Internet Kiosks for Rural Communities: Using ICT Platforms for Reducing Digital Divide

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Abstract

The rural population has limited access to communication. The cost of communication has been high as the incremental cost to extend the communication has been high. Using a new wireless option an ICT platform was conceptualized and implemented. This platform was extended to cover a large number of villages. This is an example of a successful public-private partnership. Systematic skill development has been the critical success factor that facilitated easy adoption and rapid diffusion of the ICT platform. Entrepreneurs helped in creating the infrastructure and building trust among the rural community that sustained the operation of the platform. The ICT platform has been used for a variety of innovative applications. Public private partnerships can be a major form of institutional arrangement that could be used for reducing digital divide, where large-scale investments are essential.

Biographical Notes

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Introduction

India has barely 30 million telephone connections and less than 4.5 million Internet connections for its 1000 million people. Most of these connections are confined to large cities (around 100 cities). 'Bharat Sanchar Nigam' Ltd., the largest basic telephone operator (BSNL), loses money or just about breaks even in providing connections beyond these 100 cities. No private operators have ventured or has any significant plan to venture much beyond these 100 cities. Small towns and rural areas thus have very little connectivity. The scope of the case study was to elaborate the development of an ICT platform for a large rural community through a private public partnership.

India has a large number of rural villages that do not have telephone connectivity. Within India the digital divide between rural and urban India is rather large. Bridging the digital gap requires considerable investments. A new technology that uses Wireless in the Local Loop has the potential to reduce the cost and thereby increasing the number of villages that are linked. Digital Convergence is emerging as an opportunity and this concept could be used for reducing the digital divide [1].

Telecommunication infrastructure has been weak in India:

- Nearly 60% of Indian homes in cities have cable TV
- Telephone and Internet in only around 2-3% of Households
- Communication technology with significantly lower per-line cost required

With the cost of providing telephone and Internet connections being around Rs.35,000 per line, a revenue of about Rs.1000 per month is required for an operator to break even. This is affordable to hardly 2-3% of Indian households and mostly in the large cities. In contrast to this, cable television connections have increased from zero barely a decade ago to about 50 million today. The key to this has been the following:

- Affordable cable charges (Rs.60-150 per month)
- Low cost second hand color TVs or new black and white
- Small-scale cable TV entrepreneurs whose overheads are far lower than that of the corporate sector.

This has made cable TV affordable to nearly 60% of the Indian homes, including large cities, small towns and rural areas. However, there is a broad middle class of 150 million people. The per-capita income of this group of people falls between Rs.35,000 to Rs.50,000 in 2002. Therefore, the amount that the middle-class household would be willing to spend on a telephone is small. The only way the middle class and the people in rural areas can be provided telephones and Internet connection in India, without large-scale subsidy, is by reducing the telecom infrastructure cost. If the per-line cost can be brought down somehow to Rs.15,000 (from Rs.30,000 today), rapid expansion of the telecom network can take place. The question is: *can technology be used in an innovative manner to make this possible?*

Origin of the Idea

To overcome the above said issues, the TeNeT Group has decided to come up with new technologies. This case study illustrates the implementation of a low cost technology platform that was created for reducing the digital divide.

Some of the features of technology used are given below:

Significantly, ***lower per-line cost***, making it much more affordable. Specifically wireless in local loop provides simultaneous and 35/70 kbps Internet connection with lower investment enabling a small operator to invest with incremental expenditure as the number of subscriber's increases.

The main vision of this Group is ***"To significantly enhance the quality of life of every rural Indian by drawing digital revolution profitably".***

With this vision, **n-Logue communications Pvt. Ltd.** has taken the challenge of providing sustainable access throughout rural India by starting some pilot projects. As in this part, they started one project in Melur block of Madurai District. It was sponsored by the ***Sustainable Access in Rural India (SARI)*** project and it is a unique Private-Public-Government-Institutional partnership. DHAN foundation is also a local partner in this project.

Today, Internet access is becoming increasingly important. Those who have an Internet connection have rapid access to all kinds of information, and this could create another divide between the rural and urban areas. A telecom network installed today must therefore provide widespread access to Internet.

Project Strategy

The project embarked as a low cost ICT platform for reducing the digital divide and increasing the reach of telecommunication.

