, Sri Lanka's telecom infrastructure and capacity, as a component of its ICT infrastructure and capacity, are now understood to be key elements in the future development of the country.

From a regulatory stance, the telecom sector has gone from historically being a revenue "cash cow" to potentially being a *built* national resource. It is increasingly a necessary input into the efficient and effective operation of all aspects of a modern economy. Sri Lanka cannot afford to be left behind through the application of outdated regulatory policies and ideas. Over the past decade, the telecommunications sector in Sri Lanka has changed remarkably, and there are now several major players. They are listed in Appendix 1, along with the service areas that they cover. Despite this thriving competition, the telecommunication sector is still one of the major bottlenecks to ICT success.

5.1 Sri Lanka Telecommunications

The history of Sri Lanka's telecom sector is comparable to the standard history of the telecom sector in developing countries. The relevant modern history focuses on voice telecom and can be divided into two eras. In the first era, from Independence onward, covers a period where the telephone company, SLT, is state owned, a natural monopoly by virtue of the technology, and a revenue source to a cash strapped national government.

The first era begins to close in 1996 when SLT it was converted into a public company under 100% government ownership. In 1997, 35% of SLT was sold to Nippon Telegraph & Telephone Corporation of Japan (NTT). At the same time, a management agreement was signed under which NTT took over management of SLT, including installing an NTT executive as the SLT CEO. In the first era, SLT was formally committed to universal service but fell woefully short of even a fraction of that goal.

The management agreement was initially for three years, but was later extended until August 2002. The government has recently given notice that it intends to renegotiate the agreement. This renegotiation window was a part of the original agreement, but the previous unilateral extension had persuaded many observers that a full bilateral renegotiation would not take place this time either. Renegotiation presents an opportunity for significant changes in light of the challenges facing the telecommunications sector.

To a large extent, the second era has been driven by the rapid development of digital communications in the last decades of the twentieth century. The ICT revolution has several impacts on the telecom sector.

The first important impact is that digital communications, and especially wireless links, bring an end to telecom's status as a natural monopoly. The new technologies allow effective end-to-end competition. This presents new challenges for telecom players and national telecom regulatory bodies. In Sri Lanka both were slow to

[7] It is interesting to note that VoIP is not as large an issue in developed countries, where there is a far more extensively developed land-line infrastructure, communications costs are lower, and the telephone companies themselves are beginning to aggressively move in this direction.

respond since (a) the structure of the phone company was accustomed to living in a placid environment of graduate change, and (b) telecom regulators had a similar perspective and continued to view regulation with a strong bias toward government revenue maximization and protection of the state-owned monopoly.

The rapid growth of telecommunications infrastructure to support text and data, coupled by the growth of voice-over-wireless have begun to challenge both the competitive position of SLT and the existing telecom regulatory model. At the moment this challenge is represented by the fact that SLT retains a monopoly on landline local loops within Sri Lanka, and a monopoly on international access to undersea cable.

Competing providers of non-voice digital services must either buy backbone bandwidth from SLT, or resort to satellite links. Since SLT also seems to retain a monopoly on VoIP, some believe that it is illegal for the competing wireless telecom companies, and digital networks, to pass voice over their networks (the fact that it is not actually known for certain is one of the curiosities noted in section 3.1).

SLT's approach in areas where they have an absolute or de facto monopoly has been to wait for demand to materialize before re-acting, instead of making pro-active investments to spur market demand. As a result overall external undersea cable capacity is currently limited to only 20 Mb/s, and prices are in the order of 5-7 times that in India. It has been reported that SLT is planning on increasing capacity to 90 Mb/s in the near future. One can only hypothesize on what is driving this radical increase. There has also been some talk of SLT lowering their international rates, but for ICT exporters only.

Another example of SLT's inability to meet market expectations is the high incidence of illegally bypassing SLT's international voice monopoly (via VoIP or satellite interconnect) and of call-back (whereby a caller makes a very short off-shore call to request that the far location call them back, thereby completing the call at the lower foreign long-distance rates).

As for NTT and the NTT management of SLT, it is clear that it has helped SLT in many ways, and SLT has responded in some measure to competition from voice-over-wireless and competition in the provision of digital services. Their offerings and service levels are markedly better than they were five years ago, and their prices are generally competitive in areas where they are not a sole-source provider.

Nevertheless, there is a widespread, belief that the terms of the current management agreement must be revised in order to meet the demand of the coming decade. Indeed, the government's decision to renegotiate the contract simply echoes this. In areas where SLT still has a monopoly, specifically landline local loops and international voice access, there is a widespread belief that the ICT industry and the public in general are not being served well.

5.2 Deregulation and the Telecommunications Regulatory Commission

5.2.1 Telecommunications Regulatory Commission

Sri Lanka took early action to begin the deregulation of the telecommunications industry. However, the impact of deregulation was less effective than it might have been. The positions taken by the Telecommunications Regulatory Commission (TRC) suggest that the TRC has not fully recognized, or was not allowed to recognize, the extent to which technological progress had eroded the natural monopoly aspects of telecommunications.

As a result, the TRC has been identified as a major obstacle to telecommunications progress in many reports and interviews. Among others, the issues have been reported to be:

- the less than arms length relationship with SLT;
- the fact that both the TRC and SLT report to the same ministry;
- the TRC selectively and preferentially enforcing its own regulations, often to the advantage of SLT or other "friends";
- the refusal or inability to deregulate selective parts of the industry;
- restrictive and varying interpretations of licensee rights with regard to VoIP;
- the inability of the TRC to police unlicensed operators[8]

In fairness to the TRC, its hands have been somewhat tied at least partly due to the contractual terms of the relationship involving NTT, SLT and the government.

Evidence from reports and interviews singled out the TRC Directorate as one of the obstacles to progress in telecommunications (de-)regulation. During interviews with the Director of the TRC and his staff, the project team was presented with positions that were very much in contradiction to the previous reports. The views, as expressed in the interviews, were quite in line with the ideas of deregulation to promote competition, the wider use of VoIP, and the view that telecommunications are a built national resource, essential for socio-economic development. The team had difficulty reconciling these views with those found in previous reports.

There is also some evidence that the TRC would like to extend its domain to include non-communications ICT areas to include (possibly) such things as management of the country level domain name (.lk) process, electronic signatures, etc.

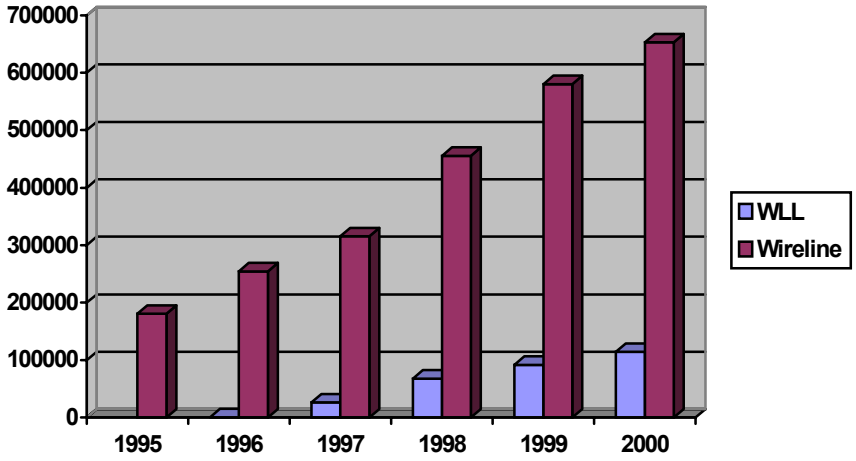
In keeping with telecommunications regulatory efforts elsewhere, and in support or World Trade Organization (WTO) principles regarding independent regulation, it is certainly time to make the TRC a truly independent body. It should retain responsibility for spectrum management. TRC policies should promote a more competitive telecommunications sector, driven by customer needs. Doing so has modest potential for producing government revenues directly. However, it has greater potential for producing revenues indirectly, from income and production taxes, as the application of ICTs stimulates domestic and export revenues. The non-communications aspects of ICT such as domain name management, electronic data interchange and electronic signatures should remain outside of its jurisdiction.

5.2.2 Competitive Telecom Providers

The competitive telecom business in Sri Lanka is complex and hard to get a handle on. This is in part because of the confusion over exactly what is allowed and what is not, in particular with regard to VoIP and the rights and restrictions on links to global networks

Two competitive companies are licensed to provide local loop voice service, but only using radio transmission. They have done a remarkably good job at providing this service at competitive prices and with a good service record. The growth as shown in the accompanying chart is interesting. The service was first available in 1995. In 1998, the carriers had a stable product and SLT was still experiencing *very* long delays in installing new lines. As a result, the number of installed wireless links almost tripled. By 2000 (the last year for which data is readily available), wireless links had a 15% market share in a field traditionally served exclusively by wired connections.

[8] The TRC does not have the equipment to allow the monitoring of illegal use of radio-frequency spectrum – the only practical way of monitoring such illegal use. There has been talk of acquiring such equipment and the trained staff to operate it.



For point-to-point service, the competitive wireless service tends to be more expensive than SLT wired services. This is not surprising, given SLT's large install base. However, the competitive companies have a reputation of a better record for reliability and fast repair (although SLT has improved measurably).

There are some wired point-to-point competitors (who cannot carry voice), but they do not have a significant market share.

Competitive providers have some satellite external connectivity but must obtain all undersea connectivity, both voice and data, from SLT. With one exception, there is relatively little use of VSAT[9].

A summary of the major competitive telecommunications providers in Sri Lanka can be found in Appendix 1. In addition to these, there are an estimated 145 unlicensed operators in the market.

