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A report on PAN-supported
Internet Service Providers

CANADA

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version: final

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February, 1999

This report, at the request of the International Development Research Centre (IDRC) aims at providing background, technical and institutional information, as well as analysis and' recommendations on the current situation and prospects on six Internet end-user access service providers (ISPs) located in Bangladesh, Cambodia, Laos, Mongolia, Sri Lanka, and Vietnam.

It might be perceived to some as odd that IDRC has decided to hire an outsider to Asia to carry out this assignment, and this is culturally understandable. However, the consultant is definitely not an outsider to the Internet nor to issues related to sustainable human development. Also, an informed outsiders' view is frequently useful and even indispensable to evaluate projects and processes. The consultant does hope this report will be useful and helpful in this regard.

These ISPs were funded by IDRC's Pan Asia Networking Program Initiative (PAN)[1]. In all (perhaps except Vietnam) there was fairly good, extensive and relatively up-to-date information available, including updated reports on the IDRC projects. Actually, documentation in Singapore was so extensive that took most of the time of the consultant's travel schedule (about two weeks) in organizing and sorting it out, which left less time than expected to carry out actual visits.

The consultant initially proposed to visit Cambodia, Mongolia and Vietnam, besides staying at PAN's main office in Singapore to collect documentation and further information. In the case of Cambodia, a visit was made - since they claimed difficulties in responding to the consultant's questionnaire and other information requests in responding by email. This visit to Phnom Penh was also a good opportunity to be able to provide some technical advice to the CamNet staff, which involved sending software updates and configuration routines for the main router.

A planned visit to Vietnam to better understand the status of the local project had to be skipped at short notice due to time constraints and as suggested by IDRC at the time. In the case of Mongolia, there was good information available and the consultant had the opportunity to meet the project director in an earlier conference in Geneva.

Some of the common features of the ISPs surveyed in this report are that they have been conceived as access providers and continue to focus on this activity, received substantial financial support from IDRC, are not by themselves providing relevant human development content which would differentiate them from other typical ISPs, and in all but two cases (Bangladesh and Sri Lanka) were the first of their kind providing relatively stable Internet access services in their respective countries.

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[1] Original documentation on the projects and on PAN can be found at *http://www.panasia.org.sg*. Only excerpts are included in this report.

Another common feature is that most of them are detached from cooperative or integrated work with the local research community – thus raising significant issues regarding local capacity building and local availability of the Internet as an information resource for research and academic / technical training. We should note that making the Internet available to consumers has nothing to do with developing a strong research and education/training base in the field of ICTs. This is further commented below.

The report includes this introduction, with a short explanation of the overall analytical framework used in the report and comparative comments on the projects involved, and six ISP reports, as well as appendices with the questionnaire's documentation, Internet usage statistics in the region and the consultant's CV. The filled-out questionnaires are available on diskette upon request. The ISP reports are structured as follows:

- short country background;
- background on Internet developments in the country;
- development of the IDRC-sponsored project;
- conclusions and suggestions.

None of the ISPs' project coordinators explicitly agreed to helping in submitting a questionnaire to their users. This request was always left blank in the ISPs' questionnaires - which seemed to indicate this was a sensitive issue. Thus, most of the information on quality of service comes from reports already available, surveys by third parties, or individual conversations with users in some cases. Also in several of the projects there was abundant documentation available at the Singapore office, which helped to ease this difficulty.

This report benefits from useful comments and suggestions made by Ricardo Gómez, Maria Lee Hong, and Randy Spencer (all from IDRC). Special thanks to Dr D. Enkhbat (from Mongolia's Datacom) who was the first to fill out the ISPs' questionnaire, thus helping me to improve it.

My thanks also go to the other ISPs' people who took the time and effort to fill out the (perhaps excessively technical) questionnaire: Md Tariq Alam (Bangladesh), Chew Lip Ping (Laos), Helge Selrod (Sri Lanka), and Tran Ba Thai (Vietnam). Moa Chakrya and the people at Cambodia's MPTC were specially kind during my visit. Last but not least, my gratitude also goes to Maria Lee Hong and Phyllis Lim at IDRC's regional office in Singapore, for their patience, help and kindness during my stay there. Special thanks to my friend François Fortier for his help in reviewing the situation in Vietnam.

Of course, none of the people mentioned here bear any responsibility for the contents of this document.

From the point of view of computer networking in general and the Internet in particular, some of the key issues which relate these technologies to sustainable human development can be listed as follows:

- Universal access: existence, affordability, universality.
- Content provision: information for human development, strengthening of local culture.
- Capacity building: research network, training structure (network engineering, operating systems, applications, systems' and institutional management).
- Projects' sustainability.

An attempt is made here to present the framework used to review the projects by presenting the consultant's vision of the paradigms and principles as they relate to the general goal of sustainable human development, and illustrating the presentation with some conclusive examples drawn from the specific projects reviewed. Thus, this chapter of the report already provides a summarized view of some of the general conclusions reached by the consultant.

The universal access paradigm

This is a major cornerstone of the strategic proposals on the development of computer networking in the face of objective social needs. Universal access might look like a simple concept – in essence, it means to make sure everyone is able to access, use and participate in the information and communication networks. Unfortunately, this is impossible under present human development levels and trends in most countries, as well as infrastructural availability, which makes this simplification useless for development purposes except as a conceptual reference.

Distances between haves and have-nots do not cease to widen. Currently, the three richest persons in the world own more assets than the sum of the GDPs of the 48 poorest countries, and half of humanity goes by on a daily income of less than two US dollars a day[2]. To talk about the right to information to these people who are fighting (and frequently losing) a daily battle for food and decent shelter might be akin to preaching in the desert and compares to screaming to a person falling from a building that she has the right to protest against her woes.

Clearly, mapping universal access directly to every person as a short- or medium-term development objective is a utopian approach. An alternative is to seek ways to disseminate access as much as possible to key (institutional and individual) social actors who effectively act as multipliers in such a way that an ever increasing number of people end up reaping the benefits

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[2] Quoted by Ignacio Ramonet, "Stratégies de la faim," *Le Monde Diplomatique* (Paris: November, 1998).

of this dissemination – even though most of them will never get to touch a keyboard or even use a telephone or see a computer. In the process, of course, also seek as much capilarization and individual access as possible.

The risks of defining the proper approach to implement universal access policy are similar to trying to put to practice the goal of universal service in telecommunications. As odd as it might sound, in the early 1930s AT&T's proposal of becoming a nationwide monopoly - which was officially accepted - was justified on the grounds of being the only effective way to guarantee universal service[3].

Universal access to information and communications technologies (ICTs) should follow a process chain: universal access must exist (ie., must be available); if it is available, it must be affordable to the final user; if it is affordable, it must be unrestricted (in order to guarantee free access to available information); if it is unrestricted, it must be useful (in order to justifiy investing in it as a social expenditure priority); and, last but not least, it must be enjoyable (since an essential component of the human development paradigm is freedom for leisure).

The major challenge of universal access projects is thus to contribute to the attainment of this process chain in full, taking into account that individual access for all is a present impossibility. In the most general terms, the 150 million people who currently have individual access to the Internet worldwide are less than 3% of the global population; half of these are in the USA and Canada, and more than 70% of these are in developed countries[4]. While Internet technology is already available and operational in nearly all countries, in most of the developing countries only a negligible percentage of the population in some urban areas have individual access to a telephone and a computer.

In the case of PAN (or pre-PAN projects also supported by IDRC), we could say that initiatives in Cambodia, Laos, Mongolia and Vietnam provided at least innovative approaches to universal access and in some cases attained structural advances in this direction.

Content provision

Just as universal access forms must take into account social needs, so does content development, which is one of the key components of PAN-supported projects, as the general description of the program's goals clearly implies: "PAN's aim is to promote electronic networking in Asia; the use of information and communication technologies (ICTs); the development and sharing of information resources; and the research and development of Internet systems, technologies and policies [...] The four cornerstones of PAN are: email and Internet access through

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[3] Robert Cannon, "The Universal Service Program for Schools, Libraries, and the Internet," *The CPSR Newsletter* (Palo Alto: Spring 1998, p.4).
[4] Data from NUA Internet (*http://www.nua.com*).

telecommunications connectivity; content building and dissemination through websites; access, communication, linking, sharing and exchange through networking; development of Internet policies, technologies and systems through applied research."[2]

In none of the ISP projects covered by this report the goal of content development (explicitly stated in the original project descriptions as a justification for approval) was so far carried out in a significant way, judging by information availability through their Internet services. Actually, some relevant issues directly related to content development are not emphasized, not detailed or simply not mentioned in the project reports made available to the consultant. Some of these would be, for example:

- tools for delivering and displaying contents in local idioms and dialects where international standards have not yet been established (a serious problem in Cambodia, for example, where LIDEE and the Open Forum have been developing pioneering work);
- implementation of suitable systems to stimulate information publishing and sharing (including databases) beyond mere institutional presence homepages;
- collaborative knowledge management through thematic or institutional intranets/extranets, using tools such as discussion lists, electronic conferencing and so on;
- facilitating access to internationally available information sources and services on human development; etc.

Capacity building

An essential component to ensure self-sufficiency of the specific projects (and of sustainable development in general), capacity building involves, in the case of undertakings focused on infrastructural development of ICTs, forming a stable and reproducible base of human resources in network engineering, operating systems, hardware assembly, configuration and maintenance, end-user applications, as well as systems' and institutional management and planning.

The short and intense history of the Internet is a clear example that technologies of this type flourish and consolidate themselves where a reasonably well established academic research network (or at least a network with heavy involvement of the academic community) has been built. USA, Canada and Western Europe aside, the examples of Brazil, Chile, Peru, South Africa, and even Cuba (in extremely adverse circumstances) should be mentioned as nations in which the Internet was established with a previous and relatively significant academic presence which today provides a critical mass for further development of this technology.

Asian countries, like any other, particularly the less technologically advanced, cannot pretend they can build this knwoledge and training base on ICTs by giving low priority to research networks operated by academic institutions – in fact, the most advanced ones in the region have

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5 Quoted at PAN's website: *http://www.panasia.org.sg.*

been doing the opposite. Unlike some other technologies, the technical development paths of ICTs are universal in terms or requirements (an ISP or a backbone operator need the same basic expertise, hardware and software in San Francisco, Santiago or Phnom Penh) and necessary training.

Leaving national network development to private companies or just state monopolies alone will probably satisfy consumers' demands but will not guarantee a strategic pool of advanced technicians and researchers. In most cases, private services will not provide subsidized space for experimentation and extensive data transfer which the academic community requires.

One immediate example is worth mentioning. No matter how advanced in terms of Internet infrastructure a country might be, there is only one way to fully participate in the Internet II initiative, the state-of-the-art Internet research program now in process: this is through its academic research network. Singapore for example is involved in Internet II not because it has SingNET – the private Internet services monopoly – , but because it has SingAREN – its advanced research network. Actually, one of the objectives of SingAREN is to provide advanced technology support to SingNET.

Of the six projects surveyed, Vietnam and Mongolia seem to be the ones with the closest integration with a national research network project.

In most developing countries, implementing and sustaining academic networks, particularly in their infrastructure development and capacity building components, requires significant outside support from international development agencies - but is a necessary pathway to local capacity building in networking technologies.

Sustainability

Particularly in situations in which the projects are the major technical reference for continuing development of ICTs (like in Cambodia and Laos, for example), an effort should be made to maintain and enhance them (with proper evaluation and eventual reorientation) even though from a business perspective they might not survive by themselves.

Especially in the case of ISP projects – specially the ones which stay focused on access per se -, sustainability is understandably difficult since in most situations competition (or entry of large transnational companies) is already challenging the survival of most smaller systems. In all six countries (like in most other developing countries) there is a telecommunications privatization program in process or being planned, which will drastically change (for the worse) the competition prospects for independent access operators.

Paradoxically, this is the case of some of the PAN projects where the business component was a priority goal which led to skipping or playing down other important components along the lines

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of PAN's mission - which in our vision is particularly the case of Sri Lanka.

Regarding the for-profit alternative for ISPs' sustainability in the face of increasingly competitive (with tendency to cartelization) markets, one risk here is whether this business is a good investment alternative, and another is distorting the development purpose of the grants. In fact, based on the consultant's experience as a founder and director of a relatively large ISP in Brazil from 1989 to 1998, a number of local conditions contribute to difficult projections and are usually common to all ISP projects are listed below:

- *Window of opportunity*: the ISP business throughout the world literally shot up beginning in 1995, with the generalization of WWW publishing and Internet email services. Those who had planned to enter the business before this "explosion" are the ones who in general took over the local markets. In some countries, national policies prevented private development of ISPs - in most of them, these policies were or are being relaxed (a significant and very recent case is India).
- *Small startups*: in many cases, the ISP business evolved as a modular investment process in particularly favorable market conditions, thus allowing for ROIs shorter than 2-3 years. Thousands of ISPs around the world were born as 1-2 people operations and built from there upon availability of revenue and homeopathic injections of capital.
- *Rapid evolution of infrastructure*: the modular investment approach allows for building up technical infrastructure at a pace which enables the use of the most recent technologies. Example: targeting 1,000 users in the first year and purchasing right away a pool of 60 modems which might become quickly obsolete makes it difficult to replace them before they depreciate - and it is not uncommon to still see subscribers of ISPs using much more advanced modems than the ones at the ISP side to connect.
- *Rapid implementation*: in several markets, the timing of implementation has been crucial to make an ISP project viable. There are several instances in which, when a 1-2 year feasibility study ended and resources were finally secured, its conclusions were already stale, due to the pace of the business. In other words, what was true in the study might no longer be true in reality due to quicker competitors taking over and thus rapidly closing the window of opportunity.

This is a short summary of the suggestions made at the end of each project's analysis. Common needs to be addressed are in the fields of capacity building, immediate training of mid-level network operators, content development and viability of multi purpose community telecenters.

In most cases, the ISP business has become very competitive, with several private companies offering services and growing presence of larger international operators, so that alternatives for continuing support of network service providers must be sought.

In general, the PINS (PAN Information Networking and Services) initiative which IDRC is supporting in the Philippines, Nepal and Vietnam might be extended to other countries as an alternative to those projects (or a continuation of the same with a new focus) and might cover several of the needs identified below.

Bangladesh

- Concentrating the project in deploying Internet technology to the benefit of the main mission of Grameen (financial credit to lower income families, capacity building).
- Develop Web-based information and transaction services oriented to the main mission.
- Study the possibility of deploying Internet-enabled, self-sufficient MCTs for dissemination of the technology, local public access to information (particularly on Grameen's services) and serving as a means for capacity building. Actually, Grameen already operates a pilot telecenter at its own premises in Dhaka.
- Refocus its target Internet market towards providing specialized value-added Internet information and transaction services to companies and organizations and develop its own dial-up access only when absolutely necessary. Grameen is already offering Web site development expertise.
- Last but not least, seek ways to establish partnerships in order to strengthen the network research community in the country - with a focus on research oriented to human development-related networking projects.

Cambodia

- Emphasis should be given to capacity building, as project people interviewed by the consultant insisted, particularly since the academic community is in a state of disarray and extreme lack of resources and has no condition at this point to lead this process in Cambodia by itself.
- In the meantime, creative support projects for training to form network technicians at all levels are urgent and essential, as stated in interviews by MPTC officials. If possible, these

projects should also provide seed to stimulate development of an academic research network.
- Cooperation with local NGOs such as the Open Forum, LIDEE and others should be strengthened, particularly regarding alternatives for short-term training.
- Study comprehensive support to projects related to the list of current needs, as presented by MPTC and detailed in the chapter on PAN-Cambodia.
- Also, expertise is needed for a master backbone development plan which is adequate to the country's needs in the provinces, particularly with the installation of the German-backed trans-Cambodia fiber telecommunications pipeline which links Thailand to Vietnam as well as other national telecommunications infrastructure projects.

Laos

- Expertise in the provinces is needed to enable developing and maintaining local installations even for the current UUCP message exchange technology. Short-term training on basic network server administration and maintenance is urgently needed.
- The present installation could be offering more advanced services as soon as a direct international link to the Internet is allowed, since the project uses an advanced hardware and software platform. International agencies might be able to expedite this process, as it was the case in the recent past with several of the PAN ISPs.
- The service in Vientiane lacks better dial-in facilities, and this needs to be addressed as soon as possible.
- Specific technical support to design an upgrade of the current project with a view to reach the provinces with stable service should be provided, in such a way that provinces' hubs could serve as the basis for a future national Internet backbone.
- Any future project should in any case fully monitor recent developments regarding opening to commercial Internet operators in the country, in order to refocus as needed.

Mongolia

- Since the IDRC-supported project still leads in network development and was a pioneer in this regard in the country, a longer term joint development program could be studied which would involve the efforts to extend service to all provinces.
- Datacom is well-suited to be part of a network of regional training centers in a coordinated capacity building effort. This component should be considered in further funding prospects. Cambodia and Laos in particular might benefit from Datacom's expertise in using alternatives to land lines for extending connectivity.
- PAN-Mongolia is probably the most advanced of the PAN ISP projects in terms of human resources with expertise in most of the Internet infrastructure. Projects in the region should take this into account with the view of involving Mongolian consultants in future initiatives.

Sri Lanka

- IDRC should plan to pull out of the PLN *business* as soon as a viable and other competent

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business partners can take over (the same goes of course for WIF) - trying to make sure that the large investment made so far is not lost.

- Funds thus obtained could then be directed to other development oriented projects using ICTs more directly focused on the poorer, rural areas of the country, depending on a study of social needs of this technology.
- If one of the alternatives is developing multi purpose community telecenters (MCTs), it will require a careful feasibility study before any further investment is made.
- IDRC should study other areas in which there could be continuing cooperation with PLN, particularly training and content development. If the MCTs' component is proven to be viable, this could be a key tool for developing a long-term training program.

Vietnam

- Competition in the ISP business in the larger cities is ferocious, so alternatives to the current access projects should be sought. PINS Vietnam seems to be a welcome initiative in this regard.
- Among the ISPs surveyed by this report, Netnam is the only organization which explicitly declares commitment to research and development. If this can be made more precise, it could become an interesting line for further cooperation with IDRC.
- It seems Vietnam is one of the most developed of the six countries surveyed in terms of availability of local expertise in network management. There is a functional research network which has been the foundation for Internet development in the country. If this is so, IDRC's focus on content development projects and on capacity building with the research community is an interesting path to pursue.

Short background on the country

Bangladesh has the largest population among the six countries involved in this report – about 120 million, of which less than 20% live in urban areas and more than 60% are illiterate[6]. With an area of only 144,000 Km^2, this means a high population density of more than 800 people per Km^2.

Agriculture employs nearly 60% of workers, and per capita GNP is less than US$250 – meaning that the average citizen of Bangladesh earns in about eight years the equivalent international market value of one of today's typical personal desktop computers. The local telco (BTTB) is a state monopoly, although cellular phone service is operated by four private companies.

The telephone density is very low – less than one telephone per 400 inhabitants in the larger cities, and one per 4,000 people in the rural areas – and waiting for the installation of a phone line may take up to 10 years, although BTTB has recently started a modernization program with help from Japanese development funds.

Background on the Internet in Bangladesh

Bulletin board services (BBSs) started in 1993, but Internet email and news services were first reported in 1994. In 1995, as reported to the NSRC[7] by APNIC, there were several email/news providers in Bangladesh, connecting to the Internet via UUCP and attempting to become full ISPs. Among them were AGNI BBS, Aurora One, Data Corner, PraDeshta, and the Bangladesh Bureau of Standards. A FidoNet[8] node operated by the NGO Policy Research for Development Alternatives (UBNIG) in partnership with APC's GreenNet in London was also active.

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[6] Background information on countries is taken from several sources, including original project descriptions and reference texts like the *Third World Guide* (Montevideo: ITEM, 1998).

[7] Several references are made in this report to the National Startup Resource Center, a reliable source of historical information on developing countries' Internet development. All of these references are to the NSRC's public information database at *http://www.nsrc.org.*

[8] FidoNet is a store-and-forward network of BBSs using an automatic transfer protocol created by Tom Jennings long before the spreading of the Internet. Its decentralized architecture is similar in conception to the Internet.

On January 4, 1996, the government authorized operation of private, fully connected Internet services. At the time, some email service operators and a few academic institutions were working to establish a consortium for managing the country's TLD. However, until at least 1996 the Internet was far from becoming present in education and research institutions in the country. As quoted by Azad and Islam[9], "even most prestigious higher institutions like University of Dhaka and Bangladesh University of Engineering & Technology are beyond its reach."

In 1996 the first VSAT-based network was deployed in the country (initially with five 64 Kb/s land stations), and in October, 1996, the first full-time international link to the Internet was established by Information Services Network (ISN), which had been operating local services since the beginning of that year. In July, Grameen CyberNet and two other ISPs started operations. All of the services were based in Dhaka. In 1997, six providers were making available online Internet, according to Azad and Islam – four of them connected to the Internet via VSAT stations and two others connected through leased landlines.

The VSAT link is very costly (approx. US$8,700 per month), a major reason for the high costs to subscribers. But the initial investment to establish a VSAT-linked ISP is extremely high – about US$32,500 for a ground station and nearly US$30,000 for 40 dial-up phone lines, not counting network and computer hardware and software.

Typical ISP rates were very expensive, particularly in view of the country's per capita income (see table below).

Year	Type	Regular subscriber	Student
1996	Registration	US$250.00	US$125.00
	Per minute	US$0.075	US$0.075
1997	Registration	US$125.00	US$75.00
	Per minute	US$0.086	US$0.086
Source: providers' data, Azad and Islam study.			

Given these high costs, a survey among subscribers conducted by Azad and Islam (110 users – 50% students, 39% professionais, 5% teachers) in 1997 showed that more than 83% of the time spent online was to exchange email, 12% for WWW surfing and 5% on newsgroups.

Today's rates are much lower. Registration fees are about US$60 and monthly fees (including 10 hours of connect time) are US$10. Some providers continue the practice of discount prices for students.

Azad and Islam quote a 1996 "small study" which indicates that out of 41 government ministries,

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[9] A. K. Azad, N. Islam, "Overview of Internet Access in Bangladesh: Impact, Barriers, and Solutions," published in the PAN site, *http://www.panasia.org.sg* (Singapore: n/d).

only seven had more than 10 computers, while five ministries had no computers at all. Regarding human resources, 23 ministries had no computer personnel at all and only three ministries had more than 10 data processing specialists. This minimal official exposure to computer technology, coupled with the lack of an academic Internet, gives a measure of the difficulties in forming trained personnel in the field of ICTs in Bangladesh.

In 1997, when the first Internet café (The Buzz) was inaugurated in Dhaka, the total subscriber count to all Internet services was about 5,000 - and 40% of them were using ISN.

In December, 1998, total subscriber count in Bangladesh was estimated at 10,000, or less than nine per 10,000 inhabitants, while in India, for example, the figure was about 50 per 10,000[10]. The following are the ISPs considered active in the country:

Agni Systems – One of the first BBS operators, now offers email, conferences and selected Usenet newsgroups, as well as a public repository of software and documents available via FTP.

BDOnline – Offers dial-up Internet access.

Brac -BDMail Network (http:// www.bdmail.net) – A joint venture between Delta Network Systems and BRAC, operates with a 64 Kb/s VSAT link and offers the full range of typical Internet services

Drik Services – An image bank service with the goal of promoting the work of photographers and writers which also offers dial-up email services. The email project derived from their need to contact colleagues abroad. They established email exchange with the development organization ToolNet in the Nederlands and started selling this service – one of the customers was the Grameen Bank.

FastNet Services – Offers email services and WWW hosting, as well as UUCP connectivity.

Grameen Cybernet (http:// www.citechco.net) – GC is the second ISP in Bangladesh to go online, and is currently a joint venture of Grameen Bank and CITech Co. Ltd. (a large software and hardware distributor). Services offered: online PPP account; WWW site hosting; leased lines (sub-POP services); training. This is the Internet project supported by IDRC's PAN.

Information Services Network (http://www.bangla.net) – Bangladesh's largest Internet operator and the first to run a full-time international connection to the Internet (through a 64 Kb/s VSAT station) has more than 3,000 subscribers.

Kaifnet Services (http:// www.kaifnet.com) – provides PPP accounts, as well as email-only subscriptions.

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[10] Estimated from data available from NUA Internet (*http://www.nua.com*).

Pradeshta Net (http://www.ncll.com) – Runs a network of access points aroung Dhaka. Has the most diversified list of network-related services available among the providers for which information could be obtained: dial-up access from several locations; consultancy projects; email; WWW hosting; LAN/WAN integration; Internet-related software distribution; etc. The company is in the field of professional data communications since 1991. One of its leaders is now providing consultancy to the Bangladesh National Scientific and Library Information Network (BANSLINK) project, being developed by the Ministry of Science and Technology since 1995.

SpectraNet (http://www.spctnet.com) – The only active provider outside Dhaka for which information could be obtained. Based in Chittagong, it provides business-oriented services in partnership with IBM, including: dial-up access; sub-POP services; WWW design and hosting; corporate LAN/WAN consultancy and integration.

Project background

PAN-Bangladesh was conceived in 1996 (IDRC/ASRO # 96-8003-01), with an IDRC grant of CAD$249,685 to Grameen Bank (approved in January, 1997) "to establish an alternative ISP in Bangladesh, aiming at provision of affordably priced Internet services to educational and research institutions, social organizations as well as government agencies. It will allow the integration of Grameen Bank's office system with Internet facilities at headquarters, zonal and branch levels. This project will provide the appropriate milieu for experimenting with the concept of the true telecottage. And it will enable Grameen Bank to initiate and engage policy-makers and ISPs in Bangladesh with Internet policy and service issues."

Actual operations initiated in September, 1997, just after a supplementary grant from IDRC in the amount of CAD$110,000 (which added to the first grant to a total of approximately US$250,000). The joint-venture created to carry out the project (Grameen Cybernet) today is a relatively small operation, with six employees, annual revenue of about US$9,350 and annual expenses (including capital cost) estimated at US$53,724[11].

The specific objectives of the project's phase one were:

- to build Internet networking capacity within Grameen Bank for more efficient intra-national communications, in particular to facilitate rural communications;
- to initiate the integration of GB office systems with Internet facilities;
- to enable GB to publish information across the Internet, and to network with GB replications and bilateral and multilateral partners outside Bangladesh;
- to establish an Internet access point that will be available to universities and other

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[11] As reported by Grameen in the questionnaire.

eucational and research institutions, social organizations as well as to government agencies; and
* to promote awareness of the Internet and computer networking in Bangladesh.

The project also involved opening up an Internet public access center on the ground floor of the GB building "that will target initially at personnel from educational, research and social organizations and government agencies, and later, when the services consolidate, at the public at large."

The first phase intended to be a "pilot and capacity building exercise," mostly focused on the bank's internal communication needs.

An important aspect of this project is its association with Grameen Bank, probably the most significant (and successful) rural microcredit undertaking in the world. The microcredit project (focused on the poorest rural families) initiated in 1983 had so much success that today it handles assets in excess of US$500 million, provides more than 4 million small loans a year (with negligible default rates) , and, as one measure of its success, holds accumulated savings from its borrowers of more than US$100 million[12].

The bank is 92% owned by its borrowers, who elect 2/3 of the managing board (8% ownership is retained by the government), and has diversified to include several large investment ventures in irrigation and crop diversification, low intensity fish farming, handloomed cotton fabric production, garments and other products for the local urban market, as well as equipment leasing, rural cellular phone distribution, and dissemination of solar and other renewable energy technologies in rural villages.

Part of the interest income is used to fund a massive education, social development and family planning program reaching 12 million people. This program could benefit a lot from the adequate use of new communication and information technologies, which in itself would already justify support from any donor to an Internet development project for Grameen Bank – given the fact that, although the bank is quite advanced in the use of computer technologies, it had next to no experience in wide area computer networking, particularly the Internet.

Another consequence of the exceptional growth of the microcredit project is its recent outreach. The bank's services are present in nearly half of the more than 68,000 villages of Bangladesh - thus constituting the largest institutional network in the country. The scale of the project and its diversification led to the creation of a trust organization (Grameen Trust), which is working to extend its microcredit experience to other regions of the world.

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[12] Information on Grameen Bank's operations taken from the original project description and a number of other sources.

Conclusions and suggestions

The deployment facilities of the Internet coupled with its relatively low cost and flexibility in operating with literally any of the currently available operating systems and computers (even a digital cellular phone can include Internet email facilities) make it the technology of choice to enable the bank to progressively install data communication facilities throughout the villages, at the same time that the bank's network can serve as the leading propagator of this technology in the interior of the country for a number of other uses related to the goal of universal access. And extending the project to other countries makes knowledge and availability of Internet technology practically mandatory.

It must be noted, however, that the bank has significant investment capacity (judging not only from its assets' size but also its investment projects already mentioned), and this raises the question of the real need for IDRC to disburse funds for this specific ISP project.

There is no question that the bank needed outside expertise to develop its Internet system, but, particularly given the fact that ISPs already existed in Bangladesh when Grameen Cybernet was conceived, its existing pool of well trained human resources in data processing could well be the basis for another IDRC project, which would concentrate on building capacity in network engineering and on methods to contribute to universal access in the regions the bank is operating.

On the other hand, Grameen Cybernet is confronting growing competition from other commercial providers (some of them much larger and more sophisticated operations) and is finding it very difficult to compete as an access provider - a situation which might be made worse with entry of international private companies in the telecommunications sector. As stated in a response to the questionnaire, "We [are] using PSTN line where maximum data communication speed is 9.8 kpbs but user end are getting speed maximum 2.5kpbs for download and average 1.5kpbs for browsing. Therefore, our system is slow which may discourage people to be a subscriber of us." This coincides with a survey among subscribers of ISPs in Dhaka which lists the Grameen service as one of the slowest and with lowest access quality[13].

Finally, given the situation of poverty and resource distribution and the ensuing fact that individual access will be for a long time to come the privilege of a very small percentage of the population (the upper urban echelons who can afford a phone line *and* a computer), any ISP project which concentrates on commercial services for individual or corporate clients is not the appropriate choice for international development agencies to spend money with.

Thus, some scenarios for further development of the project could be:

- Concentrating the project in deploying Internet technology to the benefit of the main mission of Grameen (financial credit to lower income families, capacity building).
- Develop Web-based information and transaction services oriented to the main mission.
- Study the possibility of deploying Internet-enabled, self-sufficient community centers (telecenters) for dissemination of the technology, local public access to information and serving as a means for capacity building. Actually, Grameen operates a telecenter at its own premises in Dhaka.
- Refocus its target market towards providing specialized value-added Internet information and transaction services to companies and organizations and develop its own dial-up access only when absolutely necessary. Grameen is already offering Web site development expertise.
- Last but not least, as a recommendation which should be common to all PAN projects, seek ways to establish partnerships in order to strengthen the network research community in the country - with a focus on research oriented to human development-related networking projects.

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[13] Survey conducted in 1998 by the online NGO service Bangla.ORG, covering Agni Systems, BDOnline, Brac-BDMail Network, Drik Picture Library, FastNet Services, Grameen Cybernet, Information Services Network, Kaifnet Services, Network Computing Line Ltd., Pradeshta Net, and SpectraNet.

Short background on the country

Cambodia has 181,040 Km2 and nearly 10 million people (about 10% of them in urban areas). Illiteracy is high (65% in 1995) and telephone availability is minimal (three phone lines per 1,000 people, not counting recent cellular phone operations in Phnom Penh). Per capita GNP is one of the lowest in Asia (less than US$200) and the main economic activity is agriculture, employing 74% of workers.

Since the general elections in July political instability had worsened, and Cambodia, at least until December, 1998, was in practice a country without its parlamentarian government, since the coalisions could not agree on the formation of the new government. On the other hand, the recent surrendering of Khmer Rouge leaders Khieu Samphan and Nuon Chea might open up the way for a signficant peace initiative. In the meantime, plans are under way to begin a privatization process of the telecommunications infrastructure, in a scenario or near failure of most physical infrastructure in the country.

Background on the Internet in Cambodia

Until 1994, no publicly available or commercial international email service existed in Cambodia. During that year, the Open Forum of Cambodia developed the first international store-and-forward email service in the country - the Open Forum Information Exchange, with the aim to provide access to information and communication to Cambodian institutions - government and non-government - and other institutions and individuals working in cooperation or support with Cambodian institutions.

After one year of operation, the Open Forum was providing email and news services to more than 100 public institutions or their staff members - government ministries and Cambodian and foreign NGOs.

In 1995, an NGO coalition called Cooperation Committee for Cambodia (CCC) developed, with support from IDRC (IDRC/ASRO # 95-5020), another store-and-forward email and news service (CCCNet), initially establishing message transfer between Phnom Penh and the Institute for Global Communications (IGC, USA). This service initially operating as a FidoNet BBS node switched its link in August, 1995, to PacTok, a network of email and electronic conferencing services using the NGO system Pegasus, in Australia - also an APC member.

A project report dated October, 1995, indicates that "despite the difficulties of telecommunications technology in Cambodia the network grew quickly. There were 50 network

members by the end of August 1995 with several NGOs on the waiting list to join. Users currently subscribe to 22 e-mail conferences and transmit on average a total of four megabytes of data per week."[14]

In CCC's own words, "CCC was established in 1991 by NGOs working in the country to help improve their assistance to the Cambodian people, through facilitating contacts and coordination amongst NGOs themselves, and helping links between NGOs and the Cambodian Government, International Organisations and other supporting relief, reconstruction and development efforts." The aim of CCCNet was to "encourage cost-effective information exchange between local and international NGOs working in Cambodia and their overseas partners in order to enhance their efficiency and effectiveness." By the end of 1995, CCC was already planning to move from FidoNet to TCP/IP technology.

In the meantime, a commercial email services company started to operate in Phnom Penh. Unilink, operated by International Management and Investment Company (IMIC), offered users a wider range of services than CCCnet including file attached messages, access to several gateways and fax services. They had about 50 users and their focus was business clients.

Shortly after the CCC initiative and still in 1995, an NGO called PADEK established its own email system with ToolNet in Amsterdam. This was a smaller scale operation with about 10 users, most of them NGOs.

By 1996, therefore, at least four international email providers were operating in Phnom Penh, serving about 150 subscribers. Several users subscribed to more than one service due to reliability problems.

Services at the time were quite expensive for Cambodia. As an example, the table below shows annual fees to use CCCNet in 1995.

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[14] CCCNet report to NSRC (*http://www.nsrc.org*, August, 1995).

CCCNet annual membership fees (US$), 1995	
International agencies	775
Foreign NGOs	555
Local NGOs	355

Prices since then have been reduced substantially. The Open Forum now offers dial-up email access for US$8 a month to Cambodian users (US$20/month to international subscribers and larger organizations).

Meanwhile, negotiations by the Ministry of Posts and Telecommunications (MPTC) were progressing with Sprint (USA) and Telstra (Australia's satellite operator and long distance carrier, operating in Cambodia since 1989) to establish full-time Internet links in the country.

On May 24, 1997, the first full international link to the Internet was established between the MPTC and SingNET (Singapore), operated by MPTC's Internet service CamNet - a 64 Kb/s VSAT connection. Service was scheduled for official inauguration on June 01, 1997. Price for unlimited dial-up PPP access was established at US$40/month. Target clients were defined as "academic/research, commercial, non-governmental, government." In April, 1998, the link was upgraded to 128 Kb/s.

Also in 1997 MPTC agreed to allow Telstra to provide the full range of Internet services in the country. Thus Big Pond was inaugurated with a 128 Kb/s satellite link to the Telstra backbone in Australia.

Currently, all existing email services do their UUCP traffic through CamNet. An agreement between the MPTC and Telstra has in effect established a service oligopoly for direct Internet services until October, 2000. This means that all other operators except MPTC's CamNet and Telstra's Big Pond cannot provide direct PPP access to the Internet, although they can continue to provide store-and-forward services.

No local Internet services of any kind are available outside of Phnom Penh. A German-funded fiber optic link between Thailand and Vietnam will pass through Cambodia (should be operational in 1999), from the Northwest through Phnom Penh and to the Southwest of the country, and should thus provide basic infrastructure for distributing local network services in the corresponding regions.

The table below provides a rough distribution of Internet subscribers (including subscribers to the store-and-forward services), currently estimated at around 2,000 (20% of which are estimated to be women). Figures have been provided by CamNet.

Estimated distribution of users of all data network services in Cambodia, 1998	
Academic, research, educational	5%
Commercial	45%
NGOs	40%
Government	10%
Source: CamNet.	

Development of value-added services

Since 1997, IDRC-supported LIDEE Khmer, a civil organization of technicians and scholars who have been trained abroad, provides introductory Internet training and Web site design services. LIDEE also runs a small public Internet access center (connected through a low-speed, 19.2 Kb/s leased line to CamNet) at its premises and operates another at the foreign correspondents' office (which helps in funding the operation of the telecenter and training activities).

The IDRC-funded Cambodia Information Project (CIP) is also doing capacity building on Internet services, and a result is the KIDS service (Khmer Internet Development Services), formed by young students trained in Web site design and who are already selling their services to obtain self-sufficiency. KIDS also provides access services through a small dial-up telecenter at the CIP's premises.

Another telecenter is the newly opened KU Internet Access Services, operating as a private business associated to a travel agency. Yet another is Casablanca's Internet Cafe, which is the only to operate as a cybercafe, serving food and drinks.

These telecenters usually charge up to US$12 an hour for foreigners; in some of them, rates might be lower for Cambodians. Some also charge US$1 for each outgoing email message. Private email addresses can be obtained at US$10 a month. Current daily usage of these telecenters range from six to 20 people.

Thus, despite tremendous infrastructural difficulties and very low resources, the Internet is spreading in Phnom Penh in creative ways. However, it is significant to note that the presence of the Internet in academic institutions is practically none. Even though the pioneer effort of the Open Forum in 1994 was motivated by the need to provide email for a graduate scholarship at the Ministry of Agriculture, there isn't a national research network project, and a recent effort to enable a special satellite link for this purpose (through support from the Asia Internet Interconnectivity Initiative - AI3 - consortium) has not advanced.

Also of note is the continuing presence of the Open Forum as a leading services center, despite its extreme lack of resources. It is the only Internet group in Cambodia to develop an advanced management and control system for Internet services administration, running on a UNIX platform. Certainly the Open Forum could become a leading UNIX training center in Cambodia, if adequate and long term funds were available to develop a capacity-building project. In comparison, one of the two most advanced Internet systems in the country (CamNet) does not have UNIX expertise, either for development or operational purposes.

Project background

IDRC's presence as supporter of network projects in Cambodia dates back to 1994, when an agreement was established with the Cooperation Committee for Cambodia (CCC) with the following objectives: "... to install and set up an affordable electronic mail network for NGOs and other interested groups in Cambodia and to recruit and train a Cambodian administrator for the system [...] in particular it was sought to provide NGOs access to electronic mail and limited Internet conferences in order to improve their access to information relevant to their work and to provide cheaper communications."

A progress report in October, 1995, indicated that the initial project rapidly reached full capacity: "... the demand for network membership has been far greater than expected. Original plans were made for a membership of 30 organisations. There are now 50 members and others waiting to join. Still others who would have joined CCCnet have joined other networks as a second choice."

In 1996, IDRC approved a broader project (IDRC/ASRO # 96-8002-01), now under the PAN PI, called "PAN-Cambodia." The general objective was "to enable Cambodians to benefit from the full Internet access that is made possible through a 512 Kb/s JCSAT-3 Ku band from the AI3/WIDE Project that is sponsored by the Japan Satellite Systems Inc. It will assist in the establishment of three Internet Access Centres: a Public Access Centre at the LIDEE Khmer premises, a University Access Centre at the University of Phnom Penh, and a Government Access Centre at the Commission for Development of Cambodia. Other limited access points (usually consisting of a single computer with dial-in access) to the Internet Operations Centre at the Ministry of Posts and Telecommunications will also be set up. The Public Access Centre at LIDEE Khmer will be run along the lines of an Internet electronic cafe. It will be PAN's first attempt at exploring the concept of a 'telecommunity cottage'."

The amount of CAD$249,490 was approved in September, 1996, for this project, and the recipient institution was the NGO LIDEE Khmer.

The specific objectives were listed as follows:

- to establish or facilitate Internet connectivity in Cambodia, specifically for use within community, research, academic, NGO and government sectors;

- to build capacity in aspects of Internet management, service provision, content development and usage;
- to establish or assist in the development of Internet Access Centres for research, education and general public interest;
- to establish operational management and promote sustainability of the Internet·service and the Public Access Centre;
- to assist with development of Cambodian content on the Internet;
- to assist in building awareness of the Internet within Cambodian society.

In December, 1996, IDRC approved a supplemental grant of CAD$241,600, this time having the Ministry of Posts and Telecommunications as beneficiary. The original project with LIDEE Khmer, initiated in September, 1996, was scheduled to end by September, 1998. This would extend the PAN-Cambodia project to December, 2001.

Actually, one of the objectives to be attained in the first period of the project (making viable the AI3 link for non-profit and research purposes) was never materialized, since IDRC came to realize that this could impair the project's capacity to become self-sustaining. On the other hand, the project made no provisions for the effective building of a national research network, which would require government support and would help justify the costly AI3 link beyond the initial two years during which its costs would be covered by AI3.

The supplemental grant therefore meant a significant reformulation in the general orientation of the project. Now it would support the development of a general commercial ISP operated by MPTC. The balance of funds in the hands of LIDEE Khmer was to be transferred to MPTC.

Actually, some of the original objectives were attained, including the installation of the telecenters which are in operation until now, and some regular activity in users' capacity building at the LIDEE telecenter's premises. Any self-sufficiency perspective for these telecenters is difficult at best, although a lot of creative ways are being practiced by LIDEE and other groups to keep these initiatives open. Their plea, however, as stated to the consultant, is for more resources from abroad to guarantee survival of these centers.

The reformulated objectives, as stated in the supplemental grant proposal, were:

- to establish a national ISP business which will provide full Internet access services at costs which are affordable to the various sectors of Cambodian society (education and research, government, voluntary agencies and the commercial sector);
- to train Cambodian personnel in the technical and managerial skills necessary to operate and manage such a service, under current technological conditions and as Internet technology evolves;
- to generate a modest stream of net earnings which will accrue to the Royal Government and to the education and research institutions of Cambodia.

The supplemental grant was to be used exclusively to cover the costs of a 64 Kb/s leased line to SingNET for the first half of a five-year business plan in which total investment cost was estimated at CAD$500,000 for the first two years of the project. Actually, summing up the original with the supplemental grant, IDRC's contribution has been CAD$491,090, and nearly 65% of it was to be spent in the first year. The cost of the international leased line alone amounts to CAD$96,640/year.

The reformulation of the project involved the incorporation of a new legal business entity capable of operating under the following features and conditions:

- ownership to be vested in MPTC;
- a management board of five persons, three nominated by MPTC and two nominated by IDRC; after five years of operation, the Centre's position on the Board is to be transferred to a Cambodian education and research institution acceptable to MPTC and IDRC;
- a service charge structure aiming at full commercial rate to the commercial sector, low rate to the education, research and voluntary sectors, mid-range rate to government sector;
- a 5% subsidy for carrying out subsidized services has been agreed to by MPTC for the business entity with respect to the royalty fees and taxes of commercial entitites that are required by law to the National Treasury;
- ability to invest any profits made during the first five years into information and communications technology projects in Cambodia;
- ability to allow in the sixth year the transfer of IDRC's share of 40% of the company's profits to IDRC's beneficiary, which will be a Cambodian education and research institution acceptable to MPTC, and which will replace IDRC at the company's Board; and
- ability to allow at the end of the fifteenth year of the business for all seats on the Board to revert to MPTC and all profits to be retained by MPTC.

Current needs

Interviews with officials at the MPTC resulted in the following list of needs seen as most urgent to advance the Internet in the country:

Network Information Center - This means forming what the MPTC calls CamNIC, the organization to manage the Cambodia Internet top level domain (TLD) - thus bringing to Cambodia the service of IP number and domain name distribution to Cambodian users and operators. Certainly APNIC can provide all the necessary information to organize and maintain this service.

Capacity building - The described needs include forming technicians in: network engineering, configuration and maintenance; UNIX operating system installation, configuration and maintenance; integration and deployment of Internet applications; network and server security.

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Backbone architecture - Design and implementation of a national backbone structure guaranteeing that national traffic among backbones stay within Cambodia. This means establishing policies for backbone interconnection through national NAPs (network access points).

Articulation with other initiatives - This includes close coordination with telecommunications infrastructure development, as well as development of value-added services and follow-up on new technologies.

Development of electronic commerce - The government is particularly worried about the issues involving Internet e-commerce, with its transborder and tax implications, as well as its impact on other forms of commerce. While it does want to allow its development, it feels the need for an accurate and careful analysis of these and other implications in order to formulate adequate policies and regulations.

Conclusions and suggestions

We agree that the MPTC's stated needs touch some of the key points for further Internet development in the country. Emphasis should be given to capacity building, particularly in view of the fact that the academic community is in a state of disarray and extreme lack of resources and has no condition at this point to lead this process in Cambodia. International funding agencies should however consider a project to do a deeper assessment of the situation and provide guidelines for projects aiming at regrouping and development of research and training facilities.

In the meantime, creative support projects for training to form network technicians at all levels (installation of equipment, hardware configuration and maintenance, network design, configuration and maintenance, operating systems administration, as well as all value-added Internet applications) are urgent and essential, as stated in interviews by MPTC officials. If possible, these projects should also provide seed to stimulate development of an academic research network.

Also, expertise is needed for a master backbone development plan which is adequate to the country's needs in the provinces, particularly with the installation of the German-backed trans-Cambodia fiber telecommunications pipeline which links Thailand to Vietnam as well as other national telecommunications infrastructure projects.

It is also important not to lose the significant expertise developed by NGOs, like LIDEE, the Forum, and others. There are extremely creative and innovative techniques and systems which have been developed within these initiatives which can serve as references and can be built into or coordinated with a capacity development program.

Background on the country

The Lao Peoples' Democratic Republic (Lao PDR, or just Laos), with an area of 236,800 Km2, has a population of about 5 million with an illiteracy rate of 43% and a per capita GDP of less than US$350. The main economic activity is agriculture, which employs more than 75% of workers.

Lao PDR has a minimal telecommunications infrastructure, with a phone line availability of less than three per thousand people.

Background on the Internet in Laos

The first international public email service in Laos was established at the end of 1994 by LaoNet, an international working group of academic expatriates, using a FidoNet BBS at the National Polytechnic Institute (NPI). This BBS connected by international dial-up to a FidoNet hub in Washington, DC (*permanet.org*) to exchange email files. LaoNet had been working with government instances to help develop network services in Laos.

In 1995, the few non-academic subscribers to Internet services connected through long distance calls to commercial services in Thailand– the telephone charges alone were about US$0.60 per minute. Several NGOs and individuals used a BBS in Thailand operated by Jamie Zellerbach.

At the government level, institutions such as the Science, Technology and Environment Organization (STENO) and the Ministry of Agriculture were also using similar e-mail exchange services. UN offices in Vientiane were also using UUCP message transfer through UNDP.

In August, 1995, IDRC's PAN co-sponsored with STENO an information technology seminar, with the general objective of reviewing the issues on network services in the country and present Internet technology to several instances of decision-making. The seminar report issued in January, 1996, found out that "Lao IT industry lags extremely far behind most of the advanced South East Asian countries such as Thailand, through years of neglect and the effect of the Western technology sanction against communist block countries. Until recently, Lao IT exposure was limited to simple IBM PC based word processors. There is no significant number of other general purpose computer in Laos, apart from IBM PC systems."

Similarly to the situation in Cambodia, where Khmer script is not yet standardized for data processing, the report also stated that "the handling of Lao information is complicated by the inability of hardware to deal with Lao script, requiring proficient users to have English language

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as a prerequisite. A critical lack of computer technology reading material in Lao further restricts the development of a user base, who depends largely on Thai reading material. Lao system development is at the moment piggybacked onto Thailand whose development of a Thai system with Thai script being similar to Lao."

At the time, STENO was leading the effort to handle Lao fonts and develop customized word processors for the IBM PC platform, and with Thailand's Chulalongkorn University developed a DOS-based word processor which used Lao fonts– the " CU Lao" . LaoNet and a private company in Thailand in partnership with STENO also contributed to the development of Lao-based word processing and desktop publishing in DOS, Macintosh and Windows environments.

The report also identified extremely low levels of available expertise in informatics or network technology, and a computer base of about one thousand PCs (486s or Pentiums), and recommended "the Lao authority to avoid a monopoly situation developing [in Internet services]."

At the time, Vientiane already counted on a newly installed ISDN-capable digital telephone exchange.

One result of the seminar was the clear definition of STENO as the government entity playing the leading role in developing ICTs in Laos. Also, a STENO/LaoNet/IDRC partnership was proposed with the following general objectives, as described in the seminar report:

- Assessing and planning a controlled introduction of an immediate Internet connection into Laos starting with a UUCP feed system.
- Leading up to a full Internet connection via a 64 Kb/s leased line to possibly Thailand's NECTEC.
- Approaching Thailand NECTEC and TOT, via an existing Thai-Lao Cooperation Committee to collaborate and assist in developing a Thai-Lao aid package for funding of a leased line, and training.
- Developing a local industry and a support group, capable of maintaining the required technical support and development base.
- Expanding and building a cost effective self sustaining system and network infrastructure to meet with future growth.
- Continually improving and developing quality services for customers.
- Expanding the network into the provinces using Vientiane as a base for internal training.
- Identifying and seeking source of direct aid from various donor countries and companies.
- Marketing and further developing a user base in Laos.
- Promoting and increasing Laos exposure to the world with the use of the WWW.

Still in 1995 STENO was established as the top level domain (TLD) administrator for the ".la" domain and a class B block (about 65,000 IP numbers) was allocated to Laos by the Asia Pacific Network Information Centre (APNIC). Initially, the primary domain name server was Thailand's

NECTEC, since this country seems to have been the most logical choice for Laos as far as immediate international connectivity is concerned.

At the time, a new digital telephone exchange was available, coexisting with the old telco infrastructure (which only allowed operator-assisted long distance calls), as well as mobile analogue and digital (GSM) services. The digital exchange is ISDN-capable and larger cities are linked through microwave. Intelsat satellite services could also be leased and there were plans to deploy a national fiber backbone.

The report also indicated that the government planned to allow Internet services to be established in a " controlled manner", and STENO has been chosen as the official agency to coordinate this process – which would allow for step-by-step Internet availability to government ministries and educational communities, business and international agencies.

Initial estimates for 1995 on the market potential for Internet services indicated that about 20% of personal computer owners would be using the Internet. At the time, about 1,000 personal computers were in use, and the estimated growth was to reach about 2,000 Internet users by 1997 with a PC count of about 7,000. The report also stressed the importance of making available a nationwide network of email exchange.

Guidelines for capacity building were also presented in the report, emphasizing the need to start by "training Lao trainers." Training topics seen as most needed were:

- UNIX system administrators;
- network technology operators;
- developing local technical documentation;
- general system maintenance and support.

They are correct in presenting network engineering and operating systems as separate training topics. The full features of network architecture, configuration and maintenance are complex issues which go much beyond a specific operating system, involving physical architecture (geographic connectivity layout, etc), optimal transport technology mix (land lines, several radio-based methods, etc), routing technology (increasingly complex as routers and routing processes and software become more sophisticated), and advanced security issues. Most of Internet network technology training is also independent of the chosen operating system, so that programmers trained in UNIX and Internet networking will easily migrate Internet services to Windows NT and some other operating systems – while technicians trained in non-UNIX OSs will have a harder time to handle UNIX.

The report expected that by 1996 Laos would be able to activate a full-time international link to the Internet. The expected cost of a 64 Kb/s leased line to Bangkok was US$1,500/month.

In 1998, the PAN-Laos system remained as the only significant Internet operation in Laos, still exchanging data files with SingNET using UUCP.

Project background

IDRC's presence as s supportive source for technology development in Laos started in 1986 with a project called "Enhancing user services at the Centre National de Documentation et d'Information Scientifique et Technique (CNDIST)" (IDRC/ASRO reference 86-0162).

Its aim was to "open opportunities for the Ministry of Science and Technology's librarians to make contact with the more progressive information centres in Thailand and to access their literature." IDRC contributed CAD$98,450 over two years to this project.

CNDIST is a department of the Ministry of Science and Technology (MOST), and it was built between 1982 and 1987 with support from from UNDP as part of the latter's worldwide inititative to develop documentation and information centers in developing countries.

The library development project was followed by a larger one, approved at the end of 1991, called "Developing information services and infrastructure in Lao People's Democratic Republic" (IDRC/ASRO reference 91-0178). IDRC contributed CAD$250,000 to this project over four years, while CNDIST would contribute with in kind resources estimated at CAD$88,710.

The goal of this second project was "to establish a minimum critical set of information activities to support development research in Laos [...] through enabling the utilization of computer technology, specifically introducing database-building, [desktop publishing], repackaging of information, library networking and resource-sharing, marketing the existence of information, promoting the use of information, as well as extending the base knowledge of policy-makers on information-related issues."

At the end of 1995, IDRC's PAN allocated CAD$89,020 towards a national Internet project called PAN-Laos. Coordinated by STENO, its first phase would have a duration of one year. The general goal of this project was to establish a country-wide Internet service in several phases. At the time, PAN was supporting network projects in Mongolia and Vietnam.

Until this project with STENO, only precarious and mostly experimental email exchange services were available (see above). The first phase of the project aimed at establishing a regular and stable UUCP link between Vientiane and Singapore or Thailand to carry email and news traffic. Depending on the project's performance, a second phase would enable an international leased line (64 Kb/s) to the Internet during 1996, thus making available to Laos users the full range of Internet services.

The ensuing Internet services provider would operate independently of STENO, and had to pursue a self-sufficiency business plan. It also involved capacity building in network technology as well as in administrative and commercial skills, and would seek subscribers among all sectors of society – including local and international NGOs active in the country.

As described in the original project document, "users of PAN-Laos will see themselves as such, rather than simply as users of STENO's technical services." A national committee to "oversee development and administration of the network" with participation of several organizations besides IDRC and STENO's representatives, as well as the user community, would act as a strategic advisory body on Internet development, much like the Internet steering committees established in many other countries.

Full service with the present UNIX technical base however started only in January, 1997 - when the committee was also officially constituted -, although the installation was ready to run in August, 1996. A number of problems, mostly related to lack of expertise in configuring and maintaining the UNIX system, delayed regular operation. Six months later staff still had problems in handling the operating system in basic administrative tasks (such as storage management and so on), requiring outside expertise to correct these problems. By September, 1997, PAN-Laos had 163 users distributed as shown in the table below.

Distribution of subscribers to PAN-Laos Internet services, September, 1997	
Companies	47
Local NGOs	none
Foreign NGOs	35
Government agencies	45

Individual accounts	12
Staff accounts	24
Total	163
Source: Chew Lip Ping, PAN-Laos Consultancy Report *(Singapore: May, 1998).*	

Currently, the PAN-Laos system can still be considered advanced in terms of basic hardware and software for the limited type of service it offers (comparing to the current typical menu of Internet services provided by ISPs worldwide). It uses Sun servers which are still employed by thousands of smaller-scale ISPs around the world to offer the full range of those services. System management routines are - at least in their operations manuals - as sophisticated as in any larger ISP.

Probably for extra-technical reasons PAN-Laos does not maintain list server or newsgroups services - although this can also weight significantly on a system whose international connectivity is based on long-distance dial-up UUCP. On the other hand, connecting to the system is difficult because of the limited number of dial-in lines (only four are currently available).

However, to date PAN-Laos does not have a full-time link to the Internet, which had been conditionally planned for 1996. Actually, any Internet service beyond international email has not yet received clearance from the government, although tenders have been issued for possible commercial Internet operators.

The service currently supports more than 300 users and is working to extend access to the provinces of Luang Prabang, Savannaket and Champasak. A technical study to develop this has been prepared by a PAN consultant[15], and contains useful information on the available infrastructure in the provinces (see table below). The growth of users has led to increasing complaints, particularly from government subscribers, on the difficulty to connect to the service.

The consultancy report mentions that the other provinces' infrastructure is such that, in the view of the author, it does not justify at this point implementing any effort at extending the network to those places.

Province	Population	Computer shops	Training places	Available computers	Phone lines	Email subscribers

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[15] Chew Lip Ping, *PAN-Laos Consultancy Report* (Singapore: May, 1998).

Luang Prabang	114,519	n/a	n/a	40	1,000	1
Savannaket	671,581	1	1	100	2,000	3
Champasak	500,994	n/a	n/a	20	1,000	.	1

Source: Phonpasit Phissamay, STENO PAN-Laos Email Project team member, quoted in Chew Lip Ping's report.

Conclusions and suggestions

PAN-Laos represents a significant (and, to a certain extent, successful) effort at providing data communications services in a situation of minimal technical infrastructure and strong government controls.

Lack of available expertise precludes at this point launching a network of UUCP hubs in the provinces, so subscribers outside of Vientiane still have to dial long distance to exchange email.

The present installation could be offering more advanced services as soon as a direct international link to the Internet is allowed, since the project uses an advanced hardware and software platform. It does lack better dial-in facilities, and this needs to be addressed as soon as possible. However, a direct link to the Internet will require additional expertise in configuring and maintaining routers and servers, putting significant additional pressure on the 5-people staff. Security issues are of particular concern.

Possibly PAN could orient future projects in the direction of technical training to allow the building and maintenance of a network of hubs in the main cities, interconnected by radio or phone lines, with the prospect of making progressively available at least nationally the full range of Internet services. These hubs could serve as the basis for a future national Internet backbone.

For any future development, it is important to take into account that, as stated in a response to the questionnaire, the government has issued tenders for commercial Internet operators, so the focus of IDRC support might have to change.

Short background on the country

Mongolia has the lowest population density and the highest per-capita phone line density of the six countries where PAN ISPs are in operation. The population of about 2.5 million is distributed over 1.57 million Km2, and the phone line distribution reaches three per 100 inhabitants. Agriculture employs 40% of workers, while services employ 39%. Per capita GNP is about US$350.

This is also the country where PAN had the greatest impact in terms of scale, level, and quality of services.

Background on the Internet in Mongolia

The first initiative towards establishing the Internet in Mongolia was MagicNet (the acronym means Mongolian Access to Global Information and Communication Network), carried out in 1994 by Datacom Ltd (a state-owned telecommunications company which was transformed into a private company owned by its workers early that year). It was also the first Internet infrastructure project to obtain crucial support from IDRC's newly-created PAN program, and it still leads network development in the country.

MagicNet started in a manner similar to other pioneer networking projects in several regions – first by running PC-Mail, and then installing Major BBS, the same which had been used much earlier in Latin America, for example, by AlterNex (1987) and Chasque (1989). With Major BBS MagicNet could go beyond email and was able to provide forums, database services, searchable file libraries and email/fax services. A batch email transfer program (Waffle, UUCP) through international dial-up calls to the Institute for Global Communications (IGC), an APC member in San Francisco, allowed for email and news exchange with the Internet.

Waffle transfer with IGC started in September, 1994, and a month later MagicNet adopted dial-up UUCP, with sessions twice a week at speeds ranging from 700 bytes/s to 1 KB/s. By April, 1995, UUCP calls to IGC increased to two per day.

In July, 1995, packet switching equipment started to be delivered to the aimags (provinces) to enable Mongolia's X.25 network through VSAT links. The goal was to make available Internet services through the VSAT-based X.25 network, thus extending data communication services to the 20 aimags (in 1998, service was actually available in 15 aimags). At the time, MagicNet counted nearly 500 subscribers.

In January, 1996, the first full-time link to the Internet was established with a US Sprint link to

California through PanamSat (128 Kb/s), with funding from the National Science Foundation in the USA and the Mongolian government.

By the end of 1996, a significant advance in the use of wireless modems to expand the network was achieved, connecting to the Datacom backbone with 115 Kb/s asynchronous radio-modems the Mongolian Technical University, National University of Mongolia, Computer Science Management Institute, Computer Centre of Science Academy, as well as the headquarters of the Science Academy and the American Embassy.

The network was based on Freewave radio-modems using Linux PCs as local routers in each end-point organization. Again, support from NSF was crucial for this initiative, as well as technical expertise from the Wireless Field Test (WFT) Project for Education (Colorado Springs, Colorado, http://wireless.oldcolo.com). WFT technicians designed and installed the wireless system.

At the end of 1997, there were plans for an international link upgrade to 512 Kb/s (actually made effective in 1998 to 384 Kb/s), and total number of subscribers to Datacom's Internet services (including users in remote LANs) was nearly 2,000. At this scale, hardware, software and networking technologies being used by Datacom could be considered quite up-to-date, combining Cisco routers, Sun servers for DNS and WWW, NT servers for mail, Apache WWW servers running on Linux as well as WWW NT servers and Portmaster communication servers.

Also, Datacom's system has been interfaced to a VSAT-based X.25 network serving government and academic institutions in the aimags (VSAT links are at 256 Kb/s). The fact that the services are quite stable shows there is good on-site expertise to properly handle such a diversity of platforms – a significant achievement, considering that only three years earlier none of these technologies were available in the country.

At the time, Datacom also upgraded their wireless network to use Multipoint modems, which seemed more suitable to handle connections using one of the radio-modems as hubs, but continued to rely on Freewaves for point-to-point wireless links.

In a report to NSRC dated January, 1998, Datacom reported that "as of December, 1997, MagicNet served almost 2,000 dial-up subscribers and more than 10 leased-line subscribers in the cities of Ulaanbaatar and Erdenet. Free server space is provided to more than 42 government and other organizations for their Web presence. The 10th issue of the journal A.MN@ was published. The MongolianOnLine website makes links to more than 100 organizations considered of relevance to the country's social and economic milieu."

The following table shows the breakdown of the user base at the end of 1997.

Academic, research and education	20%

Commercial subscribers	40%
Local non-profit organizations	10%
International agencies	20%
Government	10%
Source: Datacom report to NSRC, Nov.1997.	

At the beginning of 1998, Datacom started to test high-speed four-wire modems (HDSL) at 2 Mb/s (to carry E1 digital dial-up trunks) and 756 Kb/s.

The table below shows the services' pricing structure at the beginning of 1998.

Service	Sign-up charge (US$)	Monthly charge (US$)
Class Messaging – unlimited usage time and email	75	15
Class Domestic - unlimited usage time and email; free access to domestic Web information	75	19.5
Class Global - full Internet service and up to 1 MB of free homepage space	75	75
Source: Datacom report to NSRC, January, 1998.		

Today, Datacom is a full Internet services organization technically comparable to similar services in developed countries, still facing practically no competitors. Besides the full range of Internet services (with the exception of NNTP distribution – possibly due to volume of traffic – and telnet access – for system security reasons, telnet is allowed only directly to the Worldgroup BBS), it is also the TLD administrator for the ".mn" domain. Its international links are operated by Global One (one TCP/IP at 384 Kb/s and one X.25 at 64 Kb/s) at a total monthly cost of US$27,000.

Project background

PAN Mongolia was the first project to be considered and approved within the framework of the PAN Program Initiative of IDRC. The proposal was submitted to IDRC's Board in September, 1994 (IDRC/ASRO reference # 94-8008).

The project aimed at supporting further development of the first network services provider in Mongolia, Datacom, operator of the MagicNet email system. The initial amount approved by IDRC was a one-year grant of CAD$98,000. The recipient's contribution to the project, estimated at CAD$56,200, included staff, dial-up Internet connection and subsequently full Internet connection, and a PAN-Mongolia worshop.

This first phase terminated in March, 1996, and a supplemental grant in the amount of CAD$130,000 was approved by IDRC as a partially recoverable grant, which extended the project's first phase to September, 1998. This grant was "for establishing a Public Internet Center (PIC) for training of the public in general [Internet] services." PIC has trained hundreds of people during 1997. Datacom covers Internet access costs and provides technical services free of charge. PIC is preparing its first CD publication.

As IDRC considered that phase I of PAN Mongolia completed "very successfully", a second phase of the project was approved in September, 1998 (IDRC/ASRO # 98-8003-01), to "carry out a comparative study of different wireless TCP/IP networking equipment and to test two different experimental content-carrying networks using wireless technologies, one in the capital city of Ulaanbaatar and another, in a provincial town, for selecting one technology/system for implementation in the 22 aimags (provinces) of Mongolia.

This phase of extending Internet services to the rural areas is being implemented in concert with the government of Mongolia, which has a stated goal and approved national plan to network and provide Internet access to all government offices and educational and research agencies throughout the country, and in particular, to bring equity to the largely rural-based population."[16]

Conclusions and suggestions

In general, the project has been quite successful regarding its main goal of providing Internet access facilities on a national basis, and in combining local expertise with a very organized implementation.

Also successful is the effort to stay at the forefront of technology, particularly regarding adequate means of connectivity in the interior of the country. Datacom today has accumulated significant expertise in specifying, configuring and operating networks based on the latest radio-modem spread-spectrum technology - although the advent of large satellite data networks such as Iridium, Globastar, Teledesic and others might provide more effective alternatives in the near future. This expertise could be made available to other PAN projects. Cambodia and Laos in particular have expressed the need to consider this technology for backbone expansion. Datacom also has extensive expertise in operating VSAT links, which can be (or is being) used in several of the PAN-supported ISP projects.

Still, a lot needs to be done, particularly to extend services beyond Ulaanbaatar, as explained in the questionnaire's response: "Three major cities of the country have digital infrastructure (inter-

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[16] Another IDRC-supported project (IDRC/ASRO # 97-0210) named "Satellite Broadcasting Web Center for Secondary Schools in Mongolia", scheduled to start in October, 1998, is not covered by this report.

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city digital microwave lines, fiber optic lines between digital telephony switches). But still very low telephony density in the cities. Very low quality (old analog microwave) connections to another 20 provinces. In 1998 we installed our data-only VSAT stations in 15 provinces."

PAN-Mongolia is probably the most advanced of the PAN ISP projects in terms of human resources with expertise in most of the Internet infrastructure. Projects in the region should take this into account with the view of involving Mongolian consultants in future initiatives.

Short background on the country

Sri Lanka has nearly 19 million people in an area of 65,610 Km2. More than 75% of its population is in predominatly rural areas. Illiteracy is low (less than 10%) but telephone distribution is one of the worst in the region- less than one phone line per 1,000 people. Per-capita GNP is about US$700, and 49% of workers are employed in agriculture.

Background on the Internet in Sri Lanka

The seminal Internet networking project in Sri Lanka is the Lanka Educational and Reseach Network (LEARN). According to the LAcNet website (*http://www.lacnet.org*), LEARN provides e-mail facilities and Internet connectivity to educational and research institutes in Sri Lanka. Initiated in 1990 with just e-mail transfers, LEARN has now completed its second phase with dedicated Internet connectivity to the following organizations: University of Colombo; University of Moratuwa; The Open University; University of Kelaniya; University of Ruhuna; University of Peradeniya; University of Sri Jayawardenapura; Natural Resources, Energy & Science Authority; Arthur C. Clarke Centre. Around 30 other universities and research institutes, as well as individual academics, use the dial-up LEARNmail and Internet services.

Almost from its inception 1990, e-mail transfer to LEARN sites in Sri Lanka was funded by LAcNet through contributions, mainly from SLNet members. In November 1995, LEARN was reported to have direct Internet access via Sri Lanka Telecom (SLT) - a 64Kb/s line from Colombo to the University of Moratuwa.

According to records in the Network Startup Resource Center (NSRC, *http://www.nsrc.org*) database, in 1993 the first reliable international dial-up UUCP link between Sri Lanka and the USA started in the academic community, thanks to people like Randy Bush and O. Crepin-Leblond, providing regular UUCP service between the University of Moratuwa and Stanford. Formation of cadres who began to learn UNIX and TCP/IP -- the original basis for starting up Internet development -- thus picked up in the academic community.

In 1994, Randy Bush reported to the NSRC: "On 7 September 1994, a part-time scheduled TCP/IP link to Sri Lanka was commissioned. The connection is by Lanka Internet Services, Ltd. [*http://www.lanka.net*], an open provider, i.e. academic, commercial, NGO, ... are all welcome. LISL is in the process of providing a higher speed dedicated link. Within Sri Lanka, LISL currently provides the full range of dialup PPP/SLIP services, as well as dedicated lines, POPmail with DOS/Mac clients [...] The impetus and initial funding came from Sri Lankans residing in the US, students and ex-pat engineers who wanted to do their part to contribute to

building networking for Sri Lanka."

As early as January, 1995, Information Laboratories (Pvt) Ltd. (*http://www.is.lk*) was beginning to provide Internet information services in Ratmalana. Currently, the firm provides information services such as e-mail, Usenet, WWW and BBS's in Sri Lanka, as well as specialized training and consultancy services on Internet and related fields.

A report in May, 1996, by Chand Samaratunga of LISL to the NSRC speaks for itself in showing the level of services available in Colombo before the beginning of operations of PLN, and is quoted here in full:

"Lanka Internet is Sri Lanka's first ISP and entered the Internet business in April 1994. Lanka Internet provides dialup access (slip/ppp) and dedicated Internet and WAN access (copper leased line and wireless) in speeds of 64k, 128k, and to E1. At the end of the first year of operation, the customer base exceeds 1000 and the cost of access has dropped by more than 50%. [...] Lanka Internet's web server is based in Sri Lanka [http://sri.lanka.net] with a high speed T3 mirror in the USA [http://www.lanka.net]. Lanka Internet's client base includes the Ministry of Foreign Affairs, Sudu Nelum (White Lotus) Movement, University of Peradeniya, Colombo Medical College, University of Moratuwa Electronics Department, Bank of Ceylon, Commercial Bank, Seylan Bank, United Nations, World Bank, Nestle, Unilever, Lipton, Blue Diamonds, Mobitel, Celltel, Call-Link, Ceylon Electricity Board, numerous foreign embassies in Sri Lanka, and NGO organizations. In addition to its commercial operations, Lanka Internet presently offers special concessionary academic rates for all Schools and Universities in Sri Lanka, and plans to sponsor the activities of the Internet Society of Sri Lanka within the public and private primary and secondary school systems in Sri Lanka."

As early as December, 1996, LISL reports to NSRC: "... Lanka Internet is connected to Sprint in Washington D.C., via a 256kb/s fibre optic line. The network is fully TCP/IP. within Sri Lanka, we carry IPX also encapsulated within IP. Domestic network consists of about 10 dedicated leased lines on copper, and about 5 radio links using Cylink radios. In addition there is an ongoing plan to develop a metropolitan Colombo wide radio network using Aironet Wireless LAN cards as a MAN. The equipment we use are Pentium computers with SCSI hard disks, and about 32MB of RAM running Solaris x86 2.5.1, in all our servers. We currently have 2 mail servers, 2 web servers, 3 PPP servers, 1 mail relay, 1 anonymous ftp server, 1 ftp/telnet server for customers, along with a firewall server. We are in the process of retiring our original "all in one" server which is an ancient Sparc Classic. Lanka Internet has over 90% of the Internet customers in Sri Lanka, and currently has over 2000 paying customers. Our pricing is Rs. 3500/ month (about US $ 50/ month) flat fee for unlimited dial-up access. For 64k leased lines the cost is Rs. 55,000/month (about US $ 1000/month) flat fee."

In January, 1996, Sri Lanka Telecom (*http://w3.slt.lk*) was the second ISP to enter the market in Colombo, according to the NSRC records, offering services similar to LISL's.

Another ISP to start operations in 1996 was ITMIN (*http://www.itmin.net*). ITMIN is actually a well-established ISP which was also formed with support from international development agencies (in this case, UNDP and UNIDO) for the initial purpose of serving the export industry but now providing general Internet access and value-added services.

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Thus, not only the quality and sophistication of services available in Colombo was already quite advanced (involving even digital access services at a par with ISPs in North America), but the prices quoted were already much lower than the ones initially estimated by the project team.

Still, a recent report by an Internet consulting firm in Ireland (Nua Ltd, *http://www.nua.ie*) provides a report on current market prospects:

"Sep 10 1998: A recent surge in use of the Net in Sri Lanka is expected to continue and analysts predict that by the year 2000 there will be 50,000 people online. This is up from an estimated 14,000 users today. Growth has so far been concentrated in the wider Colombo region and local experts reckon only 30 percent of the potential market has been tapped. The relatively sudden growth has been attributed to a drop [in] PCs prices due to the abandonment of import duties last year and an improved telecommunications system after the government de-regulated the telco market three years ago. Other factors contributing to the boom include the licensing of two wireless loop operators, Lanka Bell and Suntel, two years ago and the sale of 35 percent of Sri Lanka Telecom, a semi-state telco, to Nippon Telephone and Telegraph, a Japanese telco. There has been 160,000 new phone lines installed in the last year. The majority of PC vendors are offering free Internet connection to consumers thus every computer sold is potentially another Internet user. There are currently seven ISPs in Sri Lanka and discussions are underway to implement a interconnection agreement for data transfer so data will not have to go via servers in the US. There are plans to introduce a number of ISDN services, a factor which will speed up data delivery."

Project background

This is a special case among the PAN ISPs - two international development agencies (IDRC from Canada and the Norwegian Agency for Development Cooperation – NORAD – through a foundation in Norway) team up to form a for-profit company in a developing country (Sri Lanka) for the purpose of exploring the Internet access services market. The company, called PAN-Lanka Networking (PLN), was founded in September, 1996, and started provision of Internet access in May, 1997.

Shareholders of PLN were IDRC, WIF (Worldview International Foundation, a Norwegian foundation supported by NORAD), and an investor residing in the USA (Vikas Aggarwal) who became technical director of the startup.

The initial investment structure was: WIF, US$163,700; IDRC, US$154,229; Mr Vikas Aggarwal, US$55,000. IDRC disbursed a total of about US$233,900 to this project up to March, 1998.

In its first eight months of operation (May-December, 1997), PLN managed to reach more than 300 subscribers. By comparison, another commercial operator (ITMIN) is quoted in one of the

PLN reports[17] as having 400 subscribers "with far larger staff, resources and marketing budget."

At the end of 1997, PLN had a staff of 20 people - which means a rate of approx. 15 subscribers per staff, which doubled nearly one year later (Oct.98). Even at this level, this is a very low number for typical ISP operators (we have to remind ourselves that the technology and human resources needed to run an ISP are practically invariant from country to country), in which a typical subscriber density per staff in successful operations is about 10 to 15 times higher. For comparison, here are some figures from other ISPs (all of them, incidentally, operated or initiated by NGOs):

ISP (country)	Subscribers	Staff	Revenue (est.1997)
AlterNex (Brazil)	8500	20	US$2,200,000
Chasque (Uruguay)	2000	9	US$400,000
GrennNet (England)	800	5	US$400,000
IGC (USA)	12000	25	US$2,500,000

At this staff level, one can expect PLN to be able to handle more than 5,000 subscribers if we could consider this as a typical ISP facility. It must be noted however that, excluding the two top salaries (general manager and marketing manager) which amount to a combined US$6,000/month, the average monthly salary of staff is US$220/month, which is very low as compared to ISPs in countries like Brazil, Uruguay, and many others, not to speak of England and USA (salaries of the two top employees is close to the ones at similar posts at IGC in the USA, and higher than the same at GreenNet in England).

On the other hand, a larger underpaid staff may be more ineffective than a smaller group of more expensive and better qualified people - and this is usually the hiring criteria in this type of activity. In the case of PLN, however, given national salary levels, the distortion is more due to overpayment of some directors than to unusually low salaries for the rest of staff.

Earnings from subscribers' accounts went from approx. US$5,000/month in December, 1997 (about US$250 per staff) to approximately US$10,000/month in October, 1998 (US$500/staff), while the average monthly expenditure per staff is estimated at US$550.

Objectively, the service was still running at a loss, spending nearly US$300,000 per year to serve about 700 users up to October, 1998. In other words, the project was spending almost US$430/user and obtaining less than US$200/user - thus subsidizing commercial users at the

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[17] Helge Selrod, Progress Report, Dec.01, 1997.

yearly rate of more than US$130/user. PAN regional office has since informed the consultant that the latest figures show a breaking-even point, which would mean either that the documentation figures are not accurate or that there was unusually exceptional growth in demand after October, 1998.

Technically, the infrastructure seems to be among the best that can be obtained in Colombo at this point - particularly with the investment in E1 digital trunks - which puts PLN as technically prepared to continue to compete for the retail access market. With 75 dial-up lines, it can support up to 1,500 individual subscribers (actual value depends on usage patterns which must be evaluated regularly).

Judging by the current available data on usage patterns (particularly the average retention time currently estimated at 20 min), the present infrastructure could support even more subscribers - which might permit to achieve a goal of increasing revenue from dial-up services to nearly US$30,000/month - if the market permits the prices to be maintained at the present level, which is unlikely. Another digital trunk is planned to be used for leased line services - although currently only one leased line contract has been obtained.

The partnership with Suntel in the upgrade to digital trunks may provide a good opportunity to significantly increase the dial-up subscriber base - which might justifiy using the second E1 trunk also for dial-up access. Actually, this would allow for a more efficient use of the existing digital modem pool and could permit extending the user base to 3,000 - if there is such a demand at this point in Colombo, considering as well the competing ISPs.

PLN is striving to comply with one of the project's goals, which is to extend Internet services beyond Colombo. The original project called for a local access point in Jaffna, which is operational although the service is only used by a few government agencies and business organizations, given the extreme difficulties with the telephone infrastructure. To compensate for this, innovative alternatives are being implemented. One of them is the letter transmission service, which basically consists in scanning letters and delivering them to Colombo for printing and posting.

Another PLN initiative is a proposed pilot project for a multipurpose community telecenter (MCT) – a place open to the general public allowing for Internet access using locally installed computers, and ideally providing regular training on information and communication technologies. The first extensive MCT project in developing countries is the one promoted by the Peruvian Scientific Network (RCP) – in which there has been an attempt to disseminate as many telecenters as possible with a strong commitment to capacity building and self-sustainability. Although larger telecenter experiences still need comprehensive evaluation, there is information already available on these processes which could provide guidance to develop PLN's initiative.

Conclusions and suggestions

The original project documentation states: "Developing an ISP involves relatively low capital costs [...] but initial investment is unlikely to be recovered in the first 2-3 years. On the other hand, ISP-type projects, done with other partners, offer the best prospects for the PAN [Program Initiative] to generate revenue to sustain operations and recover the initial investment."[18]

These generalizations on ISPs as income-generating activities have already been commented in a preceding chapter (Methodology). In particular, in view of the consultant's experience, the PLN project was comparatively a large initial investment venture (about half a million dollars in the first year with high density of human resources involved) for the type of business and expected market scale.

Project's documentation states that "Lanka Internet Services (LIS) is presently the only private sector company that offers Internet services to the public at large. However, its pricing is extremely high, as a result of which easy access to the Internet for the average Sri Lankan is not a reality. LIS charges USD300 for each installation and USD30 per month for the 'economy' dial-up IP account as well as per minute charges and data volume charges. Even in comparison to other developing countries these charges are extremely high. It is projected that the PSL [PLN] can make Internet services available at several times below the LIS prices."

Aside from the mention to the "average Sri Lankan" - a rural person who will not have direct access to this technology in the foreseeable future in a country with very low phone density and per capita income of less than $700, no matter how ingenious an Internet project can be -, this appraisal of the market is just a snapshot, not taking into account that, as soon as competition presents itself, as in any business, prices will fall - as they have fallen dramatically throughout the world. If this is so, and if the project plans ROI in 2-3 years only, it is a temerity to imagine that PLN would remain the most cost effective alternative in such a period of time - an eternity for Internet standards.

Thus, on the business aspect of the project, it is hard to predict it will be able to survive in an increasingly competitive environment and given the possibility that larger operators providing access might enter the market (telcos included, which is a clear trend in many countries), particularly considering that it is still too expensive for the type of service and subscriber base as compared to typical ISPs. Besides the ISP competitors already mentioned, international corporations are entering the market with larger scale projects, like Ceycom (Ceylinco Group/ Hughes / Hutchinson, *http://www.ccom.lk*).

Since March, 1998, PLN's general manager has envisioned a diversification towards a range of value added services - particularly solutions for the corporate market involving Web presence, Web deployment of information services, intranets, and LAN connectivity. While this

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[18] PAN-Lanka Project, Appraisal, page i, 1995.

diversification is fundamental to ensure survival, it is difficult to establish market prospects for this line of business in Sri Lanka from the available information. The latest estimates for usage growth already quoted point to a maximum of 50,000 users throughout the country (less than 0.3% of the population) by the year 2000, and it is difficult to imagine reasonable economies of scale for accomodating all the operators already in the market.

On the development aspects, although the proposed extension to Jaffna might be justified on these grounds, it still remains within the realm of developing a private business - particularly when some of the key target customers in Jaffna are organizations (the military, state instances) which can at this point develop their own facilities. On the other hand, there is no reason to expect that competitors are not planning to extend services to other provinces as well.

The general manager has recently mentioned his intention to quit PLN and move to develop multipurpose community telecentres. This is an entirely new development requiring a careful proposal, especially given the difficult prospects of sustainability of projects of this type. MCTs involve hiring trained personnel, making sure security precautions are taken, availability of equipment maintenance, stable power supply, and an effective management system to ensure good use of the communication and training facilities. This translates into significant initial financial commitment and sizable running costs. As a business (like the emerging telecommuting centers in the USA, for example), this will require careful cost-benefit analysis in the particular situation of Sri Lanka, so it could not be taken beforehand as a priority business alternative for the PLN project.

Given these aspects and possibilites, our vision is that IDRC should plan to pull out of the PLN *business* as soon as a viable and other competent business partners can take over (the same goes of course for WIF) - trying to make sure that the large investment made so far is not lost. Funds thus obtained could then be directed to other development oriented projects using ICTs more directly focused on the poorer, rural areas of the country, depending on a study of social needs of this technology.

Short background on the country

Nearly 80% of the 72 million vietnamese live in rural areas. The total area of the country is 329,560 Km2, and phone line density is very low - less than five phone lines per 1,000 inhabitants.

Per-capita income is less than US$300 and agriculture employs more than 65% of workers. The illiteracy rate is just 6%. Availability of personal computers is estimated at less than five per 1,000 inhabitants.

Background on the Internet in Vietnam

Early international connectivity for Internet email exchange dates back to the end of 1992, in an effort of the Coombs Computing Unit of the Australian National University (ANU) to establish store-and-forward message exchange with Vietnamese research institutions through Hanoi's Institute of Information Technology (IOIT), a research department of the National Center of Science and Technology Information and Documentation (NACESTID). In 1993, by decision of the government, research on Internet technology prospects for Vietnam was commissioned to the IOIT.

In 1994, IOIT obtained financial and technical support from Australia (Australian National University) and from an European non-governmental development agency (International Cooperation for Development and Solidarity - ICDS) to implement computer network facilities. Support for the development of a research network also came from the Center for Nordic Research in Denmark. Thus, the Vietnam Academic Research and Education Network (Varenet) was created as the first basis of an academic research network, and Netnam, funded by ICDS, became the first public network service with the aim of providing connectivity and information services to the development and business community, as well as individual users.[19] Email and conferencing services software was Galacticomm's Worldgroup.

The project had been planned in three phases, culminating with a full-time Internet link between the IOIT and AARNet (the Australian research network) in 1997. By April, 1994, Varenet was already running a metropolitan network of 12 nodes in several academic and research centers, with regular email traffic via UUCP to the Coombs Computing Unit in Canberra. As early as the beginning of 1995, however, the project was running out of funds, given the relatively small

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[19] François Fortier, *power@grassroots.org - Delivery error: user unknown* (The Hague: September, 1998, draft). All subsequent references to Fortier's work are from this paper.

amount donated by the sponsoring organizations, which threatened to end regular UUCP traffic with Australia. Thus IOIT started to charge for services. While international organizations using Netnam agreed to this, researchers of the academic community had to rely on financial help from abroad or on government subsidies.

The initial success of both initiatives shows an evidently repressed demand eager to gain access to such services, as described by Fortier: "By the middle of 1996, Varenet was serving approximately 300 domains, mostly for Vietnamese universities and research institutions. In turn, Netnam received an enthusiastic response from the NGO community, serving 80% of those present in Vietnam (65 out of 70) within a year of its establishment."

On the other hand, Fortier also notes that Vietnam Posts and Telecommunications (VNPT) - the state monopoly in charge of telecommunications - lobbied the government for full control of Internet services and concretely resisted the development of the IOIT projects - including denial of infrastructure services. Arguments used included issues of national security as reasons to keep the entire range of telecommunications services in the hands of the state. Censorship aside, this was not unlike the strong lobby by Brazil's TELEBRAS state monopoly with similar purposes - and which was equally unsuccessful.

Fortier reminds us that this concern and practice of control and censorship by governments regarding the Internet was a major issue in several countries in the region, quoting the obvious example of China and the surprising actions of the Singapore government in imposing severe control measures until at least 1996. This process receded in favor of a more open policy even in China, as a result of clear pressures from the international business community.

In 1996, this was the range of services provided by Netnam as described in their report to the NSRC:

- *E-mail* - Send and receive electronic-mail to and from the Internet. This permits to exchange e-mail with any correspondent at less than one-tenth the price of a fax or telex.
- *Forums* - An ever-expanding number of electronic discussion forums are available on NetNam, allowing subscribers to discuss and exchange information of common interest on specialized or general topics. For example, forums may include forestry activities, street children, news broadcast, NGO administrative concerns, office rentals, commercial services, classified adds, social activities, etc.
- *Databases and File Libraries* - As the system grows, more and more information are available for on-line retrieval, including text files and databases provided by NetNam or made available by subscribers that wish to share information and programmes with others. This may include various directories of organizations and resources, statistical compilations on development issues, annual reports, maps, specialized documentation, utility computer programmes, shareware of all types, etc.

The IOIT system operates two access centers at the time - Hanoi and Ho Chi Minh City, with

several research centers and other organizations connecting to each of these hubs through dedicated or dial-up lines.

The subscription policy has been consistent with the stated purpose of Netnam's project - to primarily support the NGO community and development projects. Although international email was expensive (given the cost of the UUCP sessions), at about US$0,15/KB (meaning that the cost of sending the entire contents of a 1.44 MB floppy would cost more than US$200), there was no cost for email exchange within the Netnam system, and the connect time charge was about US$0.60/hour. On top of these variable charges, there are registration and monthly charges which depend on the nature of the subscriber, as shown in the table below.

Type of subscriber	Prices	
	One-time registration (US$)	Monthly charge (US$)
Normal	20.00	30.00
NGO and charities	10.00	20.00
Very low income users	No charge	10.00

Sources: IOIT's Web site, Nov. 1998. Prices unchanged since 1996.

On March 05, 1997, the government issued an executive order creating the National Internet Coordination Board (NICB) with the mission of "temporary regulation for the administration, establishment, and utilization of the Internet in Vietnam."

On May 24, 1997, through an interministerial rule, Vietnam established a consistent and formal general policy for operation of the Internet, establishing formal control of contents and requiring certification for every Internet service and subscribers as well,[20] although only in November of that year ISP authorization certificates were issued to private companies.

In the meantime, a data communications company owned by VNPT (Vietnam Data Communications, or VNMail) was operating an X.400-based email service since September, 1996, and serving more than 2,000 users one year later, when it was running what seemed to be the first international leased lines to the Internet from Vietnam (to US Sprint in California at 64 Kb/s and to Telstra in Australia at 256 Kb/s). By the end of 1997, VNMail switched to full TCP/IP service.

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[20] Fortier, *op.cit.*

On November 29, 1997, Vietnam celebrated full access to Internet services, including WWW servers, in what was called "Vietnam Internet Day." This was the day the government finally issued authorization to four private ISPs to initiate full Internet operations.[21]

As reported at the time by NUA Internet, "a [government] document released [a week before Internet day] ironed out any speculation of what kind of Internet experience the people can expect when it announced that individuals will not be allowed to take part in online discussions about economic, political, cultural or social issues about Vietnam, that firewalls will be installed to monitor information and sending coded information will be banned."[22] Backbone operation remains a monopoly of VNPT.

Project background

IDRC's involvement with Internet development in Vietnam started with PAN project # 96-0015-01, "PAN-Vietnam National Intranet," but the Centre's involvement with research support projects in Vietnam dates back to 1991 (IDRC/ASRO # 91-0136), with a proposal to build a decision-support management information system for economic development, having as counterparts the Center for Science and Technology Information (CESTI) and NACESTID.

A grant of CAD$148,905 (over two years) was approved in December, 1996, for PAN-Vietnam, and the recipient was IOIT. The abstract of the project in the project documentation read as follows:

"This project is aimed at the creation of a content-based intranet in Vietnam as a country partner of IDRC's PAN. This intranet will be based on the networking infrastructure in place at the IOIT, NACESTID, Hanoi, and the Centre for Science and Technology Information (CESTI), Ho Chi Min City. IOIT will be the Network Operations Centre (NOC) and NACESTID and CESTI will be responsible for developing and coordinating the content base from various research and development institutions in Vietnam. The project will strengthen the networking infrastructure at IOIT, NACESTID and CESTI as local network partners of a PAN-Vietnam intranet; strengthen their capacity in information management and information service, intranet and Internet publishing; sensitize potential governmental and non-governmental R&D organizations to Intranet information networking, and obtain their active participation to develop a national Web site of Vietnamese R&D research information and publications."

Specific objectives were listed as follows:

- to strengthen the networking infrastructure at IOIT, NACESTID and CESTI as local network partners of a PAN-Vietnam intranet;
- to strengthen the technical and administrative capacity of IOIT staff in networking

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[21] The four ISPs were: VDC of VNPT with VNN network, FPT with FPTnet, IOIT with VAREnet & NetNam, SaigonPostel with Saigonnet.

[22] News from NUA Internet, *http://www.nua.com.*

operation and the capacity of NACESTID and CESTI staff in information management and information services, intranet and Internet publishing;

- to sensitize potential governmental and non-governmental R&D organizations to intranet information networking and obtain their active participation;
- to train the staff of participating institutions on Web publishing (HTML work, home page design, etc);
- to develop a national Web site of Vietnamese R&D research information and publications;
- to conduct research on Vietnamization of Web software and technology;
- to link the national intranet to the PAN program and to institutions abroad to promote Vietnamese research.

The project proposal listed an impressive number of networks in operation in Vietnam at the time the PAN-Vietnam project was considered:

- *Prime Minister's Office* - Nation-wide Information System on Public Administration (operating connections to over 40 department and 60 provinces, incorporating both leased line and dialup connections, all within country).
- *State Bank* - Nation-wide Banking System (operating leased lines within Hanoi, and dialup connections to 53 provinces).
- *Ministry of Finance* - Nation-wide Information System for Governmental Financial Management (accessing 5 separate information systems via dialup connections).
- *Ministry of Trade* - Trade Information Centre (using dialup connections nation-wide).
- *MOSTE* - Nation-wide Science and Technology Information System (dialup connections to 53 provinces, dialup international email connection)
- *Vietpac* - National X.25 carrier network operated by the Vietnamese Data Communications Company.
- *Varenet* - National Internet network for academic and educational institutions, linked to the Internet via NetNam Internet Service Provider, and operated by the Institute of Information Technology (IOIT).
- *Netnam* - Internet Service Provider - Operated by IOIT.
- *VNN* - Internet Access Provider and Internet Service Provider - A company under Vietnam Post Telecommunication Corp. (VNPT).
- *FPTnet* - Internet Service Provider- owned and operated by a state-owned company.
- *SaigonNet* - Internet Service Provider- owned and operated by a share-holding company.
- *CINET* - Internet Content Provider operated by Ministry of Culture and Information.
- *Vinet* - An Intranet operated by BaTin, a private company.
- *Vitranet* - An Intranet operated by a company.

The estimated total of personal computers available in the country at the time was above 300,000, distributed as shown in the table below. At the time, less than 5% of these PCs had modems.

Type of PC owner	Estimated total numbers	Distribution
Government	75000	25%
Private institutions	165000	55%
Personal	60000	20%
Totals	300000	100%
Source: IDRC PAN-Vietnam project proposal, 1998.		

Conclusions and suggestions

Netnam is now an Internet services state company, with 35 employees, an estimated gross annual revenue of US$150,000 and annual expenditures of US$140,000. Their stated mission is now to "provide Internet Services to customers [and to assist institutions] in creating and disseminating content on [the] Internet." The competition is "ferocious," and there are four ISPs sharing a market of less than 20,000 users.

A questionnaire's response states they have 100 dial-up lines and mention 25 users per line, which would indicate a total of 2,500 subscribers (including most NGOs in the country which can afford a computer and a phone line) and 200 UUCP accounts.[23] However, their WWW site tells subscribers that there are 14 lines available in Hanoi and only four in Ho Chi Minh City - an indication that the responses might be unreliable.

Among the ISPs surveyed by this report, Netnam is the only organization which explicitly declares commitment to research and development: "We are carrying out research in: network management, network security, Internet services, database, etc., [which takes] 20% of annual budget."[24] This includes testing of the latest aDSL modem technology - which has also been mentioned by PAN-Mongolia - although no further reporting was available to evaluate this.

As all other ISPs officially operating in Vietnam, the IOIT system provides the full range of Internet services. However, as in all other ISPs surveyed, IOIT does not provide mirroring of international newsgroups.

Lack of updated reports does not clarify the status of the full-time connectivity to the Internet of the IOIT system. The questionnaire's responses leave this portion blank. However, the system is

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[23] Information from the questionnaire.
[24] Ditto.

fully connected to the Internet, since its main site is readily accessible from abroad - indicating that probably a 64 Kb/s leased line is operational from IOIT in Hanoi to the VNPT backbone.

IDRC is currently discussing the development of a PINS[25] project with IOIT and other organizations in the country. To date, no report on the progress of this project was made available to the consultant.

It seems Vietnam is one of the most developed of the six countries surveyed in terms of availability of local expertise in network management. There is a functional research network which has been the foundation for Internet development in the country. If this is so, IDRC's focus on content development projects is an interesting path to pursue.

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[25] PAN Information Networking and Services providers, a new type of project emphasizing content development and capacity building.

The table below has been assembled with data from NUA Internet and shows, as expected, wide variations as compared to the total population figures, as well as very fast growth (also as expected) in some countries where data is quoted for different points in time.

In some cases – India and Japan, for example – there are significant discrepancies among sources. In several cases data from NUA is relatively old or not available (like in Laos, for example) due to what NUA considers lack of reliable sources.

The table is followed by another short table showing NUA's estimates of worldwide distribution of Internet users as of January, 1999.

Internet users in the Asia/Pacific region				
COUNTRY	DATE	NUMBER	% TOT POP.	SOURCE
Australia	August 1998	4.2 million	23.4	Australian Bureau of Statistics
Australia	June 1998	3.28 million	18	Morgan Research
Australia	September 1997	1.21 million	6.7	IDC
Bangladesh	September 1997	7000	0.005	Nando Techserver
China	December 1998	1.5 million	0.1	Xinhua News Agency
China	July 1998	1,175,000	0.08	Nando Times
China	January 1998	500,000	0.004	Utusan Online
China	June 1997	200,000	0.001	Frost & Sullivan
Hong Kong	April 1998	850,000	13.40	AC Nielsen
Hong Kong	August 1997	500,000	7.90	Survey Research Hong Kong Ltd.
India	November 1998	500,000	.49	IndiaLine
India	November 1997	120,000 - 240,000	0.02	Wired
India	October 1997	68,718	-	Reuters
India	July 1997	80,000	0.01	Reuters
Indonesia	May 1998	80,000	-	Indonesian IT
Indonesia	December 1997	80,000	-	Micronics Internusa
Japan	October 1998	14 million	11.1	Nikkei Market Access Survey
Japan	March 1998	12.1 million	9.6	Nikkei BP
Japan	January 1998	8.84 million	6.40	Access Media International
Japan	September 1997	8.6 million	6.80	Nikkei Market Access
Malaysia	January 1998	600,000	3.0	Jaring Network
Malaysia	October 1997	137,436	.7	IDC

Malaysia	February 1997	30,000	0.15	Telecom Malaysia Berhad
New Zealand	November 1998	561,300	15.8	IDC New Zealand
New Zealand	January 1998	560,000	15.8	AC Nielsen McNair
New Zealand	October 1997	327,290	9.1	IDC New Zealand
Philippines	September 1998	320,000	0.03	Yu Ming Chin Asia Online, Philippines.
Philippines	August 1997	100,000	0.01	Paul Budde Communications
Philippines	August 1997	84,425	-	IDC
Singapore	September 1997	500,000	14.7	Nielsen
South Korea	January 1999	3.1 million	6.7	National Computerisation Agency
South Korea	November 1998	1.8 million	3.9	IDC Asia Pacific
South Korea	February 1997	700,000	1.53	Inet, Inc.
Sri Lanka	September 1998	14,000	-	Reuters
Taiwan	September 1998	2.8 million	12.9	Institute for Information Industry, Taiwan
Taiwan	October 1997	480,012	2.0	IDC Research
Thailand	January 1998	131,000	-	IDC Research
Vietnam	June 1998	6,000	-	Nikkei BP AsiaBiztech
Source: NUA Internet (http://www.nua.com).				

NUA's estimates of worldwide Internet users' distribution January, 1999	
World Total	153.25 million
Africa	1.14 million
Asia/Pacific	26.55 million
Europe	33.39 million
Middle East	0.78 million
Canada & USA	87 million
South America	4.5 million
Source: NUA Internet (http://www.nua.com).	

Introductory note

This questionnaire was submitted to the six ISPs' coordinators in September, 1998. Several of them complained of its complex technical nature. This was intentional, to help the consultant measure the degree of technical sophistication of Internet access services and local expertise available to develop and maintain them. In some cases, respondents just skipped some of the technical details, while in others questionnaires were returned nearly complete.

The questionnaire is preceded by a help document which is quoted in this report since it is useful to understand why some of the more detailed questions have been inserted.

Nearly all of the respondents, as already noted, skipped the request to submit a consultant's questionaire to their own users – which led the consultant to seek other means to obtain evaluation views on their services, since this could be a clear indication this kind of user survey by a foreign consultant might not be desirable or could cause difficulties. Only Cambodia was unable to deliver the questionnaire on time.

Since the questionnaires are large documents in themselves, they are available (for Bangladesh, Laos, Mongolia, Sri Lanka and Vietnam) on diskette upon request.

PAN Evaluation Questionnaire Help

rev. 31.Aug.1998 - c.a.

Part I - Institutional and services profile

Besides the general information on origins, organization, mission statements, etc, one of the main goals of this part is to try to characterize the institutional presence of the services' provider in the Internet industry within their region/country. Even in the USA, several major Internet companies are verticalized - i.e, selling several or all of the typical Internet services, from dial-up access (in some cases even physical cabling is involved) up to transaction[1] services and extranet[2] hosting.

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[1] This involves a broad range of financial and commerce services (from Internet banking to shopping malls, etc).

[2] This is a very recent services trend for ISPs, derived from the significant advance of professional multi-purpose intranet packages (generally called "knowledge management" tools) in which the client side software is just a Web browser - thus enabling the hosting of intranet servers outside of the users' premises. High-end intranet packages

However, the trend is one of specialization, and many Internet companies are finding important market niches in operating specific value added information and/or transaction services which go much beyond the pioneering search engine sites like Yahoo and Alta Vista. These include free Web-based mail hosting, portals (sites which help leading the user to information in other sites), hubs (portals which also host content services), personalized services (hubs which allow the user to configure a "personal homepage" selecting presentation format and her choice of a broad range of information services). They also include hosting of third party services (servers, extranet sites, etc) as well as development of Internet-based corporate solutions, and so on.

Also, Internet services organizations are going deeper into the transactions'services market - which involves a degree of specialized and secure operation usually above most information services.

Due to the increasing sophistication of access services (which raised the minimum investment levels required to provide the quality of service users are expecting today), companies which are specializing in state-of-the-art dial-up access and so-called "sub-PoP" services (leased line connectivity solutions) are now much larger than the initial profile of access providers of just 3-4 years ago. Users now expect full digital operation using advanced communication servers at 56 Kb/s or ISDN, or even xDSL solutions at much lower hourly prices.

Another objective of this part is to learn how the organizations are planning for their future. For the non-profits in particular, it is important to understand how they plan to be self-sufficient and continue to obtain funds for the development of their services/mission.

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involving full document management and collaborative tools are too expensive for most companies, and "renting" access to a secure server running these packages somewhere on the Internet may prove a better economic solution.

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Part II - Connectivity and EDP/LAN[3] infrastructure

This part should be answered only by the organizations which provide some form of access services (dial-up or "sub-PoP" services) - even if these services are limited to a smaller constituency within their universe of clients. Some services which specialize in Web hosting, for instance, sometimes provide a few dial-up lines exclusively for the purpose of allowing remote maintenance of server machines.

The questionnaire goes a bit more technical here than it apparently should. The reason is that access technologies are in a process of rapid change (in some cases forcing ISPs to drop perfectly good equipment in favor of costly hardware upgrades to keep themselves competitive), and the intention is to capture as much as possible the current state of affairs regarding technical advance of the organizations involved in this field.

Focus on the communication servers is important to measure the extent of change to newer DSP (digital signal processing) technologies which are supposed to be cheaper to upgrade - newer digital servers provide better performance and more advanced management and accounting services, and their prices per dial-up or leased line port are dropping substantially. Also, authentication and accounting technologies such as RADIUS, which are embedded in the communication servers, may further facilitate user account management.

Many ISPs obtain an important part of their revenue by reselling bandwidth. This means renting leased line connections to other organizations (usually to connect these organizations' LANs to the Internet), thus subletting their Internet backbone connection and effectively acting as a smaller point of presence (PoP). Since typical use of these links to corporate LANs does not make full effective use of the allocate bandwidth, this reselling may become quite profitable. Many organizations prefer to use this "sub-PoP" service instead of going directly to the backbone[4] provider for several reasons: more personalized service, quicker return for maintenance, and usually a range of value-added services is also incorporated into the service package (domain registration, IP block allocation, LAN and intranet server configuration, training, etc).

Another item is the hardware and operating system environment employed to provide Internet services. Although UNIX is still regarded as the best platform, it might require more advanced human resources than NT for setting up, maintenance and development. Until recently, UNIX

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[3] EDP = Electronic Data Processing . LAN = Local Area Network.

[4] We do not rule out the possibility that the ISP is also the backbone provider. We expect of course the questionnaire to accomodate this situation.

machines were also more expensive than DOS/Windows or even Macintosh platforms. However, the growing presence of truly reliable public domain UNIX servers (FreeBSD and particularly Linux) is spreading this technology at much smaller platform costs and making available more human resources capable of handling it also at lower costs.

Finally, it is also important to obtain information on the state of Internet-related services provided by telcos, long distance carriers, satellite operators, cable TV operators, etc, which directly affect providers of dial-up and leased line services. If possible, please do provide as much qualitative and quantitative information on these services at national and local level as you feel useful for the evaluation.

Part III - Basic Internet services

This includes the typical range of services just above dial-up or PoP access. This is the usual services package available with most ISPs, and as such is supposed to be well-known, so no need to explain much further.

Given the particular conditions of connectivity for the end user in most countries involved in this evaluation, however, it would be interesting to obtain as much information as possible on the effective use of "lower-speed" technologies, such as UUCP and direct terminal dial-up (using telnet services) to obtain and distribute mail and news. Some ISPs operate as hubs of networks of small BBS (bulletin board system) services and this is an efficient way to reach communities deprived of mainstream telephony services. BBSs might use one or more of a range of connectivity solutions to the hub, including long distance dial-up, eventually existing X.25 networks, or even packet radio networks.

It is also important to evaluate the levels of security involved. Some ISPs do not provide any telnet service (for fear of keeping an open door to the hacking world). Many still operate "public" SMTP[5] services, i.e, SMTP servers which allow unauthenticated relaying of messages - thus contributing to perpetuate the spamming plague.

List servers are still a very useful tool allowing conferencing even in precarious connectivity conditions. This service is so important for group discussion that even Web-based conferencing systems (such as WebBoard and others) include mail list service synchronized to the Web conferences. So are the newsgroups (used today by major information companies such as Clarinet and others to distribute newsfeeds).

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[5] Simple Mail Transfer Protocol - the main mail server tool of the Internet. Improper configuration may result in uncontrolled and unidentified mail spewing out of the SMTP server - usually leading to the site being filtered out of the Internet if the spamming persists. The most recent version of *sendmail* (the SMTP service program used in UNIX machines) already incorporates anti-spamming features as default.

Part IV - Value-added Internet services

This part refers more specifically to information, transaction and consulting services mostly based on WWW technology. Several providers might specialize in just one of the services (for example, hosting of Web sites and/or hosting of third-party Web servers). Others might be Internet consultants, or only Web site designers.

Since this part of the questionnaire is mostly descriptive and already includes a basic explanation in the questions themselves, we do not elaborate further.

As a final note, we would like to stress the importante of including as much relevant information as possible. If you feel you need more space, do not hesitate to extend the spaces provided in the tables, and attach further documentation in English or French.

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Part V - Surveying users and partners

This is a free form space to capture your suggestions on how to best approach your users and partners in order to obtain their opinions and suggestions on your services.

PAN ISP Evaluation - ISP Questionnaire

This information survey is part of the PAN ISP Evaluation Project at the request of the International Development Research Centre (IDRC).

The terms of reference of this evaluation include:

- review documents relevant to activities under evaluation;
- examine Web usage statistics;
- develop and submit questionnaires to stakeholders;
- analyse responses;
- prepare an interview guide and carry out project site visits to 3-4 locations;
- prepare a first draft of the report to be presented in November, 1998;
- prepare a final report by December, 1998.

The main objective of this information survey is to obtain data on Internet service providers which have been or are being supported by PAN in Asia in order to attempt an adequate evaluation of the development of these services as compared to their original objectives. In some cases, responses to this questionnaire will just mean an update to reports already submitted to IDRC. Another questionnaire is to be presented to users and other stakeholders which are not directly involved in ISP operations, and at the end of this questionnaire we request your suggestions on how to better reach these stakeholders.

This survey covers technical, administrative, institutional, marketing and other service aspects of the day-to-day operations as well as development perspectives of those providers. This survey, in some cases, will be complemented by in-site visits by the consultant in agreement with the institutions involved.

As part of his contract with IDRC, the consultant will ensure that all information gathered as part of his work in this project is kept confidential. All the information obtained will be made available to IDRC who will decide on its eventual reproduction in close agreement with the institutions involved.

The results of this evaluation are primarily intended to orient IDRC's decision making regarding new undertakings in the field of ICTs (information and communication technologies) in Asia and other regions. However, it is hoped it will also serve as a relevant reference on past work and strategies of the ISPs involved.

The ISP questionnaire

This questionnaire is partly derived from reading of available information at the PAN site and other information made available by IDRC, as well as from the consultant's nearly 15 years experience in planning, developing and operating computer network inititatives (including 10 years involving Internet technology).

This is not a short form, unfortunately. There is plenty of detail involved in order to capture information on the several aspects of history, current operations and development strategies of the organizations involved and try to do a meaningful and useful analysis.

Several of the questions and the very approach to organize them might be open to discussion, and every suggestion is welcome. However, given the tight deadline, the consultant requests that even if the presented form is not the ideal one, an effort is made to answer all applicable questions and make good use of all free form space available for extending comments and information by the deadline.

In the case of free form replies, if reports or any other documentation which has been made available to the consultant already provides a reply, you might refer to that report (please provide detailed reference) instead of repeating its information in the specific question.

An effort has been made to develop a single questionnaire for all ISPs involved. This is complicated, given the diversity of services, approaches and missions. On the other hand, this would provide a uniform framework to organize information obtained from the survey, and it is hoped the respondents will be able to just skip or adapt (by using the free form spaces) the questionnaire's sections to their own situations.

How to reply

Just fill out this document, sent you by e-mail, which is in table format and can be extended easily to accomodate additional free text information when necessary, and return it as an attachment by e-mail to cafonso@ax.apc.org. **The deadline is Sept.15, 1998.**

Structure

The questionnaire is organized in five basic areas, as follows:

–   Institutional / administrative aspects: institutional organization, institutional dependencies, administration, target clientele, R&D strategies, business / self-sufficiency strategies.

–   Connectivity and EDP/LAN infrastructure: involving all technical facilities to enable dial-

up and dedicated access, routing and LAN technology used at the ISP's facilities, in-country backbone services, EDP hardware and operating systems, and so on.

– Basic Internet services: availability and facilites provided for telnet, smtp, uucp, ftp, nntp.

– Value-added services: Web site development, Web site hosting, advanced Web-based services, extranet services, intranet development, other information services.

– Interviewing users and partners: the consultant needs to capture the view from stakeholders other than operators of the ISPs involved. A separate questionnaire is being developed to be submitted to these stakeholders, and the ISPs' input is needed on the most adequate ways to approach these.

Part I - Institutional and services profile

Current legal status	
Official name of the organization:	
Full address of the organization:	
Non-profit private organization __	Government department __
Public educational organization __	Private educational organization __
Private company __	State company __
Other (please describe):	

Original legal status when founded (if it changed at all)	
Non-profit private organization __	Government department __
Public educational organization __	Private educational organization __
Private company __	State company __

Other (please describe):	

Other institutional information

Founding date:	Date in which legal status changed (if applicable):
Date in which it began to offer network services:	Current number of employees:
Current estimate of gross annual revenue (US$):	Current estimate of annual expenditures (US$):

Original mission or line of business of the organization:

Current mission or line of business of the organization (if different from above):

How do you characterize the main nature of your network services?

IAP (Internet Access Provider) __	IISP (Internet Information Services Provider) __	Both __

Main target group or maket niche (please describe):

If non-profit, please describe your strategies for self-sustained operation and development:

Please describe the current situation of market competition in your country regarding your line of activities:

Please describe your activities in research and development, including if applicable the usual percentage of the annual budget allocated to these activities:

Please describe the current situation in your country regarding availability of network infrastructure services as it may affect the development of your mission or business (backbone operators, telephony services, cable TV services, etc):

Network services profile

Typical IAP (Internet Access Provider) services

Dial-up access __	Leased line access __
FTP __	UUCP __

Other IAP services (please describe):

Value-added services

Hosting of Web sites __	Hosting of Web servers __
Web-based information services __	Web site development __
Other value-added services (please describe):	

Dial-up access

Dial-up circuits

Number of dial-up analog lines:	Number of dial-up digital lines:
Number of digital trunks:	Digital trunk standard (E1 or T1):
Initial purchase and installation costs per dial-up line (US$):	Monthly cost per dial-up line (US$):
Monthly cost per digital trunk (US$):	Total of users per dial-up line:
Current weekly average of simultaneous dial-up users online:	Average connect time per user (minutes):

Communication servers in use (please indicate all that apply)

Livingston Portmaster PM-2x Number of servers: Number of ports:	Livingston Portmaster PM-3x Number of servers: Number of E1/T1 trunks:
Ascend Max series Number of servers: Number of E1/T1 trunks:	Cyclades Z/Y series Number of servers/boards: Number of ports:
Cisco access server Number of servers: Number of E1/T1 trunks:	3Com/USR server Number of servers: Number of E1/T1 trunks: Number of ports:

Other communication servers - please describe, quoting make, model, number of ports or number of E1/T1 trunks:			
Dial-up protocol (check all that apply)	terminal __	PPP __	SLIP __
	Other (describe):		
Dial-up authentication	RADIUS __	Other:	

ISDN service

If you provide ISDN service, please describe, including number of ISDN lines, make and model of communications server used, and phone company costs to you:

Packet switching access (X.25)

Total bandwidth of X.25 trunk in Kb/s:	Number of logical X.28 simultaneous channels:
Available dial-up speed (provided by supplier of X.25 service) in Kb/s:	Monthly cost of X.25 trunk (US$):
Dial-up cost per minute of X.25 service (charged by supplier of X.25 service - US$):	

Since costs per volume of traffic depend on distance, please include the costs table provided by your supplier of X.25 service, either as an annex to this questionnaire or in this box:

Please provide a brief description of your contry's packet switching services. Is dial-up access available nationwide? Is it possible to arrange for reverse charges so users are billed only by the Internet services provider (who in its turn receives an itemized bill from the X.25 service operator)? How do you rate the quality and reliability of the X.25 service?

Third-party dial-up service

Do you purchase modem time from other Internet services providers (sometimes provided by some backbone operators)? Please describe:

Do you sell modem time to other Internet information providers? Please describe:

Please attach or insert here a detailed price list of your dial-up access services:

PoP (point of presence) services and connectivity

Backbone links

Main router make and model:

Main link protocol	Direct IP __	ATM __	ISDN __	X.25 __
	Other (describe):			

Main link speed:		Main link cost (US$/month):	

Main link backbone provider:			

Physical line of main link	Fiber __	Radio __	4-wire __
	Other (describe):		

Second link protocol	Direct IP __	ATM __	ISDN __	X.25 __
	Other (describe):			

Second link speed:		Second link cost (US$/month):	

Second link backbone provider:			

Physical line of second link	Fiber __	Radio __	4-wire __
	Other (describe):		

If you use links to more than one backbone, please describe your routing setup, including BGP/AS (autonomous system) configuration if applicable. If you have more than two links, please describe briefly the additional links (protocol, speed, provider):

Dedicated line services ("sub-PoP" services)

Current number of dedicated lines leased to customers:
Typical leased lines' speeds:
Typical IP service leasing rate (US$/month):
Quantity of currently available server ports to install leased lines:
Do you also use radio-modems for sub-PoP services? Yes __ No __

xDSL service

If you are testing, planning to deploy or are already running xDSL access services (such as aDSL or other), please describe:

If you feel important, please provide more details on your sub-PoP services:

Please attach or insert here a detailed price list of your sub-PoP services:

Hardware platforms and operating systems

Internet services platforms

Main machine	SPARC __	Intel __	HP __
	Alpha __	IBM RISC __	Apple __
	Other (describe):		

Main operating system	Solaris __	Linux __	FreeBSD __
	AIX __	HP/UX __	Windows NT __
	Other (describe):		

LAN platforms

LAN server machine	SPARC __	Intel __	HP __
	Alpha __	IBM RISC __	Apple __
	Other (describe):		
LAN server operating system	Solaris __	Linux __	FreeBSD __
	AIX __	HP/UX __	Windows NT __
	Novell __		
LAN workstations' operating system (check all that apply)	Solaris __	Linux __	FreeBSD __
	AIX __	HP/UX __	MS Windows __
	Other (describe):		
LAN transport	10-Base-T __	100-Base-T __	thin coax __
	Other (describe):		
Estimate of LAN size	Number of LAN stations:	Number of LAN servers:	Number of machines providing Internet services:

| Backup / data integrity (check all that apply) | DAT __ | CD-R __ | 8 mm __ |
| | RAID __ | Other (describe): | |

Other information or comments on platforms and operating systems used in your facilities:

E-mail

POP3/SMTP software (please indicate name and current version):

Please describe your SMTP configuration, particularly regarding measures against spamming (such as blocking unauthenticated relay of messages, etc):

If you provide list server services, please indicate name and current version of list server software (such as majordomo and others), as well as the current number of active lists:

Telnet

If you allow telnet to any of your servers, please describe the services provided via telnet (examples are PINE, news readers, lynx, etc):

UUCP

If you provide UUCP services, please describe, including number of individual and institutional UUCP accounts:

Is UUCP still considered an important means of e-mail and news communication among your users? Please elaborate:

FTP

If you mantain a public FTP area, what is it used for? Please describe:

NNTP

Do you maintain a mirror server of newsgroups?   Yes __   No __

If yes, current number of newsgroups available at your NNTP server:

Please describe any other basic Internet service provided by you (excluding HTTP-based services):

If not already included in your IAP services, please attach or insert here the detailed price list of basic Internet services:

Hosting of Web sites

If you sell disk space in your Web server, please indicate the usual method employed by your users to update their homepages (check all that apply):

FTP upload / download __	limited telnet access __	E-mail of files to webmaster __

Other (please describe):

Third-party CGI execution:

Unrestricted CGI programming __	Behind a firewall in a special CGI-hosting machine __	In the Web server but only after verification __

Other (please describe):

Hosting of Web servers

Please describe your policy regarding hosting of third-party machines at your site:

DNS registration

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If your TLD (top level domain) administrator allows the provision of DNS services by network providers, please describe your policy regarding DNS registration for your users:

Web-based information and interactive services

Please describe additional services such as newsfeeds, interactive services (conferencing, bulletin boards, web-mail, chats, etc), multimedia services and so on - if applicable, please also identify the services which are available privately to registered users or to the general public:

If you maintain your own local content creation/development team, please describe its goals and the types of information services generated:

Please describe your efforts (and results) in making available Web information services in local language(s), if applicable:

Web-based services consultancy and development

If applicable, please describe the range of consultancy, programming and design services provided. Please include a description of tools commonly used (Web site design tools - Cold Fusion and such -, backend database servers, CGI technology, etc). This should include all intranet / extranet / WWW development services offered by your organization:

Further information on Web-based services

Please attach or insert a detailed price list of your value-added services, including advertising (banners, etc) if applicable:

This is a free-form space to capture your suggestions on how to better approach your users and partners to evaluate their opinion and suggestions on the services you provide. The best way from the consultant's point of view would be for each ISP to choose their own method of submitting the questionnaire to their users and partners, making sure their responses reach the consultant by e-mail no later than Sept.30, 1998. The users/partners questionnaire will be adapted as a result of your responses to this questionnaire, so please make sure your responses reach the consultant by September 15, 1998:

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Studies

1964-1969: naval engineering, Escola Politécnica, University of São Paulo, Brazil.

1974-1976: Master in Economics, York University, Toronto, Canada.

1976-1979: doctoral studies in Social and Political Thought, York University, Toronto, Canada.

Activities

1970-1973: industrial projects consultant, Oficina de Planificación Nacional de la Presidencia de la República (ODEPLAN), Santiago, Chile.

1974-1980: co-director, Brazilian Studies/Latin American Research Unit (LARU), Toronto, Canada.

1976-1980: development projects consultant, Division of World Outreach, United Church of Canada, Toronto, Canada.

1981: co-founder, Instituto Brasileiro de Análises Sociais e Econômicas, Ibase, Rio de Janeiro, Brazil.

1981-1997: co-director, Ibase. during this period, conceived and implemented the AlterNex project, the first computer-based communications and information system in Latin America dedicated to serve civil society organizations. Officially inaugurated in July, 1989, it was also the first Internet services provider in Brazil.

1990: co-founder of the Association for Progressive Communications (APC), as Ibase's representative. APC is an international consortium of organizations which share similar objectives in democratizing communications and information through computer networks worldwide. APC has recently joined the UN's Economic and Social Council (Ecosoc).

1991-...: member, AGIS (Agenda 21 Information Support System).

1991-1992: proposed and coordinated the "UNCED Information Strategy Project in Rio" (UNCED ISP/Rio), first Internet project specifically developed for a UN conference. ISP/Rio's aims were to provide communications and information through the Internet so that organizations which had not been able to come to Rio were able to follow up on the events via the network. The project operated successful Internet telecenters in all main conference spaces.

1995-1997: member of Internet Brazil's Steering Committee.

1996-1997: executive director, Altercom Serviços Ltda, an Ibase company created to operate and develop AlterNex.

1997-1998: chair of the Executive Board, Association for Progressive Communications (APC).

1997-...: non-paid consultant, Informatics 2000 Program, Interamerican Development Bank (IADB).

1998 (March): consultant, United Nations Development Program (UNDP), Argentina – project to develop an Internet-based NGO network including organizations affiliated to the UN.

1997-1998: coordinator of the project to adapt and translate a large Intranet software system (Livelink Intranet from Open Text Corporation) to Portuguese and Spanish.

1998 (October-November): consultant, International Development Research Center (IDRC), Canada – assessment of PAN Asia ISPs.

1998-...: development director, Information Network for the Third Sector (Rits), Rio de Janeiro, Brazil.

Publications

Multinationals and Brazil (Toronto: Brazilian Studies/LARU, 1975), co-author, with Marcos Arruda e Herbert de Souza.

State and Capitalist Development in Brazil – The Fiscal Crisis (Rio: Editora Paz e Terra, 1977), co-author, with Herbert de Souza. Also published in Spanish by UILA, Mexico, 1977.

Theory of the State – A Critical Contribution (Rio: Editora Vozes, 1988).

"NGO Networking - The Telematic Way", **Development**, journal of the Society for International Development (SID, Roma), 1990:2.

"Telematics and the NGOs - The Moment of Networking", **Reflexion**, journal of El Taller (Reus, Spain), 1991.

"The Internet and the Community in Brazil: Background, Issues and Options", **IEEE Communications Magazine**, July, 1996.

"Au service de l'action politique", **Manière de Voir**, Le Monde Diplomatique, October, 1996.

The Internet and Social Strategies, Corporate Watch Project, San Francisco, California, November, 1996 (*http://www.corpwatch.org/trac/feature/feature1/Afonso.html*).

A Report on the Development of Internet Services in Brazil, prepared for IDRC, December, 1996.

"How about a Latin American accent for the Net? ", **O Globo**, Rio de Janeiro, February 9, 1998.

How the NGOs, with help from the Internet, blocked the MAI, Canal Web, May, 1998 (*http://www.canalweb.com.br*).

Speeches, awards, etc

Namur Award, International Federation of Information Processing (IFIP), Namur, Belgium, January, 1996.

Communications for Development: Applying Information and Communication Technologies to Development Needs – speakers, symposium promoted by Friedrich Ebert Foundation (FES) and IDRC, October, 1996.

Global Knowledge '97 – representing APC. Promoted by the World Bank and other agencies, Toronto, June, 1997.

Informatics 2000 Conference – speaker. Interamerican Development Bank (IADB), Washington, DC, September, 1997.

50th Annual DPI/NGO Conference: Building Partnerships – speaker, United Nations Department of Public Information, New York, September, 1997.

Salzburg Seminar – faculty member, session 351, "Non-Governmental Organizations: Leadership and Civil Society", Salzburg, Austria, November, 1997.

PAN Americas Consultation – speaker, IDRC, Montevideo, Uruguay, December, 1997.

University and New Technologies: Impacts and Applications – speaker on the theme

"Citizenship and Networking ", promoted by the Alfa Project of the European Community, São Paulo, Brazil, March, 1998.

Second Summit of the Americas – speaker, " Informatics and Civil Society", Informatics 2000 Exhibition promoted by the IADB, Santiago, Chile, April, 1998.

CONIP '98 – speaker, "Internet and Civil Society ", Annual Congress on Public Informatics, São Paulo, Brazil, May, 1998.

Salzburg Seminar – faculty member, session 358, "Internet and Social Issues", Salzburg, Austria, June, 1998.

Human Rights and the Internet – speaker, Canadian Centre for Foreign Policy Development, Montréal, Canada, September, 1998.