The major elements of the project strategy are the following:

- Use a shared platform to deliver a variety of high quality services, allowing Internet access to be financially self-sustaining or profitable while reaching the rural poor.
- Help markets to work by wiring regions densely and creating a local network effect. Putting at least one connection in each village, will promote local/regional communication and information flows, while aggregating rural markets and attracting private sector interest.
- Create and develop new access devices and applications to appropriately serve user needs and account for environmental conditions.
- Undertake rigorous, non-anecdotal research on SARI's effects and the existence of rural information and communications markets.
- Offer access to schools and health clinics at low or no cost, and help them learn to use it effectively.
- Remember that training and marketing are as important as technology and should be considered in every endeavor.
- Value local champions and entrepreneurs and encourage their leadership; cooperate with residents and existing organizations.
- Do not exacerbate existing divide or power inequities.

By combining technological, social and economic aspects this project attempts to ensure rapid diffusion of the Internet.

Project Objectives

A project was envisaged to achieve this. The objectives of the project are:

- To provide Internet and Voice connectivity in the villages of 3 blocks in the Madurai District of Tamil Nadu.
- To research and develop appropriate access devices for rural Internet and Telephony
- To research and source other supporting technologies like alternate sources of power and
- To research and facilitate the development of applications that will be of utility to the users of the service in these villages.

The Project Sponsors

The project started as a pilot project with the name SARI (Sustainable Access to Rural India) in Madurai District of Tamil Nadu. This phase was sponsored by the following organizations:

a. Center for International Development at Harvard University (CID) – Colin Maclay
b. Media Lab at the Massachusetts Institute of Technology (MIT) – Michael Best
c. TeNeT Group at the Indian Institute of Technology-Madras (TeNeT) – Professor Ashok Jhunjhunwala
d. Internet Business Capital Corporation (IBCC) / I-Gyan Foundation – Jayant Sinha

The project was envisaged as a private-public partnership.

Key roles assigned

The planning, execution and management of the project is done by n-Logue Communications. Appropriate Local Service Providers (LSPs) for the various activities were selected. There are two important participants, whose major roles and responsibilities are as follows:

1. Participant : SARI Sponsors

Role : Project Sponsorship

Responsibilities

1. Initial funding
2. Project review oversight and development of appropriate evaluation methodologies
3. research and development

2. Participant : n-Logue

Role :Project Management

Responsibilities

1. Selection of location
2. Selection, purchase and commissioning of access centre and subscriber equipment
3. Selection of a project partner in Madurai to assist in performing the following:
   - appointment and training of local service partner to run the access centre
   - selection of sites for village information centres and training of persons to operate them
   - selection of appropriate applications for the subscribers
   - interfacing with all government and other regulatory bodies in the area
   - management of the various participants and sub-contractors to ensure completion of project as per objectives.

Technology Used

A few alumni of the Indian Institute of Technology, Madras (IIT-M) founded Midas in April 1994. Midas' mission was mainly to provide a technology that will provide cost effective voice and Internet access to as many villages as possible. The technology is known as corDECT Wireless in Local Loop (WLL) system. IIT-M also incubated n-Logue Communications, an Internet Service Providing Company. This company has acquired license to provide Internet access to Tamil Nadu and Andhra Pradesh, initially and extending the same service on all India basis. n-Logue is deploying Midas' WLL Technology to provide this service at Nellikuppam area.

What is corDECT?

The corDECT wireless in Local Loop (WLL) system consists of a DECT Interface Unit (DIU or the Wireless Subscriber's Exchange), a Compact Base Station (CBS), and a Wall Set (WS or the Subscriber's Terminal). The DIU performs system control and does the interfacing to telecom network. In other words the DIU acts as a mini exchange. The Compact Base Station or simply the Base Station offers a wireless access in the area on twelve simultaneous channels. A CBS can provide communication for a distance of 10 kilometres in a line of sight situation. The distance can be increased by another 25 kilometres by introducing a Relay Base Station (RBS). The Wall set or the subscriber's terminal is a fixed wireless terminal connected to any standard telephone, modem or a FAX machine. The Wall Set-Internet Protocol (WS-IP) provides the simultaneous voice and the Internet data facility to the subscriber(s). Also included with the package is Network Management System (NMS) software and is used to manage 30 DIUs and their subscribers. The NMS performs operation and maintenance (O & M) functions for all the DIUs and the subscribers connected to them.

CorDECT Wireless in Local Loop Technology is a versatile system of communication that can offer connectivity to the entire India at a very low cost and maintenance [2]. No digging for copper wire laying will be necessary. Also, it is only system in the world, which can offer simultaneous voice and Internet data. A composite picture of the system is shown in plate1. Plate 2 shows the Bharath Sanchar Nigham Limited (BSNL) installations in India. Also, the Mahanagar Telecom Nigham limited (MTNL) is getting 35,000 lines between Mumbai and New Delhi. Recently, Midas has signed a deal with Reliance Telecom for deploying 1.5 million lines in 1,450 sites throughout the Country. The CorDECT WLL Technology is shown in **Fig 1**.

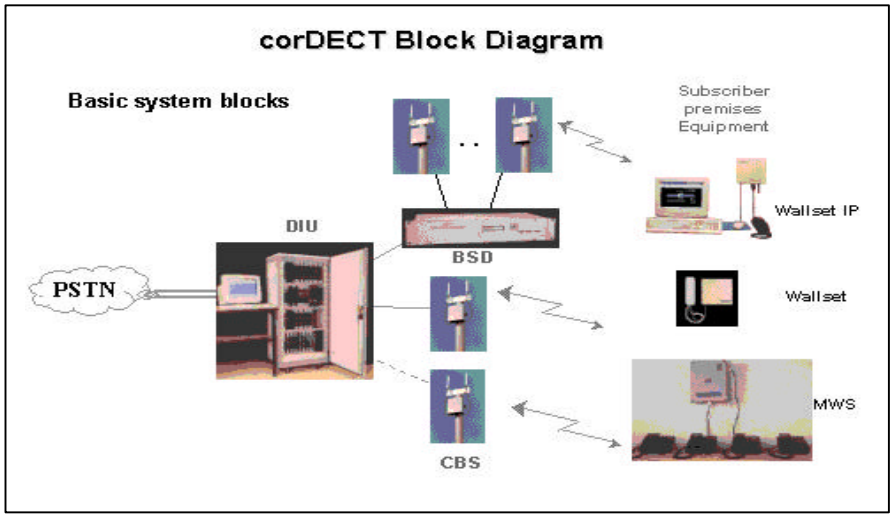

Fig 1 : CorDECT WLL Technology

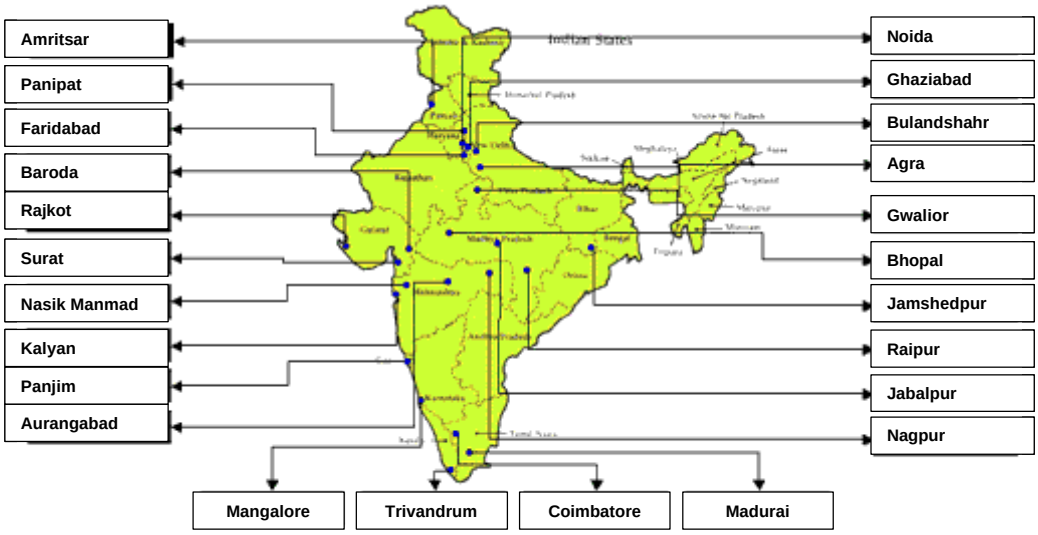

Fig 2 : BSNL Service Sites

n-Logue uses the CorDECT WLL Technology developed by Tenet Group to produce the access. CorDECT is an advanced Wireless Access system that can operate keeping the economic as a low cost technology. Midas Communication Technologies and IIT, Madras has developed it, in association with Analog Devices, USA.

It provides a complete wireless access solution with seamless integration of voice and internet services, providing simultaneous toll quality voice and 35/ 70 kbps Internet access to wireless subscribers. CorDECT is based on the DECT air interface standard specification from the European Telecommunication Standards Institute (ETSI). The CorDECT air interface supports 10 kms of line-of-sight connectivity and has the provision to extend this to 25 kms.

The components of the corDECT Wireless Access System are:

- **The DECT Interface Unit (DIU)**

  This is fully redundant subscriber radio exchange with 2 OMC PC Consoles. It can also act as a voice PBX with up to 8 E1 connections (using R2-MF or V5.2 protocols) to P5TNA/Voice. It switches voice traffic to the telephone network using the V5.2 protocol to connect to an exchange. It also switches Internet calls to a built-in Remote Access Switch (RAS), which then routes the traffic to the internet network. System reliability is guaranteed by redundant hot stand-by architecture. The OMC (Operation and Maintenance Console) allows real-time

monitoring and management of the entire corDECT system. A fully configured DIU consumes less than 600 W power.

- **Wall Set with Internet Port (WS-IP)**

  This is the equipment at the subscriber premises. It has 2 ports, one a standard 2 wire RJII interface for connecting to a DTMF or decadic telephone, FAX machine or modem. The other is an RS232C Internet port for connecting to a computer obviating the need for a modem. The PC establishes a dial-up Internet connection using a standard dial-up utility. This means that voice and internet can be used simultaneously. The power to the Wall Set is provided by a 12V adaptor connected to the mains, or by a solar panel connected in parallel. It has a built-in battery charger providing 16 hours standby and three hours talk time for voice calls.

- **The iKON Remote Access Switch (RAS)**

  The iKON RAS terminates the connections from the subscribers and is connected to the DIU using 2 E1 ports. It does IP routing for 60 simultaneous corDECT Internet calls. The RAS has a 10-basT Ethernet port to connect to the Internet. It supports RADIUS for accounting. PAP for user authentication and is managed using SNMP.

- **Network Management**

  CorDECT provides comprehensive operation and maintenance through the corVIEW OMC Console. The features include hardware and software configuration, subscriber administration, accounting, fault notification and traffic. The functions range from a bird's eye-view of the operational status of a network of corDECT systems to probing the internals of an individual wall set. CorVIEW supports the SNMP protocol and can be connected to the corDECT system by any IP network.

  The Wall Set can be connected to the DIU through:

  1. The Compact Base Station (CBS), for distance upto 10 km
  2. The Remote Base Station (RBS), for distance upto 25 km
  3. The Base Station Distributor (BSD), for distance beyond 25 km

- **The Compact Base Station (CBS)**

  This provides the radio interface between DIU and Wall Set. It is connected to the DIU through 3 pairs of twisted pair copper wires. The DIU feeds both power and

signal to the CBS. A DIU can be connected to up to 20 CBS and each CBS supports up to 12 simultaneous voice calls. The structure of CorDect is given in **Fig 3**.

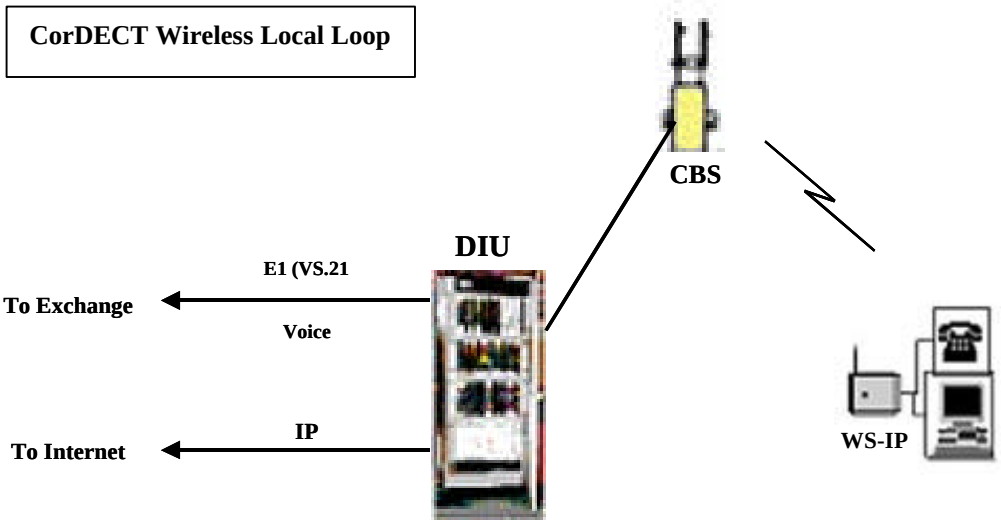

Fig 3 : CorDECT WLL structure

The Remote Base Station (RBS)

The RBS extends the range of the corDECT system by another 25 km. It relays DECT pockets between the CBS and subscriber units through a two-hop DECT wireless link one between WS-IP and RBS and the second between RBS and CBS. It can handle 11 calls simultaneously. **Fig 4**, shows the CorDECT interface with Remote Base station.

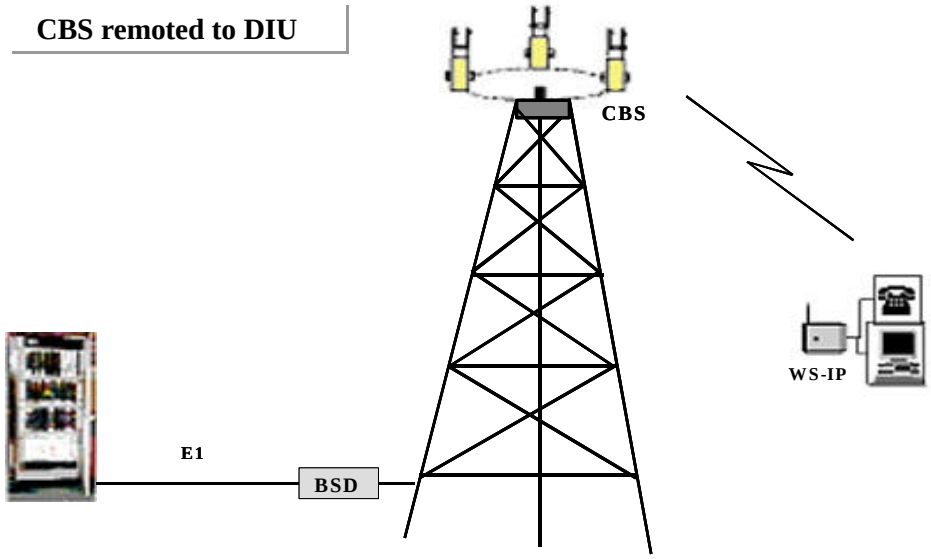

Fig 4 : Interface between CBS with RBS

- **The Base Station Distributor (BSD)**

  The BSD is a compact remotely located, locally powered, rack-mountable unit that supports up to 4 CBS. It connects on an E1 interface to the DIU, which may be on copper, fibre or radio. The link distance depends only on the link design. It is designed to connect pockets of subscribers located far away from the DIU. The connectivity between RBS and DIU is shown in **Fig 5**.

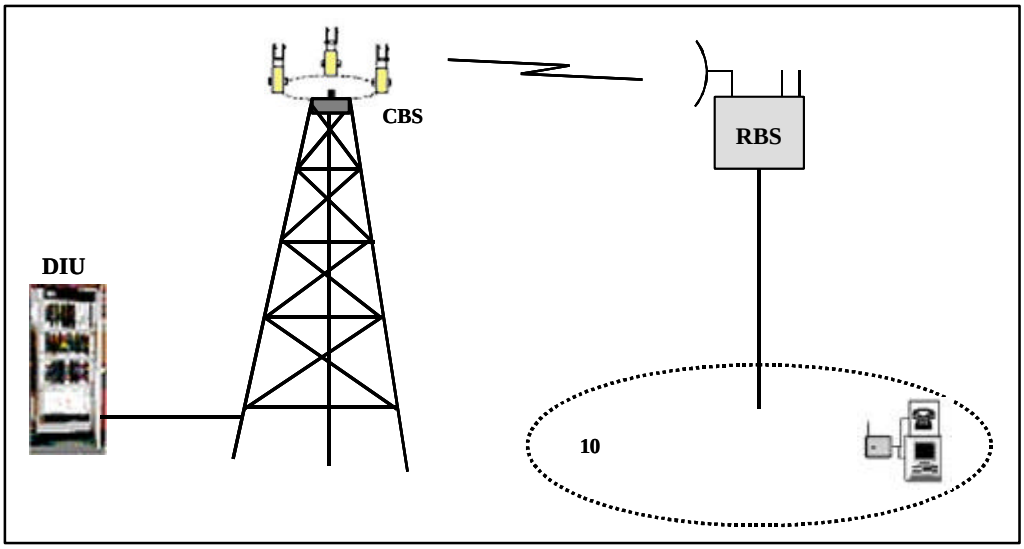

Fig 5 : Base Station Distributor

The advantage of this technology is that it addresses the networking needs of both densely populated cities as well as sparsely populated villages. It supports 10 Kms of line-of-sight connectivity and has the provision to extend this to 25 Kms using Relay Base Stations.

Business Model Envisaged

n-Logue's business model is based on the belief that delivery and management of the Internet Service should devolve to the level of the supply chain that comes closest to the user of the service. This draws, in large part, from the success of the cable TV operations in India. In this decentralized model of operation, in every place it wishes to operate, n-Logue will identify and partner with a local entrepreneur (also called a Local Service Provider or LSP). These LSPs will find subscribers, provide services and collect payments. **n-Logue will provide to the LSP**, all the equipment, training and support as well taking care of regulatory and connectivity issues. For operating and faster roll-out, the company has adopted a 3-tier Franchisee arrangement model as indicated in the **Fig 6**

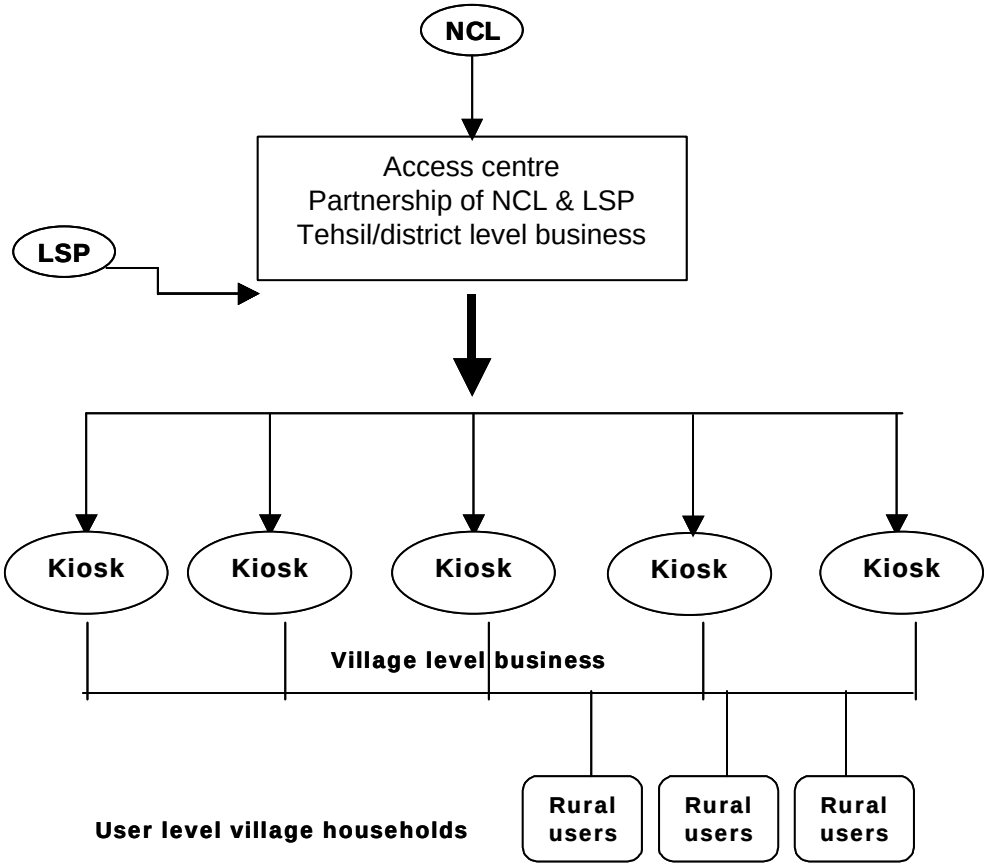

Fig 6 : The 3-tier Franchise model

At the first tier is n-Logue, the company that implements the project. The second tier was represented by the local service provider (LSP) at taluk level- in this case SARI, and in other cases a local entrepreneur - who runs the Access Centre. The third tier is the village level kiosk operator.

N-logue will provide all the equipment in ***Access Centre (AC)*** consisting of Digital Interface Unit (DIU), power controller (UPS), one server machine, multiple clients and corDECT Wireless Local Loop (WLL) which allows simultaneous flow of voice and data on a single line at a much cheaper rate and provides 35/70 kbps simultaneous Internet and telephony within the areas of about 25-30 km (or 2000 sq Km) radius, training and support as well taking care of regulatory and connectivity issues.

n-Logue will provide all initial training and support to technical personnel, both at the access centre and at the kiosks and will take end-to-end responsibility for ensuring the completion of the project.

LSP will manage the facilities provided in the Access Centre and also able to provide the e-mail, hosting customers web pages and services to his customers including kiosk operators as well as individuals. n-logue and LSP (Local Service Provider) will jointly study and find out such entrepreneur in every rural village with in the command area.

The village level kiosks have corDECT Wireless system, a Pentium/Celeron PC with color monitor, speakers, Microphone, web camera, printer, Sound Card, four hour power back-up for PC and also different applications suite in local language as well as in English. These village level internet kiosks are with the brand name Chiraag in this case. Chiraag is a word that means the beginning of a flame, implies a feeling, is both positive and exciting, something that is deemed to grow so fast. Chiraag is a symbol of hope and optimism.

Background of SARI

SARI is part of the Digital Nations consortium of the MIT Media Lab and Harvard's Center for International Development in collaboration with IIT-Madras and the I-Gyan Foundation. It seeks to show that viable markets exist for information and communication services in rural poor areas by inventing and deploying innovative technologies, assessments, and business models. The ultimate goal is to link these activities to sustainable human development objectives.

Through the development and introduction of appropriate and enabling technologies and applications, SARI will foster economic development and improve health and learning. It will do so in a financially sustainable way, even as it reaches into the poorest and most disadvantaged communities. SARI's diverse partnership of universities, non-profits and the private sector has begun to implement a unique project that will begin by wiring approximately one thousand neighbouring rural villages in each of two Indian districts.

SARI's magnitude is essential because it will allow us to benefit from the Network Effect, which will be far more empowering than a few connections placed only in more urban areas. The large number of users helps support financial viability by aggregating demand, develops richer content and community by integrating people, and provides a powerful environment for research.

There has been a great deal of enthusiasm about the value of information and communications technologies (ICT) but precious few unqualified successes and little or no rigorous evaluation. The SARI project counts on a collaborative and interactive research agenda drawing on the expertise of Harvard's Center for International Development, IIT Madras and the MIT Media Laboratory. The key research areas

include: 1) technology, applications and content, 2) assessing social and economic impacts, 3) and business models for financially viable and self-sustaining access.

Midas Communication and n-Logue Communications in association with the Massachusetts Institute of Technology (MIT) in the USA started a prestigious SARI (Sustainable Access in Rural India) joint Project. It was proposed to undertake deployment of telephones and Internet in villages of Madurai district of Tamil Nadu, India. The SARI project seeks to show that viable market exists for information and communication in the rural areas of Tamil Nadu. It is proposed to connect 1000 villages and demonstrate that rural access can be sustainable.

Local Partners in SARI Project

DHAN Foundation is the local partner in the SARI (Sustainable Access in Rural India) Project in Madurai District and it is running 19 kiosks with the help of self-help group. The project was taken up with the objective of proving that there exists a viable market for Information and Communication Services in rural poor areas, which can be tapped using innovative technologies and business models. The project intends to setup 100 Internet kiosks in rural areas in Madurai district to test this hypothesis.

DHAN Foundation intends to continue the program to achieve meaningful and sustainable result in this theme. In the next three years DHAN Foundation would join hands with like-minded professionals and institutes in this venture and take up following activities and service, which would be serving the rural population in general.

DHAN Foundation as the local partner has 20 Internet kiosks under this project. Each Internet kiosk has a PC with 1 GB hard disk with other accessories. Internet facility is provided with the help of Wireless Local Loop (WLL) technology developed by IIT, Madras. All these are provided free of cost by the SARI project to the kiosks. The project has provided dot matrix printers also to the kiosks. The Internet usage is chargeable and the fees are to be paid to the ISP, n-Logue Communications. DHAN Foundation has upgraded 12 kiosks with 10 GB hard disks. The villages are selected for kiosk operation based on the number of households in the village, potential of the village for income generation and the need for development.

DHAN Foundation identified the members of ***Kalanjiam*** Community Banking - ***Self Help Groups*** to run communication centers in the villages as a business. Commercial and developmental services are being provided in these kiosks. These include computer education at low cost, e-governance, eye-care applications, agriculture information, innovative technologies for grassroots development in agriculture and animal husbandry,

e-mailing, browsing and k (kiosk)-Commerce. By using this K-commerce in their kiosks they are exchanging the goods like vehicles, food grains etc., without third party involvement.

Project In Melur

Melur is one of the 14 projects that n-Logue is implementing across the country; it was sponsored by the Sustainable Access in Rural India (SARI) project and is a unique Private-Public-Government-Institutional partnership. It aimed at bridging the `digital divide' between rural and urban areas, establish rural connectivity, facilitate dissemination of information on all fronts of social development to the villagers, at a low cost. This new, cheap and robust wireless technology brought the information revolution to the rural areas.

n-Logue is deploying this project in the rural villages of Melur Taluk in Madurai District. This will connect every village and small town in that area and provide Internet services to the people of the taluk. Now this facility was connected to nearly 50 rural villages within the radius of 25 Km from the Access Centre and the villagers, who already used this facility, are enjoying with the fruits of these facilities.

A kiosk will be set up in each village to service the needs of the people in that village. Separate connections will be provided to schools, colleges, primary health centres, etc. Dhan Foundation, the project partner in Madurai will assist in training personnel to manage these connections and introduce people to the Internet.

The project aims at identifying and providing appropriate access technologies and applications that will be of use to the local community. Possible applications are school education, farmers' commodity market information, e governance, local commerce, etc. The project will receive initial funding from outside for procurement of equipment as well as paying for its operation, but will eventually become self-sufficient and pay for itself.

The main activities implementing in these village level kiosks at present are e-governance, e-commerce, market prices, complaints to Aravind Eye Hospital through web cam, queries to agricultural universities, e-mail, computer education, job typing works. Many successful happenings came out by the users of these kiosks in all the applications like e-governance, Aravind Eye Hospital and agricultural universities.

More than 50 villages in Melur taluk (about 25kms. from Madurai in Tamil Nadu), are connected to the Madurai Agricultural College and Research Institute, by n-Logue's

wireless network. Villagers can e-mail their agricultural queries to the College and receive an answer via chat/e-mail/net meeting.

The first Access Center was established at Melur Taluk, which is located in Madurai District, 28 kms from Madurai city. To this Access center are linked around 56 Information Kiosk at various villages around this Taluk. All these information Kiosks are fairly doing well, and also earning good income based on the efforts being put in by the kiosk operator.

There are 56 kiosks are running in Melur Block, out of these 19 are running by the self-help group of DHAN foundation, who is a local partner in this project. All these village level kiosks are operated by the village based operators, who have some knowledge about the computers. All these operators are doing good work for popularizing these kiosks. On an average each kiosk operator is earning Rs.3000/- per month.
The location break-up of these kiosks are as given in **Table 1**. The list of services available at Melur is given in the **Table 2**.

Table 1: Location-wise break-up of Kiosks

Type	No. of kiosks
Educational institutes	7
Government connections (Taluka, B.D.O and S R O Offices)	3
Under n-Logue (Rural villages)	20
Corporate offices	2
DHAN Foundation (Rural villages)	19
Polytechnic Colleges	2
Residential school	1
Private connections	2
Total	56

Table 2 : List of services available at Internet kiosks in Melur

A	**Min-Arasu** (E-government application)
1	Birth Certificate
2	Death certificate
3	OAP Application
4	BDO Wellfare schemes
5	Guideline Valuation
6	Encumbrance
7	Water complaints
8	Download applications
9	Send online petitions
B	**Health services**
10	Online appointment with eye doctor
11	Eye camp information and Registration
C	**Agricultural services**
12	Agricultural Advice from university through Live conference; email
13	Market prices
14	Soil testing
D	Veterinary services
15	Online registration for vet. Trg programmes
16	Advice from veterinary doctor
E	**Communication services**
17	Email
18	Voice mail
19	Photo mail
20	Video mail
21	Inter village postal service
22	VOIP Service
23	Chat service
24	Net meeting and video conferencing
25	Typing and DTP in local language
F	**E-Business**
26	Classifieds
G	**Entertainment**
27	Lottery results online

28	Astrology
29	Games
H	**Value web services**
30	Check LIC policy status online
31	Rail ticket information
32	Web links
33	Browsing
34	Matrimonials
I	**Travel services**
35	Travel booking fro train
36	Travel booking fro buses
J	**Education**
37	Model question papers
38	Examination results
39	Webulagam career advice
40	Webulagam college service
41	Education CD's
42	Literacy programme-tamil
K	**Jobs**
43	Job posting
44	Resume posting

These kiosks are implementing all the services except VOIP, villagers and kiosks operators are also asking for VOIP, which is very easy to communicate with lower cost. The data regarding number of villagers benefited, income generating through each kiosk, users category and types of benefits are given in the **Table 3**.

Table 3 : