Impact of ICTs in Rural Areas (India) Phase II – Information Village Research Project

supported by

International Development Research Centre (IDRC), Canada

Canadian International Development Agency (CIDA), Canada

Terminal Report [2000-2004]

Articles from MSSRF [Annexure 42]

implemented by

M S Swaminathan Research Foundation

ICTs and Poverty Alleviation

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The role information and communication technologies (ICTs) can play in poverty alleviation is discussed based largely on what has happened in the past six years in a cluster of ten villages in Pondicherry in southern India through the intervention of M S Swaminathan Research Foundation. If intelligently used ICTs can make a difference to the lives of the people. The paper concludes with a set of recommendations and action points for governments in developing countries, donor agencies and non-governmental organizations involved in implementing micro level poverty alleviation programmes.

ICT and development

In recent years information and communication technologies (ICTs) have been deployed in numerous initiatives in rural communities in developing countries. Many world leaders, including UN Secretary General Mr Kofi Annan, have spoken about the tremendous potential of these new technologies to transform the lives of the poor. "Groups as diverse as the United Nations, the G8 nations, Foundations, national, state and local governments, and private companies have seized upon the hope that the use of ICTs could enable even the poorest of developing nations to 'leapfrog' traditional problems of development like poverty, illiteracy, disease, unemployment, hunger, corruption, social inequalities so as to move rapidly into the modern Information Age," says Kenneth Keniston,[1] Director of the MIT-India programme. Mark Malloch Brown,[2] Administrator of UNDP, is convinced that "ICT can help us reach the targets established by world leaders at the Millennium Summit, including the goal of halving poverty by 2015." Are these hopes over optimistic and have such comments led to high expectations?

As recently as 2001, there was considerable skepticism about the advisability of investing on ICTs among international donor agencies. As pointed out by Brown,[2] "in both developed and developing countries there is still considerable skepticism as to whether providing access to information and communication technology can play a significant role in reducing poverty." Alfonso Gumucio Dagron,[3] development communication specialist *extraordinaire*, says, "There are too many examples of (ICT) projects that are only bombarding the Third World with computers, in the most irresponsible manner and for the benefit only of hardware and software companies." Among the hundreds of projects he examined Alfonso Gumucio found only a handful of "experiences of use of new information and communication technologies

that are paradigmatic in the way they contribute to development." With such a poor record one cannot really blame the skeptics. As Kofi Annan has noted "the gap between information 'haves' and 'have-nots' is widening, and there is a real danger that the world's poor will be excluded from the emerging knowledge-based global economy."[4]

Unfortunately, there is so much hype about so little achieved. The number of conferences on ICTs for development is increasing out of proportion to what is actually being done in the field. If the energies and funds invested on these conferences were directed at real grassroots level work we would have had many more examples of successful projects and happier communities.

What is poverty and what can ICTs do to help the poor?

According to the World Bank,[5] 2.8 billion people live on less than US$2 per day, and 1.2 billion or one-fifth of the world's population live on less than US$1 per day. Although international development agencies would like to halve the population of the ultra-poor by 2015, the situation seems to be worsening. "Not only has absolute poverty and life-expectancy worsened in a disturbingly large number of countries, but by almost all measures, inequality has worsened, both within and between countries," says Prof. Raphie Kaplinsky[6] of the Institute of Development Studies at the University of Sussex.

Poverty is much more than the mere absence of money. Often generations in poverty lead people to a sense of utter hopelessness and rob them of their sense of self-respect and dignity. They find themselves in a *cul de sac*, not knowing how to get out of the poverty trap. They are deprived of access to essential assets and opportunities such as education, healthcare, employment, land and other natural resources, services, infrastructure, and credit. They have very little say in their polity and society. They are not empowered to participate in making the decisions that shape their lives. They become increasingly marginalized, excluded and vulnerable to exploitation. This exploitation manifests in several forms such as bonded labour, child labour, inadequate compensation for work if and when they get work, ill treatment and deprivation of basic rights. It will be naïve to believe that we can solve the problem of poverty by providing access to computers and telecommunication to the poor of the world.

Let us look at one research project (at the micro level) that has successfully used ICTs in rural development and the lessons learnt.

Anatomy of success: The Information Village Research Project

What makes a project successful? Are there well-defined prescriptions for success? While it is difficult to define a fixed set of criteria for success in ICT-enabled development projects in different parts of the

world, it is clear that emphasizing technology cannot bring in success. Rather development projects should be people centred. The Information Village Research Project of M S Swaminathan Research Foundation (MSSRF) has attracted the attention of the world and has won the Stockholm Challenge Award and the Motorola Dispatch Solution Gold Award. It has been widely written about in international media.[7,8] It is basically a people project, where it is important for the project implementers to get to know the local people, their context, and their needs (and wants) before they can make any meaningful intervention with or without the use of technology.

It is an experiment in electronic knowledge delivery to the poor. MSSRF has set up knowledge centres in 10 villages near Pondicherry in southern India and connected them in a hub-and spokes configuration by a hybrid wired and wireless network – consisting of PCs, telephones, VHF duplex radio devices, spread spectrum and e-mail connectivity through dial-up telephone lines or VSAT – that facilitates both voice and data transfer, which enable the villagers to get the information they need to improve their lives. We use wireless links to connect villages without telephones. We use solar energy to run our computers so we can provide our services even during power failures, which are frequent in these villages. The hub located at Villianur, a small town 13 km west of Pondicherry, serves as the value addition centre. All the knowledge centres are open to everyone, irrespective of age, sex, religion, caste, and level of literacy and education. No one is excluded. The centres provide information on such aspects as crops, farm practices, animal husbandry, market prices, education, health, employment opportunities, government entitlements, weather, fishing conditions, bus timings, micro-enterprises, and rural yellow pages. About 50,000 people living in these villages benefit from this programme.

The project, supported by International Development Research Centre and Canadian International Development Agency, draws its sustenance from Gandhi's concept of Anthyodaya (unto the last). The project is conceived in a holistic manner and emphasizes an integrated pro-poor, pro-women and pro-Nature approach to development. Because it would be impossible to provide the same level of access to ICT tools to all the people in the world as is currently the norm in the affluent countries, we thought of a more practical model: community ownership of technological tools, community-based access, and resource sharing. The community provides quality space and electricity and nominates volunteers, and MSSRF provides the technology, training and managerial help. We use the local language, i.e. Tamil, and multimedia (to facilitate use by illiterate users) and encourage collective action. We do not use technologies simply because they are there; we use them only when there are specific needs that they can address. We also use blackboards, billboards, public address systems and a twice-monthly community newspaper to reach out to a broad spectrum of people. One of the strengths of the project is the judicious blending of traditional and modern technologies.

The bottom-up exercise begins with local volunteers polling the community to find out what they want and what they already have. The initial survey of several thousand households in the region revealed

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that there were very few public access telephones, reading rooms or libraries and post offices. We trained local volunteers to collect information from different sources, such as the nearby Meteorological office, markets, government departments, primary health centers, educational institutions, and traders selling seeds, fertilizers, and pesticides. We now have about 100 databases, which are updated frequently. The information is fed into an intranet-type network, and access to the information is provided through nodes in different villages. Each centre is manned by at least two volunteers at any given time.

The project also looks for useful information from elsewhere. For example, twice a day volunteers at the Villianur hub download forecasts on wave heights in the Pondicherry coast from a US Navy website <https://www.navo.navy.mil/LIBRARY/Metoc/Indian+Ocean/Bay+of+Bengal/MODELS/SWAPS/Sig+Wav+ Ht+and+Dir+Series/index.html>. The volunteers interpret the information, prepare a written statement and a sound byte, and transmit them along with the satellite image to the knowledge centres in coastal villages through the network. The volunteers in the coastal villages post the printout of the satellite image and the forecast statement on the centres' bulletin boards and broadcast the sound byte through a public address systems several times a day for the benefit of fishing families. The loud speakers are located in such a way that everyone in the village is within hearing range. Not only the fishermen hear the announcements, but also their families. On days when the men folk are advised not to venture into the sea, the women also hear the announcements and are in a position to tell their husbands not to go out and while away the time but to stay home and do some household chores! Ever since the knowledge centres started making these announcements, there has not been a single death in mid sea nor any loss of boats or nets due to foul weather. People of Veerampattinam, one of the coastal villages, consider this to be the greatest benefit they have received from the knowledge centre.

The knowledge centres serve the needs of the people in times of emergency. Once a villager came to one of the knowledge centers with a request for identifying donors of a rare type of blood for a critically ill patient. A message was sent out over the network immediately and volunteers at the different knowledge centres alerted the local communities. A number of people came forward to donate blood. On another occasion a cow was in labour for several days but was unable to deliver the calf. The owner of the cow was worried that the cow, her only asset, might die. A message was sent to the nearest knowledge centre, and the volunteer there contacted several veterinarians in the region and one of them came to the village and delivered the calf and saved the cow.[7]

Value addition to the raw information, use of the local language and multimedia (to facilitate illiterate users), and the participation by local people right from the beginning are some of the noteworthy features of the project.

About 300 users walk into these centres on an average day. They get answers to their queries, use computers (for typing documents, filling in forms, playing games, learning from CD-ROM educational material, etc.), read newspapers, and make telephone calls. The work of the centres is monitored through monthly participatory appraisal meetings in which MSSRF staff, knowledge centre volunteers and community representatives take part. All centres maintain user registers.

The centres have been running for more than six years, and as we go along we open new centres and add new databases and extend the range of our services.

Lessons Learnt

Of course, it is easy to list both the achievements and lessons learnt from hindsight. These were not so obvious in the early days of the project when we were trying to understand the basics of transforming the lives of the rural poor through the use of information and information technology. It was like any research project. When we start work on a difficult problem, we hardly know much and we tend to grope in the dark and try different leads, but as we progress many things become clear. The important lessons that we have learnt are listed in no particular order.

We owe our success to our clear **vision.** Prof. M S Swaminathan asked "If ICTs can benefit the advanced countries and the rich everywhere, why can't we press them into service to help the poor?" He did it at a time when there was considerable skepticism among donor agencies on investing in ICTs. He believed that we could use ICTs as a crosscutting theme in other sectors like agriculture, health and education and the results proved us right.

The project was **bottom up** and **participatory** right from Day One. In most villages the demand came from the people. The relation between MSSRF and the village community is one of partnership in progress, and not donor and recipient. The entire village community – a wide cross-section of men and women, landed gentry and the landless, educated and the illiterate – was consulted and involved. We adopted a policy of '**inclusiveness.**' Appreciating this aspect of our programme, Prof. Bruce Alberts,[9] President of the National Academy of Sciences, USA, says: "My experience in India has made it clear to me that our nation would be much more successful in such endeavors if we were humble enough to incorporate the potential beneficiaries of a service into its initial planning."

What is more, we built in **gender concerns** right from the beginning. Early on in the project, a gender specialist was invited to conduct a workshop for the women in the villages. The village volunteers do much of the work, and more than half of the operators and volunteers providing primary information are women. This has positively reflected in the increase in the number of women users. Handling of PC and

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answering men's questions give women new confidence and status in the community. Some knowledge centres (KCs) provide counselling to women. As mere information or knowledge cannot lead to development, the centres provide assistance to the community in seeking employment, setting up self-help groups and micro-enterprises, and getting micro-credit. Many women have formed Self Help Groups (SHGs) paying monthly subscriptions. They borrow money from the SHGs, especially for education of children and starting cottage industries. The interest on the money borrowed accrues to the SHGs. The KCs help women get training related to economic opportunities such as incense stick manufacturing, pickle making, phenyl and soap oil production and making ornamental artifacts from seashells.

In the beginning we were not sure how long would the village volunteers, many of whom had finished only middle school education, take to learn to use computers and to operate the associated communication devices. We were surprised at the speed with which they learnt. Many of them are fluent in typing text in Tamil, which has more than 240 characters, using the standard QWERTY English keyboard with 26 characters. As Swaminathan often says they took to new technology as fish to water. Now these volunteers are training others in the villages to learn to use computers.

Another lesson that we learnt was that the **content should be relevant to the local needs**. While interest in ICT-enabled development is mushrooming and thousands of telecentres have been planted during the past six years and millions of dollars have been invested in buying computers and ensuring Internet connectivity, there are only a few projects that are really useful for the local community where they have been set up, in terms of supporting development and social change. "A good example of telecenters that really care about providing appropriate information to their constituency is the network known as Village Knowledge Centres, set up by the Swaminathan Research Foundation. **The concept is articulated around community needs, not the opposite**," says Alfonso Gumucio.[10] The Village Knowledge Centers in Pondicherry are such an important and coherent experience, largely because of the development of local databases and local web pages that are relevant to the people and that take into account their daily needs, their culture and their language. If this is not embedded into a project, it cannot have any positive results for the community. "While most telecenters that have failed to deliver are like Cadillacs in rural areas, the Swaminathan 'knowledge centres' are like barefoot doctors and the Green Revolution, both of which have delivered and are appropriate to their contexts," says Alfonso Gumucio. In developing local content we do consult experts in agricultural universities, premier hospitals, government departments, etc.

It is important to **use the right technology** to achieve specific goals. We use a mix of technologies and the mix has to be smart enough to meet our objectives. We also need to train the local volunteers in their use. Thus we manage social mobilization on the one hand and technology

management on the other, and bring these two together to reap maximum synergy. We have an open mind on technology. In the beginning we started with somewhat high-end technologies such as interconnected computers and communication technologies, but we found that even traditional technologies have an important role to play. For example, the information on wave height we download every day from a US Navy web site reaches the fishermen through a public-address system. We also use blackboards and billboards at our centers to display the latest news and announcements. Simply because something is old it does not lose its value. And the latest and most advanced technology may not be relevant to local needs. Although it is possible to access Internet from five of our knowledge centers, the local communities do not use the facility very often, as it does not provide answers to many of their questions. Indeed they use Internet only for limited purposes, especially for accessing examination results, employment news and information from Central government departments. Answers to most questions are provided from information collected by our staff and the team of volunteers from mostly local sources. The community newspaper (Our Village News) we publish twice a month is read avidly by many. We now print 7,500 copies of this free newspaper and distribute it in over thirty villages. The impact of this newspaper has exceeded our expectations. People from neighbouring villages have started coming to the centres and want to use the services provided, especially advertising their products and services. The newspaper has made our knowledge centres better known in the entire Union Territory of Pondicherry. Within two days of release of the first issue in February 2002, more than 60 people contacted the knowledge centres. Many villagers find our newspaper refreshingly different from the commercial newspapers and magazines that devote considerable space to news about crime and violence, politics, and international affairs.

The project to be successful has to be **integrative**. Merely providing information using tools of ICTs is not enough. It has to be accompanied by other activities that will ensure the creation of livelihood opportunities and greater income levels for the community. After all information is only one element in the development process. To get optimal results and reap the benefit of synergy we need to integrate it with other key factors. The trick is to figure out how best to use ICTs to leverage efforts in each aspect of poverty alleviation – improving healthcare delivery, agriculture and animal husbandry, capacity building, creation of livelihood opportunities, organizing micro-credit and micro-enterprises, and ensuring that people get their entitlements.

Managing ICT for D programmes

The project calls for considerable managerial skills. On the one hand we have to mobilize the entire population of the many villages we work in and get accepted by them. That is quite a task. We need to liaise with government officials, local institutions, traders, and a number of others. We need to form self-help groups, help in setting up micro-enterprises, arrange micro-credit, and help market the

products coming out of micro-enterprises. We must build partnerships with other institutions such as government offices, hospitals, agricultural universities, research centres and field stations, markets, etc. to have a constant flow of relevant information. Above all, we must work out a smooth withdrawal strategy, ensuring that the knowledge centers, self-help groups, micro-enterprises, etc. will continue to function and with greater efficiency, after we withdraw.

Widespread access to information can lead to changes in social equations. For example, many villagers are now aware of government entitlements and they go and ask for them. The officials are now receiving more inquiries and more claims than ever before. In another example, landlords who pay part of the wages to their landless laborers in kind can no longer give lower quantities of whatever they are giving in kind, as the prices are known to everybody. The officials who are bombarded with queries and the landlords may not like what is happening. There have, in fact, been occasions when certain landlords have brought in labour from outside the village when the local labour demanded the right quantity of rice given as wages in kind. Situations like this require considerable tact and persuasive skills to sort out. In the early phase of the project, three knowledge centres set up at private residences had to be closed, as the services did not reach all sections of the people in the village and were monopolized by the relatives and friends of the residents.

Often people ask about 'enabling conditions' or 'environment' that can facilitate development projects achieve their goals. Development agencies should work to create the enabling environment. As our early surveys revealed, most people in the villages we work with were poor and there were hardly any telephone or reading room. We worked towards **community ownership** of technologies and the knowledge centers, facilitated the creation of social structures such as self-help groups and helped them obtain the much-needed finance. If the conditions are favourable, then where is the challenge for the development agency?

Sharing Experience

Donor agencies are keen that lessons learnt and experiences gained in such projects should be disseminated widely and replicated in different parts of the developing world. We are fully aware of this need. Indeed, in October 2002 we conducted a South-South Exchange Traveling Workshop with the specific purpose of sharing the knowledge and experience of different development projects.[11] We invited 21 participants from 11 countries for this pioneering event and all of us spent seven days together, two at MSSRF headquarters in Chennai and the rest of the days in our project villages. Participants met and spoke to the village communities, volunteers and field staff of MSSRF in a dozen villages and exchanged notes. The discussions that took place were lively and animated. Such face-to-face meetings and hands-on demonstrations by local people were found to be extremely useful by all participants as well as by the

village communities. Financial support for this workshop came from Hivos, IICD and IDRC. These organizations also selected the participants from among their partner organizations. The second South-South Exchange workshop was held during 30 October – 6 November 2003. Nineteen participants from 12 countries took part with financial support from Global Knowledge Partnership. We have received requests for the third such workshop to be held in 2004.

In March 2002 we joined hands with OneWorld International in an experiment on creating an Open Knowledge Network (OKN),[12] in which we tested the possibility of connecting many villages in different continents using WorldSpace radio and exchanging information – both uploading information from each centre to one of the WorldSpace satellites and downloading the information on to a WorldSpace radio and jacking it up to a PC where using XML filters one can download the information relevant to a particular village or community. Subsequently OneWorld has carried out a similar pilot experiment in Africa and the next step is to link villages in the two continents. The OKN was officially launched by Prof. Swaminathan during the World Summit on the Information Society held at Geneva in December 2003.

A large number of researchers, students, experts from international agencies, and journalists have visited our knowledge centres and written about our work. And we have been invited to talk about our work at many national and international conferences and workshops.

Prof. Alberts, who has visited our project villages three times, sees in this experiment the seeds of a virtual university. He sees the knowledge centres as a bridge between scientists and the rural communities. Not only can the rural people forward their questions to the experts but also their insights that could be useful to the scientists in formulating their own research. In 2003, MSSRF set up the National Virtual Academy for Food Security and Rural Prosperity (NVA) and initially we will be working in about a hundred villages in three districts of Tamil Nadu, viz. Thanjavur, Pudukkottai and Dindigul. The knowledge centres in these villages will facilitate two-way communication between the local communities and experts. For this purpose MSSRF has entered into partnership with a variety of institutions ranging from Central Government Departments (such as Space and Meteorology), universities (Tamil Nadu Agricultural University), research laboratories, field stations, veterinary colleges, and non-governmental organizations.

Now we are invited to set up similar programmes in Andhra Pradesh, the remote hilly tracks of Ladhak, the North-eastern states, Orissa, one of India's poorest states, and Rajasthan. In October 2003, we held a two-day Policy makers Workshop. About 70 participants drawn from Government, NGOs, academia, and corporate sector took part and came up with some very useful recommendations. Plans are afoot to

extend the Pondicherry experiment to the more than 600,000 villages in India in collaboration with open universities and NGOs.

Need for caution

Surely there are other projects that accomplished excellent results, but certainly not many. Also one has to be cautious as often rigour is lacking in evaluating such programmes. Recently the *Christian Science Monitor* reported that Little Information Communities (LINCOS), a project intended to help the poor in Costa Rica, ended up helping the well to do.[13] Says LINCOS business director Marvin Cabezas: "LINCOS's main contribution to the region has turned out to be commercialization of products, encouraging people to sell directly outside the country and to take risks." LINCOS has now revised its strategy; from now on they will aim to help local business people![14] Says Richard Heeks[15]: "At present ICTs are reinforcing more than attacking inequality: men are benefiting more than women and the rich are benefiting more than the poor. The challenge is to create conditions for reversing the polarities; but that is a challenge for social movements more than computers." Institutional documents and "success" reports often are at variance with reality. Says Alfonso Gumucio[16]: "One thing is what is written in project reports, and another thing is what is really happening at the community level. Definitely, the tool is still to be shaped. Let's not forget that most of the ICT experiences at the grassroots level are only 4 or 5 years old. It is too soon to claim victory and too soon to discard them, but not too soon to question them and to make sure that they will be sustainable and for the benefit of communities after the external assistance withdraws. Communities should adapt technology to their needs and to their culture, not the opposite. As of today, the ICTs in our Third World countries are only 'experiments with a potential'." This is not the first time we are confronted with the idea that technology is the panacea for development. The previous wave of 'diffusion of technology', which was supposed to help the underdeveloped countries magically join the industrialized world through the use of modern technology graciously provided by the international cooperation agencies, failed miserably.

In his Presidential address to the Fellows of the US National Academy of Sciences, Bruce Alberts[9] told, "I learned to my surprise that most of the international organizations established by the United Nations with the great hope of using science and technology to improve the human condition are seriously hampered by bureaucracy and a lack of energy, innovation, and resources."

Realising that throughout history technology, left to itself, has invariably exacerbated the rich-poor divide and recent attempts to press ICTs in service of poverty alleviation have not been all that successful, we should try to identify appropriate ways of applying ICTs at the micro, macro and intermediate levels and create the enabling environment that would guarantee the appropriation of these technologies and the programmes by the poor themselves. These include community ownership of technology, promotion of

the concept of public commons and the use of open source software. As information by itself cannot be the magical cure for poverty, we should embed ICTs within integrated development strategies for combating poverty so that both achieve their optimal effect, and avoid the mistake of putting the technology cart ahead of the need-based development horse. Donor agencies should not judge the sustainability of ICT-enabled development projects merely in financial terms but by social benefits. If financial viability is the main criterion of success, most projects will turn their attention to making money and abandon their social goals. Also, stand-alone projects can hardly make any impact. Instead donor agencies should facilitate creation of sector-wide capacities and implement large-scale programmes. The potential supportive role of ICTs (and their limitations) should be incorporated in the Poverty Reduction Strategy Papers (PRSP).[17] It would help if donor agencies work in unison, and therefore formation of groups like Utstein[18] should be encouraged. Recognising that many multilateral agencies have been ineffective and far from being cost effective, priority should be accorded to make them efficient and to bring down their transaction costs. After all, funds earmarked for poverty alleviation and development should enrich programmes at grassroots levels and not go to meet the excessive pay and perks of officials and experts. Donor governments should be persuaded to raise their quantum of aid to developing countries, adopt pro-poor trade policies and refrain from exchanging the aid money for arms and ammunitions.

Recommendations

- We must realize that ICTs are a necessary but insufficient condition for development, and that they must be used as part of integrated development. National ICT strategies must be subordinate to poverty alleviation strategies.
- As left to themselves ICTs will only exacerbate the rich-poor divide, efforts should be made to create an enabling environment that would help the poor take advantage. If we address the problems of the poorest, the problems of the rest will be taken care of automatically.
- Recent experience, limited though it is, has shown that we should create the enabling environment for ICTs to deliver optimal results and to facilitate increased information and communication flows. ICTs mean much more than computers and the Internet, and many technologies, both traditional and modern, can play a role in appropriate situations.
- To the extent that the knowledge gap is an important determinant of persistent poverty, we should encourage greater communication and information flows both within and between countries. To the extent that information is critical to development we should use ICTs in the best possible way to share information and achieve this greater interaction.
- We should be clear on the development and information delivery strategies before deciding on the technology. We should not make the mistake of putting technology ahead of the community needs, and resist the considerable pressures from corporations and their countries' governments to push their technologies.

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- Donor agencies should shift the focus from bridging the digital divide to poverty alleviation. Indeed the digital divide is a reflection of broader socioeconomic inequalities, and a symptom of much more profound social and economic divides.

- Donor agencies should work in unison to maximize the return on their investments, avoiding duplication of effort and supporting larger programs nationwide (or even worldwide).

- We should learn to discriminate between genuinely good programs and mere hype. We must learn from successful projects and try to replicate the factors that led to their success. We must encourage bottom-up and demand-driven programs, and the involvement of local communities from the outset.

- The investment of government and corporate money into computers and technology infrastructure has not been matched by a commensurate investment in the creation of relevant and engaging content or appropriate human resources. Not much has been done to show the rural poor how ICTs could be of value in their lives. Such imbalances should be redressed.

Action

Donor Agencies

1. Encourage a favourable environment for ICT-supported programmes in partner countries
   – including freedom of expression, transparency, accountability, community ownership of technology, the public commons, and open source software.
2. Examine ongoing programs – focusing on the significance of actual experiences, and
   identify good practices and success factors.
3. Encourage mutual learning by supporting, for example, South-South Exchange workshops, and building partnerships and networks (e.g. IDRC's PAN Asia network).
4. Encourage the evolution of homegrown models and avoid the tendency to transplant western models based on an oversimplification of reality.
5. Evolve systems for evaluating and monitoring ICT-enabled development programmes and avoid heaping praise and awards on programmes too early. Involve people from developing countries in advisory bodies (as IICD has done).
6. Earmark a portion of donor funds for capacity building of project/ programme implementers.

Governments in Developing Countries

1. Facilitate participatory democracy, starting from the grassroots, and tilt policies in favour of cooperation and complementarity between different segments of society rather than competition.
2. Encourage transparency in government and pro-poor policies, create social opportunities, and ensure fulfillment of basic entitlements to the poor.

3. Liberalize communication policies that create space for community radio (and television) broadcasting.

4. Facilitate the spreading of ICTs, especially computer literacy, low-cost telephony and high bandwidth Internet, if necessary through subsidy for users in rural and remote areas.

5. Facilitate the integration of ICTs in all development projects, e.g., by supporting the formation of self-help groups, micro-credit and micro-enterprises, capacity building, e-governance, etc.

6. While negotiating with international (bilateral and multilateral) donor agencies, include ICTs as a key component of the Poverty Reduction Strategy Papers.

7. Encourage the corporate sector to take an active part in ICT-enabled development. ITC's e-*chaupals* in India have made a mark in a short time. The Tata group's literacy initiative is another example of corporate involvement.

NGOs

1. Choose projects with care, based on a correct appraisal of the needs of the constituency and the organization's skill base. Have a clear vision of the objectives and the roadmap. Involve the community right from the beginning and ensure community ownership and participation. Considerable handholding is necessary in the early stages.

2. Choose the right funding agency (one whose mandate matches your project objectives). And if you need to work with other NGOs/ Civil Society Organizations, choose the partners carefully paying attention to their programmes and areas of strength.

3. Be ready to learn from others' experiences and to share your own with others. Keep abreast of developments related to your projects. Be ready to work (whenever needed) with the government, other institutions and individuals.

Acknowledgement

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68th IFLA Council and General Conference
August 18-24, 2002

GLASGOW 2°°2

Reaching the unreached: How can we use ICTs to empower the rural poor in the developing world through enhanced access to relevant information?

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Abstract:
Often funding agencies and donor governments face the question should they support ICT activities in their development projects. Should the money be invested in computers and communication devices or will it be better spent on food, shelter, health, and education? The choice need not be 'either or'. If used intelligently and innovatively, ICTs can form an integral component of development projects, as is shown by the award-winning Information Village project of M S Swaminathan Research Foundation. The important point to remember is that one does not have to use technology because it is there, but one uses it if there is a genuine advantage. In any development programme, people and their contexts should decide how one goes about implementing development interventions. The needs of the people and the best means to satisfy them should determine the whole programme. Often ICT-based development projects do not bring in the expected results because of undue emphasis placed on technology. Against this background, the factors that led to the success of the Pondicherry experience are analysed.