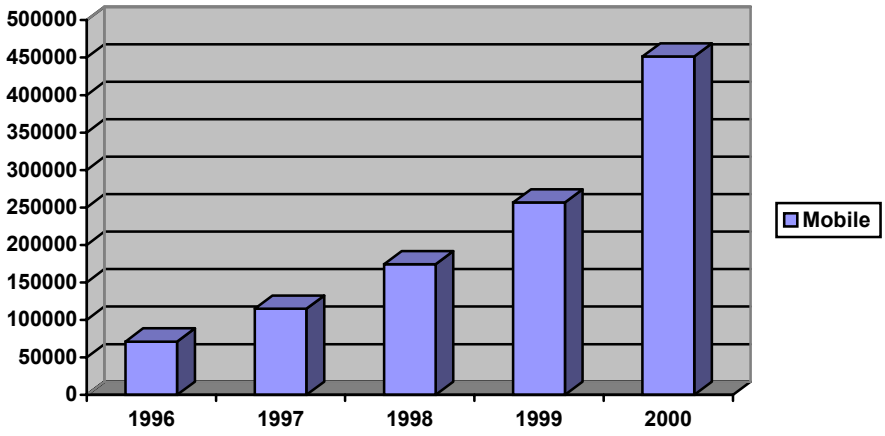
5.2.3 The Mobile Telephone Market

There are four competing mobile telephone providers in Sri Lanka[10]. SLT is prohibited from offering services in this sector, but they do maintain a presence in this market owing to the partial ownership of one of the existing vendors.

The business is thriving. The service providers have been innovative in their marketing plans (as is common in this sector all over the world). They offer package plans that, unlike the fixed telephone services, allow a user to pay a higher fixed price per month for a large block of un-metered time or a lower per-minute rate. In 2000, the mobile phone market was 37% of the total telephone market, having grown at a compound growth rate (CGR) of 57% over the past 4 years.

[9] One telecom provider, an off-shoot of a financial services group, uses narrow-band VSAT extensively, but its network is not adaptable to the wider-band needs of voice and data-intense transmissions.

[10] The largest provider is Dialog GSM (MTN Networks), a wholly-owned subsidiary of Telecom Malaysia. The second largest provider is Mobitel, a joint ventire of SLT and Telstra of Australia. The other two providers are Lanka Cellular Services, a subsidiary of Hutchison Telecommunications International of Hong Kong, and Celltell Lanka, a subsidiary of Millicom International Cellular.



A mobile telephone owner who uses it only lightly would pay in the order of $10 per month, while a moderate user would pay about $30. It is widely believed that for heavy telephone users, mobile communications tend to be less expensive than fixed access.

Two anecdotes are worth recounting:

- One of the review team members noticed that all users of a particular mobile telephone company had phone numbers beginning with “077” – regardless of where on the island they were located. So the logical question was: If you are in Colombo, and you call someone else, does the charge vary depending on whether the other party is in Colombo or elsewhere on the island. Several users of this company answered “I don’t know”.
- Similarly, when asked whether the cost of a call was the same regardless of the type of the receiving phone (wired-fixed, wireless-fixed, mobile, same mobile company, different company), that answer was again “I don’t know”.

While there were reports that wireless quality and coverage were not as good as could be, it is clear that the overall cost of using a mobile phone in Sri Lanka is not a large enough concern for the users to care about these details.

Geographic coverage for mobile telephones varies with supplier, but generally, it is only in urban areas in the southwest, and selected areas (such as around Kandy) in other parts of the country. Currently mobile access is not a substitute for fixed telephone service (wired or wireless) if you live outside of a heavily populated area.

5.3 Internet Access

There are many ISPs in Sri Lanka, with SLT being the largest. At last count, there were 17 active providers, with an additional 10 licenses issued. Most of these players are quite small. The vast majority of subscribers are in the Colombo area, but there are points-of-presence in several other urban centres. SLT offers access to its ISP service as a local call from anywhere on the island. However, this service is only available to those who use SLT local loops for their voice telephone. As noted in Attachment A, there are cases where the SLT loops cannot sustain a data connection. All ISPs (or their downstream supplier) interconnect at the Sri Lanka Domestic Interchange, so in theory, intra-country traffic will never go offshore.

The cost of Internet ISP access is comparable to similar services elsewhere in the world. Many non-SLT providers only offer 28.8/33.6 kbps dial service, and access from many non-SLT local loops is limited to 28.8 (presumably due to the use of compressed 32kb voice services). A typical cost (from SLT) is US$11 per month for 150 hours.

The actual per minute cost of dialup Internet access is normally high because of the additional per-minute cost of voice service in Sri Lanka. The base cost of a telephone line is low (about US$3-4 per month). However, the cost per minute, particularly during weekday daylight hours, is abnormally high (for SLT it is US$1.80 per hour after the first 8 hours)[11]. Attachment A recounts experiences while attempting to access the Internet from Hotels in Colombo and in other areas. It also provides more details on telephone usage costs from the three providers as well as from several major hotels. The overall conclusion is that the ability to access the Internet is not quite as bullet-proof as the suppliers claim.

Discussions with both SLT and TRC employees said that moderate to heavy Internet users would have more economical access with a leased line (at about US$200 per month) – a solution that is not economical in its own right, nor feasible for the vast majority of Internet users in Sri Lanka.

5.4 Prognosis for the Future

Most observers believe that the industry must be completely opened up, with a "level playing field" for all players and a competitive market for ICT services, including VoIP. Both safeguards and new initiatives are needed to ensure that rural areas are well served. Of particular import is competitive market access to undersea external connectivity.

With the emergence of wireless competitors, SLT has demonstrated that they can adapt and could successfully compete in a competitive environment. In some ways SLT has followed the market in a sector where strategic leadership involves leading the market. In a more competitive environment, new and enhanced products and services will be offered to lead the market, attracting business that would otherwise bypass Sri Lanka altogether.

6. Electricity

Electrical power availability and distribution is and will continue to be a problem in Sri Lanka. 76% of power is generated by hydroelectric facilities, and there has been a drought for several years. Moreover, it is reported that some hydro generation equipment is off-line due to insufficient or improper maintenance. Almost all of the rest of the power is generated using fossil fuels, all of which must be imported. There is negligible power generated from renewable resources (wind, solar, wave motion).

In 1997, it was forecast that power consumption would increase at 10% per year. In fact, for the following two years (the most recent for which statistics are readily available), it has grown at somewhat below that rate, specifically at a CGR of 7%.

Due to the drought, generation equipment failures, the time required to bring new generation facilities online, and the cost of foreign fossil fuels, the amount of power available is severely limited. The fact that the power distribution grid experiences transmission losses in excess of internationally accepted levels does not help.

At the moment, there are rotating power outages, with power typically being cut for about 4-6 hours per day. This has severe implications on ICT facilities. Unless a facility has very reliable generator backup power, computers and networks will fail regularly, often in disastrous ways. Most backup generators are not built to run for 6 hours per day, every day. As a result generators fail. Many systems have battery-

[11] Curiously, this mode of pricing is used by all venders, SLT and competitors. For competitors, it is not clear if this is required by regulation, or was by choice. Certainly mobile phone providers have seen the wisdom of block-usage pricing.

powered UPS systems, but these too are not designed for this type of regular power outage[12].

7. ICT Industry

The software and telecom sectors of Sri Lanka's ICT industry, despite many problems and a relatively small size, are thriving.

Several Sri Lankan software companies have proven themselves in local and world markets. Based on the quality of produce, and overseas acceptance, several can easily be judged as world-class. As discussed section 5, the competitive telecommunications sector is innovative and aggressive.

7.1 Identified Problems Confronting the ICT Sector

There are a host of problems that have been identified. The issues leading to problems, some of which are addressed elsewhere in this report, include:

- Lack of transparency in government with regard to software acquisitions;
- Lack of direct access to moderately-priced international bandwidth;
- Lack of skilled technical people especially at the more senior skills levels;
- Lack of ICT knowledge by senior management in all sectors;
- Variable and varying government policy;
- Tax incentives that reward exports but punishes success in local markets.

7.2 USAID, The Competitiveness Initiative and the ICT Industry Cluster

During the last year or so, the U.S. Agency for International Development (USAID) sponsored a series of studies with the intent of developing several key industry sectors in Sri Lanka. The ICT industry was one of these. Several reports identified in Appendix 2 go into this initiative and its associated strategy in more depth.

In conjunction with this "Competitiveness Initiative" strategy, a group called The ICT Cluster was formed. It is a volunteer group comprised of several special-interest working groups covering infrastructure, education and training, marketing and promotion, venture capital and legal issues.

The survey team reviewed a number of the Competitiveness documents, and met with several of the key players. The documents are well focused and the people clearly understand the issues at hand. We have some concern that appropriate lessons may not be learned, given that the comparison countries are India, Ireland and Israel. Although all three have performed in an exemplary manner regarding ICT, they may not be the best examples for this time in Sri Lanka's development. In fact, one respected USAID person has pointed this out, suggesting other countries such as Jordan and Pakistan that may be more realistic role models, and certainly should be considered prime competitors. In addition, some of the estimates for growth seem overly optimistic. Nevertheless, the direction is correct.

The Cluster seems to have a weak focus in its initiatives. The cluster is committed to a "more level playing field" and greater recourse to market forces. It also seemed overly quick to express an interest in tackling all problems and issues, across all sectors, if ICT is part of the ultimate solution.

Widening its scope is likely to cause the Cluster to loose momentum and be less effective. Reasons for this include:

[12] Typically after a major outage, it may take 16-24 hours for the batteries to fully recharge – and here the power will go out again in 18 hours.

- The Cluster is a volunteer effort, and if the focus strays too far from the areas that are of interest to the key players, they may loose interest;
- The Cluster has not included some of the key stakeholders in these out-lying areas.

The Cluster Initiative is likely to be more successful in its own right, and a better source of models and lessons for other cluster groups (and from USAID's perspective, for other countries), if it first succeeds in the pursuit of its primary focus and does not attempt to be all things to all sectors in the first instance.

8. Use of ICT in the Commercial Sector

There are three distinct levels for presence of ICT in Sri Lanka's commercial sector, depending on the sub-sector. They are:

- high penetration and prevalence;
- low penetration and prevalence;
- highly varied penetration and prevalence.

A similar stratification pattern is repeated within other sectors. ICT presence is high and pervasive in the financial sector. It is low in the rural and agricultural sectors. ICT is less pervasive and more uneven in the tourism, transport and travel sectors, as well as in the retail and wholesale sectors.

Sri Lanka's financial sector was early to adopt ICT applications. The domestic development of software for the automation of the Sri Lanka stock exchange was a significant achievement. The quality of the software has resulted on overseas sales and brought significant business to its developers, Millennium Information Technology Ltd. The Millennium software company, in turn, has been the source of several successful spin-offs of new software companies.

Sri Lanka's banking sector (particularly the private banks) has likewise been an early adopter of ICT applications. While there is some unevenness in the degree of ICT absorption by institution, all banks have moved or are moving to a significant level of "back-end" ICT application. All are moving toward a significant level of "up front" (customer focused) ICT applications include automatic teller machine (ATM) access, point of sale credit card clearance, and online (telephone and Internet) banking.

Part of the early success of the financial system is based on the fact that financial services are data intensive and many financial "deliverables" are little more than credit or debit entries in the financial record. The existence of competitive "data only" bandwidth providers facilitated the development of private bank networks, made point-of-sale services possible, and supported the deployment of ATMs. By the banks' admission, this communications technology was expensive, but "not for a bank".

The challenges that remain are mainly organizational and not technical. For example, there is no agreement on a policy to interconnect ATM machines, although such agreements are likely to emerge. Given the low level of land-lines, for data or voice, beyond the south-western Colombo region, banks are using back-end wireless solutions and looking to expand customer services using such innovations as mobile banking kiosks, some complete with ATMs and internet access for online banking and other uses.

SLT's own ISP service provides local-call dial-in for Internet access throughout the country. Thus, long distance rates are less of an obstacle. However, the structure of metered local rates, and the absence of (high speed) land line access from many parts of the country means that many regions continue to face considerable obstacles to access. Attachment A documents one of these obstacles.

Most private companies in the financial sector have made significant ICT infrastructure investments both in Colombo and throughout the island. Several of

these companies are planning to leverage these ICT capabilities by providing non-financial services as well. For example, a bank will be installing kiosks in rural areas primarily as banking terminals, but will also allow them to be used as more generalized Internet access devices, and to provide entry-level telehealth services (online booking of urban clinic or specialist visits).

There are no unique obstacles to a more pervasive utilisation of ICT services in the financial sector, except possibly for the lack of ATM interconnect. The obstacles that do exist link back to three factors:

- the general shortage of higher level ICT skills for managing ICT implementation and the managerial skills for ICT-driven organizational change;
- the generally low level of access and adoption on the part of customers and clients;
- the lack of high-quality telecommunications (both dial and leased) in remote areas.

The tourism and travel sectors have as high a stake in embracing ICT solutions to in-house administration, management and production, as well as to supply chain and customer relations management. In addition to using ICT to increase efficiency and effectiveness in the production and delivery of their product, they face the unique challenge that their "product" is a perishable service. An airline or bus cannot carry forward today's empty seats to tomorrow's market. A hotel or tourist resort cannot carry forward this week's empty rooms to next week.

In tourism and travel ICT has an additional role to play, a role in raising utilisation (occupancy) rates, rates for seats in travel and for rooms/beds in the tourism sector. Many of Sri Lanka's world-class tourist facilities are making use of ICTs, especially the Internet, to market their products worldwide. Much of their online presence operates as "brochure ware". At the moment online booking is limited and online prices are typically set higher than those available to the client through local (source country) agencies. This is because travel consolidators and wholesalers are in a position to extracted better rates in exchange for assurances of higher occupancy rates.

For the rest of the commercial sector it is not possible to generalize. In-house ICT applications for management and administration, for production, and for supply chain and customer-relations management require three things. They require an awareness of the potential applications of ICTs. They require a business case that supports implementation. They require access to the human skills necessary to carry out implementation.

From a cursory inspection it would appear that for many elements of the commercial sector effective awareness is low, hindering the capacity to construct or consider a business case for ICT. Given a business case, there are few if any obstacles to acquiring hardware and software. There may be some obstacles to connectivity based on access constraints, both bandwidth and connect time charges.

There certainly are obstacles resulting from the shortage of skilled ICT professionals in Sri Lanka as detailed in section 4.

8.1 Use of the Internet

The use of the Internet is just a particular ICT application, but nevertheless a cornerstone application. Moreover, the problems here are symptomatic of the more general ICT issues in Sri Lanka.

As mentioned above, various industries in Sri Lanka are making use of e-mail and the web. However, it is notable that virtually none of them have truly integrated it into their business. It was difficult to find examples where the use of either e-mail or the web was a crucial link to business success. More likely, it was ancillary, and not highly

viewed. As an example mentioned earlier, some hotels have web sites and even allow booking over the web. But they don't actually expect people to use it, and set prices online to virtually ensure that it is not used. Web sites are typically very incomplete, and generally lack sufficient information (such as prices) to be used as a practical selling medium.

Certainly part of the reluctance of businesses to use the Internet is the relatively small number of Internet users within the country. Even the bank that has instituted Internet banking has done so for the visibility it provides, not because it is a major path for customer activity.

This will not likely change without some economic motive, which will not be there until there is far wider use of the Internet in general. That will not happen without lowered price barriers, enhanced rural access and increased ICT literacy.

9. Heath Care

As mentioned in section 3.1, the heath care system in Sri Lanka has been and continues to be remarkably good. That being said, other than the form of technology integrated into medical equipment, ICT is almost non-existent in health systems in Sri Lanka. Even in the private hospitals, computer use is largely relegated to billing. This is despite the fact that ICT in health is frequently touted as a leading sector for ICT in developing countries.

As an example, we were told that in many hospitals and clinics, when a patient is seen for a second time, there is no process by which their previous medical records can be consulted. This will result in test being done repeatedly and important information not being available. It is unfortunately the case that even in modern, developed country hospitals, emergency care must often be administered without the benefit of prior records. But a previously scheduled clinic appointment should be able to do better.

Just as technology is very sparse within the health care system, it is similarly sparse within the medical schools. One medical school we discussed was quite happy with a few computers that could dialup to connect to the Internet.

A recent program announced by the World Health Organization, and funded partially by the Sorus Foundation will make medical journals available to heath care professionals at reduced or no charge (as well as help build the high-performance infrastructure to allow this to happen)[13]. Sri Lanka is not eligible, despite its GNP/person being below the cut-off level because the publishers already have an established market there that they do not want to impact. However, it illustrates that there is a belief that giving public health workers, researchers and policy makers access to high-quality, relevant and timely health information via the Internet is of great value, even in the least developed of countries.

Telemedicine is another area that may be of great value. The one trial (by a commercial organization) unfortunately found that the cost of the equipment coupled with the lack of interest on the part of local physicians and of specialists made it completely impossible. Other jurisdictions have found that timely medical diagnosis without prior travel can reduce treatment costs.

Overall, ICT can be used at all levels within a health care system, ranging from simple book-keeping to supporting the training of medical practitioners to advanced form of medical treatment. In Sri Lanka, little of this is happening, and the efforts that

[13] Further information can be found at: http://www.healthinternetwork.org/src/eligibility.php, http://www.un.org/millennium/sg/report/Health-Aug2001.htm, and http://www.hin.org.in/Pdf/HIN%20Summary%2017%20March.pdf

we could unearth in discussions with the private sector and the Ministry of Health were ones that what will have limited impact.

It is admirable that the overall quality of health care is as good as it is. It would seem that whenever health care investment decisions have been made, little attention has been given to the potential role of ICT in health. This is an understandable decision in each particular case, but sometime soon, the health support infrastructure system needs to start catching up. With some local funding and coordination of the various external funding sources, coupled with careful planning, this should be possible.

10. Government and its varied arms

10.1 The Relationship between ICT and the Government

Government has a dual relationship with ICT. On the one hand government is a major sector in the economy and as such is a major client of the ICT sector as it pursues e-Government[14] for efficiency and effectiveness, and e-Governance in pursuit of its democratic ideas and policy objectives. On the other hand, it has responsibility for helping the entire socio-economic fabric of the country to benefit from the opportunities flowing from rapid advances in ICT.

Today all governments must deal with promoting both the supply and the demand sides of national e-readiness.

10.2 Current situation

There is a clear requirement to address both the long-standing issues facing Sri Lanka's ICT sector, and the challenge of raising Sri Lanka's ICT "absorption capacity" across the rest of the economy. This is not a new situation, and there have been repeated attempts to address it. To quote from a recent USAID report describing a set of interviews[15], *"While politely stated, there was a general perception that at present there is a lack of leadership within the GSL on IT, and that this is a key mission component that is having an increasingly adverse impact on not only the government, but also the private sector as it does not have a strong visionary government partner with which to move forward."*

While these challenges are not new to Sri Lanka, the occasion of a newly elected government has given cause for great optimism. There are indications that this regime is embarking on a wider involvement of stakeholders across sectors and a greater involvement of the successful entrepreneurs in the ICT sector.

Part of the historical policy challenge for Sri Lanka has been to mobilize sufficient political will at the top, empower suitable "champions" within government and from relevant sectors of the economy, and secure "buy-in" from stakeholders on both the supply and demand sides of the ICT deployment process. In the interviews for this report there was a mood of cautious optimism.

The combination of the protracted civil conflict and a slowing economy have left the government nearly bankrupt, so any projects it undertakes will need to factor in this unfortunate but unavoidable fact.

[14] The terms *e-Government* and *e-Governance* are used to describe forms of Government and Governance that heavily rely on ICT ("e" for "electronic") technology, in a similar way that *e-Mail* implements the functions of traditional paper mail, but built upon a technological infrastructure.

[15] Model Computer Commerce Law Project – Internet for Economic Development: Sri Lanka, April 2000, page 16

It comes as no surprise that any government effort around ICT policy will involve three avenues of action. One, of course, has to do with the uses of ICT within government: i-Government (digitizing and access information), e-Government, and e-Governance. A second and broader avenue is the focus on the role of ICT in national development. A third is to view the ICT sector itself as a leading sector in the economy, leading in terms of growth, employment and prospects for export revenue, as well as a possible source of savings on import expenditures.

In discussions with stakeholders, there were of course many differing opinions presented. There was however a consistent reference to "getting the rules of the game right" with respect to government telecommunications policy, as well as tax and incentive policies, as well as creating a competitive "level playing field" for the stakeholders.

At the time of the site visit to Sri Lanka, the intent was to publish a "roadmap" identifying the government's priorities in ICT. The roadmap was derived from the USAID TCI and Cluster documents discussed in section 7.2. More recent reports indicate that the government has decided that although the origins of the roadmap are within the USAID initiatives, it would take full control and ownership of it, and that it would address the wider needs of the overall country instead of the previous narrower focus. These are wise decisions in that any and all government ICT policy initiatives need both a full buy-in by the government, and the relevant agencies, and the identification of "champions" within the government. This is necessary in addition to the wider buy-in from stakeholders across sectors.

This lack of internal champions and absence of a process leading to buy-in appear to have been major shortcomings in previous ICT policy efforts[16]. One result of the absence of appropriate stakeholder consultation and buy-in has been to skew government support away from strategies that would support e-readiness capacity building and toward strategies that intent on promoting export sector development. Some evidence of this is the differential fate and funding for capacity building efforts of CINTEC (see section 10.5.1), as compared with the marketing efforts of the Board of Investment (see section 10.5.2).

The External Relations Department within the Ministry of Finance has recently initiated a project to draft a new ICT Policy for Sri Lanka. It is not yet clear what the relationship is between the roadmap and this ICT policy exercise[17]. Hopefully they will ultimately come under one owner and not end up being competing initiatives. Also hopefully, these endeavours will lead to substantive, effective actions. To quote from a comment made by a Sri Lankan bank executive following the publication of an IT policy document in 2000[18], *"Sri Lanka was good at providing policy statements since the beginning of the IT revolution. But it is unfortunate that these policies have never been implemented due to reasons of conflicts of interest of individuals and departments."*

10.3 E-government

Much is said about e-government, and a large number of the people interviewed said that it was a good and even essential ingredient in ICT planning. However, it is both interesting and of some concern that almost every person questioned had a different and typically very restricted view of what e-government meant.

[16] It is interesting to note that in the teams review of existing documents, we found many *proposed* government ICT-related policies, but none that were ultimately implemented.
[17] Support for this planning exercise has been funded by the Swedish International Development Cooperation Agency (Sida) at the request of the External Relations Department, as part of the Development Cooperation Agreement between the two governments.
[18] IT Policy 2000 – Repsonses – CINTEC, page 5

Among the views were:

- Data sharing between Ministries and departments;
- Automation of processes – within a single department;
- Re-alignment and automation of processes within multiple jurisdictions;
- Presentation of information and interactions with public;
- Offering increased service and convenience to the public;
- Automation of processes with industry (such as taxes);
- Transparency in government interaction with business.

In fact, e-Government covers all of these and more. It is useful to partition the role of ICT here into three categories of ICT and government.

1. The simplest is the one which views government as just another sector in the economy and looks to how government uses ICT for its own internal administration and management, for its "supply chain" management and for its "deliverables and customer relations" management.

   There is a clear and present need for a coherent "within government" policy and implementation strategy here. In order to achieve efficiency and effectiveness in implementation this needs to be co-ordinated at a senior level. There is also wide scope here for the intergovernmental sharing of expertise and lessons learned.

2. The process of converting government information to digital format, for internal and external use, is called i-Government. As part of efficient government and good governance, a serious strategy of i-Government should be an explicit component of a government's own ICT policy strategy.

3. Lastly, the government is, of course, a political entity and ICT policy must support the political objectives of the government. In democratic society those objectives include openness, transparency, and participation. The application of ICT to these objectives is called e-Governance and it too needs to be an explicit part of any national ICT policy, arrived at through appropriate stakeholder consultation.

Given the financial situation of the national government, and the need to demonstrate quickly that the government is both motivated to change and capable of effecting such change, an e-Government strategy needs to focus on a few, achievable, visible projects. It also needs mechanisms for coordination across units of the government, as well as for the sharing of lessons learned.

In parallel with these lead ICT implementations, the government needs embark on a more gradual program involving the more mundane uses of ICT within all branches of the government. Examples include:

- the simple i-Government provision of information to citizens and businesses (see section 11.3.1for one of the key ways to ensure citizens can access such information);
- the provision of remote access to online registration for simple deliverable services;
- the effective use of word processing and other computer tools where this has not yet been done;
- the continued deployment of personal computers, the building of internal local area networks, and the use of e-mail and similar tools;
- the establishment of standards and practices to encourage widespread use of ICT, while being careful not to "over-regulate"[19].

[19] An example of "over-regulation" that was mentioned in several interviews was the fear that the government would enforce the traditional form of Electronic Data Interchange (EDI) instead of allowing the more open and flexible standards currently running over the Internet.

This will involve both the building of infrastructure as well as a massive training opportunity and exercise. The guiding principles should be rapid “return on investment” (ROI), user skills development, the transfer of lessons learned, and progressive stakeholder buy-in. The example of the Singapore Civil Service Computerisation Program (CSCP) is certainly of interest. Since its launch 20 years ago as a means of increasing government productivity, it is reported to have returned nearly $3 for each dollar invested.

10.4 Ministry of Information Technology and a Chief Information Officer

The ICT portfolio has had several homes within the Sri Lankan government of recent years. It currently resides primarily within the Ministry of Economic Reform, Science and Technology, although several key areas of ICT still report to other ministries. Telecommunications is arguably the most important area that does not report to the Technology minister.

ICT issues span all ministries, and ICT is generally seen as to be of crucial importance to Sri Lanka. As such, there has been much discussion whether there should be a separate Ministry of IT, pulling together all of the crucial parts of the ICT puzzle including telecommunications.

It is the feeling of this review team that such a move could be a practical way for Sri Lanka to proceed. Focusing all ICT issues on a single, high-ranking Minister would be a method of ensuring that competing requirements are properly addressed.

As a complementary or alternative proposal, the government could create the office of the Chief Information Officer. The position would have to be very senior and report to the very top of the government. Moreover, the person must be selected based on qualifications and a proven track record.

Either of these proposals, as essential as they are, is fraught with risks. In either case the process of creation would have to build from strong top-down leadership and a cross-ministry consultative process that insured inter-Ministry, and within-Ministry acceptance of the vision and mission of the newly created office. Without that the position would be opposed, ignored or marginalized.

10.5 Organizations within Government

There are two organizations of particular importance in any assessment of ICT and ICT policy in Sri Lanka. Both are linked to the government but operate relatively independently. They are:

- The Council for Information Technology (CINTEC)
- The Board of Investment of Sri Lanka (BOI)

Each has its own varied and interesting history, which need not be recounted here. Each has a potentially important role to play in the future of ICT in Sri Lanka so each is dealt with briefly below.

10.5.1 CINTEC

CINTEC, originally called the Computer & Information Technology Council and later renamed the Council on Information Technology, was created in 1984 by an Act of Parliament to make policy recommendations and monitor the developments achieved. It reported directly to the President. By all measures, its creation was an early and far-sighted on the part of the government of the day.

CINTEC has orchestrated a number of important ICT advances since that time. Unfortunately, in recent years, it has been progressively marginalized by government

action. It has been diminished in terms of its resources and its position as an advisory body and source of expertise. For example, under the previous government, CINTEC reported to the Minister of Education with no direct ties to the industry or technology ministries. It is unclear whether it had any role in ICT and Education policy, even with that reporting structure. Although it has continued to play a productive role in some of its domains, it has lost much of its ability to make a major contribution, or have a significant impact, on ICT policy in the country.

It was visionary to have created CINTEC as early as 1984 and the neglect is unfortunate. The renewed focus on ICT and using it as a lever to enhance the effectiveness of the government and the overall socio-economic status of Sri Lanka will need the services of an institution such as CINTEC. If CINTEC did not exist it would have to be created. It may well be that the stigma of its recent ineffectiveness will require that it be reborn with a new form and perhaps a new name, but a cross-ministerial group with strong ties to players outside of government will undoubtedly be needed.

If a CIO position were to be created, as mentioned in section 10.4, it would be important that the proposal be explored and developed in full collaboration with CINTEC (as is or reborn) playing a key role. It would be unwise to entrust that task to a more partisan and self-interested stakeholder group.

10.5.2 Board of Investment

The Board of Investment (BOI) is charged with generating external investment in Sri Lanka but has in effect, in the ICT area, operated as a marketing body. It markets Sri Lankan ICT exports, and it markets Sri Lanka's ICT sector to foreign investors. Our reports indicate that despite some notable successes, it has been less successful at attracting ICT investment to Sri Lanka than it has been in other sectors. It is more difficult to assess how successful it has been in Sri Lankan ICT export production.

By all accounts as presented during the site visit, and based on analysis, the BOI is both generously funded and well designed to operate as a marketing arm for the government.

In light of the financial situation of the government, and the high quality of the local software sector, is understandable that BOI's marketing strategy for the ICT sector has focused on (a) attracting foreign investment to the sector, and (b) promoting sector exports in foreign markets.

The BOI's strengths are not in the areas of ICT policy, strategy or implementation. They are well placed to market what is there. They are not in a position to make policy, implement strategy, or build capacity. Those tasks should fall to others, with the BOI participating as an interested stakeholder, and with the BOI responsible for marketing the resulting opportunities (for investment) and capacities (for export). If, as is hoped, the ICT sector in Sri Lanka becomes a major economic driver, the BOI will have to play a key role in helping to bring in outside capital to fund this growth.

10.6 Law Reform

Virtually all countries in the world (developed and developing) that consider ICT important have recognized that laws related to certain issues must be adjusted (or created) to allow ICT to thrive. The areas concerned include intellectual property rights, computer crime, electronic transactions and signature, privacy and data protection.

Sri Lanka started on a path of ICT law reform in 1987 with the establishment of the CINTEC committee on Law and Computers. There are currently groups looking at legal issues within CINTEC, the Legal and Judicial Reform Project within the Ministry

of Justice[20] as well as within the ICT Cluster (with coordination between the three efforts). Several laws have been passed related to the admissibility of computers records in legal proceedings, intellectual property rights and software protection. Recent progress has stalled, at least partly due to lack of financial support and resources, and the lack of government commitment. The new government seems more likely to pursue this area aggressively.

11. Colombo and the Rest of Sri Lanka

11.1 Colombo vs Sri Lanka

At all levels of aggregation, statistics about any aspect of ICT in Sri Lanka are highly misleading and can be deceptive when used for policy purposes. Virtually all ICT activity is centred in Colombo, with small pockets in the Galle and Kandy areas. As specific examples:

- SLT states that 90% of Internet access is in Colombo;
- IBM states that 90% of its business is in Colombo;
- The University of Ruhuna, located only several hours drive from Colombo and adjacent to Galle, has an exceedingly difficult job attracting and keeping technical staff;
- Average telephone density (teledensity) in Sri Lanka is in the order of 6.5 telephones per 100 people. However the teledensity in Colombo and other populated areas is in the order of 10 times higher than in rural areas. 70% of all telephones are in the Western Province.

There is clearly a desire in the country to spread ICT development over a wider geographic area than just Colombo, but it appears that it is not going to be an easy task for several reasons, discussed below, not necessarily in order of importance. That too shifts by region, by sector and by end use.

For the size of the population, and its economy, Sri Lanka is woefully short of ICT human resources at all levels. The shortfalls are most critical at the very low end and the upper ends of the skills ladder. The skills levels and job expectations of the computer science and IT university graduates mean that they are destined for either a major urban centre in Sri Lanka (i.e. Colombo) or for emigration.

The supply of lower level skilled technical personnel is being poorly met. Private training facilities span a wide range of training quality. The ability of more remote, and rural, areas to attract and retain even low skilled IT personnel remains low in light of supply. The innovative design of the external BIT program of the University of Colombo will go some way toward reducing this problem.

At the upper ends of the ICT skills ladder there are three areas of unmet demand. Within the ICT sector, there is a shortage of people skilled in ICT design and project management. Beyond the ICT sector there is a shortage of people skilled in ICT implementation and ICT project specification, both in the private and the public sectors. This shortage in the Colombo area translates into a virtual dearth in outlying areas. Based on the interviews, it would seem that only a small minority of trained people have sufficient family or emotional ties to cause them to remain in rural areas for more than a few years.

Lastly, there is a shortage of educators and trainers, both for university level teaching and research, as well as for training across sectors such as health, education, and agriculture. This is particularly difficult for computer science and IT courses at the university level. Recent course graduates can handle the entry-level technical courses. However, upper level courses require either the additional depth that comes from graduate work or the additional skills that come from applied experience. Junior

[20] A project funded by the World Bank.

level instructors are inadequate there. For the moment this problem is being partially addressed by senior faculty from one university (e.g., University of Colombo) travelling to teach intensive sessions at other universities.

The lack of high-quality and high-performance telecommunications is also an impediment to moving any effective ICT organization outside of the Colombo area.

11.2 Jaffna and the Northeast

The LTTE-controlled areas in the Jaffna and northeast areas are worthy of particular mention. As would be expected, the infrastructure in these areas has at best been ignored, and more typically has been decimated.

If, as hoped, there will be a peaceful settlement to the dispute, one can expect that there will be massive redevelopment in the area. As one of the few "silver linings" to this dark period, this is an opportunity to build a 21st century infrastructure in these areas. It would be foolish not to use the opportunity to install modern technology such as fibre-optics and VoIP-based communications to serve this area. In the normal world, one can rarely afford to scrap virtually all installed infrastructure and start again. Given the virtual dearth of existing infrastructure here, this is close to possible. The result could serve as a model for other areas, and provide this troubled area with an advantage in rebuilding its economy.

11.3 Rural Issues

It would be incorrect to assume that there is no ICT presence outside of Colombo, but that presence is relatively minimal.

Computers and communications are just beginning to be used in rural bank branches, and this is often the first occurrence of technology in a community.

11.3.1 Telecentres

A telecentre is generally defined as a community based point of access to telecom and digital services. Telecentres often provide some measure of Internet content provision. It is usually distinguished from an "Internet Café" by virtue of the fact that an Internet café is a commercial operation. The blending of telecom and digital services with some provision of food and drink is a way of spreading the overhead costs of facilities in an Internet café.

There are a number of larger Internet cafés in operation in Sri Lanka, as well as many tiny e-mail and web access points. The actual number is hard to determine. The smaller shops do not advertise and are recognizable only by a small "Internet Here" sign in a window, and because the market for the larger operations is not stable. In researching this report, Internet searches were done to identify Internet cafés in Sri Lanka. Most of those cafés found by the search engines now seem to be defunct.

Telecentres are frequently supported on a less than full cost recovery basis on the assumption that they are serving community needs and operating as a focal point for introducing technology, including email and the Internet, to the local community. The telecentre movement is in its infancy in Sri Lanka, with various stakeholders expressing interest in community telecentres, Internet cafés, Internet kiosks, and a variety of point of access facilities.

There are many models for building and supporting telecentres, as well as a growing body of knowledge and publications documenting them. Regardless of the model used, they require local champions and a business model to ensure self-sufficiency, or an implementation plan that justifies their support as a public community asset.

It is difficult to construct a history of telecentre efforts in Sri Lanka. The absence of a consortium of stakeholders mentioned above with respect to ICT in education and health is reproduced with respect to telecentres.

There are some current efforts. The Sarvodaya Movement, an important NGO (non-governmental organization) in Sri Lanka has begun building telecentres. They currently have three in operation, with plans to build several dozen more in the next year if external funding can be obtained. They are a very disciplined organization, and the probability is high that once built, the centres will become self-sufficient.

Several other groups reportedly have one or two centres, but detailed information was hard to obtain. Unlike in other countries, there is no coordination or information exchange between groups involved in telecentres. Indeed, to a large extent, they do not even know that the other groups exist.

When the issue of telecentres was raised with other stakeholders, mainly urban players in Colombo, all were quick to say they would be moving into telecentre development in the near future. This included banks, software companies, SLT and the ICT Cluster. The Sampath Bank is currently building banking kiosks in a number of rural towns, and they plan to equip them to serve as Internet access kiosks as well.

It was impossible to tell how much this was bravado, wishful thinking, or turf protection. What is clear is the lack of, and need for, some sort of consortium structure in order to share lessons learned. It is unlikely that a purely commercial market driven strategy is optimal here. This is an area for some consideration in the development of a national ICT policy and strategy.

One of the roles assigned to, and attributed to, the initial introduction of computers into the community (whether it is through the school system, telecentres, or in other ways), is their impact on increasing the technology-awareness of rural groups, and reducing the technology-fear level.

One simple example, and the basis of the success of pre-paid phone cards in the telephone sector, is the ability of local family members to communicate with overseas family members. In Guyana, for example, the first public phones installed by the privatized phone system had no coin or card slot. They could only be used to place overseas collect calls.

This same communication drive extends to the ability of rural people to communicate via e-mail, both with offshore family members, or those who have moved to Colombo, and for other purposes.

11.3.2 Electricity and telephone service

It proved hard to get consistent estimates on the extent of electrification and the extent of telephone access.

- One source reported that 50-55% of Sri Lankans have access to electricity[21].
- Another put the figure at 25-40% (varying based on province but excluding the north and east)[22].
- A third stated that “About 2.3 million consumers are provided with electricity which is about 50.1% of the total households in the country”[23]

No statistics could be located regarding the percentage of villages served.

[21] U.S. Department of Energy, Energy Information Administration - http://www.eia.doe.gov/emeu/cabs/srilanka2.html

[22] Asia Development Bank - http://www.adb.org/Documents/CAPs/SRI/0102.asp

[23] Presumably this means that 2.3 million is the number of paying customers – 1 per household. Ministry of Irrigation and Power - http://www.bii.gov.lk/New_Folder/POWER%20SECTOR.doc

With respect to telephone service, SLT claims that telephone service is available in virtually all rural towns. It stated that there are in the order of 1,000,000 telephone lines in Sri Lanka (fixed line, wireless and mobile), with well over two thirds of these servicing the Colombo area. Other respondents claimed that the penetration into rural areas was nowhere near that good. The fact that reliable statistics were so hard to come by is perhaps indicative of the magnitude of the problem. Even if a community is served by SLT, the connection charge increases with the distance from SLT's distribution point. If the distance is 2 km, the connection charge is on the order of US$600 – a very substantial amount of money to a rural Sri Lankan. There are also cases where simple voice connectivity does not guarantee Internet connectivity (see Attachment A).

Regardless of the details, rural areas are not going to be able to access the benefits of ICT (e-mail and Internet access) and other technology-based services until there is basic access to electricity and connectivity. These needs must compete, of course, with other needs for adequate nutrition, clean water, etc.

Sri Lanka has traditionally relied on hydroelectric power. With major draughts over the last several years and aging equipment, the power generation system has been under great stress. Additional hydro and fossil fuel facilities are being developed, and there is some minimal efforts going on to develop alternative energy sources. But Sri Lanka's energy supply problems are not going to go away overnight.

However, for the rural sector, telecom access has a much lower level of energy demand than do other sectors. With appropriate care and planning it is possible to roll out a sustainable telecommunications infrastructure that is only minimally dependent on the overall power grid and power supplies. Local sources (sun, wind) power many of the fixed wireless telecom sites in the world.

While Sri Lanka must set its own development priorities it is important to recognize that in some ways and some settings telecom connectivity can run ahead of electrical connectivity. Already, wireless telephone service has allowed many parts of Sri Lanka to access modern communications. The various vendors have been exceedingly innovative and aggressive in building up this market. National telecom policy needs to be designed to encourage creative thinking and this type of entrepreneurship with regard to access and connectivity.

12. Donor Issues and other External Relations

12.1 Donor Issues

Several interviewees focused on the need to coordinate donor activities and to ensure that the donor priorities met those of the Sri Lankan government.

There was particular disdain for donor agencies that "shopped around" until they found a Ministry or department that would accept a donation (or at time a loan) for their pet project.

Of particular interest and perhaps concern are the external agencies (in areas such as in health) that do not go through the Department of External Resources, but go directly to the focus area within the government. These activities need to be synchronized with the overall ICT planning efforts.

There was interest in putting together "Mahaweli for ICT", referring to the major power projects of past decades where a number of donor countries and agencies cooperated on one large global project. Clearly such a proposal is overkill, but the concept of more coordination does have appeal.

12.2 Other External Relations

During a number of interviews, it was noted that for reasons that are not clear, Sri Lanka does not tend to make use of available external cooperation opportunities. Instead, Sri Lanka often tends to look exclusively towards places such as India and Singapore for their alliances. Three particular examples are noted here, but they are not unique:

- There are a number of British Commonwealth groups that are active in areas that could benefit Sri Lanka, but there seems little interest in participating.
- There are British trade associations that strive for alliances with their counterparts in other countries, but again, historically, there has been little interest in pursuing these in Sri Lanka.
- The infant telecentre movement in Sri Lanka seems to be unaware of groups elsewhere that are willing to share experiences and knowledge.

It is not clear that all such alliances will help, but there is a vast body of knowledge available, and the review team could not help but feel that it would be to Sri Lanka's benefit to participate more widely.

13. Issues related to the war

It is both curious and interesting that in the over 450 pages of reports that were read prior to and during this project, there was just one sentence referring to the ongoing war and the impact it might be having on the Sri Lankan ICT industry and on the economy in general.

The war has in fact had a major impact. The following is no doubt just a subset of the effects:

- the drain on the government's finances clearly has affected its ability to invest in technology;
- the drain on the government's time has similarly affected its ability to effect change;
- the war has encouraged skilled people to leave the country, and has discouraged other from returning;
- foreign investors have remained leery of investing in the area while there has been ongoing conflict.

Many believe that the current peace initiative has a real chance of succeeding. Indeed, the Prime Minister has pleaded that it is the country's last chance for peace.

Following the tragic events of September 11, 2001, the US has classified the LTTE as a terrorist organization. Some donor countries are reported to have said that continued support is contingent on peace efforts. There seems to be a belief that factors such as these will cause both sides to negotiate in good faith, and ultimately find a peaceful compromise.

There are, of course, some who recognize that many of the words that are being spoken have been heard before, and sceptically believe that nothing will change.

Much of the potential for success in the ICT areas described in this document depends on the first group being correct.

14. Conclusions and next steps

Based on the number of reports that were uncovered during the course of this survey, ICT in Sri Lanka has not had any shortage of internal and external studies. In reviewing them in preparation for drafting this report, it is interesting to note how some issues get repeated in report after report with little resulting discernable action,

and other issues get studiously or obliviously ignored. We believe that we have not been guilty of the latter, and hope that the former will not be our fate.

Sri Lanka is a country of many contrasts, and a review of ICT issues brings many of them into sharp focus.

- Sri Lanka remains primarily a rural country, but one with no shortage of 21st century technology in its urban centres.
- Sri Lanka is a country that traditionally and still values education highly, and has ensured that its citizens receive education, but is in a serious crisis because of the lack of technology skills at all levels.
- Sri Lanka has a health care system that is a curious mix between 19th century management, and 20th-21st century medicine.

Sri Lanka has taken many steps to be able to use technology effectively as means of improving its economy. It must continue in this direction, but moreover must begin to use ICT as a lever to benefit all other sectors of society.

14.1 Human Resources and Education

With a 90% literacy rate and a high respect for training and education, Sri Lanka is in a good position to move quickly to address most of its ICT training issues. The poor quality of some rural for-profit ICT training institutes is a problem. But the fact that these institutes attract so much business implies that the population *wants* such training.

There is notable progress in the ramping up of tertiary ICT training, and these efforts must be continued and perhaps be increased. There must be a concerted effort made to address the severe shortage of high-end technical personnel and qualified senior instructors. The recent efforts to ramp up the number of externally trained PhDs with the longer-term intent of graduating PhDs internally are encouraging, but this will be a long process. Repatriation (temporary or permanent, real or virtual) of trained Sri Lankans living elsewhere should be considered an integral part of this effort. Efforts must be made to ensure that all university graduates, regardless of the discipline emerge with basic ICT literacy and high level of comfort using computers and the Internet.

In parallel with these efforts, radical efforts must be taken to introduce technology to the generation of students in primary and secondary schools. Given the relative dearth of technology-aware teachers in these schools, this will be require innovative action, and should be guided by similar experiences in other countries. Given the current technology in use, computers/Internet skills and English language skills are symbiotic, with progress in one facilitating progress in the other.

There is also a shortage of entry-level ICT skills (word processing, etc.). However experience in developed countries has shown that this shortage will be automatically addressed as technology becomes an integral part of Sri Lankan society.

Lastly, the education sector must begin to use ICT throughout its administrative functions.

14.2 Telecommunications and Electricity

In the last six years, there has been a radical change in the telecommunications market in Sri Lanka. The semi-deregulation has allowed competition in some key areas (to the exclusion of SLT in the mobile market). In 2000, SLT now had only 54% of the voice telephone market in Sri Lanka, down from 78% in 1996, and 100% a few years earlier. Competitive carriers have also captured a large part of the point-to-point market.

However, there are still major problems that must be addressed. The seminal report by Garrison[24] identifies many of these problems, and is recommended to the reader. The issues that need addressing include:

- Reformulation of the regulatory body to ensure independence, defence of the public good, uniform enforcement of regulation and liberal view on open-market competition;
- Allowing more liberal use of emerging technologies such as VoIP to provide wider access to basic telephone services;
- Restating the principle of ubiquitous rural access;
- Allowing open competition on international, undersea bandwidth for both voice and data with the incumbent (perhaps radical) lowering of costs;
- Rationalizing the cost of local dial access to provide for both low base costs and more reasonable overall costs for larger-volume users.

The overall electrical system in Sri Lanka is inadequate to meet today's needs, and needs major augmentation to meet the needs of tomorrow. This report cannot do justice to the complexities and details of this area, but simply notes that addressing it is crucial to ICT success.

14.3 ICT Industry and The Competitiveness Initiative

Despite many barriers, the ICT industry in Sri Lanka is relatively robust. But there are many issues to address to allow it to become a lead sector of the local and export markets. Other than the human resources and telecommunications issues noted in the preceding sections, changes are needed in tax incentives plus consistent and transparent government action. Moreover, there needs to be an explicit concerted campaign (including perhaps tax benefits or other measures) to allow and encourage business to integrate ICT and Internet technologies into their businesses.

The various USAID-sponsored activities are encouraging and will likely lead to productive change, assuming they stay focused on their immediate goals.

14.4 Health Care

Health care is an area traditionally viewed as a great beneficiary of ICT, not only as it is integrated into medical technology but as a facilitator and enabler in the delivery of health care. This is virtually non-existent in Sri Lanka. Having lagged behind is often a benefit when one finally decides to move, as there is no previous technology that must be integrated into the new schema. This is true in this case, but the gap between where they are now and what is possible is very large. To attack it, there will need to be careful prioritization to ensure that the return on investment is quick and measurable.

14.5 Government

The Sri Lankan government must address the use of ICT both regarding its own use of technology as well as how its policies affect the rest of the country's ability to integrate and benefit from technology.

To do both will require a champion reporting into the highest levels of government who can focus on the issues and orchestrate cooperation across wide number of other departments and ministries.

Creation of a formal policy and strategy is a major first step, and there are strong indications that this task is being taken seriously. Sri Lanka has a long history of writing policies and strategies, however, so follow-through will be the key test.

[24] Listed under *ICT Cluster* documents in Appendix 2.

Regarding the use of ICT within the government, as in health care, there is a long road ahead. Targets should be picked aggressively, but carefully to as to have a high probability of success. Initial targets should be selected based on early return on investment, and visibility to the various sectors that need convincing that the plans are real and not just words.

The related constructs of CINTEC, an ICT focused ministry, and a CIO should be carefully weighed to ensure stakeholder support from within government, the ICT sector, and the education sector.

14.6 Rural Issues

There will be no easy and short-term answers to trying to widen ICT's circle of influence outside of Colombo and the urban areas. However, spreading the use of ICT into rural setting, in ways that make sense, must be a continued priority.

Telecentres is an important component of this process in many countries. In Sri Lanka, the implementation of telecentres is in its infancy, despite the concept showing up in many reports and plans. Where there is work beginning to happen, it is in isolation from parallel activities elsewhere in the country.

The government should facilitate the creation of telecentres, and encourage the various stakeholders to work together. Moreover, they should avail themselves of the vast amount of information about telecentre developments in other countries.

14.7 Civil Unrest

The nearly 20-year conflict has taken a large toll on all aspects of Sri Lanka society, and ICT development simply reflects that larger picture. With the possibility of a peaceful settlement, there can be additional money pumped into education and infrastructure, additional government focus on ICT and other development issues, and enhanced external investment from both the public and private sector.

This "peace dividend" is a key component of future ICT success, and one can only hope that this dividend will be collected by the people of Sri Lanka.

14.8 Moving Forward

Several ICT highlights stand out in this study. The ICT picture in Sri Lanka is indeed part patchwork quilt (making creative use of what is there) and part crossword puzzle (with many of the "squares" blank and unconnected).

As well, it was clear that multiple sectors and stakeholders now understand that ICT as more than just another industrial or service sector. They understand that ICT infrastructure and human capital can become a key national resource.

Lastly, while Sri Lanka's citizens have a fine reputation for working together, there is repeated evidence, across sectors and activities, of shortfalls in collaboration and cooperation around ICT. There appears to be lack of political will and identifiable senior "ICT champions" within the government and indeed in other parts of the public and private sector. At least part of the cause is repeated past failures to move forward when plans are presented.

As the government and other groups struggle to create advances in ICT for development in Sri Lanka, it needs to ensure that there are senior ICT champions coaching the process along, and that ICT stakeholder participation is secured at all levels.

Attachment A: Internet Connectivity Experiences

On a subsequent trip to Sri Lanka in April 2002, the project leader for the present study plus several other people (both foreign and local) tried to connect to the Internet from a number of hotels in Sri Lanka using the public, switched telephone network. The experiences during the present study had been very good. Although there had been some difficulty accessing university dial-in pools after 10 pm (when telephone rates decrease), generally access, particularly to SLT, was excellent, and the hotel that the team was using had very reasonable local telephone rates. For the April trip, one of our Sri Lankan hosts was very knowledgeable about access from more remote areas, and based on his experience, we were not expecting any problem connecting from the various first-class hotels that the team would be using.

On arrival in Colombo, we found that our hotel had excellent connectivity. It also had prices for local calls that were significantly higher than those at the hotel used during the first trip. Specifically, the rate per minute was SL Rs 25.00 instead of SL Rs 2.00. As a result, using the Internet for several hours in the evening could cost as much as the hotel room itself.

The group also stayed in two other hotels, one in Sigiriya, and the other in Kandy. Both were deemed to be first class tourist hotels.

In Sigiriya, we found that guest could only place phone calls through the hotel operator, and that no direct dial calls were possible. That inconvenience alone would certainly make accessing the Internet more awkward, but knowledgeable users could probably get it to work. However, we were also told that it was impossible to access the Internet from this hotel because of “line problems”.

Ultimately, we were given access to a dedicated line in the hotel office, as well as a “high-speed” line that was used for credit card authorizations. None of these proved usable for Internet connectivity. All hotel telephone access was via wireless connection provided by SLT. Apparently, they are using an older, slow form of connection that cannot sustain virtually any sort of data connection. The hotel itself tries to use their dedicated line for data connectivity, but they have limited success at best.

One group member on our trip has had significant experience with a similar rural SLT installation. In that case, after significant escalation of the problem throughout SLT ranks, they eventually replaced the wireless equipment with a different model that allowed Internet connectivity at full dial-up speeds. We have to assume that there may well be a large number of rural SLT customers that also cannot access the Internet, despite their having phone service from the country’s prime vendor, and despite SLT’s claim that their Internet service can be accessed, as a local call, from any SLT provided telephone.

The next day we moved to a hotel in Kandy. As the hotel had just recently been constructed, and the telephones in the rooms had “data ports”, we were not expecting any problems. We immediately found out that it was again impossible to dial calls directly from our rooms. We were told that this was due solely to a problem with either their hotel switchboard or the SLT lines feeding the hotel, and that it would be fixed later that evening. It was not fixed by the time we left two days later. Moreover, we were told that all local (voice or data) calls from hotel rooms were billed at the rate of SL Rs 65.00 per minute!

We also inquired about the possibility of using a phone line elsewhere in the hotel, from which we could dial directly. We were told that they had a few such lines, but that the price was still SL Rs 65.00 per minute.

Upon investigation, we discovered that the hotel has an “Internet Cafe” (a single computer and printer connected to a modem and a dial telephone line. We were told that the cost was SL Rs 250.00 per ½ hour to use this setup. We were also told that if we used just the telephone line, it would cost SL Rs 65.00 per minute, or SL Rs 1950.00 per ½ hour. After some significant “convincing” by our local hosts, the hotel management agreed that we could use this line (plus a second one), at the Cafe rate of SL Rs 250.00 per ½ hour.

In all, it was an illuminating experience. As noted in the body of the present report, the rates charged by the various telephone companies for local calls are very high if the total usage is non-trivial. Given the rates charged by many hotels, they either expect their guests to make very little use of the telephone for outgoing calls, or they expect their guests to be very rich. They are certainly not prepared for guests making regular use of the Internet, and some hotels are not prepared for any Internet use at all.

Moreover, there is reason to believe that both residential and business rural telephone customers may have significant problems as they begin to access the Internet.

The following table show the marginal rates that the three telephone providers in Sri Lanka charge for local calls, as well as those charged by a selection of hotels. Taxes are included in the prices. For the three vendors, the cost of a call depends on the time of day that it is placed. The exact boundaries vary from carrier to carrier, but High period generally covers weekday business hours, Middle period is evenings, and Low period is night. Weekends generally are either Middle or Low depending on the time of day.

As a first order approximation, one SL Rs equals one US cent ($0.01).

Total Cost of a Telephone Call (SL Rs)

Minutes	SLT	Lanka Bell	Suntel	Colombo Hotel 1 (Lanka Bell and SLT)	Colombo Hotel 2 (SLT)	Colombo Hotel 3 (SLT)	Kandy Hotel (SLT)
1	3 3 3	5 4 3	5 4 3	4	32	25	65
5	16 6 3	12 9 4	16 9 5	12	48	125	325
10	32 13 6	22 14 4	30 15 7	22	89	250	650
30	95 31 13	59 37 7	85 40 16	62	252	750	1,950

Appendix 1: Demographics and Key ICT Data

Demographics, Economic & ICT Parameters	Sri Lanka	India	Poland	Sweden	Source, Year & Notes
Number of:					
Fixed line Telcos	1				
Wireless "fixed line" Telcos	2				
Mobile telcos	4				CIA,1998
ISPs - operating	5	43	19	29	CIA,1998
"	17				OnSite
ISPs - licensed	27				OnSite
Population (1000's)	19,409	1,029,991	38,634	8,875	CIA,2001
Number of "fixed" lines (1000's)	495	27,700	8,070	6,017	CIA,1998
"	672	26,511	10,175	5,889	TRC,ITU,1999
"	767	32,476	10,946	6,057	TRC,ITU,2000
..per 1000 people	25.5	26.9	208.9	678.0	calc (CIA)
Expansion rate	14%	23%	8%	3%	calc(ITU)
% digital switches	~100%				
Mobile phones (1000's)	229	2,930	1,780	3,875	CIA,1999
"	257	1,884	3,956	5,165	ITU,1999
"	430	3,577	6,747	6,369	ITU,2000
..per 1000 people	11.8	2.8	46.1	436.6	calc (CIA)
Expansion rate	67%	90%	71%	23%	calc(ITU)
All phones (land+mobile)	1,197	36,053	17,693	12,426	calc (ITU)
..per 1000 people	62	35	458	1,400	calc (ITU)
Percentage in Colombo	~90%				
Internet users (userids) (1000's)	65	4,500	2,800	4,500	CIA,2000
"	65	2,800	2,100	3,666	ITU,1999
"	121	5,000	2,800	4,048	ITU,2000
.. Per 1000 people	3	4	72	507	calc(CIA)
"	6	5	72	456	calc(ITU)
Expansion rate	86%	79%	33%	10%	calc(ITU)
Internet hosts	1,209	23,445	171,217	522,888	ITU,1999
"	2,155	35,810	339,816	595,698	ITU,2000
.. Per 1000 people	0.11	0.03	8.80	67.12	calc(ITU)
Expansion rate	78%	53%	98%	14%	calc(ITU)
Mobile telephone costs (sample)	$16				2 hrs/month
	$40				20 hrs/month
WAP, CLI, SMS, etc. all available					
ISP Dialup costs	$5.00				50 hrs/month
	$10.00				150 hrs/month
ISP Dialup including telephone usage (50 hours - ½ day, ½ evening)	$60.00				
Internet cafes, telecentres, etc.	$1.00/hr				Colombo
	Up to $5/hr				Rural areas
Electricity consumption (M kWh)	5,604	424,032	120,007	128,819	CIA,1999
.. Per 1000 people	0.29	0.41	3.11	14.51	Calc
PCs (1000's)	135			4,500	ITU,2000

..per 1000 people	7.0	-	-	507.0	calc(ITU)
Televisions (1000's)	1,530	63,000	13,500	4,600	CIA,1997
..per 1000 people	79	61	349	518	calc
Radios (1000's)	3,850	116,000	20,200	8,250	CIA,1997
..per 1000 people	198	113	523	930	calc
State-financed Universities	13				
Number with full ICT programs	3				

Demographics, Economic & ICT Parameters	**SLT**	**Lanka Bell**	**Suntel**	Notes
Tel line cost – Installation (US$)	145 and up	160/1st, 80/addl	260 or less	Note 1
Tel line cost – per month (US$)	2.00 – 3.00	3.50	6.50	
Local cost/hour – day (US$)	0.70 – 1.80	1.06	0.97 – 1.16	Note 2,3
.. Evening (US$)	0.24 – 0.60	0.65	0.48 – 0.58	Note 2,3
.. Night (US$)	0.08 – 0.20	0.06	0.16 – 0.23	Note 2,3
.. Regional – day (US$)	1.40 – 3.60	2.84	2.32 – 2.90	Note 2,3
.. Regional – evening (US$)	0.35 – 0.90	1.29	0.97 – 1.16	Note 2,3
.. Regional – night (US$)	0.08 – 0.20	0.39	0.39 – 0.48	Note 2,3
Additional cost for ISDN line	2.00			
64kb leased line (where avaialble)	$200			

Source ID	**Source Details**
CIA	CIA World Factbook 2001 – http://www.odci.gov/cia/publications/factbook/
ITU	ITU Telecommunications Indicators – http://www.itu.int/ITU-D/ict/statistics/
OnSite	Determined during discussions with local telephone and ISP companies.
TRC	Telecommunications Regulatory Commission

Notes	**Details**
1	SLT installation cost increase in proportion to the distance from the distribution point.. Suntel installation costs are apparently negotiable, depending on a guaranteed monthly spending commitment.
2	SLT prices are lowest for very customer with very low usage. The gradually increase until a customer reaches the top tier. This tier can be reached after as little as 4.5 hours of usage per month (9 hours of local calls)
3	Suntel prices vary depending on whether calls terminate at other Suntel customers, or on competition lines.

	Fixed Telecommunications Providers						
	SLT	Suntel	Lanka Bell	Lanka Internet	Ceycom	LankaCom	Electrotek
Parent/Affiliate Company	NTT	Telia	-	-	Hughes	SingTel	BT
Wire Loops	Yes	-	-	-	-	-	-
Radio Loops	Yes	Yes	Yes	-	Yes	-	-
Wire Point-Point	Yes	?	-	Yes?	-	Yes	-
Radio Point-Point	Yes	Yes	Yes	-	-	Yes	-
ISP Services	Yes	Yes	-	Yes	Yes	Yes	Yes
VoIP	Yes	-	-	Yes?	Yes	Yes?	Yes
VSAT	-	-	-	-	Yes	Yes	?
Direct External Connectivity	Fibre, Satellite	Satellite	-	-	Satellite	Satellite	-
Yes = Provides service - = Does not provide service Yes? = Probably provides service, or provides it unofficially ? = Unable to determine if provides service							

Appendix 2: Previous Sri Lanka ICT Reports

The project team reviewed over 20 documents related to ICT in Sri Lanka.

ICT Cluster/The Competitiveness Initiative/USAID Documents

Model Computer Commerce Law (MCCL) Project - Internet for Economic Development: Sri Lanka - Final Assessment (draft); April 2000; ARD, Inc. for USAID; pg 46

Draft Document on Strategy for the ICT Sector; T.I. Jamaldeen - ICT Cluster Coordinator, The Competitiveness Initiative; pg 32

Draft Report of a Mission to Sri Lanka, June 2001, George Sadowsky, Prepared for J.E. Austin Associates; pg 15

A Competitiveness Strategy for Sri Lanka's ICT Industry; The ICT Cluster; pg 56

Telecom and IT Development in Sri Lanka, William Garrison Jr., ICT Cluster, The Competitiveness Initiative; pg 16

Sri Lanka ICT Opportunity Examination; December 2001; Jonathan Metzger, USAID; pg 39

A Roadmap for ICT Success in Sri Lanka; February 2002; The Competitiveness Initiative; pg 29

Board of Investment of Sri Lanka Documents

A Roadmap for the Information Technology Industry in Sri Lanka; June 2001; Board of Investment of Sri Lanka; pg 14

A Guide to Connectivity in Sri Lanka; Board of Investment of Sri Lanka; pg 16

The IT Industry; Board of Investment of Sri Lanka; pg 24

Information Technology, Opportunities for Investment in Sri Lanka; Shehara De Silva, Deputy Director - Investment Promotion, Board of Investment of Sri Lanka; pg 7

Human Resources/Education Documents

Development of Information Technology in Sri Lanka - Concept Paper/Proposal; Ministry of Higher Education and Information Technology development; pg 11

Human Resource Development in IT - A Case Study of Some Innovative Initiatives from Sri Lanka; Prof. V.K. Samaranayake; pg 11

Telecommunications/TRC Documents

Fixed Wireless Access; March 2001; M.K. Jayasekera, Deputy Director (Policy and International Relations), TRC; http://www.aptsec.org/satrc/Third-SATRC/23_SriLanka_FWA.doc; pg 4

National Telecommunications Policy; TRC; pg 11

Metrix on Reform of Telecom; Source not recorded - probably TRC; pg 3

Regulatory Issues in Sri Lanka; March 2001; M.K. Jayasekera, Deputy Director (Policy and International Relations), TRC; http://www.aptsec.org/satrc/Third-SATRC/22_SriLanka.doc; pg 4

CINTEC Documents

National Policy For Information technology (IT); August 2000; Council for Information Technology (CINTEC); pg 29

IT Policy 2000 - Responses; Council for Information Technology (CINTEC); pg 46

Sri Lanka Information Technology Policy; Draft June 2001; CINTEC; p7

Ministry of Economic Reform, Science & Technology - CINTEC - Progress Report - 2001;CINTEC; pg 16

Energy Documents

US Department of Energy Sri Lanka country profile; http://www.eia.doe.gov/emeu/cabs/srilanka2.html; pg 7

Power Sector - Policy Directions; October 1998; Ministry of Irrigation and Power; http://www.bii.gov.lk/New_Folder/POWER%20SECTOR.doc; pg 16

Miscellaneous Documents

.lk Country Profile; Prof. V.K. Samaranayake, Indran Ratnathicam; pg 2

Appendix 3: List of Interview Subjects

AFFILIATION	INTERVIEW SUBJECT
Lawyer, Consultant to CINTEC	Jayantha Fernando
Embassy of Sweden	Mrs. Ann Marie Fallenuis, Charge d'Affaires Anders Eriksson, Deputy Head of Mission
CINTEC	Ajit Ekanayake, Director/CEO
University of Colombo	Prof. Samaranayake Gihan N. Wikramanayake Dr. Kodikari, Head of Department of Computer Science Harsha Wijewardhana, Consultant to University and several government ministries
NDB Bank	Eran Wickramaratne, CEO, Advisor to Minister of Economic Planning, Science and Technology
Federation of Information Technology of Sri Lanka	David Dominique, Executive Director
Sampath Bank	Parama Dharmawardene, Deputy General Manager - Corp Banking and Systems Development Ranjith Narangoda, AGM, Card Centre & Systems Development Vimal Indrasoma, Senior Manager – IT/DB Admin K.A.D. Nimal, Senior Manager – I/T (Computer Operations)
IBM	Kavan D. Ratnayaka, Country Manager
The Competitiveness Initiative	T.I. Jamaldeen, Information and Comunication Technology Industry Specialist
USAID Consultant	Mark Frazier, Chairman, Development Informatics
University of Ruhuna	Camillus Jayawardena, Director, Computer Centre
Ceycom Global Communications Ltd.	Gamini Guawardena, Executive Director Nishantha Dantarayana, Marketing Manager (Ceycom Telemedicine Ltd.) Rohan Sirisena, Manager - Internet Services,
Lanka Education & Research Network (LEARN)	Gihan V. Dias, Technical Manager
Sarvodaya	Dr. Harsha Liyanage, Deputy Executive Director (Resource Development)
CINTEC Internet Committee	Jayantha Fernando Harsha Wijayawardhana Dinesh Sattrukalsinghe, Computer Society of Sri Lanka Rohith Udalagama, Managing Director, LankaCom Services
Hatton National Bank	Chandimi Hemachandra, Deputy General Manager – IT
LankaCom Services	Rohith Udalagam, Managing Director
Telecommunications Regulatory Commission of Sri Lanka	R.D. Somasiri, Director General of Telecommunications Palitha Silva Gunawardene, Director of Ecomonic Affairs

	Prasad Udugampala, Assistant Director-Tariffs
ACTOS (Computer Training Association)	Krish Ravichanthiran, President
Software Industry Association	Palitha Rodrigo
Ministry of Planning	Upali Dahanayake, Director(Economic Infrastructure), Department of National Planning L.V.D. Dharmawardana, Assistant Director, Department of National Planning
Board of Investment	Shehara de Silva, Deputy Director General (Promotion)
Sri Lanka Telecom	Prashantha Robertson, Head of Sales & Development Research Section Ajantha Seneviratne, Deputy General Manager, Head of Section – Teleshop
Interblocks	Dinesh Rodrigo, Managing Director, CEO
External Resources Department ICT Policy Committee	Ranjit Fernando, Secretary, Ministry of Exterprise Development, Industrial Policy, Investment Promotion and Constitutional Affairs Naresh Ediwira, e-Commerce Technologies, Director/CEO A.M.P.K. Attanayake, Deputy Director, Department of External Resources Faiz Mohiddin, Director of External Resources
British High Commission	Miratha Perera, Commercial Officer
USAID	Sarasali Fonseka, Project Management Specialist Gary Robbins
The Competitiveness Initiative	Charles Conconi, Chief of Party
ICT Cluster	Lalith B. Gamage, Chairman, Managing Director/CEO, SLIIT Nissanka Weerasekera, Managing Director/CEO, nextventures
Ministry of Heath	Dr. Sunil Senanayake, Director – Health Information, Management Development & Planning Section

Appendix 4: Acronyms

Acronym	Definition
BIT	External Degree of Bachelor of Information Technology
BOI	Board of Investment of Sri Lanka
CINTEC	Council on Information Technology
ICT	Information and Communications Technology
ICTs	Information and Communications Technologies
LTTE	Liberation Tigers of Tamil Eelam
NGO	Non-Governmental Organization
NTT	NTT Communications Corporation
SLIIT	Sri Lanka Institute of Information Technology
SLT	Sri Lanka Telecom
TEL	Technology Enhanced Learning
TRC	Telecommunications Regulatory Commission
USAID	U.S. Agency for International Development
VoIP	Voice over IP (TCP/IP)