Some people from the community in Pondicherry MSSRF works with

Introduction

The widespread availability and convergence of information and communication technologies - computers, digital networks, telecommunication, television, etc. - have led to unprecedented capacity for dissemination of knowledge and information. The impact of this fourth information revolution is felt in education, research, medicine, government, business and entertainment in many parts of the world. But as Anton Mangstl[1] points out, the benefits have reached only about 5% of the world's population. The new ICTs have in fact led to a digital divide not only between rich and poor nations but also within nations. Even in affluent United States of America, as Rev. Jesse Jackson has pointed out ICTs have not only widened the digital divide but also deepened the racial ravine, and the relative disadvantage suffered by inner city populations (mostly Blacks and Hispanics) is continually on the rise. History has shown that technology by itself is a great divider. It exacerbates the inequalities in society. Is there then no way for the poor and the downtrodden to benefit from ICTs?

"Groups as diverse as the United nations, the G8 nations, Foundations, national, state and local governments, and private companies have seized upon the hope that the use of ICTs could enable even the poorest of developing nations to 'leapfrog' traditional problems of development like poverty, illiteracy, disease, unemployment, hunger, corruption, social inequalities so as to move rapidly into the modern Information Age," says Kenneth Keniston,[2] Director of the MIT-India programme. Mark Malloch Brown,[3] Administrator of UNDP, is convinced that "ICT can help us reach the targets established by world leaders at September's Millennium Summit, including the goal of halving poverty by 2015." Are these hopes over optimistic?

In July 2001, I was invited by Hivos, the Dutch development ognization, to a workshop on ICTs and development held at Museum Naturalis, Leiden, and to another workshop at IICD, The Hague, on a similar topic. I met a number of the country's important development researchers and enthusiasts and many of them told me that Ms Eveline Herfkens, Dutch Minister for Development Cooperation, was keen to invest on development activities in the least developed countries of the world, but was a bit skeptical about investing on ICT-related activities. They wondered if some of us from the developing world, especially those who are working with ICTs, could convincingly argue the need for supporting ICT-based development initiatives. Incidentally, Ms Herfkens is not alone. There are many others who have genuine doubts about the advisability of funding ICT-based development projects. As pointed out by Mark Malloch Brown,[3] "in both developed and developing countries there is still considerable skepticism as to whether providing access to information and communication technology can play a significant role in reducing poverty." The skeptics draw support from many not-so-well conceived ICT

projects in developing countries, many of them in the hands of economists and technicians who fail to appreciate the social and cultural issues that are key to a communication strategy.[4]

I took part in both the workshops, both well attended and focused. Indeed at the Leiden workshop not only did I make a presentation of the well-known Pondicherry Information Village project but was also interviewed on stage by a leading Internet journalist. Inevitably, this question of the role of ICTs in development came up more than once and I reiterated my own and our Foundation's firm belief that as long as programmes are people-centred and as long as technology can make a distinct difference ICTs are important and deserved to be supported. Experts like Monkombu Swaminathan and Bruce Alberts believe that with intelligent intervention, we can make ICTs an ally in the equity movement and that if ICTs can benefit the rich there is no reason why we should not work towards reaching the benefits of ICTs to the poor. Indeed Swaminathan believes that ICTs can be used very effectively in our effort to include the excluded and reaching the unreached and Prof. Alberts keeps quoting the example of the Information Village Project in Pondicherry as a model for others to follow.

Information for development: The Pondicherry experience

What has been achieved by the Information Village project of the M S Swaminathan Research Foundation? Let me intersperse my own description of the project with the comments of three eminent people – a journalist, a Nobel-class scientist and a development communication specialist. Let me begin with a couple of quotes from an article entitled "Connecting rural India to the world" by Celia Dugger in *The New York Times* dated 28 May 2000.

"Embalam - In this village, the century-old temple has two doors. Through one lies tradition. People from the lowest castes and menstruating women cannot pass its threshold. Inside, the devout perform daily pujas, offering prayers. Through the second door lies the Information Age, and anyone may enter. In a rare social experiment, the village elders have allowed one side of the temple to house two solar-powered computers that give this poor village a wealth of data, from the price of rice to the day's most auspicious hours."

The door to modernity and the door to tradition at Embalam temple

Here 'anyone' includes the Dalits, people of the lowest castes, who were referred to as 'untouchables' in pre-Independent India. Caste-based division is still a problem in southern India despite strict laws being in force, and our knowledge centre at Embalam has made a minor dent. A new knowledge centre in Thirukanchipet, a village of Dalits, has led to another minor social revolution. These villagers used to get their tea served in cups reserved for them in the tea stall in the neighbouring village Thirukanchi; the upper caste men would use a different set of cups. After the Dalit volunteers started working with computers and new technologies at the knowledge centre, they became a bit emboldened and started displaying on the notice board of the knowledge centre the poems of the Tamil revolutionary poet Subrahmanya Bharathi, who had played a key role in India winning Independence from British rule, which questioned caste-based divisions in society and reiterated that all men are equal. Within a few weeks the tea stall started serving them tea in the same cups used by the upper caste clients. Yet another example of including the excluded.

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Celia Dugger's story in New York Times ran to half a page and that is probably the first time that NYT devoted so much space for a developmet story from a non-Western country. She continued:

"Information from the computers in this area, where people live in thatched mud huts, has saved the life of a milk cow named Jayalakshmi, prevented the blindness of an old woman named M. Minakshi and routinely warned fishermen of stormy weather that can claim lives. Some months back, Subrayan Panjaili, a round-faced woman who cannot read or write, sat in the courtyard of her small home in the village of Kizhur, in Pondicherry, with the family's only milk cow, Jayalakshmi. For five days and nights, the cow moaned while in labor. Something had gone wrong and she was unable to deliver her calf. Mrs. Panjaili grew ever more fearful that the cow would die. "This is the only good income we have," she said, explaining that the four gallons of milk the cow produced each day paid the bills. Word of Mrs. Panjaili's woebegone cow soon spread to Govindaswami, a public-spirited farmer. The village's computer, obtained through the Swaminathan Foundation, is in the anteroom of his home. The computer is operated full time and for no pay by his 23-year-old, college-educated daughter, Ezhilarasi, who used it to call up a list of area veterinarians. One doctor arrived that night and, by the light of a bare electric bulb, stuck his arm into Jayalakshmi, pulled out the calf's spindly leg and tied a rope to it, then dragged the calf into the world."

Ms Minakshi was sent to Aravind Eye Hospital in Madurai , about 200 km away, and she got her cataract removed.

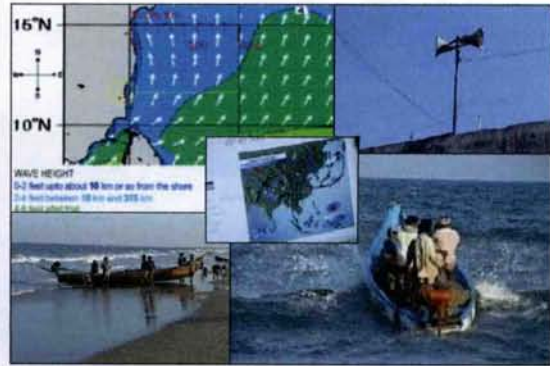In an experiment in electronic knowledge delivery to the poor, we have set up knowledge centers

VHF two-way radio, Internet, Spread spectrum antenna and solar panels at Villianur

in ten villages near Pondicherry in southern India and have connected them by a hybrid wired and wireless network -- consisting of PCs, telephones, VHF duplex radio devices, spread spectrum and email connectivity through dial-up telephone lines -- that facilitates both voice and data transfer, and have enabled the villagers to get information they need and can use to improve their lot. All the knowledge centers are open to all, irrespective of age, sex, religion, caste, and level of literacy and education. The entire project draws its sustenance from the holistic philosophy of Swaminathan, which emphasizes integrated pro-poor, pro-women, pro-Nature orientation to development and community ownership of technological tools against personal or family ownership, and encourages collective action for spread of information and technology. The bottom up exercise involves local volunteers to gather information, feed it into an intranet-type network and provide access through nodes in different villages. The ten villages are connected in a hub and spokes model, with Villianur, a small town 13 km west of Pondicherry, serving as the hub and value addition center. Value addition to the raw information, use of the local language (Tamil) and multimedia (to facilitate illiterate users), and participation by local people right from the beginning are the noteworthy features of the project. Most of the operators and volunteers providing primary information are women, thus giving them status and influence. All centres came up because of demands made by the community. Apart from these villages, the project had established knowledge centers in three more villages but had withdrawn because either these centers did not share information with all people in the village, or did not maintain regular hours and did not maintain the equipment well.

In the villages where the project operates, we have shown that access to timely and relevant information does make a difference to the life of the rural poor. We have also shown that new ICTs can play a role in this effort. For example, the Value Addition Centre at Villianur delivers daily images obtained from a web site run by the US Navy of the predicted wave conditions in the Bay of Bengal to the centers at Veerampattinam and Nallavadu. The villagers there are fisherfolk, and the sea conditions are of crucial interest for their safety. The information is so critical that the voice report from Villianur is transmitted at the coastal villages over a

Wave height data from a US Navy website brought to fishermen of Veerampattinam

public address system to the fishermen as they prepare their boats in the early morning. "It saves lives", said one respondent when asked about its usefulness. Information provided in the village knowledge centres is locale specific and relates to prices of agricultural inputs (such as seeds, fertilizers, pesticides) and outputs (rice, vegetables, sugarcane), market, entitlement (the multitude of schemes of the Pondicherry government), health care (availability of doctors and paramedics in nearby hospitals, women's diseases), cattle diseases, transport (road conditions, cancellation of bus trips), weather (appropriate time for sowing, areas of abundant fish catch, wave heights in the sea), etc. Unique to our project is the fact that most information is collected and fed in by volunteers from the local community itself. The centres are operated by local volunteers, mostly women.

The seeds of a virtual university

Prof. Bruce Alberts,[5] President of the National Academy of Sciences, USA, who had visited the project villages twice, has this to say:

"I examined an imaginative set of experiments in electronic knowledge delivery designed by our foreign associate, M.S. Swaminathan, ... connecting scientists to each other is only the first step. Scientists everywhere must use these initial connections as a tool for spreading their knowledge, skills, and values throughout their own nations, including their local communities. By

Prof. Bruce Alberts addressing the people of Embalam

taking full advantage of new information technologies, the scientific community has an unprecedented opportunity to close the vast "knowledge gap" between all peoples. How might this be possible? ... ... I want to highlight a wonderful example that points the way forward. As mentioned previously, the M.S. Swaminathan Foundation has established an experimental network in India that will soon connect more than 20 isolated rural villages to a wireless Internet service. About half of the population in most of these villages has a total family income of less than $25 per month. The project is designed to provide knowledge on demand to meet local needs

using the World Wide Web, and it does so through a bottom-up process. The process starts with volunteer teams that help poll the villagers to find out what knowledge they want. Particularly popular thus far are women's health information, advice on growing local crops and protecting them from diseases, the daily market prices for these crops, local weather forecasts, and clear information about the bewildering array of programs that are provided by the government to aid poor families. To participate, each village must provide a public room for the computer system, as well as the salaries for a set of trained operators. In return, the village receives the needed hardware and maintenance for the communication system, specially designed Web sites in the local language that convey the requested information, and training programs for those villagers who have been selected to run their local knowledge system. ... ... I am enormously impressed with the quality of thought that has gone into this project, as well as by the energy, dedication, and skill of the young Indian scientists who are carrying it out."[5]

Addressing the UN-sponsored meeting on Science for African Development at Geneva in July 2001, Alberts[6] referred to the Pondicherry experience again:

"... in this village there is a computer room, connected by wireless Internet to a service center run by the M.S. Swaminathan Research Foundation. This "information village" project, and others like it, have successfully relied on women from the village itself to provide daily weather and market prices, as well as agricultural and health information, to all the inhabitants. ... ... As scientists, we need to study and learn from these experiments - so as to make a science out of connecting the world to knowledge resources. With the technology moving so fast, it is critical to "learn by doing" in this way, so that we learn how to make the next wave of the technology even more useful for productive and sustainable economic development."[6]

Indeed, Prof. Alberts sees in these knowledge centres the seeds of a virtual university connecting academia with the rural poor and a model for the United States to follow.

"I envision a global electronic network that connects scientists to people at all levels – farmers' organizations and village women, for example. The network will allow them to easily access the scientific and technical knowledge that they need to solve local problems and enhance the quality of their lives, as well as to communicate their own insights and needs back to scientists. ... ... My experience in India has made it clear to me that our nation would be much more successful in such endeavours if we were humble enough to incorporate the potential beneficiaries of a service into its initial planning."[5]

In his 138th Presidential address to the NAS, Prof. Alberts[7] spoke about his second visit to the the knowledge centres and the role of these centres in empowering women:

"In particular, the women had clearly been empowered, and they enthusiastically reported how their sudden access to information about crops, weather, market prices, and government programs had improved the life of the village."[7]

Can ICTs deliver by themselves?

Can we then solve the problem of poverty by providing access to computers and telecommunication to the poor of the world? Let us hear Alfonso Gumucio Dagron,[8,9] a leading

expert in development communication and the author of *Making Waves: Stories of Participatory Communication for Social Change*, a report to the Rockefeller Foundation, 2001:

"In the field of dreams of ICTs pushers the picture is rather simple: ICTs and Internet connectivity are per se the solution for poverty and underdevelopment. Actually, it is much more complex than that. This is not the first time we are confronted with the idea that technology is the panacea for development. Those who have been active in development during the past 30 years, as I had, know very well the previous wave of "diffusion of technology", by which the underdeveloped countries would magically join the industrialized world through the use of modern technology graciously provided by the international cooperation agencies. Worst of all, behind it, there was the assumption that "knowledge" was a privilege of industrialized nations, and our countries in the South just didn't have enough of it. Of course we know today (there is abundant literature about it) that it was not that coarse. It could only be that simple in the field of dreams of those who know little about Third World countries, but think they know what is best.

With the risk of repeating something that everyone already knows (or should know) I will remind ICTs pushers that when we talk about technology we are only referring to instruments, not to social, economic or cultural development. A knife is just a knife, it can be used to hurt someone or to carve a beautiful wood sculpture. Content and utilization is what makes the difference. Development priorities are to be analyzed - hopefully by the "beneficiaries" - before deciding which technology is appropriate, where and how. Even Bill Gates knows that it is not a matter of pushing computers to the developing countries; not long ago he acknowledged that basic health care services are by far a bigger priority than computers and internet connectivity. Those that think that poverty in our countries is just a matter of not having access to information and technology are showing much ignorance about social injustice, human exploitation and inequalities not only between countries, but also among social classes within each country. Information is not the magic cure for hunger.

This is not to say that we should discard these appealing gadgets of progress. On the contrary, we have to avoid the frustration of using them responsively, because if we do, it will only create more frustration among the people that are supposed to benefit from the new information and communication technologies. As long as the World Wide Web is 90% in English and 99% irrelevant to a peasant in Bolivia or a factory worker in Russia, we can't be over confident about the benefits of connectivity. Most reports on telecentres in Asia, Africa and Latin America acknowledge that people use the phone and the photocopier, and very little of the computer and internet facilities. And those that use it are generally the most educated, the well off in the community, not the originally intended and most in need beneficiaries.

There are too many examples of projects that are only bombarding the Third World with computers, in the most irresponsible manner and for the benefit only of hardware and software companies. On the other hand, there are very few, I insist, very few experiences of use of new information and communication technologies that are paradigmatic in the way they contribute to development.

In my book "Making Waves" I have picked a few representative examples that show how ICTs are being used in participatory development and how these instruments can be "appropriated" by the community when the project is well conceived. There is one thing that we can not separate from any ICTs project in Third World countries: the development of local databases and local web

Virtually all documentation is in Tamil

pages that are relevant to the people and that take into account their daily needs, their culture and their language. If this is not embedded into a project, I doubt it will have any positive results for the community. *This is why the Village Knowledge Centers in Pondicherry (M.S. Swaminathan Research Foundation) are such an important and coherent experience*. The potential is also great for InfoDes in Cajamarca (Perú). The convergence between ICTs and other media is also exciting and promising. That is why I included the examples of Kothmale Radio in Sri Lanka, Púlsar in Latin America and the Local Radio Network in Indonesia.

Let's not forget that most of the ICT experiences at the grassroots level are only 4 or 5 years old. It is too soon to claim victory and too soon to discard them, but not too soon to question them and to make sure that they will be sustainable and for the benefit of communities after the external assistance withdraws. Communities should adapt technology to their needs and to their culture, not the opposite. As of today, the ICTs in our Third World countries are only "experiments with a potential". One thing is what is written in project reports, and another thing is what is really happening at the community level. Definitely, the tool is still to be shaped. I challenge ICTs pushers to go there and check."[8]

Alfonso Gumucio[9] warns us

"It is sad that many of our colleagues from Third World countries, especially those working in North America and Europe, have taken distance from the realities of our countries. They base many of their assumptions on institutional documents and "success" reports, without knowing reality."[9]

This view is echoed by Bruce Girard, the man behind Pulsar and many development programmes using radio innovatively. Indeed Girard points out (personal conversation, 4 April 2002) instances of projects, which have nothing more to show other than a well-written application sent by email, winning awards! I am afraid that there are too many desktop researchers and 'experts' in this field who have virtually no field experience but who go on churning out papers based on what they read and they are often invited to conferences and seminars on ICTs for development whose numbers are increasing out of proportion to what is actually being achieved in the field. If the energies and funds invested on these meetings were directed at real grassroot level work we would have had many more examples of successful projects and happier communities. And organizations established to achieve some of these goals do not seem to perform as well as they should. In his Presidential address to the Fellows of the US National Academy of Sciences, referred to earlier, Bruce Alberts[5] told, "I learned to my surprise that most of the international organizations established by the United Nations with the great hope of using science and technology to improve the human condition are seriously hampered by bureaucracy and a lack of energy, innovation, and resources."

The lessons learnt

What are the lessons we have learnt from our own project and the experience of others in the past

Children learning to draw on a PC at Veerampattinam

few years? Is this model sustainable? To someone who has had the privilege of watching every step from close quarters, it is clear that technology by itself may not mean much and one needs to take care of the context, content and language. Let us list the factors that led to our success:

First and foremost, the visionary leader, his able technocrat implementor and his small team of half a dozen dedicated staff understood the people and their context and got accepted by them. The local communities have trust in us. People readily offered space to set up the knowledge centers – in panchayat (local level government) offices, in temples, in government-owned buildings, and in one village in a private individual's home! In two villages the people collected money to construct new buildings to house the knowledge centre. In some villages the communities pay the telephone bills and Internet charges.

Second, our relationship with the local community is not of the "donor-recipient" type but one of "partnership in progress". Right from the beginning the people of the villages were involved at every stage. Every month village volunteers and the Foundation's staff meet and review what has been accomplished and discuss new initiatives.

We understood the need to develop 'content' – the information needed to satisfy the communities' needs - and developed much of the content in collaboration with the local people. We have created close to a hundred databases, including rural yellow pages, which are updated as often as needed. Incidentally, the entitlements database, which serves as a single-window for the entire gamut of government programmes, has created so much awareness among the rural poor that there is greater transparency in government now. Farmers get the right price for their farm produce and wage-labourers get the right wages from their employers, thanks to the knowledge centers. We are not averse to borrowing 'content' from elsewhere if it is found useful to the local community. For example, we have collected much useful information from Government

These landless labourers now get correct wages

departments, the Tamil Nadu Agricultural University, Aravind Eye Hospital, and the US Navy's website. We have held a few health camps in the villages in cooperation with well-known hospitals as part of gathering information about local health care needs.

Most of the transactions are in Tamil, the local language. Our village volunteers are trained to input material in Tamil using the standard QWERTY English keyboard. [We were indeed surprised at the speed with which the village volunteers learnt to use the computers and more so learnt to type Tamil, with its 247 characters, using the standard English language keyboard without using the template. Some of them have learnt to code in html and design web pages. As our chairman Prof. Swaminathan says, these villagers take to technology as fish to water. It is a question of getting the opportunity. We use multimedia and loud speakers to reach out to illiterate

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clients. We even have a fortnightly Tamil newspaper called *Namma Ooru Seithi* ('Our Village News'). The newspaper has become so popular that Government departments such as District Rural Development Agency, Social Welfare Board, Small Scale Industries Centre use our newspaper to publicize their schemes.

We use technology when it provides a distinct advantage. We have so far used hybrid wired and wireless technology for communication (including telephone and modem, VHF two-way radio and spread spectrum), hybrid grid-solar energy, Intranet and Internet. Currently we are testing the possibility of using World Space radio to network the rural poor of the world. This experiment forms the basis of a proposal to the G8 DOT Force and the UN ICT Task Force. Importantly, in our project the technologies and the knowledge centres are collectively owned by the community and not by an individual or a family. As people are indeed poor, it will not be possible for individual families to afford any of these technologies for a long time to come. The knowledge centres are operated by local volunteers, mostly women, selected by the community. We are looking at possibilities for revenue generation (from those who can afford) and Accenture has shown interest in developing a revenue model for our knowledge centres.

Towards a network for the rural poor of the world

We are aware of projects that have not got off the ground or folded prematurely because of the emphasis placed on technology without a clear understanding of the context and needs of the local communities.

We understand that mere provision of information cannot lead people out of the poverty trap. Access to relevant information is only part of the story. People need to build skills and capacities

Multiple livelihood opportunities

they could convert into additional income. We take an integrated view of development and are working closely with the biovillage and ecotechnology groups of our Foundation. These groups are working closely with farm families in Pondicherry and Tamil Nadu and have developed many income-generating low-cost technologies, such as mushroom growing, ornamental fish, production of biopesticides, production of high yielding varieties of seeds, converting banana waste into paper and boards, and production of green fodder for cattle. We work closely with self help and microcredit groups in the project villages. In addition, we are entering into partnerships with

government departments, schools, libraries and primary health centers in the region as well as with like-minded partners abroad. Some donor agencies such as Hivos have come forward to use our experience as the building block for ICT-related South-South exchange of experiences.

The project team and all of us at the Foundation are happy that this project has won the Motorola Dispatch Solution Gold Award 1999 and the Stockholm Challenge Award 2001 and our colleague Dr Venkatraman Balaji has won the World Technology Award, but our greatest satisfaction comes from the appreciation we continue to receive from the communities we work with.

Poor, but happy!

Before I close

Incidentally, early this year Ms Herfkens sanctioned a substantial budget to IICD for their ICT-based development programmes in eight developing countries in the next five years.

I wish to thank my colleagues, past and present, in Informatics Centre of MSSRF, our Chairman Prof. Swaminathan, the IDRC, Canada, and most importantly the village communities in the Union Territory of Pondicherry, without whom there would have been no project. I am also grateful to Prof. Bruce Alberts, Alfonso Gumucio Dagron, and the numerous media persons who made our project known to the wide world, and to organizations such as One World International and Hivos for their confidence in our commitment.

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EXPANDING THE VILLAGE KNOWLEDGE CENTRES IN PONDICHERRY

S. Senthilkumaran and Subbiah Arunachalam

INTRODUCTION

Brief History

Often funding agencies and donor governments face the question as to whether they should support the integration of information and communication technologies (ICTs) in their development projects. Should the money be invested in computers and communication equipment or will it be better spent on food, shelter, health, and education? The choice need not be "either/or". If used intelligently and innovatively, ICTs can form an integral component of development projects as demonstrated by the award-winning Information Village Project of the M. S. Swaminathan Research Foundation (MSSRF).

The project was developed in January 1998 by the MSSRF as part of its programme for taking the benefits of emerging and frontier technologies to the rural poor. M. S. Swaminathan, the architect of India's "green revolution," is a geneticist by training and an accomplished agricultural researcher. He was aware of the tremendous potential of biotechnology and genetic engineering. In the past few decades, information technology (IT) has emerged as a great force and has changed the way people live and work in the developed countries. Swaminathan hypothesised that if new ICTs could benefit rich countries, why should they not be harnessed to help poor countries. He convened an international, interdisciplinary dialogue in 1992 with participants concluding that ICTs could have a major role in promoting sustainable agriculture and rural development in the developing world. However, mere technology alone would not do the trick. Wisdom to use the technologies intelligently and innovatively would be essential. The technologies of the industrial revolution have only exacerbated the divide between the rich and the poor. Swaminathan fully realized that all technologies have this weakness. He was looking for ways to harness the benefits of new ICTs while at the same time, preventing them from further exacerbating existing divides. This is a task meant for only a few people and Swaminathan is surely one of the select few.

In order to benefit farming families, the generic information found in the networks, including the Internet, should be locale-specific knowledge that rural women and men can utilize and act upon. This was the model adopted for implementation of this project. Swaminathan has often commented, "... whatever a poor family can gain benefit from, the rich can also gain benefit; the reverse does not happen." Thus, involvement of the poorest of the poor in rural areas (over 300 million in South Asia) in managing the use of ICTs was considered essential for the success of this project.

The project, which started in 1998 in Pondicherry, Tamil Nadu, was chosen because it had certain initial advantages, such as an accessible government and reasonable telecommunication infrastructure (an urban teledensity of approximately twenty). The level of poverty is high in the rural areas, where 21 per cent of families have less than US$1 per day as family income. The biovillages project, an earlier programme of the Foundation for Community Asset Building based on biological technologies was fully operational in this region. The ICTs project was expected to complement this programme, and derive benefits from the linkages.

This project is supported by the International Development Research Centre (IDRC) and the Canadian International Development Agency (CIDA). For electronic knowledge delivery to the poor, ten villages were connected by a hybrid wired and wireless network, consisting of personal computers (PCs), telephones, very high frequency (VHF) duplex radio devices, and email connectivity through dial-up telephone lines that facilitate both voice and data transfer. This has enabled villagers to obtain the information they need and use this information to make improvements. The bottom-up exercise involves local volunteers who gather the information, feed it into an intranet, and provide access through nodes in different villages. Value addition to raw information, use of the local language (Tamil), multimedia (to facilitate illiterate users), and participation by local people from the outset are noteworthy features of the project. Most of the operators and volunteers providing primary information are women, thus giving them status and influence. All centres evolved to meet the increasing information demands made by the community.

This project has won two major international awards, viz., Motorola Gold Award 1999 and Stockholm Challenge Award 2001 under the "Global Village" category. The knowledge centres are situated in *panchayat* buildings, temples, a midday meal programme centre, and a private house.

IMPACTS ON POVERTY ALLEVIATION

Income Poverty

The Village Knowledge Centre (KC) Programme is having a positive impact on communities in terms of promoting development, social change, cultural values, solidarity, political awareness, community organization, and participation. We are currently working in ten villages. In September 2002, three more fishing villages were added. Although we lack economic data, there are several success stories recorded by journalists and scholars.

Creation and updating of relevant content to suit local needs is a key factor in the programme. Prior to commencing content-building activity, extensive consultations

were held with participating village communities through small group meetings. It emerged that the provision of dynamic information on prices and availability of inputs for cultivation such as seeds, fertilizer, or pesticides was important to every farmer. Knowledge of grain sale prices in various markets in and around Pondicherry is critical to farmers during the harvest season. This information helps farmers market their produce more profitably.

In 2001-2002, we are conducting a survey of both users and nonusers in five villages. This is an ongoing process, which is yielding very interesting results. People derive economic benefits from employment news, crops, fish market details, and computer training. They also value information on loans, and news on government entitlements, and dairy farming. Real estate agents and small merchants finalize trading deals through wireless telephones. Weather and wave height, education details, daily news, recipes, notice board announcements, important phone numbers, transportation, power outage details, and public address system announcements benefit in intangible ways. Women are very interested in health information, recipes, and names for newborn babies based on astrology. Computer training for women and children in the local village ensures safety (not necessary to travel to distant towns), and saves time and money.

Incense manufacture. A group of women in Kizhur village decided to start a small business enterprise manufacturing incense sticks. They began as subcontractors but their confidence and enterprise increased as a result of utilizing the rural knowledge centre. Due to the searches carried out by the village volunteers and project staff, they were able to develop the necessary skills for packaging and marketing their own brand name of incense. The women were quickly able to develop local outlets for their products and using the village KC, gradually found more distant customers. The village KC facilitates small entrepreneurial activity and mobilizes latent productive capacity among women who live in a culture that traditionally has the tendency to marginalize them.

Sea conditions. The MSSRF Value Addition Centre at Villianur delivers daily images of predicted wave conditions in the Bay of Bengal to the centres at Veerampattinam and Nallavadu. The images are obtained from a website run by the US Navy. The sea conditions are of crucial importance for the safety of the fishermen. The information is so critical that it is transmitted verbally to the fishermen as they are preparing their boats early in the morning, across a public address system through loudspeakers placed on the roof of the centre. The information is regarded as "life-saving" by the fishermen.

Notebook charity scheme. The school at Veerampattinam was able to make contact with a charity scheme whereby 180 notebooks were provided free of charge to tudents.

Bus service schedules. The schedules of bus services that operate in the districts in and around Chennai (Madras) and Pondicherry are a regular and useful source of information. Village travelers find that they are able to plan their journeys, often involving several connections with overnight stays, so that they are able to reduce the time spent waiting to catch connecting services. It is the nature of low-income rural households that lost time equates with lost income, or the accumulation of duties that have to be performed at a later stage. As for any busy working person, saving time represents a real benefit.

Procurement of quality seeds. Like all farmers, the villagers served by the MSSRF rural KCs require high quality seeds to achieve maximum potential. The village KC at Kizhur performs an important function in locating suitable sources of quality seeds and ensuring adequate supplies for farmers when they need them. Prior to the installation of the village KC, securing an adequate and timely supply of quality seeds was a highly unreliable process, which led to significant variations and uncertainties in crop levels. The village KC therefore contributes greatly to food security.

Veterinary services. Access to health care is applicable to animals as well as people. One farmer was able to summon help from the village KC staff when he feared his cow might die. After searching the networked information sources for a veterinary surgeon nearby, one was dispatched. The surgeon, who was contacted by telephone, arrived in time to save the cow.

Grain prices. In the village of Embalam, local farmers are able to obtain daily market prices for their produce from the village KC. There are two prices to obtain: one from the government market that has minimal fluctuations, and another from the private market with high fluctuations. Consequently, there is considerable benefit for farmers from choosing which market to deliver their produce to and from monitoring the differences between the two prices on a daily basis. The farmers consistently obtain the best possible price for their produce.

Private tuition. At the Embalam village KC, an enterprising schoolteacher has started using computer facilities to provide additional after-hours tutoring to local schoolchildren, for which he charges a fee. The village KC manager initially allowed the teacher to use the computers free of charge. After observing that the teacher was profiting from the service, the manager started charging the teacher and tuition charges were reduced. Thus, both the teacher and the village KC benefited and children were able to receive extra tuition.

Insurance. Through the information services of the village KC, villagers discovered a national life insurance scheme subsidized by the central government and operated by a local insurance agent. The agent had not sufficiently publicized the scheme and the

villagers did not know whom to approach. The village KC network was mobilized to obtain further information regarding the entitlements and the name of the agent. As a result, villagers were able to approach the agent directly and with confidence to make their applications and receive their entitled insurance policies. Furthermore, the village KC operator devised and implemented a data base that generates premium renewal advice for every household covered by the scheme. This is used to ensure that no insurance policy lapses due to late renewal payments. The policy is advantageous to the villagers to the extent that every household in Embalam village has taken out an insurance policy. Villagers are confident that their coverage will be continuous and that premiums will be renewed on time.

Employment opportunities. One volunteer at the village KC was informed of job vacancies for women at an agricultural processing factory located 5 km from Embalam. The volunteer was keen to bring employment opportunities to women in her village and therefore distributed the information via the village KC network. The factory was able to fill its vacancies faster than expected. After hearing of the village KC network, the factory decided to use it as their first choice channel to obtain local labour. Such a partnership represents a win-win situation with benefits accruing to both parties. The factory can access a steady supply of labour both quickly and cheaply, and villagers are promptly informed of job vacancies.

Savings cooperative. Village women learned about the concept of savings cooperatives through interaction with the village KC information sources. In India, savings cooperatives are a popular means of obtaining loans for people who would not normally qualify for a bank loan. The cooperatives operate by members making regular payments to the scheme, and then borrowing money when the need arises. Members are allowed to take out loans which exceed the value of their contributions. New members can even borrow before they have commenced payments. The popularity of the scheme is derived in part by the support it receives from the government. Under certain qualifying conditions, registered savings cooperatives are entitled to receive government loans at interest rates well below prevailing market rates. Local banks are required by law to provide banking facilities to registered savings cooperatives. Having discovered the scheme through the village KC, village in Embalam formed a cooperative and now use the computers at the KC to administer their accounts. One of the KC operators, who is a woman, acts as the cooperative treasurer and secretary and utilizes the KC's facilities.

The women's self-help group in Embalam is using its public access centre to sell locally-made products and handicrafts, such as lime pickles and roofing products woven from local palm leaves. They are also using the system to contact other women's groups with which to share their experiences. They have recently made

contact with another women's self-help group of "ecopreneurs" in Kulumai who have established a Rs 2.5 million business, making environmentally-friendly recycled paper products out of banana waste that had traditionally blocked vital waterways in their village.[1]

Capability Poverty

From our user register, we find that most villagers use our entitlement data base. Incidentally, as the programmes become widely known, we find greater transparency in governance.

The experience of Pondicherry and elsewhere is that one of the greatest implications for social change is the way in which bringing information into the public sphere increases the accountability of officials. This is a feature that could be built strongly into any model as a way of minimizing bureaucracy, waste, and even corruption. As one person puts it: "The only way to overcome money power is through knowledge power."[2]

Villagers often asked how the hub (at Villianur) would be able to pass on, and follow up on, suggestions they were making to different levels of authorities through the new network. The team at Villianur decided to send letters,[3] to political representatives with copies to relevant department heads in the administration.

The citizens' charter data base provides information from government departments, such as current activities and procedures to obtain various entitlements. We provide addresses of contact persons, details of schemes, application forms, and so forth.

Fishermen's housing loans. One of the tasks of the MSSRF Value Addition Centre is to seek out and publicize various entitlements which community members may be qualified to obtain. Over 100 such entitlements have so far been identified. It has become a highly complex task for individual families to understand their entitlements and how to obtain the benefits. One such entitlement of particular interest to the villagers at Veerampattinam is the Fishermen's Housing Loan, a government-subsidized scheme for providing low-cost loans to fishermen for the purpose of buying or constructing a home. Prior to the advent of the rural knowledge centre, villagers were not aware of the scheme. Today, nearly every fisherman in the village has benefited from it.

Health facilities. In 1999, when our informatics staff visited various primary health centres, we observed a number of interesting aspects. Most of the doctors at the primary health centres were men. User registration showed that women only reported colds and fevers. However, when we organized a health camp with the support of

Jipmer Hospital and Eye camp and Aravind Eye Hospital, as expected, women were found to be suffering from other ailments.

Cataract operations. The MSSRF rural knowledge centre at Kizhur discovered a health camp, a scheme for free medical treatment at a hospital more than 400 km away. For a limited period, the camp was offering free cataract operations. Several people in villages with knowledge centres applied and underwent operations.

Educational facilities. Our KCs provide information on courses available in different colleges, hostel facilities, and costs. Parents and students often refer to this data base and choose appropriate courses. Another important development is that after children started using computers and compact disk (CD) ROM educational materials, the school dropout rate declined considerably. There is a greater awareness among the community of the value of education. On the day results of public examinations of higher secondary board examinations are announced, huge crowds flock to our centres in order to see the examination results and to obtain the scorecard or mark sheets.

Schoolchildren are regularly using the centre to learn basic computer operations and seven children come to the centre regularly. The middle schools in the villages use the centres to type their exam question papers for term examinations and monthly tests. Many schoolchildren after receiving the educational scholarship application from the school, come to the centre and are guided by volunteers in filling out forms and the necessary certificates to be attached. Parents find it difficult to fill out such forms and the centre helps them whenever necessary.

EMPOWERMENT AND SOCIAL CAPITAL

Empowering the Weakest

Gender concerns are central to the project and we believe that incorporating this concern is essential for project success. Due to a deliberate decision, more than half the volunteers operating the KCs are women. This has positively reflected on the increase in the number of women users. In the evenings, some KCs provide counseling to women. Most of them form self-help groups and use the loans to educate their children and start cottage industries. KCs help women obtain training related to new economic opportunities such as incensestick manufacturing or mushroom production. By handling computers and answering questions posed by men, women are able to gain new confidence and status within the community. In the fishing village, there are fewer women users who get news through the public address system. Many women report that they do not have enough time to visit the centre due to the demands of housework and labour. Some women obtain information from other women who have visited the KC (see box 1).

Box 1.

In the village of Embalam, the century-old temple has two doors. Through one lies tradition. People from the lowest castes and menstruating women cannot pass its threshold. Inside, the devout perform daily pujas, offering prayers. Through the second door lies the Information Age, and anyone may enter. In a rare social experiment, the village elders have allowed one side of the temple to house two solarpowered computers that give this poor village a wealth of data, from the price of rice to the day's most auspicious hours.[4/]

Here "anyone" includes the Dalits, who are people of the lowest caste, referred to as "untouchables" in colonial India. Caste-based division is still a problem in southern India despite the enforcement of strict laws. Our knowledge centre at Embalam has made a minor dent in the problem. A new knowledge centre in Thirukanchipet, a village of Dalits, has led to another minor social revolution. Although the village KC is located in a Dalit (untouchable) locality, upper caste men and women visit the centre to obtain information (see box 2).

Box 2.

Information from the computers in this area, where people live in thatched mud huts, has saved the life of a milk cow named Jayalakshmi, prevented the blindness of an old woman named Minakshi, and routinely warned fishermen of stormy weather that can claim lives. Some months back, Subrayan Panjaili...who cannot read or write, sat in the courtyard of her small home in the village of Kizhur, in Pondicherry, with the family's only milk cow....For five days and nights, the cow moaned while in labour. Something had gone wrong and she was unable to deliver her calf. Mrs. Panjaili grew ever more fearful that the cow would die. "This is the only good income we have," she said, explaining that the four gallons of milk the cow produced each day paid the bills. Word of Mrs. Panjaili's woebegone cow soon spread to Govindaswami, a public-spirited farmer. The village's computer, obtained through the MSSRF, is in the anteroom of his home. The computer is operated full time and for no pay by his 23-year-old, collegeeducated daughter, Ezhilarasi, who used it to call up a list of area veterinarians. One doctor arrived that night and, by the light of a bare electric bulb, stuck his arm into Jayalakshmi, pulled out the calf's spindly leg and tied a rope to it, then dragged the calf into the world [5/]

No special efforts are made to promote access to ICTs among the poor. Our goal is to empower them to improve their standards of living through better access to useful and relevant information. Many "telecentre" projects, in our opinion, make the cardinal mistake of putting the technology ahead of the people. For us, the people, their context, and their needs come first. Then comes the content that can satisfy those needs. Technology is just an enabler to deliver the content in a cost-effective manner.

Building Social Capital

In the beginning, we selected two private houses in which to set up the knowledge centres. After six months, we realized that the private houses were not allowing socially underprivileged people inside. The owners shared the information only with their friends and relatives. In one private house, they operated the centre at irregular hours. Noticeable damage to equipment was also discovered.

In Embalam, a washerwoman, who collected clothes from her clients is now a volunteer operating computers and dispensing information. In Thirukanchipet, the *Dalit* landless labourers used to get their tea at the local tea stall served in glasses meant only for their caste. After some of the *Dalits* started working in the Thirukanchipet KC, they became emboldened to challenge this practice. They started to write poems of Bharati condemning caste-based discrimination on KC notice boards. Today, there is only one set of glasses in the tea stall. In yet another development, landless labourers who received part of their wages in kind now get the correct amount of wages, fixed by the Department of Labour.

We now have a close relationship with government departments. The Department of Science and Technology, Government of Pondicherry, sanctioned the cost of wireless technology for five KCs. The Department of Agriculture hopes to link its farm clinics to our hub. The Department of Statistics uses our network to disseminate agriculture-related information to villagers. Now field supervisors use our KCs to transmit statistical data collected in the field to their head office. We plan to charge for this service after six months. The payment will go directly to the KCs from the Department of Statistics.

The police and fisheries departments already share their contents with our hub. The Department of Education has also shown interest in linking its adult education programme with the KCs. They have also requested us to guide them to frame a curriculum for the Early Childhood Education Programme (Sarva Shiksha Abigyan), a Government of India Programme. We have already submitted some publications produced by our foundation. The District Rural Development Agency (DRDA) also hopes to link more than 500 women's self-help groups (SHGs) (micro credit and savings groups) to rural KCs to increase their knowledge and income.

We provide content for many All-India Radio (AIR) programmes relevant to rural communities. AIR Pondicherry, has broadcast the series "Silicon Valley" in which people are interviewed who benefited from the KCs. Today, government departments aim to set up information kiosks in other villages. They have already started to implement ICT applications in their work from the impact of our village KC programme.

CULTURAL CHANGE

Coping with Cultural Change

ICTs solve health problems resulting from cultural attitudes. Women's groups in Embalam and Kizhoor made it clear that cultural attitudes prevented them from discussing their health problems, especially diseases and disorders of the reproductive tract, with male doctors and younger females. Because they are in need of such information, arrangements were made with a senior professor of the Gynecology Department in Jipmer Hospital in Pondicherry to interact with around thirty women from Kizhoor and Embalam. We developed a multimedia presentation with rich graphics as a result of this meeting. The gynecology department has prepared information on prevention of many related disorders. We developed multimedia flash cards with relevant information for use by women showing minimum guidance.

Procurement of paddy seeds. Panchali lives in Kizhoor village, just opposite the local KC. When asked about the impacts of the KC, she explained the benefits derived from the information obtained from the centre. During the rice season, she obtained information on procuring paddy seeds for her land. Volunteers at the KC guided the female farmer to approach Ariyur PASIC depot where the government was selling seeds to farmers at a subsidized rate. She recalled that only five years previously she utilized the government subsidy with the help of the information obtained from the *gramsevika* (rural social worker). Since then, she has been able to secure government benefits with the help of the volunteers in the KC. Without much difficulty, she can procure paddy seeds in time for sowing. Due to the availability of timely information, she was able to save both time and money.

Paddy price information. Ms. Rengalakshmi is an agricultural labourer who lives in Kizhoor. She was of the view that the prevailing market prices of paddy in Pondicherry were only known to landlords and not to labourers. Labourers who do paddy harvest work are given wages in kind. Paddy price information is therefore vital but agricultural labourers do not have access to such price information. Landlords used to exploit labourers by paying lower quantities of paddy in lieu of wages. Today, paddy price information is available through the KC.

All-female management of a KC in a temple - Embalam. Sundary is one of the four women volunteers who manage the KC located in Amman Temple. She commented that many people in the village and even from neighbouring villages visited her KC for information regarding agricultural prices, government schemes, and the list of people below the poverty line. Around twenty women took out a Janatha insurance policy after finding out about the scheme from the KC. People frequently asked for women- and childrelated health information. Free medical check-ups for eye problems and free eye

operations arranged by this KC have been well received. During the general election, the KCs explained to people how to record their votes in the electronic voting machine through the use of visual information. Sundary observed that after taking up voluntary work, she was given the chance to visit Chennai and Pondicherry for training and met many visitors while acquiring useful knowledge and providing information to villagers. She added that the workshops on gender issues and training gave her additional confidence. Initially, those who made unfavourable comments have now started to visit the KC for information - so that all four volunteers can now operate the personal computer (PC) and other equipment without fear. She noted that they also felt confident to speak at public meetings. Rukmani, another volunteer, gave the following account:

> The siren kept in the KC is useful to agricultural coolies (workers), particularly for women who go to the field and come back on time. Previously, some landlords used to cheat the coolies by telling them that their working time is not yet over. Another impact is that schoolchildren and teachers come to use our computers. The teacher who is giving tuition to some students comes to the KC with his students and uses the centre's computer, and CDs related to plants and animals.

Furthermore, she adds:

> ...the VVV Club for Embalam women regularly conducts meetings in the KC. Members gather information from the KC... the local milk cooperative society has asked us to lead their savings groups and two of our KC volunteers agreed to it... we feel equal when we are asked to decide about the location for the site, to organize the MoU signing ceremony between the temple trust and MSSRF, and everyday we are acquiring new knowledge and our children also benefit by coming to the centre.[6/]

Leadership. The Embalam KC was established in January 1999 with the signing of a memorandum of understanding (MoU) with the temple trust. The temple trust is one of the formal village institutions consisting of five members with the government appointing the members. Supporters of the ruling party are usually appointed. There are around thirteen women's self-help groups in the village. The trust gave the space and the women's groups agreed to manage the centre by nominating four volunteers, all of whom are high school graduates and married.

In the year 2000 the then ruling *Dravida Munnetra Kazhagam* (DMK) state government was dismissed and the Congress party formed the new government with support from regional parties. This created problems in the village institution. The ruling party tried to appoint its own party cadres as temple trustees, for which there was resistance from the opposition party. Congress wanted to have control over the KC. This resulted in

conflict between the two parties and four rounds of discussions were held in an attempt to resolve the conflict. Finally, male members agreed to hand over the KC management to the women's groups in the village. They took this decision based on the assumption that the women were apolitical. Since women are not actively aligned to political parties, the arrangement is working smoothly.

Women-run KCs attract 12 per cent more female users than others. The female members seek additional information on vegetable prices, pre- and post-natal care, employment opportunities, and micro-enterprises. The centre also provides information on agriculture, training, weather forecasting, and so forth. Volunteers also said that many female members are also visiting the KC to discuss personal family problems. The women members feel that separate counseling centres for women do not exist in the villages. In future, they expect this kind of service through the KC. This is an unexpected outcome. This KC can be termed women-responsive and women-oriented.

Women volunteers who are running the KCs and managing the ICTs feel that they are looked upon as information providers. They feel proud of their new status despite initial adverse comments from the community. Volunteers have also started collecting information on indigenous knowledge systems and developing some useful brochures in Tamil for display in the news bulletins.

ENVIRONMENTAL MANAGEMENT

Managing the Physical Environment

Sea conditions. Two of our village KCs are in Veerampattinam and Nallavadu. Both are coastal villages with 98 per cent of families involved in fishing. The information requirements in these villages are different and more focused on the safety of fisherman while at sea, on the presence of fish near shore, and on techniques for post-harvest processing. These villages also receive information on wave heights for the coming 48 hours, downloaded from a US Navy website. We transmit the interpreted information through a public address system for the benefit of fishermen. The system is also used for announcing various government schemes related to fishermen, fish market details, employment news, distribution of rice in the local fair price shops, kerosene, sugar, and so forth, on a regular basis. Here is a typical account:

> Every morning at 4:30 a.m., Pannerselvan, a fisherman in the Indian village of Veerampattinam, drags his boat from the high, sandy shoreline to the water, revs up his engine and heads into the restless Bay of Bengal. As he navigates through the tricky currents, he is plagued by doubts. What will the weather be?

And what about the waves, will they be high or low? And if a storm blows in, will he ever return?[7/]

Pannerselvan in the past got his answers the hard way. When the seas got angry, he got wet. But the fishermen of Veerampattinam no longer put themselves in harm's way every time they launch their boats. Three years ago, Swaminathan chose the village for a pilot project, a demonstration for central government policy experts to show that IT could change the lives of the poor. Through his Chennai-based research foundation, Swaminathan established a minimalist communication network linking phoneless Veerampattinam with the city of Pondicherry. The Internet arrived- and with it crop prices, email, and weather forecasts with ocean wave reports.

Four times a day, a local volunteer checks the web and broadcasts the information through a village public address system. Every evening as he sits sipping tea at a nearby stall, Pannerselvan can listen and decide whether it is safe to go fishing the next day. "When the computer says that there will be a storm," he says, "there has always been a storm. We all believe in it."[8/]

Save trees. In Embalam, when local people, aided and abetted by local politicians, started felling trees in a village neighbourhood, villagers rushed to the KC and located the Forest Department phone number using the web. They used the telephone in the KC to inform officials of the illegal tree-felling activities. The wood was impounded and the culprits arrested. Fortunately, the area is free from threats of floods and drought.

INSTITUTIONAL AND TECHNICAL ASPECTS

Policy and Regulatory Environment

There are government initiatives in India, such as that of the Pondicherry City Government and the Lt. Governor, Rajni Roy, which have extended their support to the project from the start. We are not implementing state policies in our project. Our project goals concern the people and the alleviation of poverty. The project itself was funded by IDRC, by "The Friends of MSSRF Tokyo," (a Japan-based NGO) which donated computers, and the Pondicherry City Government that provided a small grant. People contributed to the construction of buildings in two villages.

The establishment of our KCs greatly helped the villagers who are now more confident. Women feel much better placed and are able to obtain valuable information when necessary.

Management of Technology

Hardware. In the beginning, we were threatened by fears that rats would gnaw through the wires and that computer technology was beyond the minds of villagers. These assumptions have been proven wrong. It is worthwhile noting that rural people are able to understand computer training as quickly as city dwellers.

Initially, we designed special computer tables for the computer and wireless system to protect them from insects. Now we are using ordinary tables for computers. The villagers use papaya and other organic methods to protect the computers from rats and insects. At the start, the villagers unintentionally moved files from one directory to another, as they were not adept at using the mouse. In the training, we began with games and then introduced software such as MS Word, PowerPoint, Excel, PKZIP, PKUNZIP, PageMaker, Photoshop, use of the Internet, and voice recording. More than thirty villagers have currently conducted their own research projects after the completion of a twenty-day computer literacy training workshop on topics such as the history of the local temple, traditional health knowledge, self-help groups in the area, analysis of market committee data, and analysis of educational facilities in the region. Well-researched reports have been produced using all the techniques in which they were trained.

The village volunteers protect the computers from dust, periodically update virus protection software, clean printers, delete unwanted temporary files, scan the hard disk, and solve problems concerned with the drivers (and dll). Hardware problems are taken care of by project staff. In most of the knowledge centres, we are only using secondhand computers donated by various organizations and individuals in Japan. We are using Compaq, IBM, Packard Bell, and locally-assembled machines for communication and for training villagers. The staff also takes care to identify the needs of the village community. So far, none of the computers has failed due to the environment. The systems are a minimum two to four GB HDD and 32 MB RAM, using Windows 95 or Windows 98. Only CD drives are updated. For power, solar photovoltaic energy is used.

Network. Prior to setting up these village KCs, participatory rural appraisals (PRAs) were carried out in each village. In each case, the community identified and provided an accessible rent-free building, electricity, and volunteers. The volunteers, who are unpaid men and women, are chosen by the community and manage the centre on a voluntary basis. The project provides all the necessary equipment and training, as well as assistance in collecting data. A memorandum of understanding (MoU) is signed to this effect and is renewed when necessary.

Local project staff maintain the systems at the hub. In the village KCs the systems are maintained by village volunteers while the community is responsible for the KC. The importance of the KC is recognized by the community. Even in times of clashes between different groups (common in Indian villages), the KC and its equipment are not damaged. The wireless system and web server administration are taken care of by the Informatics Centre of MSSRF in Chennai.

Creating and updating information. A key factor in the programme concerns the creation and updating of relevant content to suit local needs. The value addition centre in Villianur has generated around one hundred data bases to fulfill the specific information needs of the local communities. Most data bases are updated on a daily basis. A considerable amount of information is accessed from local sources. Many of the data bases are in multimedia form for the benefit of illiterate people.

Prior to starting content-building activities, extensive consultations were held with participating village communities through small groups. It emerged that provision of dynamic information on prices and availability of inputs for cultivation, such as seeds, fertilizer, or pesticides was important to every farmer. Knowledge of grain sale prices in various markets in and around Pondicherry is critical for farmers during the harvest season. This information helps farmers market their produce more profitably. We also provide information on wave heights to fisherman 24 hours in advance, for their own safety. From our user registers, we find that most villagers use our entitlement data base. Many people use the address of doctors, especially specialists, ambulance services for taking pregnant women to hospital, for their family, and addresses of veterinarians for their livestock. An education data base describes the courses available in nearby schools, colleges, and neighbouring states along with information on costs. Young people are particularly keen on this service.

We have created rural yellow pages, on which people can insert their advertisements. For example, people can determine who is renting out tractors and at what price. A tailor buying a new sewing machine can announce the sale of his old machine. Most of the data bases are developed by project staff based on the enquiries of the village community. In the collection of information, some volunteers were also involved. These rural volunteers are trained by newspaper reporters to gather useful information and present it. All the information sent to the hub is collated and transmitted to the villages. Many volunteers in the village KCs are capable of creating content and devising web pages.

The village residents are most interested in dynamic and customized information. This is a resource-intensive activity and has implications for sustainability in view of the potential of involving more locals to create and manage local and customized information content. An encouraging development in this regard is that some village KCs create content

related to agriculture, animal husbandry, education, employment, health, government announcements, income-generating enterprises, the environment, and general information.

There is a great sense of ownership among the local people, who do not view the KCs as belonging to MSSRF. This is why there is no vandalism or damage taking place against the property. The village volunteers are selected by the community. The project staff at Villianur (the hub) and Chennai (MSSRF headquarters) have cordial relations with the local people.

Determining demand for ICTs. One thing that needs to be emphasized is that we are not overly keen to use ICTs. This is not our primary goal. Our goal is to empower people through improved access to information. In achieving this goal, if the use of technology provides an advantage, we will use the technology by all means. Initially, we used interconnected computers because we needed a rapid transfer of value-added information from the hub to the villages. For connectivity, we tried the telephone and modem (wherever telephones were available), Motorola two-way radio, and later spread spectrum technology. At the same time we have not abandoned classical technology. For the fishing villages, we get the crucial wave height information from the Internet. We use a geographic information system (GIS) scale to provide the perception of distance in the visual imagery. We use real audio for transferring the voice message from the hub to the knowledge centres in the coastal villages. We also place the message on a notice board and broadcast it over a public address system. Our philosophy is "horses for courses". Whatever technology is good for a situation, we will use it.

The users have adapted well to the available technologies. Many of them are now adept at using computers and have enjoyed the benefits of obtaining the information they need. As a result, their information needs are growing. More and more villagers will be adept at using computers and communication technologies, and will wish to take advantage of new technologies. Eventually, we will withdraw from the villages, leaving the entire programme in the hands of the local community.

Suppliers of technology. From the beginning, we have been using Motorola very high frequency (VHF) business radios for instantaneous communication and data transmission between the villages and the hub. The design is based on two major components. The intelligent controller of the two-channel network is capable of interfacing with telephone lines in full duplex operation. The controller does the primary switching with EPABX/ PSDN and diverts the call to the selective subscriber unit. The controller with two Motorola GM300 base radios acts as a full duplex single-channel controller with the capability to connect two telephone inputs. It can store up to 4,000 subscriber identities (IDs) for selective calling. The subscriber unit is based on the

Motorola GM300 and GP300 models. With the combination of two units of GM300 with a suitable interface board of ST869 in full duplex mode, we can add the intelligent controller to the subscriber in full duplex mode. With the help of the interface board, we can combine both Rx and Tx GM300 radios and convert it as a loop line interface. This loop line can be connected to the exchange or to a simple telephone. The interface is capable of generating the ring voltage needed for telephone instruments to generate a ring tone. The interface also has an intelligent system to scan fifteen channels.

The advantages of this system are: (a) the distance from the hub extends to a maximum of 25 km; (b) signals can be transmitted 360 degrees; (c) we can transmit voice as well as data during the same transmission; and (d) we can retransmit any type of file such as html, Word, PowerPoint, images, and Excel. On the other hand, the disadvantages are: (a) maximum speed is 4,800 bps; (b) file size should be below 1.5 Mb; (c) messages can be sent only sequentially, not simultaneously to all villages; and (d) it supports only four or five villages.

To overcome these disadvantages, particularly the transmission of a large volume of data, we introduced spread spectrum (SS) technology in December 2001 to the villages of Villianur, Embalam, and Veerampattinam using funds from a Ford Foundation grant to MSSRF.

Line speed is very high (11 Mbps) but the signal travels only point-to-point, not 360 degrees. However, one can connect another village from the last point and not necessarily from the hub. We can cover more than 80 km from the hub using this technology. The maximum village-to-village distance is 22 km. We have an engineer trained in networking (BE) and a diploma holder with considerable skill in fixing computers and connectivity. Occasionally, we need the help of the company's engineer.

The village community is not interested in the technology aspects (any more than the urban users are). What they are interested in is getting the information they need and getting it correctly and quickly. Content is the key element in our programme (second only to the people and their context). In our scheme, technology comes much later.

Adaptability of ICTs to local needs. We do not download the information and then look for users. Through surveys and continuous dialogue with village communities, we study what information is needed and what will be useful to the community. It is a long social process that precedes the introduction of technology and the establishment of the knowledge centre. We are careful not to put the cart before the horse. This is one reason for our outstanding success. We maintain ledgers in each centre and all queries are recorded and analysed.

We have continually monitored the programme. From our survey, we have found very interesting results. People derive economic benefits from employment news, crop and fish market details, and computer training. They also rate highly information on loans, and news on government entitlements, and dairy farming. Real estate agents and small merchants finalize trading deals through wireless telephones. Weather and wave height, education details, daily news, recipes, notice board announcements, important phone numbers, transportation and power outage details, and public address system announcements all provide benefits in intangible ways. Women are very interested in health information, recipes, and naming newborn babies based on astrology. Computer training for women and children in local villages ensures safety (women do not have to walk to distant locations), and saves time and money. Most nonusers have mentioned that they could not find time   due to labour and office work. Some villagers are shy because they are uneducated, and the elderly are uncertain if they will get respect from young volunteers. Some old men avoid the centres because they are run by women. The community would like us to provide training in micro-enterprises and provide flash news on computer screens using multimedia, as well as increase the working hours of the hub and centres. Fishermen would like to obtain two-way communication between the sea and the shore, and training in protein extraction from fish.

Functioning of systems under climatic and power conditions. In the beginning of the project, lightning affected the wireless antennae. We therefore installed lightning conductors. Over the past five years, we have not faced any problems. During the summer, the electric power fails very frequently. To overcome this problem, we use a solar photovoltaic power backup, which uses 80 per cent solar power and 20 per cent electricity in a normal situation. We use ordinary car batteries (distilled water) for backup. The solar plant capacity is 1 KVA.

To maintain computers and communication equipment, a diploma holder is needed. From now on, we do not depend on local users for maintenance. We have trained people to use computers, and about thirty locals are currently adept at preparing project reports. We have also organized a number of training programmes. The first group of trainees is now able to train others. The villagers have demanded appropriate certification for their training. In collaboration with a private training institute, we conducted a programme that included an examination and the issue of certificates.

PROJECT EVALUATION

Results

The Information Village Research Project is a dynamic process. Despite having a well-designed plan of action, most occurrences are governed by day-to-day activities. This is in the nature of all research projects and even more so in village-based development

projects. In the beginning, we did not have an exact idea about the location for setting up the KCs. We selected two private houses in which to set them up. After six months, we realized that the householders were not sharing the information with the entire community. Instead, they only shared the information with their friends and relatives. In one centre, they did not allow socially underprivileged people, the *Dalits,* to use the facilities. Subsequently, we set up KCs in public places, such as government buildings, temples, a midday meal programme building, and *panchayat* buildings.

In the original proposal, there was no provision for solar power. We therefore, added solar power after one year. Furthermore, in the original proposal, we only concentrated on wireless communication among villages. Slowly we adopted older systems such as the public address system and a community newspaper for distributing the information to the village community, and a siren to announce times. To run the project based on the original proposal will not be prudent. We need to adapt to changing needs and perceptions. This is because our understanding of ground realities was not 100 per cent accurate in the beginning. As we went along, we learned. In this process, the continual interaction with the village community was a great help. We also received assistance from other development agencies. Earlier this year, we had the benefit of working closely with a team put together by One World International on a project called Open Knowledge Network. This was not part of our original proposal. G8 Dotforce is currently funding One World International to replicate this part of the experiment in Africa. Soon we will have around twenty African, Asian, and Latin American development workers visiting our project and exchanging notes with us. This is probably the first South-South exchange among ICTenabled development projects - another aspect not in our original plan.

Potential for Expansion and Replication

A bottom-up process and community ownership are the two most important elements for success. Any agency which is keen to replicate our experience will succeed if this is clearly understood. As we are more of a research agency, it is not our ambition to continue replicating KCs in countless villages. Our goal is to demonstrate the feasibility. We would like others to carry forward large-scale implementation. We are ready to assist them in training. The Open Knowledge Network experiment gave us an idea of how we could make the entire exercise self-supporting within a few years. However, we believe that the government and the society at large cannot abandon their responsibility to the rural poor. Such programmes will need to be subsidized for some time. Constraints arise from the nature of social organization. If the downtrodden are empowered through better access to information and knowledge, the better-off classes that benefited from earlier

social dispensation may not relish this, which may lead to tension. The success of such programmes depends on how well these sorts of problems are resolved.

Project Expansion

The hub-and-spokes model of the MSSRF Value Addition Centre (at Villianur) linked to village KCs is a workable model. Proactive intermediaries in the village KCs (identified by the community and trained by the project staff) have contributed much to the success of the project. The introduction of ICTs in the rural setting has led to the creation of a community asset. It has also led to empowerment of the users, particularly the marginalized groups, such as women and the poor.

We are in the process of considering the establishment of KCs in public libraries and schools. The idea is to bring in newer elements and expand the reach. We need to go beyond working with one section of the community. In states such as Bihar and Jharkhand it may not be possible to secure rent-free space for establishing KCs. Extreme poverty is prevalent in parts of these states. We may need to bear the expenses of such centres along with the local governments.

NOTES

1/ James Jeynes, a management consultant from Accenture, UK, spent a week at our KCs and spoke to a large number of the local people, traders, businessmen, and government officials. He has suggested a number of possibilities, which, if properly implemented, could make the entire operation of the KCs selfsustaining in about five years.

2/ Excerpt from the Open Knowledge Network (OKN) Report submitted to the G8 Digital Opportunities Taskforce (Dotforce) meeting held on 26-27 June 2002, Kananaskis, Canada.

3/ Example of a letter from the Villianur team:

> 1st March 2002
>
> Sri.Gangadaran
> Member of Legislative Assembly
> VVP Nagar
> Thattanchavadi.
> Pondicherry
>
> Subject: Request to Increase the Visits of the Medical Officer to the Heath
> Centre on all working days in Embalam village.

Reference : Representation from the Women Self Help Groups in Embalam.

Sir,

We bring to your kind notice that recently the women's self help group members in Embalam expressed their concerns. One of their grievances is that the Health Centre in Embalam village has one ANM (auxiliary nurse midwife), and one compounder who attends the dispensary unit every day and distributes medicines only for general illnesses such as fever. The Medical officer only comes on Fridays. The problem faced by people is that on days other than Fridays, they must travel to Karikalambakkam Primary Health Centre (5 km distance) if they fall sick. Since bus facilities are limited, they face serious problems in cases of severe illnesses. They explained that if the Medical Officer visiting the Health Centre is able to come to the dispensary unit every day, their grievances will be solved.

May we request you to kindly do the needful.
Thank you.

Yours sincerely,

K. G. Rajamohan
Administrative Coordinator

encl : Representation from the Embalam villagers.
cc : The Director, Directorate of Health, Government of Pondicherry.

4/ Celia Dugger, "Connecting Rural India to the World," *New York Times* (28 May 2000).

5/ *Ibid.*

6/ Interview with Rakmani (2002).

7/ *AsiaWeek* (29 June 2001).

8/ *Ibid.*

ADDITIONAL REFERENCE

Harris, R. *et al., Success Stories of Rural ICTs in a Developing Country* (Ottawa: International Development Research Centre (IDRC), 1999).

COMMENT

Ricardo Ramirez and Dan Pellerin

Two statements from this excellent article capture the essence of its message, firstly: We do not download the information and then look for users.... It is a long social process that precedes the introduction of technology and the establishment of the knowledge centre;

and, secondly:

Many "telecentre" projects, in our opinion, make this cardinal mistake of putting the technology ahead of people. For us, the people, their context, and their needs come first. Then comes the content that can satisfy those needs. Technology is just an enabler to deliver the content in a cost effective manner.

Common sense indeed, but not that common in the last round of development hype to establish telecentre showcase projects. Putting people's needs at the forefront, rather than computers, requires a confident, visionary team with a community development commitment. This article demonstrates with a vast number of examples the significant contribution that information can make when it responds to people's needs. Some of the highlights merit special mention.

The authors describe the power of the process to overcome caste restrictions: Dalit groups that would otherwise have been excluded from the village knowledge centres gained acceptance, the same applies to menstruating women whom tradition would have kept at bay. These accomplishments are perhaps an indication that the centres have ushered in some sort of new era in the eyes of the local hierarchy, making it acceptable to change tradition (not to mention abiding with modern Indian law). Experiences in Nepal echo the potential of these new technologies to put caste differences aside.

The importance of placing women in control of these efforts is noteworthy. It echoes the experience by Grameen Telecom in Bangladesh whereby rural cell phones are placed in the hands of women and research shows that this very fact increases access to the communication service by village women.[1] The increase in women's status at the village level is bound to have profound positive consequences in other aspects of village life: for example food security research has shown that women's status and level of education are positively correlated with improved nutrition practices in the home.[2]

The authors provide many examples where time-sensitive information, i.e., on prices and weather, improves villagers' decisions about when to buy inputs and sell produce, or how to market new products. Weather information helps fishermen decide what risks to take at sea and data bases with services enable villagers to access medical and veterinary help. Indeed, experience in other countries shows that most of these services are possible simply by having access to a phone. What is new in this experience is the systematic effort at doing participatory rural appraisals (PRAs) and surveying local needs

and building data bases to respond to those needs; hence the value of computers. Making local information available is just as, important as downloading information from elsewhere. In this experience, the local information is made available through a range of other conventional media such as word of mouth, public address systems, community newspapers, and radio. The combination of modern ICTs with existing and proven community media demonstrates that the facilitators of this process are not blinded by the glamour of high-tech - how refreshing!

Technology-wise, it is pretty simple but the bandwidth of 4800 baud must be rather irritating. The three new sites on the 11 mbps are fairly straightforward and quite effective without being overly complicated. A radio can be replaced relatively easily and the networking skills required are well within the realm of the regions.

It is not clear how the bandwidth used is paid for at the Internet gateway. The authors discuss the ways the network is being used and the value. How the bandwidth is presently being paid for goes a long way towards determining sustainability in the long run, not to mention the fact that the demands that the users place on the system will put strain on the 4800 baud system. Otherwise it sounds like a good network which is focused, uses local talent to a large degree, and can grow without requiring a lot of outside technical expertise. Perhaps the ongoing training includes some "internetworking" from a design and implementation point of view.

For those concerned with sustainability and replication, the authors have some challenging messages. There are important unexpected outcomes such as the women's counselling services that emerged when women sought additional information on vegetable prices, pre- and post-natal care, employment opportunities, and micro-enterprises. These unexpected outcomes are valuable and would not have appeared in conventional project logical frameworks. Research in other places where broadband connectivity is expanding increasingly shows the need to embrace unexpected outcomes. As the authors emphasize, the process is dynamic and allows people to dream of new uses.

The sustainability of these experiences needs to address several dimensions. For those concerned with the financial and technological dimensions, it is important to note experience elsewhere which suggests that the village knowledge centres should not be expected to run entirely on a customer-paid-service basis, especially as they provide so many government-related services. In one recent study it was reported that telecentres in Hungary earned 60 per cent of their revenue from government sources, some of which were competitive funds.[3/] Government agencies are major financial contributors as the centre enables the gathering and distribution of information that would otherwise be more expensive and less timely to exchange. This brokering role, whereby community needs are matched with relevant information, is noteworthy and the groups have been referred to elsewhere as "mediating organizations".[4/]

For those concerned with the social sustainability, the centres should be understood as an educational process. The e-readiness that they are providing is significant: volunteers are learning on the job, community members are finding a familiar setting with local people which will help them explore the technology, and women are gaining skills and status. These benefits are not intangible - though difficult to quantify - and merit continued support from the public sector.

Replication of the experience represents a significant challenge in that the "cookie-cutter" approach for massification is not applicable. The nature of the organization that incubated this experience cannot be ignored as it imprints on the process: the people-first commitment and the attention to local needs before prescribing technology reflects a community development philosophy. Other organizations seeking to replicate this process first need to do a self-audit of their own principles and orientation. Community ownership and bottom-up planning is central to the accomplishments described in this article, and few organizations are humble enough - and donors patient enough - to emulate such a process effectively.

NOTES

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2/ J. von Braun and E. Kennedy, *Agricultural Commercialization, Economic Development and Nutrition* (Baltimore, MD, and London: International Food Policy Research Institute (IFPRI) and Johns Hopkins University Press, 1994).

3/ F. Proenza, "Telecenter Sustainability: Myths and Opportunities" *Journal of Development Communication* (2002). An Internet version of the paper will appear in Dixon and Wattenbach, eds., *Bridging the Rural Knowledge Gap: Information Systems for Improved Livelihoods* (forthcoming). (Papers from a workshop at Food and Agricultural Organization (FAO) Headquarters, Rome, 4-7 December 2001).

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OnTheInternet

Toward a Knowledge System for Sustainable Food Security

The information village experiment in Pondicherry

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As submitted to the Workshop on Equity, Diversity, and Information Technology at the National Institute of Advanced Studies.

It is increasingly understood that the future of food security in the developing world, especially in South Asia, is dependent less on resource-intensive agriculture and more on knowledge.1 In the coming years, agriculture will need to be developed as an effective instrument for creating more income, more jobs, and more food. Such a paradigm of sustainable agriculture will require both knowledge and skills. The development of precision farming techniques in countries of the North2 emphasizes knowledge without stressing the need to create more jobs. The new agricultural paradigm in India must be recast to take advantage of knowledge in order to achieve the triple goals of increased income, increased jobs, and increased food.

The emerging information and communication technologies (ICTs) play a significant role in the evolution of such a paradigm, as was evident in an interdisciplinary dialogue called Information Technology: Reaching the Unreached, which was held in 1992.3 The key benefit of ICTs in sustainable agricultural and rural development is the ability to take generic information and render it locale specific. It is with this information that rural familiesÑespecially marginal farmers and the assetlessÑcan hope to improve productivity of labor and inputs. A program was launched in January 1998 in the Pondicherry region to determine whether ICTs can have an impact on rural livelihoods (figure 1).

This program has been noticed and described in OTI earlier

by Press4,5 who pointed out that "India's network must reach the villages if it is to make a meaningful contribution to the quality of life."

The project has an operational center located in Villianur, a large village where telephone facilities are available, including access to the Internet through three Internet service providers. The Villianur center has access to the Internet through two dial-up accounts, and it functions as the hub of a local area network for data and voice transmission covering the project villages. A private branch exchange, similar to the ones used in offices for providing intercom facility, is the key instrument in this hub. Every location on the network, including the office at Villianur, is a node in this intercom network, which functions with VHF radio (full duplex) rather than copper wires as the medium of signal transmission. With the help of regular modems, personal computers can be connected to the network.

To arrive at a reasonably clear picture of the state of existing communication habits and channels in rural areas--especially among the poorer households--a detailed survey covering 10 percent of the resident families in the proposed area of coverage (11 villages with an approximate total population of 21,500) was carried out from April through June 1998. From an analysis of the available data, certain trends emerge (table 1).

-- The predominant sources of information are the local shopkeeper, the marketplace, and the agricultural input supplier. A considerable amount of information transaction takes place between the rural poor households, and this also acts as a primary source of infor-mation. In other words, the information channels start and terminate within the supralocality.

-- The reach of electronic media, especially television, is reasonably high when one considers the prevalence of poverty in the villages surveyed (table 1).

-- There is a widespread perception that channels of development information available to the public, such as the agricultural office or the block development office, are not very effective, because the information flow through these channels does not correspond to material/ benefit flow, which should be the result.

Thus, the information shops in the hamlets need to complement the existing local channels of information to gain credibility and then need to go beyond to provide value-added information. This is necessary to ensure that the program is demand driven.

Knowledge of grain sale prices in various markets in and around Pondicherry is critical to farmers during the harvest season. Agricultural laborers, especially women, whose wages are paid partly in grains, are also anxious to know the sale prices. Detailed surveys revealed that women in rural families are interested in obtaining health-related information-- particularly concerning disorders in the reproductive tract and in child health. The village centers, according to them, should provide such information in a substantial way. They also emphasize the need for information on opportunities to augment income, such as training in new skills in manufacturing. There is near consensus that the village centers should provide all information on public schemata for rural welfare and the government's list of eligible families living below the poverty line.
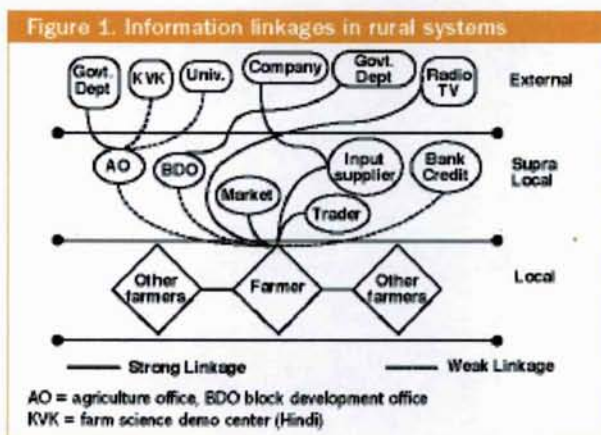

Figure 1. Information linkages in rural systems

Strong Linkage   Weak Linkage

AO = agriculture office, BDO block development office
KVK = farm science demo center (Hindi)

Table 1. Reach of cable television in rural areas of Pondicherry

Village	Number of Telephones		TV Sets (with cable connection)	Total Number of Families	Families Below Poverty Line*
	Public	Private			
Sorapet	1	3	300 (150)	626	264
Vambupet	1	Nil	100 (10)	160	118
Sellipet	2	Nil	110 (50)	424	313
Thondamanatham	2	2	50 (50)	472	51
Ramanathapuram	2	2	50 (50)	356	50
Pillayarkuppam	1	1	75 (50)	421	54
Olaivaikkal	1	Nil	15 (0)	106	12
Oussudu	1	Nil	25 (0)	444	5
Uruvaiyaru	1	4	50 (50)	531	45
Mangalam	4	1	75 (30)	569	268
Kizhur	2	3	30 (30)	400	120

Details as of June 1998.
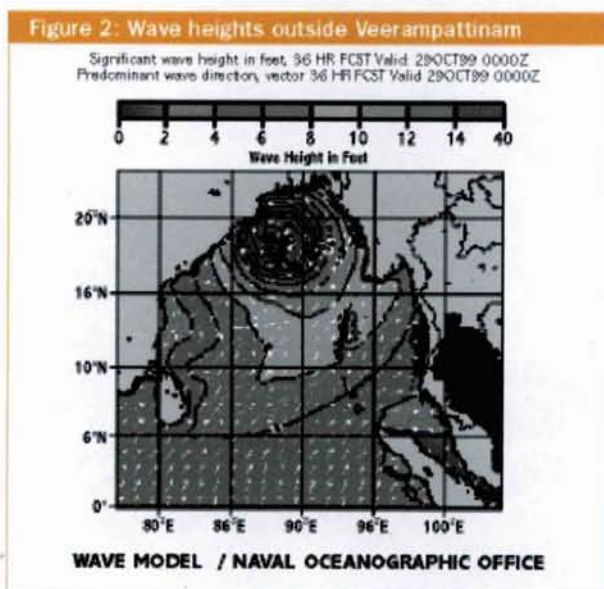* Poverty line is officially defined as an annual family income of Rs16,000 or less.
Note: A survey carried out in the neighboring region (Dindigul district in Taminadu State) in January-March 2000 covering 108 hamlets with a population of 44,211 families (about 229,897 individuals) showed that there are only 38 public phones in this area, while there are 3,897 TV sets in private homes.

The value-addition center in Villianur has generated a number of databases to fulfill at least some of these requirements. The databases are called:

-- Entitlements to Rural Families. This database provides the

details of about 130 schemata that are operational in Pondicherry during the current five-year plan (up to 2002).

-- Families below Poverty Line. The details of families in the communes of Ariyankuppam, Villianur, and Nettapakkam have been provided in this database and were compiled from the Uttar Pradesh administration. The have been updated to April 1999. Approximately 22,000 families are listed.

-- Grain Prices in the Pondicherry Region

-- Input Prices (quality seeds/fertilizers) in the Pondicherry Region

-- Directory of General and Crop Insurance Schemata

-- Integrated Pest Management in Rice Crops

-- Pest Management in Sugarcane Crops

-- Directory of Hospitals and Medical Practitioners in Pondicherry Grouped by Specialization

-- Bus/Train Timetables Covering Pondicherry Region and Two Nearby Towns

Figure 2: Wave heights outside Veerampattinam

Significant wave height in feet, 36 HR FCST Valid: 29OCT99 0000Z
Predominant wave direction, vector 36 HR FCST Valid 29OCT99 0000Z

WAVE MODEL / NAVAL OCEANOGRAPHIC OFFICE

These databases in Tamil (except the Families below Poverty Line data, which is an official document in English) are available in all of the village centers. Updates are transferred via the wireless network. In addition, interactive CD-ROMs for health-related issues have been developed, on which frequently asked questions are posed to medical practitioners, whose replies are videographed and converted to REALVIDEO format for retrieval via a PC. Topics related to general hygiene, dental and oral hygiene, and eye care have

been covered. (Videography was conducted in health camps organized by the village communities.)

Table 2. Training of volunteers	
Average time for gaining familiarity with basic operations (Windows 95)	2 weeks
Time taken to transact data on wireless	3 sittings
Time taken to gain preliminary knowledge of HTML	1 week
Word 97	2 days
PowerPoint 97	1 week
Use of Windows 95 keyboard for Tamil fonts	10 days

Veerampattinam is a coastal village with 98 percent of the families involved in fishing. The information requirements in that village are different and are more focused on the safety of fishermen while at sea, on fish/shoal occurrence near shore, and on techniques for postharvest processing. This hamlet also receives information on wave heights in the next 24 hours, downloaded from the Web from a U.S. Navy site (figure 2). (See www.nemoc.navy.mil/LIBRARY/Metoc/ Indian+Ocean/Bay+of+Bengal/MODELS/SWAPS/ Sig+Wav+Ht+and+Dir+Series/index.html.)

In addition to such defined content, daily transactions take place covering important public events and government announcements of significance to rural families. Cricket information is much sought after through well-known Web sites. One important service provided was the announcement of results of the 10th and 12th standard examinations during June 1999 and June 2000. The results and the mark sheets were available on the Web and were made available to a total of 931 (in 1999) and 1,219 (in 2000) students resident in and near the project sites, which cut short the time of waiting by at least one week.

Table 3. Analysis of users' registers in three village knowledge centers (January 1–October 31, 1999)	
Total number of users	10,656
Females	2,073
Assetless families	2,581
Illiterates	309
Persons younger than 14 years of age	2,682
Onetime users	2,985

An analysis of users' registers maintained in the village centers reveals that the proportion of women users is 16 percent. The proportion of users who are below the poverty line is 16 percent on average (the average proportion of rural

families living below poverty line is about 21 percent) (table 3). Just over 30 percent of the use is for voice telephony, indicating that voice is still an important medium for transactions in rural areas. It is found that there is increasing differentiation in the information sought over a period of six months, for example, (1) not only input prices but their availability (stock in a specific period) and (2) the differences between committee-fixed sale prices and those offered by commission agents. Government-sector information, such as data on welfare schemata, is the most-sought-after information (table 4).

A significant new dimension was added during last year with the commissioning of solar-mains hybrid power systems in all of the centers. MSSRF has seven years' experience in operating the Informatics Center with a solar photovoltaic system as the primary source of power. Based on this, the Village Knowledge Centers were also provided with solar-mains hybrid systems as the primary source of power. During the period June 1999-September 2000, the average breakdown of main line power was found to be 112 minutes per day, and transactions in the village centers were unaffected by such breakdown.

Over a 15-month period, it has been noticed that a significant amount of content has been created at the village centers. Such content is highly specific to the locality and appears to fulfill some immediate need. Examples are the develop-ment of a detailed document on sugarcane cultivation, a guide book on application of biofertilizers in rice cultivation, a how-to-style document on herbal remedies for minor disorders among children, and one on local religious festivals. In one village center, a list of voters in the local milk producers cooperative has been compiled and made public for the first time (against considerable opposition by the executives of the co-op). Youth in these villages have come forward to gather news and information in the locality and have been given training in those aspects by professional reporters of the premier local daily. Through them a system for exchanging local information on availability of materials and labor has come into existence. A link between the village centers and the local credit and savings groups (called self-help groups) has also been established whereby groups maintain member profiles and financial data in the centers.

This project received mention both in India and abroad and in detail in the 136th Presidential Address at the U.S. National Academy of Sciences in April 1999 by Prof. Bruce Alberts. It has also been noticed in Communications of the ACM (November 1998), and in Science (June 11, 1999). The 1999 Human Development Report of the UN Development Program cites this as an example of a creative project in addressing the

global information divide.

Conclusions

Evaluation of the impact of ICTs on communities is still an open issue in terms of methodologies.6 Universally accepted norms and methods for quantification of impact assessment via several techniques and parameters, including chronicling of stories. It is, however, clear that an information network will be meaningful in a rural context only if there is significant local content. Such a task is expensive; talent is not readily available and needs to be built up. This task is further complicated by the fact that very little content is available in Tamil, the local language on the Internet. Access to the little that is available is hampered by lack of standardization of fonts, which frequently requires high bandwidth for downloading of fonts. The capacity to absorb information derived from networks is reasonable in the rural setting, and some amount of intermediation between the network and the information seeker appears difficult to dispense with. Thus, village center volunteers not only need to absorb training in the use of PCs and networks but also need to be trained in facilitating the flow of information to the actual seeker.

Table 4. Analysis of users' registers / patterns (%)	
VOICE	
Personal	17.80
Program related	2.95
DATA	
Government sector/entitlements	32.72
Education	20.15
Agriculture and fisheries	13.60
Health	9.57
Employment and training	2.58

In a rural system, the social and gender barriers to information access are not insignificant, and special efforts are needed to lower them even by a small measure. The economic costs of launching and sustaining such efforts is high in the pilot phase. Notwithstanding these limitations, it is possible to develop a system of technology-based information exchange so that rural families can connect to the larger, external world in new ways they can derive benefit from.

NETWORK PARAMETERS

The operational center of the Information Village Experiment is located in Villianur, where telephone facilities are available, including access to the Internet through VSNL, a network information center, and a private Internet service provider. The center has access to the Internet through two dial-up

accounts, and it functions as the hub of a local-area network for data and voice transmission covering the project villages. A private branch exchange, similar to the ones used in offices for providing intercom facility, is the key instrument in this hub. Every location on the network, including the office at Villianur, is a node in this intercom network, which functions with VHF radio (full duplex) rather than copper wires as the medium of signal transmission. With the help of regular modems, personal computers can be connected to the network.

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bytes for all ....

Information and Knowledge in the Age of Electronic Communication: A Developing Country Perspective
by Subbiah Arunachalam, Chennai, India

We hear a lot about society becoming knowledge based and knowledge-based skills increasingly replacing physical-labour based skills in all walks of life. We keep hearing about a post-industrial revolution, the electronic or digital revolution that is profoundly affecting the nature of learning and the production of knowledge and transforming the world in unexpected ways. While much of what we hear is true, let us not forget in many parts of the world knowledge was always respected and sought after. Said an ancient Tamil poet, whereas a ruler was respected within his own country the learned were honoured wherever they went. "Let noble thoughts come to us from everywhere", says Rig Veda, one of the most ancient of scriptures surviving to this day. Ulysses left the routine chores of ruling to his son Telemachus so he could continue "to strive, to seek, to find and not to yield" in his life-long quest "to follow knowledge like a sinking star, beyond the utmost bound of human thought" [1].

Knowledge societies

Why then is our obsession with knowledge-based societies now? There are two reasons: (1) The explosive growth in knowledge, especially in science and technology. As Derek de Solla Price [2] pointed out, more than 80 % of scientists who ever walked on the earth are working today. (2) People, especially in the advanced countries, are moving out of primary occupations such as agriculture and industry into the services sector where their survival and success depend on their ability to deal with information and knowledge [3]. Underlying both these phenomena is the widespread availability and convergence of information and communication technologies (ICT) - computers, digital networks, telecommunication, television, etc. - that make rapid and widespread dissemination of information and knowledge possible. Indeed the information and communication sector is expanding twice as fast as the rest of the economy. Again neither technological revolution nor its extraordinary capacity to upset existing order is new to the world.

The fourth revolution

In fact, as argued by management guru Peter Drucker, the current digital revolution is the fourth information revolution in human history [4]. First was the invention of writing five or six thousand years ago in Mesopotamia. The second was the invention of the written book in China perhaps as early as 1300 B.C. The third revolution was set off by Gutenberg's invention around 1450 of printing based on movable types and the contemporaneous invention of engraving. Each one of these revolutions had ramifications far beyond its immediate context and dramatically altered the course of entire centuries. It would be naive to believe that the present information revolution, just about 50 years old if we assume it began with the invention of the electronic digital computer, is unprecedented in its impact. It appears so largely because of our proximity to the events that shape this ongoing revolution.

Take for example, the invention of printing. In one go, it rendered thousands of monks in European monasteries who were copying books by hand jobless and led to the emergence of a new class of gentlemen printers and typographers and the class of craftsmen printers. It led to mass production of books in fields other than religion and theology, in languages other than Latin and in prose. It made possible publication of books by contemporary authors at prices affordable even to the peasantry. It led to the foundation of universities all over Europe, which taught not just religion and theology but subjects not taught before - law, mathematics, medicine and natural philosophy. Above all it made the Protestant Reformation possible. There had been rumblings in the Church long before Martin Luther nailed his 95 theses to a church door in a small town in Germany on October 31, 1517, but the dissent could not travel far by word of mouth and the Church could suppress the revolts easily. But Martin Luther's theses were immediately printed and circulated all over Germany and Europe, transforming local dissent into a widespread religious firestorm that ultimately split the Church. In whatever terms we measure it - cost and price reductions, speed and the extent of the spread and social transformations - the impact of the third information revolution was no less than that of the

fourth.

Borderless world

What are the ramifications of the new information revolution? At the micro level, the silicon chip has become ubiquitous; it is here, there, everywhere. The microwave oven in your kitchen, the washing machine, the phone card and the car, everything is digitised. New products and processes appear in rapid succession only to become obsolete equally rapidly. The personal computer has now joined the radio, television and the telephone to create a vast and growing global network that people can use to converse, hold meetings, run virtual universities, conduct business, and transmit voice, data and images of all kinds. Even from remote Indian villages one can now call distant corners of the world and watch on television cricket matches played thousands of miles away. Simply, the world is fast becoming borderless. Europeans know that much better than the rest of the world. Now there is the European Union. Small states no longer seem viable. Much of Western Europe now has a single currency, and for a long time Europeans have been having television programmes beamed into homes across national borders and newspapers carrying supplements from their foreign counterparts. [Incidentally, for us in India, the concept of a borderless world is nothing new. Kanian Poongrannar, a minor Tamil poet, had said several hundred years ago that "every place, irrespective of where on earth it is, is my hometown and everyone, irrespective of who he/she is or where he/she lives, is my friend." Universal brotherhood at its best!]. However, from the point of view of the less developed and least developed countries, the world is still divided into two civilizations, they themselves being dependent and deeply affected by the developed countries but unable to influence them. Science and technology which played a crucial role in making the developed world what it is today have not made the same kind of impact on these countries.

Knowledge goes international

As with money and information, knowledge and technology also are becoming increasingly borderless. Look at the production of knowledge and technology today. Increasingly research is carried out by multinational teams. There has been an enormous increase in recent years in the number of research papers resulting from international collaboration. From 1981 to 1995, the number of papers with international coauthors rose by 200%, whereas article output grew by only 20% [5]. To cite one example, of all papers published by scientists in Israel in the area of new biology in the 1990s, more than 40 % are in collaboration with authors from other countries [6]. However, there is a wide variation in the participation by different regions in such international research. Most developing countries are virtually excluded. According to CNRS-LEPI, France, more than 80% of all internationally coauthored publications in 1986 involved authors from OECD countries, compared to 4.5% from Asia, 2.7% from South America and 1.8% from Africa, showing the dominance of North America and Western Europe [7]. However, when it is to their advantage developed countries do not hesitate to take advantage of the benefits that the developing countries can offer them. Many US graduate schools would face closure but for the enrolment of large number of overseas students. Both universities and knowledge-based corporations employ foreign nationals in activities aimed at the creation, dissemination and application of knowledge. Silicon Valley and the United States may well lose their edge in information technology if computer professionals of Asian origin were to leave the USA. A few years ago, the United States Congress, under pressure from people like Bill Gates, reluctantly approved granting of visas to a large number of Asian computer professionals. Increasingly, corporations establish laboratories outside their home countries in order to reap the benefits of synergy and maximize their advantage. A substantial portion of all the patents granted by the US Patent Office is granted to inventions made elsewhere. In a previous generation large-scale migration took place largely because people were driven away from their homes by hostile rulers and racial and religious bigots. But a large part of international migration of people today is driven by a demand for expertise to generate and skilfully apply knowledge. This internationalization is not confined to science and scholarship, but extends to other walks of life as well. For instance, leading international management, accounting and advertising firms are peopled by multinational teams of experts.

Implications of the digital revolution

It will be my endeavour today to look at the implications of the new digital revolution. First, I will examine the implications of the inequitable distribution and use of information technology for science

and scholarship in the developing countries. Then I will explore what the digital revolution means to the large mass of underprivileged people of the world. I will end my talk with what I believe needs to be done to be able to cope with the new revolution and get the maximum benefit out of it.

Implication of ICTs for science and scholarship

Unequal distribution of science

Production and efficient utilization of scientific knowledge are highly concentrated in a few countries. In a large majority of countries science at best is a marginal activity. It is rarely, if ever, scientists on the periphery take part in the collective endeavour of setting the research agenda in any discipline or research front. No wonder they contribute very little to the growth of scientific knowledge. About 22 years ago Davidson Frame et al. [8] estimated that the top ten countries produced more than 80% of the world's mainstream scientific literature as against 6% by more than 120 developing countries and the situation has not changed. A recent study by Mexican physicist Ana Maria Cetto [9] has quantified the unequal distribution of scientific activity and scientific journals not only between the industrialized and developing countries but also within developing countries. Of the more than 140,000 titles listed in Ulrich's Directory of Scientific Serials, close to 80% are published in North America and Europe. In contrast, all the developing countries taken together, with 80% of the world population, produce 13% of the titles. If we go one step further and analyze the data at the level of individual countries, the disparities within developing countries are even more striking. China and India in Asia, South Africa and Nigeria in Africa, and Brazil, Argentina and Mexico in Latin America dominate the scene. Again, mere numbers and percent shares do not tell the full story. Most developing country journals suffer from limited circulation and lack of visibility. The world over, both librarians and end users prefer to subscribe and read journals produced in North America and Europe and ignore developing country journals. Most of the current awareness and abstracting services as well as numeric and factual databases are compiled and produced in the advanced countries and they index only a few developing country journals.

There is a vast and growing gap in the availability of scientists and engineers in the North and in the South. There were 3,800 of them per million of population in the USA as of 1990 as against less than 200 per million in the South. For the years 1994-1996 there were an average of 300 scientists and engineers (full time equivalent) per million population in the South as a whole, as against the industrialized country average of 3,300 [10]. These are mere numbers, not taking into consideration the quality of the training and the resources at the disposal of the scientists. It is said that a single company such as the General Motors in the United States invests far more on research and development than the entire R&D budget of India, a leading performer of science in the developing world.

By every yardstick one can think of, the developing countries lag far behind the advanced countries in the enterprise of knowledge production. What is more, developing country scientists find it very difficult to get accepted into mainstream country science. They can rarely get their research published in well-known journals. Even when a developing country scientist publishes a paper in an important journal, such as Science, Cell or Journal of the American Chemical Society, it may not be quoted in subsequent work as often as papers published in the same journal by scientists from the advanced countries. As sociologist Robert Merton would say, it is rarely that developing country scientists provide 'the shoulders of giants' on which others can stand and see further in the collective enterprise of knowledge generation in the sciences [11].

Harvard Vs Hyderabad

A New Scientist editorial commented that when it came to choosing manuscripts for publication editors of reputed international journals would more likely select a submission from Harvard than one from Hyderabad, even if both manuscripts were comparable in quality [12]. When refereeing manuscripts received from journals, the New Scientist editorial says, overly-enthusiastic reviews are given to work from friends, friends of friends, and people whose work is already familiar from conferences. More negative reviews go to researchers with unfamiliar names (like Arunachalam, for example!) from far-off lands. Many American journals are perceived to be parochial even by European scientists. While I don't subscribe to a conspiracy theory, I believe there is room for improvement. As Bruce Alberts, president of the National Academy of Sciences, USA, says, "if we

interacted with somebody from Argentina, it was one of the few people from Argentina who published in our journals" or who did "our kind of science" [13]. Many countries just have no representation whatsoever in this level of science and that kind of science, and "we forget about them," says Alberts. Science has become so specialized and fragmented that much of it makes no sense to scientists in many developing countries. Many of these countries, says Alberts, really may not need biochemistry or to work on the replication of DNA but need to strengthen their scientific enterprise as a whole to be able to deal with their own problems [13].

Comparing science in the developing countries with that in advanced countries, one is reminded of Ilie Nastase's brief but telling comment on his contemporary Bjon Borg's absolute mastery in tennis in the 1970s: "They should send Borg to another planet. We play tennis, he plays something else"! The difference between mainstream science and science on the periphery is even more pronounced, so much so the late Michael Moravcsik has compared the scientists in developing countries to a bird whose wings have been clipped but nevertheless tries to fly. It is against this background that we should examine the implications of the digital revolution for science and scholarship in the developing world.

Communication in science

Till recently, the printed journal, which dates back to the mid-1660s, remained the single most important channel of communication of scientific knowledge. The object of such communication is the registration (including for claims of priority), evaluation (through peer review), dissemination and archiving of human knowledge. As long as printed journals were the main vehicle of communication and as long as the number of journals was small, there was not much difference in the level of access scientists from different parts of the world had to scholarly information. True, as most journals were produced in Europe (and subsequently North America), scientists in distant lands accessed fewer journals than their Western counterparts and after a delay of a few months transit time.

Impoverished libraries

Today there is a tremendous proliferation of journals and many of them, especially those published by commercial firms, are priced out of reach for libraries even in the West. Thanks to the rising value of the US. dollar and pound sterling against the local currency and dramatic increases in subscription prices of journals and databases, libraries in developing countries have been forced to reduce the number of journals and secondary services they receive. The situation in Africa is particularly bad. Seun Ogunseitan, a Nigerian journalist-turned-information provider once said, "Many people in our universities are not sure what is the state of science. Scientists often have to rely on what they are told, for example, by newspapers, by friends or by Time magazine. How can such people ever become authoritative and confident scientists? [14]"

Publishing goes electronic

Many primary journals and secondary services have now gone electronic. Current awareness services such as Current Contents Connect, abstracting services such as SciFinder (Chemical Abstracts) and multidisciplinary citation indexes such as the Web of Science are available on the Web, at a fee that most university and research laboratory libraries in developing countries cannot afford. An increasing number of primary journals are allowing print subscribers to have access to their web editions through password control. These include such all-time favourites as Nature and Science. The house of Elsevier provides online access to its own journals and journals by a few collaborating publishers - more than 1,000 titles in all - through the Science Direct service. Wiley Interscience gives online access to hundreds of Wiley journals. High Wire Press of Stanford University is hosting a long list of quality journals on the web. All these fee-based access will no doubt help North-North flow of information but will certainly increase the gap between the North and the South.

There have been some South-friendly initiatives. The Electronic Publishing Trust of the UK is helping developing country journals, mainly in the area of biology, go electronic, a step that could help flow of information from the South to the North. The British Medical Journal has thrown open web access to the full text version of BMJ for free. When the BMJ wanted to publicize this move, rival medical journals refused to carry a paid advertisement. A few other journals such as Gut and the journals of the International Society of Optical Engineering (SPIE) also provide free access. The National

Academy of Sciences, USA, provides free electronic access to its publications to developing country scientists [15]. Physicists have gone one step further; they circulate preprints through the Los Alamos e-Print archive long before they appear in refereed journals. This service, started in 1991, is free and it serves more than 50,000 users from over 100 countries.

Free, but ...

Free some of these may be, but in reality most developing country scientists are excluded. Take for example the Los Alamos e-Print archive for physics. Physicists at a few institutions in India - the Indian Institute of Science, Tata Institute of Fundamental Research, Institute of Mathematical Sciences, and a few others - are using this facility. But many physicists in Indian universities do not have access to Internet or email. A professor of the University of Delhi, one of India's more affluent universities, told me that until he established an Internet connection out of a research grant he received two years ago from the Inter University Centre for Astronomy and Astrophysics, no one in the university had direct access to the Los Alamos archive! In contrast, virtually every physicist in North America and Europe, I guess, will have high bandwidth access to the Internet. The relative disadvantage of developing country scientists becomes obvious. A growing number of journals, especially in the fields of science, technology and medicine, now receive and review manuscripts by email, and some journals such as the New Journal of Physics [a joint venture of the Institute of Physics (UK) and the Deutsche Physikalische Gesellschaft] are available only in electronic form. Developing country scientists who are not connected to the Net will be excluded automatically from publishing in such journals. Nor will they be invited to review manuscripts. As a result, the performance of researchers is affected, not because they are poor physicists or chemists but because they are not connected to electronic information networks.

If you ask me, surely the University of Delhi, easily one of the better-funded in India, could have provided Internet access to every faculty member if not every student long ago. The Indian universities have been talking about automating and computerizing their libraries for more than a decade and there is a networking organization called the INFLIBNET established by the University Grants Commission. Now INFLIBNET is talking about providing Internet access to all universities, but if the progress made so far is any indication it will take years before anything worthwhile is achieved.

Advantages of going digital

No doubt digital journals offer enormous advantages, such as ease of access, rapid delivery over great distances, and hypertext links from indexing services and bibliographic citations to the full text of cited documents. Forests need not be cut and journals no longer need to be bound and preserved in physical space. Authors can use video clips, simulations, supplementary material and additional colour. The rise of the Internet offers an unprecedented opportunity to change scientific publishing in ways that could improve on virtually all aspects of the current system, says Harold Varmus, director of the US National Institutes of Health, who is piloting a global electronic publishing venture covering all the biomedical sciences. Such integration of electronic access to research papers can reverse the trend of compartmentalization of knowledge resulting from the proliferation of specialized journals, says Dr Fatis Kafatos, Director of the European Molecular Biology Laboratory in Heidelberg. As pointed out by Bruce Alberts, the World Wide Web can help educate people everywhere through asynchronous learning networks [15].

The knowledge gap is widening

All that is very well, but hardly any laboratory in the developing world has Web access to journals and databases. How can their scientists be equal partners in the worldwide enterprise of knowledge production? The truth is that the transition from hard copies to electronic publishing, left to itself, will widen the gap between developed countries and developing countries, and will further marginalize the already marginalized scientists and scholars in the South.

While the communication revolution is perceived as a liberating influence, what is most likely to happen is that in many developing countries scientists and scholars will be among the last to be reached by it. In India, for example, the stock market community has a network of its own with dedicated telephone lines, but a vast majority of scientists do not even have telephones on their desks. While the rapid expansion of the Internet in the West and the speedy transition to electronic

publishing will help scientists and scholars in the developed countries to interact with colleagues and members of their invisible colleges, the already isolated scientists of the developing world will be reduced to mere spectators. The already existing gulf in the levels of science and technology performed in the developed and the poorer countries will be widened further, and that could lead to increased levels of brain drain and dependence on foreign aid of a different kind (knowledge imperialism).

In an earlier era, Indian mathematician Srinivasa Ramanujan, a genius who had not gone through a conventional training program, was nurtured in the intellectually stimulating ambience of Cambridge University thanks to the intervention of G.H. Hardy. While such individual efforts may still help overcome obstacles on occasion, what is needed to overcome the current crisis is a far more organized and systematic program of action. Early introduction of satellite-based high-bandwidth Internet access to tertiary educational institutions and research laboratories at low cost and differential pricing for information (journal subscriptions and access to databases) to allow institutions throughout the developing world to obtain the most recent journals and most up-to-date databases are high on my agenda.

Can happen but doesn't

On both fronts, I am not happy with what is happening. For example, India can easily afford to invest in high-bandwidth Internet provision to the 100 or so cities and towns where most of the nation's research laboratories and universities are located. But this has not happened. In the past two or three years there have been many initiatives piloted by resident and non-resident individuals, science academies, and high power committees appointed by the government. Some academics are talking about providing 2 gbps (gigabits per second) bandwidth! Some state governments have entered into an agreement with WorldTel, a company managed by Mr Sam Pitroda, who is largely responsible for making telephone services widely available to Indians, for making available public access Internet and email facilities in their states. With so many initiatives, one would expect the whole of India to be networked soon. And yet there has been very little change in the ground realities. Such lethargy and dithering are characteristic of developing countries. It often takes far too much time for things to happen or to translate something from the realm of the possible to reality. In the mean time, the Indian government has decided that higher education is a non-merit good and therefore of low priority for public support!

As for differential pricing, both publishers of primary journals and database producers in the affluent countries are reluctant to embrace such measures. In one rare exception, the Institute for Scientific Information, Philadelphia, offers Science Citation Index at 50% discount to most developing country subscribers. Even then it is perceived as too costly!

I would not be surprised if the gulf between the scientifically advanced nations and the others widen even further, reducing further the role of the developing countries in the enterprise of knowledge production, dissemination and utilization. But I see a ray of hope in two proposals made by Bruce Alberts in his most recent presidential address to the National Academy of Sciences, USA: "Connecting all scientists to the World Wide Web, where necessary by providing subsidized Internet access through commercial satellite networks," and "taking responsibility for generating a rich array of scientifically validated knowledge resources, made available free on the Web, in preparation for a time when universal Internet access for scientists is achieved in both developing and industrialized nations" [15]. I wish Alberts well and hope that his dream, a strong and compelling vision, gets translated into reality during his second term as president of the Academy.

Part Two: Implications of ICTs for development

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H O M E

b ytes for all ....

Information and Knowledge in the Age of Electronic Communication: A Developing Country Perspective...Part II
by Subbiah Arunachalam, Chennai, India

Implications of ICTs for development

Thus far we have looked at the implications of ICTs for the production of knowledge, especially scientific knowledge, in the developing countries. We will move on to the role ICTs play in solving information-related problems of the lay people, particularly those living in rural areas. We will begin with the dimensions of the digital divide.

The have-nots and the know-nots

Most developing countries do not have the necessary infrastructure (computer terminals, networks, communication channels, bandwidth, etc.) not only for their scientists to be able to contribute as equal partners in the worldwide enterprise of knowledge production and dissemination but also to provide their citizens empowerment through information. According to figures provided for the developing countries as a whole in a 1998 UNDP report, 18.5% of the population have a radio, 14.5% have a television, 0.4% have a telephone line, 0.7% have a computer and 0.05% have Internet access [16]. According to Bruce Girard, former director of Latin America's community radio Pulsar, 95% of all computers in the world are in the developed nations, and ten developed nations accounting for only 20% of the world's population have three quarters of the world's telephone lines. Teledensity in many African countries is less than 0.5 per 100 inhabitants, says a March 1999 ITU report. In India it is 1.86 lines per 100 persons, compared to over 60 per 100 inhabitants in the United states and Canada. Says the Human Development Report 1997: In Australia, one in five persons owns a personal computer; in India only one in 1,000. There is an average of one fax machine for every 35 people in industrialized countries; in developing countries, one fax machine serves an average of more than 1,000 people. The Swiss average four hours of international phone calls each year, compared with 60 seconds for the Chinese and 12 seconds for the Ethiopians. There are four television sets for every five people in the United States, compared to one for every 50 people in least-developed countries. For every person who logs on to the Internet in developing countries, there are 149 people logging on in the industrialized world [10]. Internet access in India, says a recent report of the National Association of Software Companies, is available to about 250,000 people - in a country of over 980 million people - and is expected to reach 500,000 people by 2,000. The simple truth is that the information superhighway is not bringing the fruits of cyber space to all. Not yet. The information revolution is still very much in its beginning stages and is limited primarily to the developed countries. In particular, the Internet is overwhelmingly American-based, English-speaking, and Western-focused. While governments, corporations and individual citizens in the industrialized nations are fast adapting to the new information environment, the vast majority of people and nations in the South are struggling to cope with the developments. There are far too many people in the developing world who have not been touched by the information and communication revolutions. These are the have-nots and know-nots who risk being always behind. Those who have access to new technologies undoubtedly are much better off now than before.

Digital divide

For all its strengths, the new economy and the high-tech revolution are exacerbating the divide between the rich and poor even within advanced countries. America's middle class shrunk from 71% of the population in 1969 to 63% in the early 1990s. Wealth is becoming ever more concentrated: the top 20% of American households own 80% of the country's

wealth, and the top 1% own 50%. Economic inequality encompasses racial inequality: According to Rifkin, 33% of African Americans, 29% of Hispanics and 11% of all Caucasians live in poverty in America. African Americans face the greatest 'knowledge' disadvantage because they have traditionally been concentrated in the most expendable job categories such as low-skilled service, clerical and manufacturing industries, all destined for even greater reduction. A recent study by the US. National Telecommunications and Information Administration revealed that while access to computers, modems and online connectivity increased throughout the United States between 1994 and 1997, the gap between the rich (white and non-Hispanic immigrants) and the disadvantaged (black, Hispanic and inner city populations) widened considerably. Analysts see stubborn racial disparities in technological access and participation in the high-tech economy [17-19]. As the Rev. Jesse Jackson pointed out recently, high-tech companies in the United States are overwhelmingly, even embarrassingly, white. Out of 384 board directors in 51 Silicon Valley companies, only five are African Americans. The boom in the new economy threatens to pass the African Americans by. White families are twice as likely to own home computers as black families, even after statistically adjusting household income. Poor schools with predominantly minority students have twice as many students per computer as middle-class white schools. Equalizing access to technology and training has become "the new frontier of civil rights."

As Professor M. S. swaminathan says, in one of the greatest achievements of the century we got rid of skin-colour based apartheid but are now facing the emergence of an information access based apartheid.

UN's concern

The United Nation is greatly concerned about the imbalance of access to electronic communication facilities. The UN's Administrative Committee on Coordination issued a statement on Universal Access to Basic Communication and Information services in April 1997 [20] in which it stated: "We are profoundly concerned at the deepening maldistribution of access, resources and opportunities in the information and communication field. The information technology gap and related inequities between industrialized and developing nations are widening: a new type of poverty - information poverty - looms. Most developing countries, especially the Least Developed Countries (LDCs), are not sharing in the communication revolution, since they lack:

- affordable access to core information resources, cutting edge technology and to sophisticated telecommunication systems and infrastructure;

- the capacity to build, operate, manage, and service the technologies involved;

- policies that promote equitable public participation in the information society as both producers and consumers of information and knowledge; and

- a work force trained to develop, maintain and provide the value-added products and services required by the information economy.

We therefore commit the organizations of the United Nations to assist developing countries in redressing the present alarming trends" [20].

Reaching the unreached

Most current discussions on digital technologies are couched in optimistic versus pessimistic perspectives. Prophets such as Peter Drucker, Alvin and Heidi Toffler, and Esther Dyson believe that the information revolution will make hierarchical bureaucracies

obsolete and will lead to a new electronic feudalism with overlapping communities and jurisdictions to multiple layers of citizens' identities and loyalties. John Naisbitt, Nicholas Negroponte, Bill Gates, Kevin Kelley and Yoneji Masuda expect to see an array of positive developments and foresee radical changes in economics, politics and culture. They hope to see expanded productivity, improved employment opportunities, and improved democratic process with a majority of people empowered to participate in public decision making. All this sounds utopian to thinkers like Neil Postman, Joseph Weizenbaum, Theodore Roszak and Frank Webster who believe that deployment of ICT will simply reinforce historical trends towards socio-economic disparities, inequalities in political power and gaps between knowledge elites and the disenfranchised. Unafraid of being dubbed neo-Luddites, they predict massive job displacement and deskilling. Between the two extremes is a small group of technorealists treading the middle ground [21].

"Although the information revolution could well exacerbate existing economic and cultural faultlines, thus widening the global rift between the North and the South, it also offers the possibility of a truly interconnected 'global village,' says Alan Hedley, the University of Victoria, Canada, sociologist, whose position is close to that of the technorealists [22]. There could be three possibilities, he says.

- In the first, left to grow unchecked information technology will more than likely solidify and reinforce existing cleavages. The 'do-nothing' approach is basically a strategy of exclusion or apartheid and it would lead to an unstable and inherently unsustainable world. The gap between technology "haves" and "have-nots" is unrelenting, says a US Department of Commerce report renewing concerns about how the info-chasm could contribute to economic injustice in the 21st century.

- The second scenario is all too familiar - the world will be increasingly homogenized and the dominant culture would push the other cultures to the background. The United States exports 120,000 hours of TV programming to Europe alone every year. The cola wars are fought on the Indian TV, celebrity cricketers and film stars backing one or the other cola. Music TV channels from the West have virtually destroyed interest in classical and native musical traditions among the youth even in countries like India which have well-developed and long-standing traditions. US style junk food chain stores and branded clothes have invaded every country edging out less expensive and better suited local products. The age of political imperialism may be over, but cultural and economic imperialism is emerging with a vengeance.

- The third and the more desirable scenario is that of a global village wherein for the first time all people of the world will have an opportunity to interact over a virtually seamless communication network. For the hitherto disenfranchised of the world, the new order could provide the means to organize and articulate their needs, such that they could eventually participate in a more just and humane, and hence sustainable world.

What should we do to realize the desirable scenario? How can we help the millions of disenfranchised in the world? How can we use digital technologies to improve their livelihood? Who will finance such a massive effort?

The new technologies are here to stay, no one can wish them away, and whoever can will take advantage of them. Also, it is clear that much as we might like it, it would be impossible to provide the same level of access to ICT tools to all the people in the world as is currently obtaining in the affluent countries. The gaps will remain. We have to think of more practical models.

I believe the first thing we should do is to shift our focus from the technology part of IT to the information (or content) part. Take my own example. As an information professional,

for the better part of my life I have been dealing with learned periodicals and their impact factors, current awareness and abstracting services, and citation indexes. I have specialized in searching the literature and have been quick to adapt to changes - from print to CD-ROM to the web. But what is the use of all these to the rural poor in India and elsewhere? The knowledge and skills I have acquired over years of diligent work in academic and research institutions and special libraries are of great help to my friends and colleagues in universities and research institutions, but are of no consequence whatsoever to most of my countrymen and millions of others. Their information needs are different. It is only on the basis of their current needs and how they get those needs satisfied one can think of meaningful technological interventions. Only a bottom-up process will work.

As resources are limited and the population to be served is very large, community-based access and resource sharing will be the only choice. That is precisely what Sam Pitroda did, when Prime Minister Rajiv Gandhi called for his help in improving telecom services in India. Thanks to Pitroda's plan, today virtually every town in India has a public telephone booth within a short distance from where one can make local, national and international calls.

Telephones are not the only tools that could be shared in the community-based access model. One could think of a whole gamut of tools to be used in tandem. For example, in remote areas where telephone lines have not yet penetrated, one could use a hybrid of wired and wireless technologies for both voice and data communication. Computers, modems, satellite connectivity can all be used to provide e-mail and Internet access as well as for storing and retrieving local information.

In short, technology, although it costs money and effort to get it in place, is the least of the problems. As I said before, it is the information or the content part which should receive our attention.

There have been many efforts at building appropriate models for the effective use of ICTs in development. Let me give a case study of one of the most successful experiments.

The "Information Village" experiment

With a modest grant from IDRC, Canada, the M S Swaminathan Research Foundation in Chennai, India, is carrying out a set of imaginative experiments in electronic knowledge delivery with a view to exploring the impact of modern ICTs on rural development [23, 24]. Swaminathan and colleagues chose a cluster of villages and hamlets near Pondicherry, the former French colony, about 160 km south of Chennai on the Coromandal coast. Half the population in these villages has a total family income of less than $25 per month. The project is designed to provide knowledge on demand to meet local needs using a mix of wired and wireless technologies and through a local web site. Through participatory rural appraisal in 13 villages, the MSSRF team chose Villianur, a market centre surrounded by several hamlets, as the project's local headquarters. Villianur is an administrative node and is well connected by roads. A value addition centre equipped with a computer, modem, telephone, a small telephone exchange (EPABX), wireless equipment, etc. at Villianur is the hub of the information and communication network. It is from here that the project staff operate and produce and update all the databases to provide information to the people. There are sub centres at three nearby villages, all within 20 km, Kizhur, Embalam and Veerampattinam, each one established after ascertaining the need through participatory rural appraisal. The actual location of the sub centres within the chosen villages and the choice of volunteers to man the centres were done with great care. In Kizhur, the information centre is located in the front room of a private home, one of the very few weather-proof houses in the village, and is being managed by a sister-and-brother duo, both high-school educated and below 25. At Embalam, the centre is located in the village temple and is managed by middle-aged women volunteers, whose husbands go to the fields and children to the school leaving ample time at their disposal. At

Veerampattinam, the sub centre was established on a demand from the local fishermen community and is looked after by the local Panchayat - the elected body of local government. At each centre, the Foundation has entered into a written agreement delineating the responsibilities of the Foundation and the village community. In general, the Foundation provides the equipment, expertise and training, and the community provides for the volunteers and maintenance.

Early on, the project team carried out a survey to find out the socio-economic status of the target population, the communication infrastructure, their information seeking habits, and their information needs. The 11 villages surveyed had 4,373 households of which 1,300 were below the poverty line (annual household income less than the equivalent of $300). The entire population of more than 21,400 was served by just two reading rooms, six post offices, 12 public telephones and 27 private telephones. There were 1,129 television sets, of which 424 were connected to cable TV. The cable connection comes at a monthly fee of less than the equivalent of $1.5 and offers three channels, all in Tamil, the local language. The services provided by the government (telephones, for example) are utterly inadequate, whereas both television and the cable TV channels have a wide reach, but TV and radio are viewed essentially as means for entertainment and not information. For really useful information farmers look up to other farm families and local traders and suppliers of farm inputs. Local government functionaries are not rated high.

The villagers get value-added locale-specific information in a wide range of fields: healthcare, transport, market, subsidies, entitlement, and so on. Particularly popular are women's health information - often not discussed in traditional societies - advice on growing crops and protecting them from diseases, market prices for these crops, local weather forecasts, and clear information about the many programmes run by the government and other agencies. Much of the information is keyed in Tamil, the local language. Incidentally the villagers can use the PCs at Villianur and the sub centres to transmit data and fax messages in Tamil. Some key information such as the day's price for rice varieties and changes in bus timings are written on a display board at all centres.

Most of the system operators and volunteers are women. Thus the programme enhances the status and influece of women by making them the providers of primary information.

Right from the beginning the Foundation has made it clear that it would withdraw after a certain time, allowing the village communities to run the show on their own as a self-sustaining venture. Will the villagers be willing to pay for information and if so how much? If they find the current services useful, it is more than likely that they will continue with the centres on a pay-per-use mode. After all, despite dire poverty, many of them are willing to pay for cable TV, because, in their view, it satisfies a felt need.

The entire project draws its sustenance from the holistic philosophy of Swaminathan which emphasises an integrated pro-poor, pro-women, pro-Nature orientation to development and community ownership of technological tools against personal or family ownership, and encourages collective action for spread of technology [25]. Within the community, Swaminathan would prefer to reach out to women and the assetless first. Experience from India's Green Revolution which he spearheaded has shown that if one starts with the poor, the rich also learn from the experience but the reverse is not true. The same way if a woman is helped the entire family is helped. His vision is one of development through job-led growth as against development which takes away jobs.

Bruce Alberts consideres this experiment a wonderful example that points the way forward [15]. Drawing on the Swaminathan model, he envisions a global electronic network that connects scientists to people at all levels.

What needs to be done

There are many experiments, especially in Latin America and Africa, funded by aid agencies. But considering the enormity of the task, what is happening is absolutely inadequate. However, there are some silver linings in the cloud. Organizations such as the World Bank, UNDP, IDRC, and the British Council, to name but a few, are taking considerable interest in this movement which is gathering momentum. The World Bank was largely responsible for the GKD97 (Global Knowledge and Development) forum on the Net which brought together hundreds of interested people - experts and the merely concerned - and threw up many worthwhile ideas and suggestions. My own interest in this issue was triggered by my participation in the GKD forum. IDRC is funding the Acacia project in sub-Saharan Africa. The British Council has floated the INDEV initiative bringing together development information from a few thousand voluntary agencies in India and helping them get on to the Net [26]. Nicholas Negroponte and a few others have formed the 2B1 group to see that the world's children gain access to computers and the Net [27]. Bill Gates has recently created two new foundations to help the underprivileged gain access to computers. A private citizen, Ms Gita Mehta, is collecting used computers in Japan and sending them to the needy in India. As Swaminathan says, what we need today is to go back to Gandhi's concept of Trusteeship - the rich, while enjoying the benefit of their wealth, should also take care of the needy. May be there should be more Linux and less Windows and more BMJs and less Science Directs!

A change in attitude among the wealthy countries can do no harm. I often wonder at the title of the ultimate in US Baseball League, the World Series. How small is their world, restricted to some thirty or forty teams playing under the American and the National Leagues and confined to a few states of the United States! With this attitude of "us and our neighbourhood constitute the world," when some policy makers in governments and international organizations decide to do something good for the world, it may not be good for the entire world but good for the limited world they are concerned with. Fortunately, we also have men of vision like Swaminathan and Bruce Alberts amongst us.

Finally...

I am an optimist. Although much of my talk was devoted to the persistence and the enlargement of the digital divide, I believe with right action and with the cooperation of different constituencies - governments, international organizations, learned societies, academies, donor organizations, voluntary agencies, etc. - we can reverse the trend and leave for our children a world which is much more informed, inhabitable and harmonious than ours. Let me end by saying that Gandhi is more relevant today than ever before.

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Information and Knowledge in the Age of Electronic Communication: A Developing Country Perspective.......Part I

About the author

Subbiah Arunachalam (Arun), a distinguished fellow at the M S Swaminathan Research Foundation, Chennai, is one of India's leading information scientists and scientometricists. He is a member of both the International and the Indian Science Writers Associations,

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HOME

Fishing with the Web in Veerampattinam

Author : Venkataraman Balaji and Subbiah Arunachalam
Date added : 2001-04-20

Brief Project Background

The project called Information Villages was started in 1998 in Pondicherry in South India by the M S Swaminathan Research Foundation. It was part of the efforts of the Foundation to take frontier technologies to the ultra-poor rural families to enhance their opportunities for improved livelihood security. The concept for the project arose from an international consultation held earlier by Professor M S Swaminathan, architect of Green Revolution in India and Chairman of the Foundation. His approach to dissemination of technology among the ultra poor in rural areas can be summarised thus: whatever a poor family can do with technolgy, a wealthier family can also do; the converse does not happen. The project called Information Villages was started in 1998 in Pondicherry in South India by the M S Swaminathan Research Foundation. It was part of the efforts of the Foundation to take frontier technologies to the ultra-poor rural families to enhance their opportunities for improved livelihood security. The concept for the project arose from an international consultation held earlier by Professor M S Swaminathan, architect of Green Revolution in India and Chairman of the Foundation. His approach to dissemination of technology among the ultra poor in rural areas can be summarised thus: whatever a poor family can do with technolgy, a wealthier family can also do; the converse does not happen.

project description

The project as a whole is premised upon the viability of creating a value addition process to networked information so that the product will become immediately useful in a local context in India. This is realised by the establishment of a hub which is connected to the Internet and which also provides the services of a LAN in the rural location. Given that the reach of wired PSTN is very low in India- a survey done as part of the project revealed that in 1998, there were only 12 public telephones and 27 private telephones available for a popumation of approximately 22000 people- a combination of wired and wireless technologies was used to access the network and the Internet. The wireless technology chosen was the VHF radio technology which is publicly available with companies using this to connect to remote offices and factories. A modification was made to enable two-wat transfer of data as well as voice, and to connect to the PSTN through a PBX board. What was set up in effect was an intercom, office-style, except that the medium was radio wave and not copper wires. It was possible to obtain data transfer rates of 14.4 KBPS with high level of voice clarity and one could tell different individual voices as they spoke on the wireless phone. PCs could be connected to this network using standard line modems and protocols such as the SMTP and MS-FAX could be used. The hub has a server running on WIN-NT using MS-EXCHANGE. The power was provided by a hybrid of solar PV panels and line electricity and this could help in running two PCs and a 18W lamp in a location for up to 12 hours even without line electricity.

In each village-there are 10 now- the access points were located in a building provided by the community free of cost. The community also identifies in each village a group of youth who are trained in managing all the opeartions at the village access point, called Village Information Shops or Rural Knowledge Centers. Each rural center has a couple of PCs connected to the wireless LAN and village residents can use the PCs or access the network under the guidance of the local managers.

It should be noted that the poverty in this area is noticeably high, with almost a quarter of families living with an income of less than one dollar a day. It is predominantly a paddy or sugarcane producing area.

Results

project results

The project has created a new community asset in the form of village access points; these are community-owned and managed with formal or legal agreements with the Foundation for maintenance and security and guarantee of access without prejudice. At least half of the local managers are women.

There are several recorded instances of community deriving direct benefits from using the network.

Veerampattinam is a fishing village with a population of about 4500. Over ninety percent of the families here are involved in fishing with nearly 80 per cent being artisanal fishermen using non-motorised catamarans. The Bay of Bengal on whose shores this village is located is known for treacherous waves. Often casualties occur and our estimate is that at least one individual died every month. With the help of access to the Internet, the fisher families are able to make use of the wave height prediction available at the US Navy web site at Rota, Spain, which also provides 12 hour predictions for wave heights for the Bay of Bengal. The fisher families make use of this information regularly and consider it life saving. To enable even illiterates to make use of this information, the predictions are announced over loud spakers and amplifiers connected to the PC in the village center.

Another benefit is accessing information on public entitlements to the rural families. Most rural residents are unaware of their entitlements in view of their poverty status, and they have now gained access to such information on housing schemes, support for school education, food subsidy for ultra poor families etc. This has become a dominant use in all the villages now

Lessons

lessons learned

ICTs can make a positive contribution to improving the quality of life of the ultra poor families in rural areas. It is essential that community ownership of ICT devices and

training is established in the initial phase to prevent influential sections from appropriating all the benefits. Special efforts are needed to identify knowledge and information needs and the genderisation of such needs must be accepted. Intelligent intermediation at the local level is an essential component in any such project. There is a need to maintain a continuous dialogue with the actual users to assess changing needs vis-a-vis the network derived information. A wide variety of access technologies are available now, and the emphasis should be on what is operable locally without cumbersome licenses or power requirements.

Development Impacts

development aspects

This project shows that there are direct impacts on development. There are economic benefits too, but these are relatively more difficult to quantify. An emerging trend is to make use of ICTs for sustaining the micro credit groups, many of them autonomously run by village women. They see a tool and an ally in the ICTs and express a willingness to meet the costs directly if an on line community banking serving a broad local area can be developed. The other is the confidence that rural families have acquired in realising their entitlements from the publicly funded schemes.

Project Information

Organisation : M S Swaminathan Research Foundation
URL : http://www.iicd.org/stories/articles/here.contact_url
Total budget in US$: USD 110 000 USD 110 000

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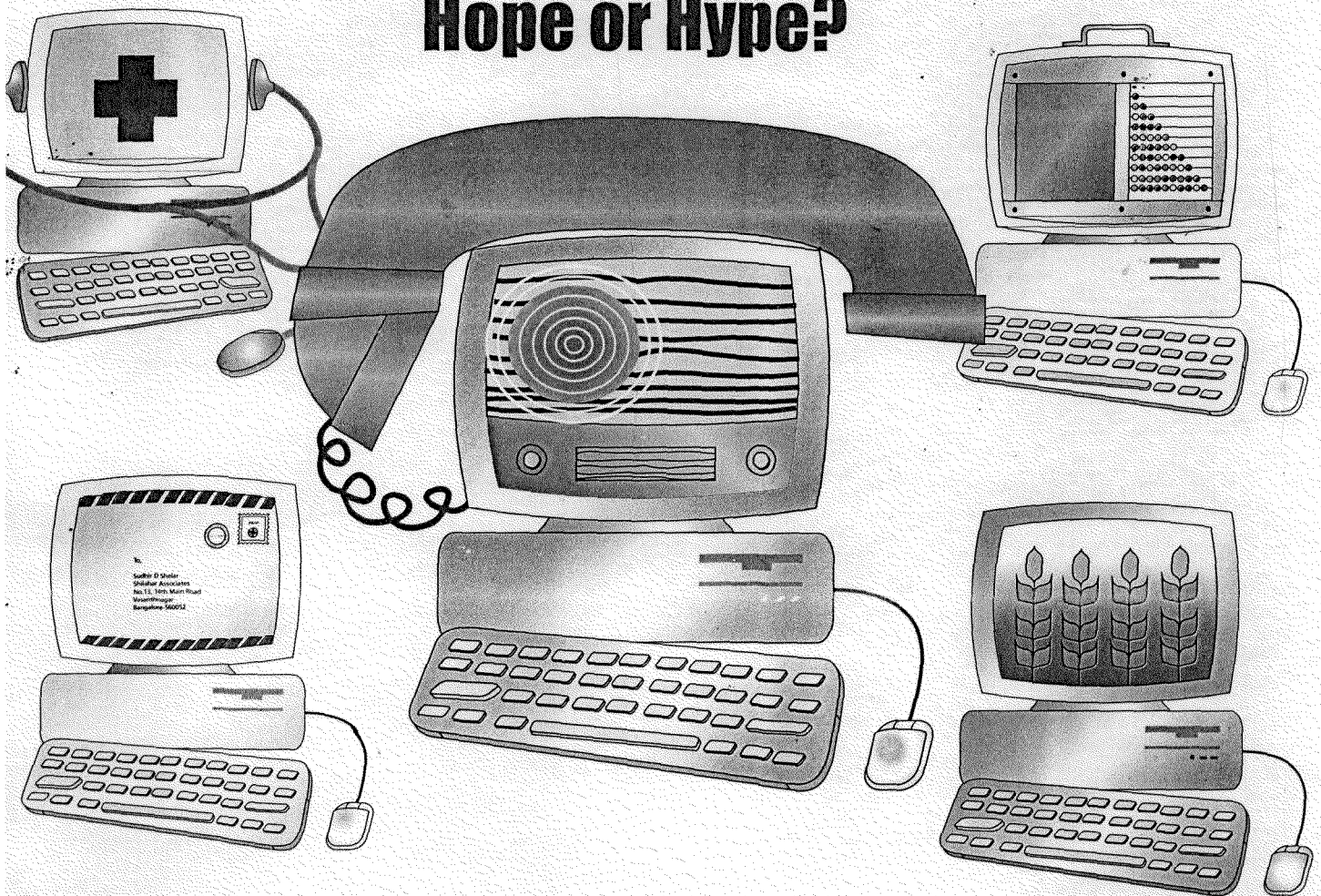
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Hope or Hype?

Preparing for a
knowledge society
Krishna P Kandath

Meeting societal needs
N Kalyan Raman

Radio broadcasting and
the Internet
Bruce Girard

Information shops

Taking IT to rural communities
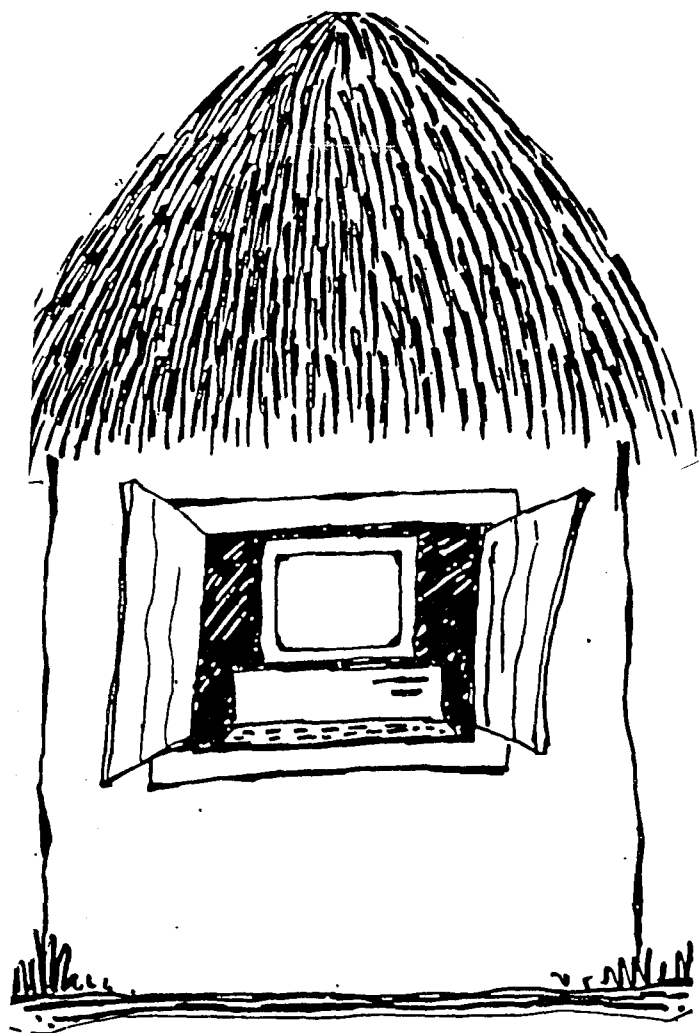
Murali Shanmugavelan
and S Senthil Kumaran

In an attempt to lessen the information divide between urban and rural India, this innovative project has set up information centres to provide local communities with information relevant to their welfare.

The ongoing Information Technology (IT) revolution has opened up uncommon opportunities to developing countries in terms of providing low cost access to information. The UNDP's Human Development Report, 1999 has described it as 'the fastest-growing tool of communication ever,' with the number of users expected to grow from 150 million today to more than 700 million in 2001. What does this mean to the poor in a developing country? The most common charge levelled against Information and Communication Technologies (ICTs) is that they benefit only developed countries. As the UNDP report points out, 'The United States has more computers than the rest of the world combined. South Asia, with 23 per cent of the world's people, has less than one per cent of the world's Internet users.'

Does this mean that we can afford to ignore IT? The answer is a resounding 'no'.

It is in this context, that the M S Swaminathan Research Foundation undertook a pilot study on the impact of IT on rural societies. The study, which focused on the villages in the Union Territory of Pondicherry, has yielded encouraging results. Based on a user-controlled and demand-driven system, the project, called the Knowledge System for Sustainable Food Security, used the local language (Tamil) as the medium of communication. Four information shops have been set up at Villianur, Kizhur, Embalam and Veerambattianam in collaboration with IDRC, Canada. The importance of modern ICT here lies in the ease with which it allows information held in many different locations to be accessed, re-formatted or value-added (with locale-specific relevance) to suit the local needs and disseminated. The rationale behind the project was to empower rural women and men with information provided through modern ICTs.

The project has an operational centre at Villianur, which is the headquarters of all information shops. This is where the 'last-mile posts' in development administration, such as the Block Development Officer's office, are located. The telephone facility is also available here and includes access to Internet through VSNL. From this central location, it is proposed to extend the wireless network for data and voice communication to the other three information shops, each serving a couple of hamlets. Local youth, preferably women with not less than formal eighth standard education, are being trained to operate the computers. Each information shop has also been provided with a solar-hybrid system as the primary source of power. This is the first time that such systems have been installed in the country

In order to arrive at a reasonably clear picture of the state of existing communication habits and channels in the project area a detailed survey covering 10 per cent (4373 households) of th

resident families in the proposed area of coverage has been ongoing since April 1998. Some of the findings that have emerged so far show that the telephone density is as low as .0089 phones per household; that the reach of television is reasonably high compared to the prevalence of poverty in the villages surveyed (1,129 TV sets of which 424 are cable connected); and that the predominant sources of information are the local (petty) shopkeeper, the market-place and the (agriculture) input supplier.

Each centre contains health related information, especially that pertaining to women and children, data on government entitlements under various schemes, new opportunities for employment and income generation, prices (agricultural input or produce) in the locality, grain and input prices (quality seeds/fertilisers) in the Pondicherry region, a directory of general and crop insurance schemes, information on integrated pest management for rice and sugarcane crops, hospitals and medical practitioners in Pondicherry grouped according to specialisations such as orthopaedics, paediatrics, etc., information on local transport/traffic and cultural/public events in the locality.

These databases in Tamil (except the one on families below the poverty line, which is an official document in English) are available in all information shops. Updates are transferred using the wireless network. Veerampattinam is a coastal village with 98 per cent of the families involved in fishing. The information requirements in this village are therefore different from the others. A US navy military website (www.nemoc.navy.mil) is accessed twice a day to obtain the weather forecast for the Pondicherry region and sent to that particular information shop.

The success of the Village Knowledge Centres will depend on how useful the communities find them. This in turn will depend on the accuracy and reliability of information contained in the local databases. The project is nevertheless a creative attempt to address the global information divide and thus empower the people. ■

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Assessment of Impact of Information Technology on Rural Areas of India[1]

Subbiah Arunachalam, S.Senthilkumaran

Summary

This project has established a hub-and-spoke model of data-cum-voice communication in a group of six villages in Pondicherry in South India. The village centers can communicate with each other as well as to the Internet. A hybrid of technologies is used - wired with wireless for communication and solar with mains for power supply. The hub provides connectivity to the Internet through dial-up telephone lines, and the staff there creates locally useful content. The village centers receive queries from the local residents and transmit information, collected from the hub, back to them. An important feature of this project is the strong sense of ownership that the village communities have developed towards the village centers. The other key feature is the active participation of rural women in the management of the village center as well as in using it. A system of close consultation between the project staff and the rural users has been evolved, so that information needs are realistically assessed. Quantitative data are collected on the use patterns, and stories of deriving benefit have been chronicled.

On the whole, the impact has been positive. There is significant policy interest in the project outcome.

Context

The project was developed by the M.S.Swaminathan Research Foundation as part of its program of taking the benefits of emerging and frontier technologies to the rural poor. Modern information and communication technologies (ICTs) were found to have great potential to contribute in this respect. An international, interdisciplinary dialogue, organized by the Foundation in 1992, conducted an analysis of the range of issues involved. The dialogue participants concluded that ICTs would have a major role to play in promoting sustainable agriculture and rural development in the developing world. To be of use to farm families, the generic information found in the networks, including the Internet, should be rendered into locality-specific knowledge that farm families, and rural women and men, can act on. This was the model adopted for implementation in this project. The Foundation's approach to dissemination of new technologies in rural areas is premised on the statement of its founder, Professor M.S.Swaminathan: "whatever a poor family can gain benefit from, the rich can also gain benefit; the reverse does not happen". Thus' involvement of ultra-poor in rural areas (there are over 300 million of them in South Asia) in managing the use of ICTs was considerer essential for the success of this project. The other critical issue was the need to involve rural women.

The project was started in 1998 in Pondicherry in South India because it has certain initial advantages: an accessible government and reasonable telecom infrastructure (urban teledensity of 20 app.). The level of poverty is high in rural areas, where about 21% of the resident families have less than one USD per day as *family* income. An earlier program of the Foundation for community asset building based on biological technologies had been fully operational in this region and the ICT project was expected to complement this program.

Objectives of this project

- Setting up of villages information shops that enable rural families access a basket of modern information and communication technologiesTraining educated youth, especially women, in rural areas in operating information shops;
- Training the rural youth in the organization and maintenance of a system that generates
- locally relevant information from generic information;
- Maintenance, updating and dissemination of information on entitlements to rural families using an appropriate blend of modern and existing channels of communication;
- Conducting impact assessment based on organization of surveys, participatory rural appraisal, and other appropriate methods of data gathering;
- Building of a model in information dissemination and exchange in rural areas that uses advanced information and communication technologies.

Methodology

All activities were preceded by a set of detailed surveys of the region (14 villages; 22000 population) for incidence of poverty, status of literacy and education, and the state of telecom infrastructure. A separate survey was carried out with about 10% of the resident population to identify existing communication habits and channels of information flow. These surveys revealed the gaps and the local availability of skills to bridge them. A good picture of the rating of various information sources by the rural families was also generated.

Participatory rural appraisal (PRA) was used as a method to identity information needs in any community. PRA was also used to assess how far the community was willing to go in operationalising the local center, by way of making in-kind or cash contributions. This was also used in the identification of a group of individuals who would be consensually chosen by the community for managing the local center. The project staff suggested that 50% of them must be women and that they should have sufficient education (at least up to high school).

Gender sensitivity in assessment of information needs was incorporated at the inception. An expert in India, sponsored by the IDRC, was invited to give an orientation to the project staff in gender matters. Subsequently, a staff of the foundation, who had won the IDRC Gender Matters Award, was invited to join the project operations at various stages to impart gender sensitivity in needs assessment and in content creation.

Technology for gaining access to the Internet was based on a hybrid of 2-way VHF radio and the wired public telephone network. This approach provided' an integrated voice and data communication capability. The data transmission was restricted to a maximum speed of 14.4 KBPS on the wireless, where Email (SMTP) or fax protocols were used. Through a PBX (office intercom-style), every village center could be connected to this hybrid network. To overcome power outages, a hybrid system of solar photovoltaic panels and grid power, interfaced by a commercially available digital circuit, was used as source of power.

The value addition center was set up in Villianur village, located in the western part of the region. The hub of the wireless system was placed here. Dial-up accounts to the Internet were also established here. This was made the project office, as well as an interface for the public and the government offices in the locality. Village centers were set up in places where the community offered secure space, free of cost. A total 01 five such village centers were set up during the project period. One of these is a village on the coast with 98% of the population involved in fishing. The total population of the 5 villages is approximately 13400 with about 47% illiteracy.

Table 1 : *Village Centers as of October* 2000

Kizhur	(Sep. 98)
Embalam	(Dec. 98)
Veerampattinam	(Apr.99)
Poornamkuppam	(Nov. 99)
Pillayarkuppam	(Apr.2000)

The village center operators were trained in PC operations and in using the data-cum voice network (Table 2). They were trained in maintaining a register to log use of the center by the local

residents. Training was also imparted in basics of management, and in handling queries from illiterates. They were frequently met by the staff in the centers, and all the center operators and the staff met once every month (the last Saturday) to sort out issues. This also helped the project staff in maintaining a view of the changes in the community needs and perceptions.

Table 2 : *Training Details*

Average time for gaining familiarity with basic operations (Win 95)	2 weeks
Time taken to transact data on wireless	3 sittings
Time taken to gain preliminary knowledge of HTML	1 week
Word 97	2 days
PowerPoint 97	1 week
Use of Win 95 keyboard for Tamil Fonts	10 days

The project staff conducted the training programs and helped generate a number of locally relevant databases. They also provide the equivalent of a helpline for the village operators in training related issues.

Table 3 : *Value Addition Center (Functions)*

Entitlements to Rural Families: This database provides details of about 130 schemes which are operational in Pondicherry UT during the current Plan (up to 2002).
Families Below Poverty Line: The details of families in the communes of Ariyankuppam. Villianur and Nettapakkam have been provided in this database which has been compiled from the UT Administration and updated till April 2000. Approximately 22,000 families are listed.
Grain prices in Pondicherry region
Input prices (quality seeds/fertilisers) in Pondicherry region.
Directory of general and crop insurance schemes. Integrated Pest Management in rice crop. Pest management in sugarcane crop
Directory of hospitals and medical practitioners in Pondicherry grouped with specialisations such as orthopaedics, paediatrics etc.
Bus/train timetables-covering Pondicherry region and two nearby towns.

The project staff have designed and developed many locally useful databases (Table 3). Many of them are frequently updated and some are updated even twice daily. A considerable part of information is accessed from the local sources, on the web or otherwise. A critical portion comes from the web, from national and international sources. All of them are transformed into locally useful material, in

format (voice/digital audio, in some cases) and in language (Tamil, spoken by 98% of the population).

Results

The value addition center in Villianur and centers in 5 villages have been fully functional (Table 4) with activities related to information dissemination, data provision and feedback collection (These five villages are functional out of seven started, two of which were closed down due to inability of village bodies there to maintain them). The number and type of users in these centers are provided in the Table 5.

Table 4 : *Schedules in the Village Centers*

Average Working Hours (daily)	9.1
Time	0900 - 1800
Average Number of Users	12.3 (per day)
Closure (weekly)	Sundays
Closure (other occasions)	local festival days
Non-scheduled closure (average number of occasions)	4.6
Average Grid Electricity Breakdown	94 min. / day

Table 5 : *Analysis of Registers in 5 Village Knowledge Centers*
(1 Jan 99- 30 June 00)

Total Number of Users	15621
Females	2832
Assetless Families	4571
Illiterates	392
Persons below 14 yrs age	4421
One-time users	3674

It is significant to note that assetless, ultra-poor families are among the major users. About 18% of the users are women, which is much higher than the proportion of women users in village public reading rooms (less than 3%). This combined figure also conceals the fact that the proportion of women users in older centers is much higher. These two results are indicators of the success of the project approach emphasizing the participation of women and the assetless families. The pattern of usage (Table 6) indicates that educational

purposes (such as use of CD-ROMs) and accessing government sector data are the two most important uses of this system.

Table 6 : *Pattern of Usage (in %) in the Village Centers (up to Jun: e 2000)*

Voice	
Personal	16.33
Programme related	1.18
Data	
Agriculture & Fisheries	6.69
Education & Training	32.01
Employment	2.05
Health	1.51
Govt. Sector / Entitlements	40.43

There have been many instances where local residents have derived benefits from the use of data and information derived from this network. Some of them are :

Availing farm labour insurance by landless Women: 157 women obtained this insurance.

School examination results and marksheets downloaded from the web; over the last 2 years about 2100 students in all the centers have used this option and saved waiting time by at least one week per person.

Ease of contacting medical practitioners and veterinarians: the local databases have been found specific and useful.

Price information related to grain sales: this is the most important benefit according every farmer (121 interviewed in June 2000) as it helps him/her with better negotiating position in dealing with price-fixing middlemen.

Fishing hamlet receives information on wave heights downloaded twice daily from the US Naval Oceanographic laboratory. This is viewed by the craft-vessel fishermen as life- saving.

Largest number of users find govt. sector data most useful; at least 147 individuals reported deriving benefits from housing schemes.

There are more such instances. In addition to provision of data and information, each of these centers has become a routine.

operational contact point between government agencies and local families. Government departments such as agriculture, rural development, fisheries, and the State Electoral Office frequently and regularly use the village centers to dissemination information to the village families. This development has been rated well by the local families.

A significant development is the emerging interest, especially among the youth, to create content that can be shared within the network. These relate to commercial information, and about education opportunities. This is picking up pace in the last 6 months. The other is the willingness of locally-based micro-credit groups (savings cooperatives), mostly founded and operated by rural women, to establish an accounts transaction system using the data network. These are likely to be taken up during the next phase of the project.

Lesson learnt

The first PANTLEG Mission visited the project site in November 1999 and conducted an intensive consultation with almost all the stakeholders in the project. It is worth summarizing the conclusions of this Mission :

- Development entrepreneurship fosters sustainability
- Pro-active intermediaries with minimal skills accelerate success
- Empowering beneficiaries has its own value
- Technology won't achieve empowerment alone
- Sensitivity to the context should be positively prescribed
- Success is a moving target, so our aim should be flexible
- Global concepts have local application when sensitively applied.
- Evaluation is time-sensitive, patience is a virtue
- Replications of principles are superior to replications of practices
- New knowledge is still needed.

The main issue of research relates to sustainability in a context where most users tend to be ultra-poor. Formation of partnerships between local bodies and the local administration appears to hold the key. Development of applications, such as an online system for community banking, will contribute to the economic sustainabil-

ity of the operations. The policy context should become more favorable in view of the character of government control of basic services in the telecom sector in many countries of South Asia. This has prevented applications-oriented services from being offered at low cost. There is hope that all this is set to change soon.

The project has attracted attention of the international development experts and national policy makers. A number of key officials of the Government of Pondicherry are closely associated with preparing extension plans of the current project. Several important officials of the Union Government have visited the sites to obtain first hand knowledge. The Parliamentary Committee for Science, Technology and Space Research made an unprecedented field visit to the project and conducted its official session on-site in one of the village centers. The Space Applications Center of the Indian Space Research Organisation has formed partnership with this project for satellite-based data broadcasting experiments. (This will allow much higher speeds of downloads from the satellites directly, without the need for high speed access to local ISPs which is generally expensive). Internationally, the project received coverage in the **Human Development Report 1999**, the **New York Times** (May 2000) and has been presented at a number of international fora, such as **GK2** (Kuala Lumpur, March 2000) and the **Geneva Forum 2000**. The project was awarded the **Motorola Gold Award 1999** for innovative and socially purposeful use of 2-way radio technology.

Acknowledgement

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ICT-enabled knowledge centers for the rural poor – A success story from India

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The words 'Libraries' and 'information centers' evoke in our minds images of special libraries, academic libraries, public libraries and children's libraries in affluent towns and cities. All of these put together including the Internet, the Open Archives and the emerging digital libraries serve only a small fraction of humankind. A vast majority of people continues to live with virtually no access to knowledge that they can use in their day-to-day life. Despite all the talk about alleviating poverty and ushering in development, the number of such people is increasing. The world is a terribly unequal place. As someone pointed out, the inequality is so silly that wealthy nations pursue drugs to treat baldness and obesity, depression in dogs, and erectile dysfunction, while elsewhere millions are so poor that they suffer from endemic hunger and are sick or dying from preventable or treatable infectious and parasitic diseases. The poor of the world need and can benefit from information and knowledge but in their struggle to keep body and soul together they cannot think of information and libraries. But all that can change.

Empowering the poor through IT-enabled information access

While scholars, scientists and librarians started worrying about the 'serials crisis' and debating on how to wrest the control of communication channels such as journals from the clutches of greedy commercial publishers and setting up 'Public Library of Science', we in a corner of southern India were looking at empowering the poor and the downtrodden in rural India and making a difference in their lives through better access to knowledge. Inspired by a visionary leader, M S Swaminathan, one of the twenty great Asians of the 20th century according to *Time* magazine, our team of not-so-highly qualified young people led by a technocrat in the making, who went on

to win a World Technology award in the education category for innovative use of new information and communication technologies, has built 'knowledge centers' in ten villages in the former French territory of Pondicherry, about 150 km south of Madras.

Taking knowledge to rural areas is nothing new in southern India. It is there, in the medium-sized town of Mannargudi in Tamil Nadu, that the late Prof. S R Ranganathan started the movement of mobile libraries on 21 October 1931 when he took books and magazines on a bullock cart to reach his rural clients. The modern day followers of Ranganathan, working at the M S Swaminathan Research Foundation, are not using a bullock cart. They are not even using a car or a motorbike. They have moved with the times and are using state-of-the-art information and communication technologies (ICTs) to gather and disseminate information and yet not baffle the villagers with technology.

The village knowledge centers are connected by a hybrid wired and wireless network – consisting of personal computers, telephones and modems, VHF duplex radio devices, spread spectrum and email connectivity through dial up telephone lines – that facilitates both voice and data transfer. The centers provide the villagers the information they need and can use readily to improve their lives. All knowledge centers are open to all, irrespective of age, sex, religion, caste, and level of literacy and education. Indeed three knowledge centers were closed because they were not sharing the information with all members of the community. The entire project reflects the holistic philosophy of Swaminathan, which emphasizes an integrated pro-poor, pro-women and pro-Nature approach to development. As it would be impossible to provide the same level of access to ICT tools to all the people in the world as is currently obtaining in the affluent countries, Swaminathan thought of a more practical model. Coming in the tradition of Thoreau, Ruskin and Gandhi, he thought of community ownership of technological tools, community-based access and resource sharing to tackle the problem of serving a huge population with limited resources. The project also emphasizes the use of local language, viz. Tamil, and multimedia (to facilitate use by illiterate users) and encourages collective action. A project of this kind cannot succeed unless the community has a sense of ownership and participation right from the beginning. The bottom up exercise involves local volunteers to collect information from different sources, such as the nearby Meteorological office, markets, government departments, and traders selling seeds, fertilizers, and pesticides, feed it into an intranet-type network, and provide access through nodes in different villages.

Here is how the news story on this project in the *New York Times* dated 28 May 2000 began:

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Embalam - In this village, the century-old temple has two doors. Through one lies tradition. People from the lowest castes and menstruating women cannot pass its threshold. Inside, the devout perform daily pujas, offering prayers. Through the second door lies the Information Age, and anyone may enter. In a rare social experiment, the village elders have allowed one side of the temple to house two solar-powered computers that give this poor village a wealth of data, from the price of rice to the day's most auspicious hours."

Here 'anyone' includes Dalits, people of the lowest castes, who were referred to as 'untouchables' in pre-Independent India. Caste-based division is still prevalent in many parts of rural India, despite strict laws against it, and the knowledge center in Embalam has made a minor dent. A new knowledge center in Thirukanchipet, a village of Dalits, has led to another minor social revolution. The center is run entirely by Dalit volunteers, but upper caste men from the neighboring village come and obtain information from the center. We also understand that the tea stall in the neighboring village no longer practices the two-tumbler system, one for the Dalits and the other for the upper caste people. These are examples of 'including the excluded', a key element of Swaminathan's philosophy.

The *NYT* story is unusual for two reasons. It is rarely that *NYT* writes about 'development', especially something happening in far off rural India, and it is rarely that a development story in *NYT* runs to half a page.

Celia Dugger, the author of the *NYT* news story, who spent several days in the project villages, continued: "Information from the computers in this area, where people live in thatched mud huts, has saved the life of a milk cow named Jayalakshmi, prevented the blindness of an old woman named M. Minakshi and routinely warned fishermen of stormy weather that can claim lives. Some months back, Subrayan Panjali, a round-faced woman who cannot read or write, sat in the courtyard of her small home in the village of Kizhur, in Pondicherry, with the family's only milk cow, Jayalakshmi. For five days and nights, the cow moaned while in labor. Something had gone wrong and she was unable to deliver her calf. Mrs. Panjali grew ever more fearful that the cow would die. 'This is the only good income we have,' she said, explaining that the four gallons of milk the cow produced each day paid the bills. Word of Mrs. Panjaili's woebegone cow soon spread to Govindaswami, a public-spirited farmer. The village's computer, obtained through the Swaminathan Foundation, is in the anteroom of his home. The computer is operated full time and for no pay by his 23-year-old, college-educated daughter, Ezhilarasi, who used it to call up a list of area veterinarians. One doctor arrived that night and, by the light of a bare electric bulb, stuck his arm into Jayalakshmi, pulled out the calf's spindly leg and tied a rope to it, then dragged the

calf into the world." Incidentally, Ms Minakshi was sent to Aravind Eye Hospital in Madurai, about 200 km away, and she got her cataract removed at no cost to her.

At a time when funding agencies and donor governments were not sure about the wisdom of funding ICT-led development initiatives, Swaminathan, who in the 1960s used agricultural technology intelligently to usher in the Green Revolution and transformed India from a perennial food importer into a food exporter and in the words of *Time* made hunger unknown in Asia, thought why he should not use the new ICTs that have benefited the advanced countries and the rich to help the rural poor in their struggle to get out of the poverty trap. True these technologies, like all technologies before them, left to their own devices, will only exacerbate the existing differences. History has recorded the evil impact of the Industrial Revolution. In our own times, we have heard Rev. Jesse Jackson talking about the digital divide furthering the racial ravine in inner cities of USA increasing the relative disadvantage of Blacks and Hispanics. But surely there must be ways, Swaminathan thought, by which the very same technologies could be used as an ally in the equity movement. It is this conviction that led to the Information Village project that has become one of the very few truly successful ICT-led development programmes.

The Pondicherry Information Village Research Project, started in 1998 with a modest grant from the International Development Research Centre (IDRC, Canada), is essentially an imaginative experiment in electronic knowledge delivery coupled with the goal of transforming the lives of the poor through the provision of information that matters to them. The project is designed to provide knowledge on demand to meet local needs, using a mix of wired and wireless technologies and through a local web site.

The knowledge centers are connected to each other in a hub-and-spokes model. Villianur, a market town and block headquarters well connected by roads, is the hub and the home of the local web site where most of the information is received and processed. We also refer to it as the 'value addition center.' This is the only center where members of staff of MSSRF – two social scientists and a Dalit girl trained as a computer professional, among them - are working. Volunteers – most of them women - provided by the local communities and trained by the Swaminathan Foundation run the nine spokes centers. Each knowledge center has three or four computers, one of them dedicated to communication with the main server at the hub in Villianur. The other computers are used by the community for typing documents, learning from CD-ROM, playing games, etc.

A center with a difference

Unlike in a traditional library, most of the information provided in these centers does not come from books, magazines and journals. Locally gathered/ generated information forms the major component. This is as it should be. Traditional libraries - and more so the Internet - tend to emphasize knowledge generated and found useful in the West. As pointed out Alfonso Gumucio Dagron, development communicator extraordinaire, "the content of the web is 90% irrelevant to the needs of 90% of the people in poor communities of the world." That is why they have hardly ever contributed to social change in developing countries. As the late Mr Adithan, founding editor of the most popular multi-edition Tamil daily *Dina Thanthi* (Daily Telegraph), once said, what use can a local guy make of news about what was happening in the US Congress or the UN General Assembly. They are too remote to have any impact on his life. For this reason, the news broadcast by CNN and BBC and most of the material available for free on the World Wide Web may not be of any use to him; it is not just the content and its relevance; even the language is alien. He will be more interested to know about happenings in his own neighborhood such as hike in bus fares or the arrival of kerosene in the local fair price shop, the interest-free loan announced by the government for farmers affected by crop failure or the entertainment programs arranged at the forthcoming car festival in the local temple.

Top on the list of information sought is the multitude of government programmes meant for helping the poor, many of them specifically meant for people below the poverty line. Unfortunately, people were not able to take advantage of these programmes for want of awareness. But after the knowledge centers were set up, information on such schemes reach virtually every household and people do benefit.

We are not averse to using other sources of knowledge, if they are perceived to be useful to the local community. For example, twice a day the staff at Villianur hub download information on wave heights on the Pondicherry coast from a US Navy site, interpret it and transmit the information to the knowledge centers in coastal villages, viz. Veerampattinam and Nallavadu, where it is put on the notice board as well as announced several times a day over the public address system. The fishermen can hear the weather forecast, including wave heights, before setting out into the Bay of Bengal on their catamarans or fishing boats, wherever they are (Fig.1).

Nor for that matter we are entirely dependent on modern technology. We use a twice monthly community newsletter called 'Our Village News' to reach out to people.

As this is a 'people program', as distinct from a 'technology demonstration program', it is important to learn what the people want and need. Therefore, even before the centers were set up,

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the MSSRF team conducted a massive survey of the local people – men and women, adults and children, landed gentry and landless labor – to find out about the socio-economic status of the people, their information needs and their familiarity with tools of information and communication. The eleven villages surveyed had 4,373 households, of which about 1,300 were below the poverty line (a *family* income of less than a US dollar per day). The entire population of more than 21,400 was served by just two reading rooms, six post offices, 12 public telephones and 27 private telephones. There were 1,129 television sets, of which 424 were connected to the local cable operator. The cable connection comes at a monthly fee of less than $1.5 and offers three channels, all in Tamil, the local language.   The services provided by government departments (telephones, for example) are utterly inadequate, whereas both television and the cable TV channels have a wide reach. Both TV and radio are viewed essentially as means of entertainment and not information. For really useful information farmers look up to other farm families and local traders and suppliers of farm inputs. Local government functionaries are not rated high.

Horses for courses, they say. The village community should get the information it needs. The information needs of an interior village may differ from those of a coastal village. That is why meetings are held every month where the village communities and MSSRF researchers and field workers discuss, in the best tradition of participatory rural appraisal, the kinds of information and services that would be most beneficial. One must remember that the poor in these villages may not be seeking knowledge the same way most of us professionals do occasionally – to enrich our knowledge in general; often they go to the knowledge centers because they need to know something so they can get some economic benefit out of it in the immediate context. It is important that such benefits are demonstrated early on so their faith in the whole enterprise is reinforced.

Local content on a local web to satisfy local needs

As Alfonso Gumucio Dagron, the author of "Making Waves", the definitive work on ICT-enabled development initiatives around the world commissioned by the Rockefeller Foundation (2001), has said, "The generation of local contents should be essential in any ICT project that aims to benefit rural or marginalized urban communities, and it should be built in from the very inception of the project, not as a complement that may (or, more likely, may not) be implemented as the telecenter develops. A good example of telecenters that really care about providing appropriate information to the constituency is the network known as Village Knowledge Centers, set up by the Swaminathan Research Foundation in Chennai (India). The concept is articulated around

community needs, not the opposite. Knowledge centers have been placed in various villages, and a 'value addition center' is in charge of building web pages with information that is relevant to local needs, such as market prices or local weather reports. The core concept is to build a 'local web' that specifically caters the local needs of local communities, in terms of contents, culture and language."

As Alfonso Gumucio rightly points out, "As of today, the ICTs in our Third World countries are only 'experiments with a potential'. One thing is what is written in project reports, and another thing is what is really happening at the community level. Definitely, the tool is still to be shaped. I challenge ICTs pushers to go there and check." Celia Dugger is one of several journalists who have visited the knowledge centers in Pondicherry and checked. Alfonso Gumucio himself thinks very high of this project.

"There are too many examples of projects that are only bombarding the Third World with computers, in the most irresponsible manner and for the benefit only of hardware and software companies. On the other hand, there are very few, I insist, very few experiences of use of new information and communication technologies that are paradigmatic in the way they contribute to development.

"In my book '*Making Waves*' I have picked a few representative examples that show how ICTs are being used in participatory development and how these instruments can be "appropriated" by the community when the project is well conceived. There is one thing that we can not separate from any ICTs project in Third World countries: the development of local databases and local web pages that are relevant to the people and that take into account their daily needs, their culture and their language. If this is not embedded into a project, I doubt it will have any positive results for the community. *This is why the Village Knowledge Centers in Pondicherry (M.S. Swaminathan Research Foundation) are such an important and coherent experience.*" [Emphasis added]

Alfonso Gumucio provides a very interesting analogy: Most telecenters that have failed to deliver are like Cadillacs in rural areas, whereas the Swaminathan 'knowledge centres' are like barefoot doctors and the Green Revolution, both of which have delivered and are appropriate to their contexts.

Content creation

Close to a hundred databases have been created and these are updated regularly, many of them on a daily basis or even more frequently. These include Current information [e.g. Today's news,

Meteorological report, wave height up to 12.00 noon and 24.00 midnight, paddy seed stock at godown, purchase price of crop and fish varieties and vegetables], Useful long-term information [Government schemes for the poor, Police department news, Programmes for Dalits], Citizen's charter [Programmes and schemes of different government departments and public institutions; for example, recently the District Industry Centre announced stipendary training programmes in more than 100 small scale industries], Cattle and feeds [Use of green fodder, Diseases of animals, Common cattle diseases], Agricultural information [Disease control in brinjal (aubergine), Paddy cultivation methods, Soil testing procedures, Earthworm manure production], Health information [TB treatment, Hospital addresses and contact numbers, Audiovisual notes on different diseases], Educational information [Guide to success in examinations, Model question papers, Courses available in nearby colleges with information on hostels, fees, admission procedures, etc.], General information [Important telephone numbers, National Insurance plans, Wage rates fixed by the government, Rules and regulations of Employment exchange] and Yellow pages [names and addresses of doctors, carpenters, masons, government officials]. Information that go into the databases are also obtained from expert sources such as the extension department of the agricultural university and the brochures put out by a leading eye hospital.

Even though people were poor and could not afford three meals a day for their families, close to 30% of the families had a television at home. This is largely because the local television channels broadcast local movies virtually everyday and often more than one movie per day. No point preaching sermons to them. They have made the choice. If they think that foregoing a meal is worth it if they can get to see a movie, so be it. It only goes to show that they are willing to adopt a technology if they see some 'value' in it. The MSSRF team decided to create and deliver 'value' in the knowledge centers. While technology costs money and effort to get it in place, the MSSRF philosophy emphasizes the creation and distribution of information or the content part of the program. In their scheme of things, after people and their context comes the content. Technology is the last of the priorities.

Early this year MSSRF, in collaboration with One world International, had tested the World Space radio to transmit information from one center to the other. The use of XML and metadata (appropriate keywords), one can quickly find out what one needs. Indeed, it should now be possible for setting up a network for sharing knowledge and experience among the poor and marginalized of the world using World Space radio as a key component. The results of our successful pilot were presented to the G8 DOT Force at Calgary, and the recommendations of a three-day workshop on Open Knowledge Network (with partners from Asia, Africa, Latin

America, Europe and North America), held at MSSRF, were forwarded to G8 Ministerial level meeting at Kananaskis. In the pilot, information under seven categories (such as traditional knowledge, advertisements, local news, etc.) was gathered from three villages and forwarded to a hub where some more information such as government announcements was added and the entire information was uploaded to a satellite after attaching metadata tags. Within an hour a daily newssheet, with news, photographs, etc. was produced in color and both in Tamil and in English at the knowledge center in another village (Fig. 2). It was a thrilling experience for the local people. Foreseeing the need for such networking, last year the Swaminathan Research Foundation organized a three-day workshop on knowledge management and knowledge sharing to which were invited representatives of NGOs, media and governments from around Asia (including Pakistan and Bangladesh), donor agencies from the North and international agencies. The new intercontinental network will use, to start with, the World Space radio and XML filters using metadata tagging. Efforts are on to see the operations becoming self-sustaining within five years (A consultant from an international consulting firm worked pro bono on this aspect) and to incorporate the possibility of rewarding individuals and communities who want to share valuable knowledge at a cost (Experts on open economies are helping on this aspect).

Extending the reach

MSSRF is often asked the question when will the more than 600,000 villages in India be 'connected'. MSSRF is a small RESEARCH organization and its mandate is to do research and come up with solutions to problems in the field of sustainable development. IDRC, Canada, the main funding agency supporting its project at Pondicherry, clearly wants the Foundation to concentrate on research and not repeating what it is doing at Pondicherry in a larger area. [In this the MSSRF's goals are different from other 'telecenter projects' such as the MIT MediaLab Asia's project in Melur, where the intention is to set up more than a thousand information kiosks using the franchising model. The MSSRF model is also different from the other Stockholm Challenge award winner, the Tara Haat of Development Alternatives, which right from the beginning looks for production of different items using locally available materials and skills in a self-sustaining manner. In some ways, these are similar to the approach of Sam Pitroda to connect India through easily accessible telephone booths. As and when a need to test new ideas arises, MSSRF is not averse to starting new knowledge centers. For example, in the Mandapam - Rameswaram area which has a delicate ecological balance and rich biodiversity, the MSSRF team has set up a few centers and is working with the local community, mainly fishermen. The team is trying to help

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them learn to enhance their income opportunities through production of artificial corals, fish pickles, cultured pearls and agar. In the Kannivadi region, off Dindigul in central Tamil Nadu, MSSRF has set up knowledge centers to help the farming community. The 'oddanchatrammarket.com' initiative has helped the vegetable producers in this area market their produce to distant locations as far as Gujarat, Maharashtra, Andhra, Karnataka and Kerala. In another very innovative experiment, the MSSRF staff has set up a literacy project wherein locally recruited animators help families to use digital cameras, and PCs with CD-ROM drives and touch screens as a quick means to help the illiterate members of the family to learn to read and write pretty quickly, often within two or three months. [The Commonwealth of Learning expert who visited the project believes that this is probably the best project of this kind he has ever seen.] Again, an excellent example of including the excluded.

Seeing the progress made by the Information Village Project, both CIDA, Canada, and the Government of the Union Territory of Pondicherry have come forward to support the project financially. While CIDA's support is to enhance the research aspect, the Pondicherry Government wants the project to be extended to a large number of villages. The project has also entered into informal partnerships with several self-help groups, government departments, All India Radio and other public institutions. The project is now providing computer literacy programmes to children and adults in most of its centers.

Virtual university

Addressing the UN-sponsored meeting on Science for African Development at Geneva in July 2001, Prof. Bruce Alberts, President of the National Academy of Sciences, USA, referred to the Pondicherry experience:

> "… in this village there is a computer room, connected by wireless Internet to a service center run by the M.S. Swaminathan Research Foundation. This "information village", and others like it, have successfully relied on women from the village itself to provide daily weather and market prices, as well as agricultural and health information, to all the inhabitants. … … As scientists, we need to study and learn from these experiments - so as to make a science out of connecting the world to knowledge resources. With the technology moving so fast, it is critical to "learn by doing" in this way, so that we learn how to make the next wave of the technology even more useful for productive and sustainable economic development."

Indeed, Prof. Alberts sees in these knowledge centers the seeds of a virtual university connecting academia with the rural poor. He also views it as a model for the United States to follow.

"I envision a global electronic network that connects scientists to people at all levels - farmers' organizations and village women, for example. The network will allow them to easily access the scientific and technical knowledge that they need to solve local problems and enhance the quality of their lives, as well as to communicate their own insights and needs back to scientists. ... ... My experience in India has made it clear to me that our nation would be much more successful in such endeavors if we were humble enough to incorporate the potential beneficiaries of a service into its initial planning."

Indeed, the recent pilot and the proposed intercontinental network could provide the stepping stone to the network Prof. Alberts desires to see, viz. a global electronic network that connects scientists to people at all levels.

Recognition

The project had won the Motorola Dispatch Solution Gold Award for 1999 (announced in 2000) and the Stockholm Challenge Award for 2001 for innovative use of technology in providing enhanced access to information to the rural poor. The Imfundo initiative (on education in Africa) invited yours truly to learn from the Pondicherry experience. IICD, The Hague, and Hivos, The Hague, want to take advantage of the MSSRF experience and are sponsoring representatives from their partner organizations in other developing countries to work with MSSRF on a South-South exchange of experiences and knowledge. I was invited to share the MSSRF experience with others at the G8 DOT Force meeting at Calgary. The One World International, when it assembled all its staff from around the world for its annual meeting in the UK late last year, chose to learn about MSSRF's work in Pondicherry. MSSRF was the only Indian development organization invited to the South Asia Foundation conference on ICTs for Development at Kathmandu, in 2001.

Sustainability

We are hearing remarks about the Pondicherry Information Village project - about it being entirely funded by outside agencies, about the lack of a business model, about its sustainability and replicability and so on. Virtually the entire higher education in India and other developing countries is subsidized by the state, meaning taxpayers' money. The healthcare expenses of

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government employees and their families are mostly met by the state. The electricity and water consumed by rich farmers in most states of India are subsidized by the state. The Indian government subsidises the cooking gas most middle class and rich families use. Many public sector enterprises in India are on the red year after year and we are not only supporting them but are even paying bonus to the employees. All of us in some way organize ourselves and fight for our 'rights' and get them too. But when we start working with the unorganized rural poor, we want to evaluate the efforts by standards that we ourselves can not live up to. To me it seems unfair.

Most developing countries, ever since wining Independence, have been dependent on aid and loans, and we are tolerating mismanagement, corruption, cheating, and all else. How many of us had asked of ourselves about sustainability in this context. If all of us well to do people depend on such subsidies, why do we think the very few worthwhile efforts towards bringing in greater access to information to the rural poor in order to give them an opportunity to have better living standards should be only through a revenue model? If people have been living in poverty for centuries, it would take time to reverse the situation. We should have patience.

Let us listen to Alfonso Gumucio once again: "How about defining sustainability in terms that are more coherent to the social and cultural functions of community telecenters? I suggest the concept of sustainability should be reviewed in terms of community ownership and in terms of concrete benefits to community organization and development, particularly in rural areas."

The Pondichery project, to start with, was funded by a donor agency. But in two villages the people collected money (subscription) to build the centers where the computers and communication equipment are housed. In most villages, the local community pays the electricity and Internet charges. The volunteers give their time. Why would poor people invest in an effort if it is not leading to concrete benefits? The project staff is talking to the communities about long-term sustainability. Indeed, they are posing the question what after the Swaminathan Research Foundation withdraws from the project. People are being prepared for self sustenance. When people find that the kind of things being done by these centers are really useful to them and are beneficial to them in the long run, surely they will not allow the centers to disappear! They will find ways to sustain them.

Let me end this essay with a quote from the Stockholm Challenge Award citation: "Today, thanks to Information Village Research, ten villages near Pondicherry, India, are linked with computers, providing information on such aspects as health, crops, weather, and fishing conditions. These new technology tools are bridging the economic and social divide between the haves and have nots. They are empowering everyone with knowledge and opportunity by an inclusive use of local language and multimedia format that allows all to participate. Because of

this project, some traditional barriers have fallen. … This project is a wonderful example of the benefits of IT, and of the power of information and opportunity."

Acknowledgement
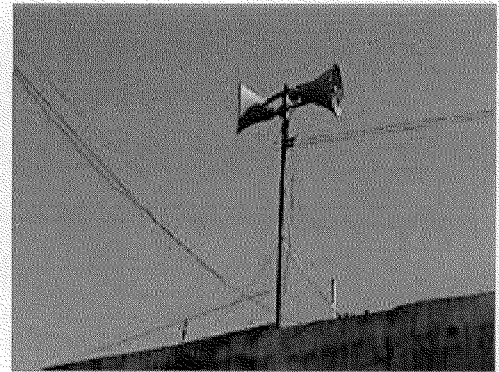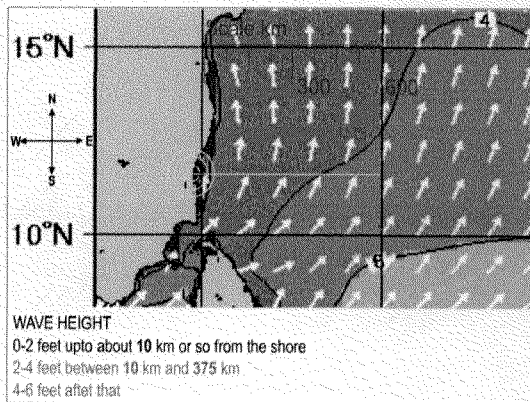
http://www.nemoc.navy.mil/Library/Metoc/Indian Ocean Bay 0f
Bengal/Models/Swans/Series/index.html

Fig. 1 - An Example of value added information. The wave height information downloaded from a US Navy site is interpreted with the help of a superimposed GIS distance scale at the Villianur hub and the information is announced in local language over the public address system at Veerampattinam and Nallavadu, two coastal villages.
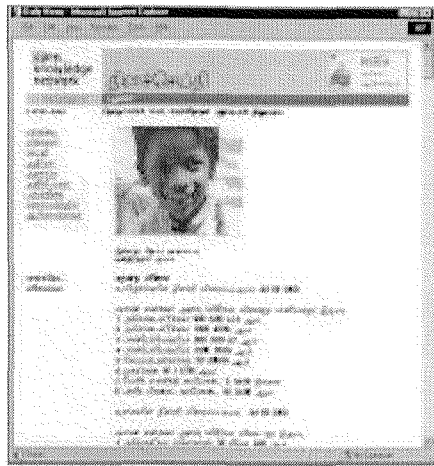
Fig.2 – A sample daily news sheet produced at one of the villages as part of the Open Knowledge Network experiment

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# INFORMATION VILLAGE

COMMUNICATION AND AGRICULTURAL MARKETS

For a market to be efficient, the buyers and sellers must have adequate information about current trends in supply and demand and about the prevailing prices of goods and services. The free flow of information is vital. However, the activities of cultivators in the rural communities of many developing countries are clouded with uncertainty — a result of fluctuating prices, environmental factors, and lack of information. Economists believe that better communication about new technologies, market prices, and government policies will help reduce the degree of uncertainty, and the risk, in agriculture.

V. Balaji and K. Balasubramanian

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TRADITIONAL SOCIETIES

In a subsistence agricultural system the exchange of information is mostly restricted to a community. Commodities are produced for consumption within the community, and local markets are very important. Barter systems operate through appropriate social institutions. For example, the Jajmani system in India provides a simple network for the exchange of goods and services between castes — a family of blacksmiths may manufacture and repair agricultural tools for a family of farmers who, in return, may give them food grain. In many parts of India specific caste groups function as announcers of information, transmitting news of various decisions. The members of those caste groups beat drums in the village squares and streets, attracting groups of villagers, and then make their announcements to the gathering. Village decision-making bodies, such as *panchayats*, play a major role in providing information for entire village communities. Another major avenue of communication is through socioreligious activities such as festivals; temples are an important locus of these community gatherings.

However, special constraints on the flow of information may be applied. For example, in Tamil Nadu, agricultural and off-farm products are bartered or sold in a weekly market called a *shandy*, and information regarding the bargaining and the final prices agreed on for livestock are private matters. The buyer and seller clasp each other's right arm, together covered with a towel. The seller indicates the price by opening his fingers. Each finger represents a unit of money. The buyer touches the seller's hand and counts the number of open fingers. He then indicates in a similar fashion the price he is ready to pay. The whole bargain and the final agreed price are kept secret. In a rural society where open physical contact between men and women is frowned upon, such a market system excludes women altogether.

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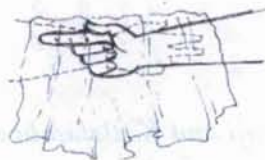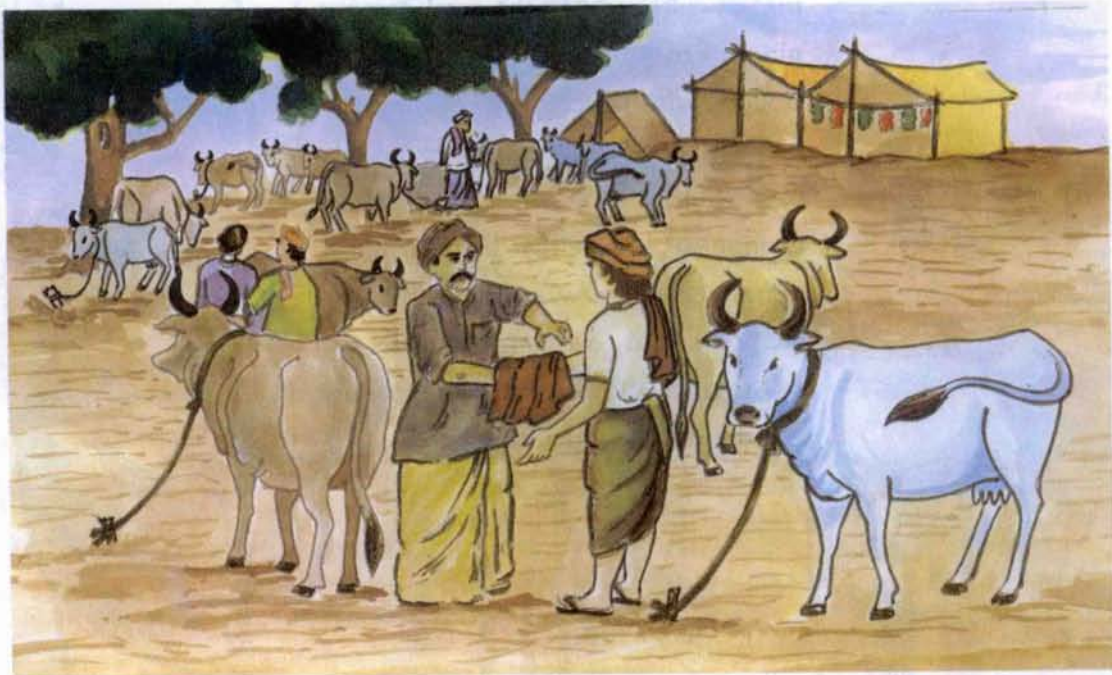
reasons: a belief that high-tech systems are suitable only for the urban industrial-service sector; lack of computer skills among rural populations; incompatibility of technological systems and rural social structure; and the high technology costs.

A MODEL OF RURAL DEVELOPMENT

The M.S. Swaminathan Research Foundation (MSSRF, Chennai) launched an experiment on the impact of information and communication technologies in rural communities in southern India. Originally called the Information Villages Research Project, the experiment was renamed the Knowledge System for Sustainable Food Security. The MSSRF believes that information and communication technologies can play a major role in environmentally sustainable rural development, not only reaching the poor but also helping them to achieve food security and social justice. Inspiration and impetus for the experiment came from M.S. Swaminathan, a crop geneticist and development expert who was also one of the leaders of the Green Revolution. Recalling the effects of the introduction of high-yielding wheat in the 1960s, Swaminathan said, "From my long experience in agriculture, I find that whenever poor people derive some benefit from a technology, the rich also benefit. The opposite does not happen." Advantages for women also have an extensive effect, he continued, because "when women derive benefit, the whole family derives benefit". The MSSRF project includes a special effort to benefit rural women.

The information village created through the MSSRF project is a model for the use of information and communication technologies in rural areas. In the first few years of its existence, it transformed a general-knowledge delivery system to a locale-specific one, meeting the information requirements of rural families in their particular socio-economic context. It provided knowledge that could be acted upon, and it examined the social, economic, and financial viability of its intervention.

MOBILIZATION

The project began in 1998 at the village of Villianur, 20 km from Pondicherry, in the Union Territory of Pondicherry. The first efforts of villagers and project staff were to develop mutual understanding. Through techniques such as participatory rural appraisal, the villagers helped the staff understand the socio-economic dimensions of the rural information village that would take shape.

At the outset of the project, two striking features were noticed. The 19 villages in the area around Villianur had a population of 22,000 but only 12 public telephones and 27 private telephones — an average of not even 1 phone per 100 people. On the other hand, satellite dish antennae and cable connections — much newer high-technology communication systems — were a common sight in the area. There were 1,130 television sets, 5 for each 100 people. One-third of all households had television sets, and one-third of those television sets had cable connections for satellite channels; in other words, nearly one-tenth of all households had cable connections. In one small village every household had contributed a small sum of money for erecting and maintaining a satellite dish antenna as a common property resource. The cable television programming came to the villages around Villianur in three channels, all in Tamil, originating from the city of Chennai (formerly Madras).

The communication habits of the population were mostly based on local and supra-local linkages. Information generally flowed from farmer to farmer. The primary sources of information were local traders, local markets, agricultural suppliers, and local banking and credit institutions. The communication linkages between villagers and local traders were particularly strong, whereas the linkages with external institutions were notably weak. Project work during the mobilization phase determined that the information requirements of the villagers could best be met by strengthening the existing linkages at the local and supra-local level and creating new linkages with external sources. The generic knowledge from external sources would have to be transformed — that is, selectively compiled, edited, and integrated with local knowledge — to become relevant or useful in the local context. It was decided that value-addition activity would take place at Villianur, where a hub would be established for the surrounding villages.

INFRASTRUCTURE

The value-addition centre thus created at Villianur was given Internet access through two dial-up accounts, and it became the hub of a local area network for data and voice transmission. Wireless transmission in the local area network was through VHF radio. The key instrument in the hub was an EPABX, an Electronic Private Automatic Branch exchange; similar to the intercoms used in offices. Every location in the local area network, including the office at Villianur, was a node in the "intercom" network. Each was given a Pentium personal computer (PC) with multimedia and a printer; the instruments were encased for protection against rodent attack. With a modem and interface, the PC could be connected to the network. Volunteers were trained in all the basic aspects of computer use. They learned to compose documents using Tamil fonts and a customized keyboard layout. Elementary maintenance training was also provided. Because most of the volunteers had never used a PC before and had attended school for only 10 years, the training period typically lasted two weeks.

Villagers, in small groups and as entire communities, participated in several rounds of meetings with project staff to assess the kinds of information needed. The information would be collected and spread, to and from the villagers, through "information shops" linked to the local area network with the value-addition centre at Villianur. A few communities each selected a place for an information shop fl for example, the village *panchayat* in Veerampattinam designated part of its office space for that purpose — and identified volunteers to work there. Combining low- and high-tech methods, each shop used a bulletin board to display e-mail from the value-addition centre and local news reports written by the volunteers. Telephones were provided for villagers to make local calls. By June 1999 the information shops were being called knowledge centres, and they had become established in the following villages:

- **Kizhur:** Located 21 km west of the city of Pondicherry, the village was home to 1,100 people, and 67 per cent of the women there were literate.
- **Embalam:** Situated 19 km southwest of Pondicherry, its population numbered 5,700. The female literacy rate was 61 per cent.
- **Veerampattinam:** Situated on the coast, 13 km south of Pondicherry, the village had 7,000 people and a female literacy rate of only 50 per cent.
- **Mangalam** and **Pillayarkuppam:** Information shops have recently been added in these two villages in the same area.

INFORMATION PROVIDED

A vital concern was for villagers to get information tailored to meet their particular needs. For example, dynamic information on prices and availability of seeds, fertilizers, and pesticides was important to all farmers but especially to those working on medium- and small-sized farms. Grain prices in the markets in and around Pondicherry were a critical matter for farmers at harvest time and of special interest to agricultural labourers, especially women, whose wages were paid partly in grain. Coastal villagers, whose livelihood came from fishing rather than agriculture, required information about marine safety, location of shoals and fish, and processing of their catch. Health issues were emphasized. Many women requested advice on reproductive disorders and on children's health. They also wanted to learn ways to increase their income, such as developing new job skills. There was general agreement among the villagers that the knowledge centres should provide complete information about the government's rural welfare programmes and maintain a list of families who are below the poverty line and eligible to participate in those programmes.

To meet the needs of the villagers, the value-addition centre in Villianur created a number of databases in Tamil and, in the case of some official government documentation, in English. The databases were shared with all the village knowledge centres. Updates were transferred through the wireless network. These databases included entitlements of rural families with respect to some 130 welfare programmes operational in the Union Territory of Pondicherry; details of approximately 22,000 families below the poverty line in Ariyankuppam, Villianur, and Nettapakkam; grain prices in the Pondicherry region; prices of seeds and

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fertilizers in the Pondicherry region; general and crop insurance programmes; integrated pest management for rice; pest management for sugar cane; hospitals and medical practitioners in Pondicherry, grouped by specialty (orthopaedics, pediatrics, and the like); and bus and train timetables for the Pondicherry region and two nearby towns.

To better serve the fishing community of Veerampattinam, its knowledge centre relayed data from the National Remote Sensing Agency regarding fish stocks in the coastal waters off Pondicherry and Tamil Nadu.

A variety of information was accessed daily at the village knowledge centres. There were news reports of public events and government announcements relevant to rural families, as well as cricket scores and other popular data from the Internet. Scholastic test results were made available to the nearly 1,000 resident students on the network at least a week earlier than through other means.

Health topics, including hygiene, dental care, and eye problems were also addressed with high-tech methods. Interactive CD-ROMs were developed at health camps organized by village communities. Typical questions were posed to medical practitioners at the camps, and their replies were videographed. Villagers could use the resultant CD-ROMs on PCs at the knowledge centres.

Although supplemented with high and low technology, oral means remained the primary medium of communication in the system. About 60 per cent of system use was for voice telephony.

In the Union Territory of Pondicherry overall, roughly 50 per cent of the rural population was female. However, most of the villagers, who used the knowledge centres, were men. Only 34 per cent (in Kizhur) to 50 per cent (in Embalam) of users were women.

Although about 21 per cent of rural families were below the poverty line, only 16 per cent of users were poor in relative terms.

The first insurance ever in Embalam was obtained as a result of information provided by the knowledge centre. A group of 48 women with no personal assets, and who worked as labourers, were insured against accidental loss of life or limb.

- Farmers in Embalam were able to cultivate a favoured high yielding variety of paddy rice ("Ponni") thanks to the timely provision of information on the price and availability of seed provided by the knowledge centre.

- Knowledge represented negotiating power. A particular labourer in Embalam was informed of market prices of grain through the network. Therefore she was better equipped to negotiate for fair wages, part of which would be paid to her in grain. Without such prior knowledge, she would have had to accept whatever quantity of grain the landed proprietor offered her.

- Cottage industry got a boost from the network. At the village knowledge centre an agricultural labourer who wanted to supplement her income learned about a government programme that provided credit and training for the manufacture of incense sticks. She participated in the training and was soon supplying incense sticks to a retail shop in Pondicherry.

- Reduction in commuting time, because of the ready availability of communication technology at the knowledge centre, was appreciated by farmers in Kizhur. Sugar industry byproducts can be used as fertilizer, but without a telephone the farmers had to commute for one hour, to the nearest refinery to find out when the fertilizer they wanted was available. A telephone call from the knowledge centre to the refinery now provided a quick answer.

- Red rot disease can ravage sugar cane crops, as it did in 1997 and 1998 on 14 farms in Kizhur. In 1999 the farmers fought back. Before planting, they used the knowledge centre to learn how to prevent another outbreak.

- Rural women have gained respect, as well as knowledge, through the system. A woman from Kizhur commented, "Rural women, even those educated in school, are not treated with due courtesy in the family or in the community. Handling the PC gives us new confidence and status, which we cannot give up."

V. Balaji, Coordinator of the United Nations Educational, Scientific and Cultural Organization (UNESCO)-endowed Asian Ecotechnology Network, and Head of the informatics centre at the M. S. Swaminathan Research Foundation in Chennai, has also designed and published databases on coastal ecosystems in the Asia-Pacific, and on agro-biodiversity in rice and millets in India. His current research interest is in the area of applications of modern Information and Communication Technologies (ICTs) for rural development.

K. Balasubramanian has been involved with the JRD Tata Ecotechnology Centre of the M.S. Swaminathan Research Foundation, Chennai, since 1996. Actively involved in Social Forestry Programmes implemented with the support of Swedish International Development Authority (SIDA), in Tamil Nadu, he has also worked in the area of Joint Forest Management and Common Property Resource Management. He was the Executive Director of the Society for Social Forestry Research and Development, Tamil Nadu.

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Creating the instruments for A knowledge revolution in rural India

Rural India is in urgent need of knowledge empowerment and the challenge before us now is to enlist technology as an ally in the movement for economic, social and gender equity. A national grid of virtual universities/colleges devoted to harnessing communication technologies and the vernacular press can play a critical role in triggering such a knowledge revolution. M.S. SWAMINATHAN on one such venture, the soon-to-be inaugurated MSSRF-Tata Virtual Academy for Food Security and Rural Prosperity, designed to serve as a resource centre for all such initiatives.

THE onset of the Industrial Revolution in Europe marked the beginning of a technological divide, leading to an increasing rich-poor divide both among and within nations. With explosive progress in many areas of technology, like information and communication, space, bio- and nano-technology, this gap is widening. The challenge now is to enlist technology as an ally in the movement for economic, social and gender equity. Therefore, the M.S. Swaminathan Research Foundation (MSSRF) chose the imparting of a pro-nature, pro-poor and pro-women orientation to technology development and dissemination as its mandate when it started functioning in Chennai in 1989. In order to assist in the articulation of concepts, opportunities and operational strategies which can help to reach the unreached in knowledge, skill and technological empowerment, an annual inter-disciplinary dialogue is being organised since 1990, under the generic title, "New Technologies: Reaching the Unreached". The first in this series was related to bio-technology. The emphasis in these dialogues has been on the standardisation of delivery systems which can ensure social inclusion in terms of access to relevant technologies. The recommendations resulted in the organisation of bio-villages.

The dialogue in 1992 was on information technology, which gave birth to the information village project in the Union Territory of Pondicherry, with financial support from the International Development Research Centre (IDRC) of Canada. Since information, to be of value to rural women and men, should be location and time specific, the term knowledge centre was used to stress the need for converting generic into location specific information and for training local women and men in adding value to information. Value-added information is appropriately referred to as knowledge and "rural knowledge centres" can generate opportunities for educated youth in villages to find a career in knowledge management and dissemination. We should train at least a million rural knowledge managers during this decade.

The MSSRF's experience in bridging the digital divide in rural India has provided some basic guidelines such as the following for harnessing this powerful tool to cross social, gender, genetic and technological divides.

- Connectivity and content should receive concurrent attention

    - Constraints must be removed on the basis of a malady-remedy analysis; for example, wired and wireless technologies could be used where telephone connections are not adequate or satisfactory. Similarly, solar power can be harnessed where the regular supply of power is irregular. The approach should be based on the principle that there is an implementable solution for every problem.
    - The information provided should be demand driven and should be relevant to day-to-day life and the work of rural women and men. Also, semi-literate women should be accorded priority in training to operate the centre, since this is an effective method of enhancing the self-esteem and social prestige of women living in poverty.
    - The knowledge centres should operate on the principle of social inclusion, thereby presenting a win-win situation for all.
    - The programmes designed to empower rural families with new knowledge and skills should be designed on the **antyodaya** model, where empowerment starts with the poorest and most underprivileged women and men.
    - The local population should have a sense of ownership of the knowledge centre. It should be client managed and controlled, so that the information provided is demand and user driven.
    - The local population should be willing to make contributions towards the expenses of the knowledge centre, so that the long-term economic sustainability of the programme is ensured. Contributions in cash or kind generate a sense of ownership and pride.
    - To be effective, the following linkages will have to be developed

        a. **Lab to Lab:** This will involve organising a consortium of scientific institutions and data providers.

        b. **Lab to Land:** This will involve symbiotic linkages between the providers of information and the users, so that the information disseminated is relevant to the life and work of rural families.

        c. **Land to Lab:** There is considerable traditional knowledge and wisdom among rural and tribal families concerning the sustainable management of natural resources, particularly water. Therefore, technical experts should not only learn from traditional knowledge and experience, but also take steps to conserve for posterity dying wisdom and dying crops.

        d. **Land to Land:** There is much scope for lateral learning among rural families; such learning has high credibility because the knowledge coming from a fellow farm woman or man would have been subjected to an impact analysis from the point of

view of its economic and social relevance to the population.

Rural knowledge centres based on an integrated application of new communication technologies, like the internet and cable TV as well as conventional ones like community radio and the local language press, can become effective instruments for harnessing the power of partnership among professionals, political leaders and public policy makers, the general public and rural families. Such partnerships alone can help to bridge the growing divide between scientific know-how and field level do-how.
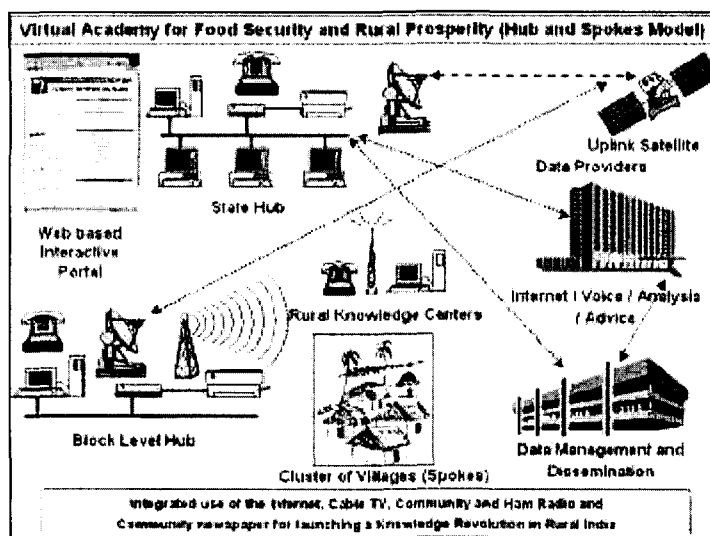
Based on the above, "learning" by MSSRF scientists, the application of ICT techniques to meet food and water security as well as livelihood needs of rural families are being intensified and extended through a virtual academy for food security and rural prosperity (abbreviated as VARP) with support from the Tata Social Welfare Trust and a range of data generators. Agriculture, comprising crop and animal husbandry, fisheries, forestry, agro-processing and agri-business is the backbone of the livelihood security system of rural areas, where more than 70 per cent of our population lives. A considerable proportion of this population has no assets like land, livestock, fishpond or any commercially viable skill. The poor are also often illiterate, a majority of them being women. Therefore the academy will lay emphasis on fostering sustainable livelihood options both in the farm and non-farm sectors. It will be on promoting job-led economic growth in villages. In addition, the five foundations of sustainable development identified at the World Summit on Sustainable Development held at Johannesburg in 2002, *viz.*, water, energy, health, agriculture, bio-diversity and ecosystem management (WEHAB) will receive particular attention. Rural and tribal women and men who constitute the knowledge management corps will be the fellows of VARP.

Water quantity and quality will be the most serious constraints to agricultural advancement in the coming years. Hence, all aspects of water conservation and sustainable and equitable use will be dealt with in the programmes of the virtual academy in detail.

Community water banks and rural "low water demonstration parks" will be promoted. The water parks will be based on attention to the following three major components.

- Mulching to promote the retention of soil moisture.

- Rainwater harvesting and the conjunctive and efficient use of rain, surface and ground water as well as treated effluents, and in coastal areas, sea water.
- Cultivation of high value but low water requiring crops like pulses and oilseeds.
- In addition to water, weather information will receive priority. We have considerable capacity in short, medium and long range weather forecasting. Such information will have to be converted into a functional meteorological package. Functional meteorology, like functional genomics, places emphasis on the action to be taken on the basis of meteorological forecasts.

During the last few years, I have been pleading for harnessing modern information and communication technologies through structured organisations like virtual universities/colleges in order to leapfrog in our quest for bridging the digital divide.

As a result, the following virtual universities have either already come into existence or are in advanced stages of development.

1.Virtual University for Agrarian Prosperity in Maharashtra.

2.Virtual University for the Semi-Arid Tropics set up by the International Crops Research Institute for Semi-Arid Tropics, Hyderabad.

3.Virtual University for Agricultural Trade in Kerala.

I hope many more initiatives of this kind will soon come up, so that, along with the Indira Gandhi National Open University, we can organise a national grid of institutional structures which can help to reach the unreached in terms of knowledge and skill empowerment. The MSSRF's experience also shows that bridging the digital divide is a powerful method of bridging the gender divide in rural India. We find that the self-esteem of poor women managing computer-aided knowledge centres has gone up speedily and significantly. This is another reason why we should accelerate our efforts to achieve technological leapfrogging in the field of ICT.

The experience now being gained in the country in the area of fostering a self-help revolution based on micro-enterprises supported by micro-credit offers an excellent opportunity for initiating community owned and managed rural knowledge centres which can be linked together in the form of a virtual academy using a hub and spoke model of organisation. Sustainable self-help groups require reliable and remunerative market linkages. The knowledge centres are in a position to foster such producer-purchaser linkages.

Rural India is in urgent need of knowledge empowerment in areas like genetic literacy (genetically modified organisms and new technologies), quality (codex alimentarius standards and sanitary and phytosanitary measures) and legal literacy (implications of the Plant Variety Protection and Farmers' Rights Act, Biodiversity Act, Intellectual Property Rights, etc.,).

A national grid of virtual universities/colleges devoted to harnessing in an integrated manner the internet, cable TV, community radio and the vernacular press for reaching every woman and man in our villages can play a critical role in triggering a knowledge revolution in rural India.

To achieve this goal, however, the virtual universities should be structured as 21st Century organisations designed to link professionals with everyone in rural and tribal areas, whether

man or woman, and irrespective of level of literacy and extent of ownership of assets. The MSSRF — Tata Virtual Academy for Food Security and Rural Prosperity is designed to serve as a resource centre for all such initiatives.

India is a land of small holdings. A small farm is ideal for sustainable intensification through eco-agriculture. A small farmer however suffers from many handicaps including access to technology, credit and remunerative markets. It is only by helping such farmers to overcome their handicaps, that small farms can become instruments for an ever-green revolution, characterised by enhancement of productivity in perpetuity, without associated ecological harm.

The smaller the farm, the greater is the need for marketable surplus to derive some cash income. Our farm families can face the challenges of the new global trade regime only by achieving revolutionary progress in the areas of productivity, quality, diversity and value-addition.

They have amply demonstrated through the green revolution that they are ready to help the country, if empowered.

The most important step to take in bringing about such empowerment is the initiation of a knowledge revolution in rural India through the effective and meaningful use of modern information and communication technologies.

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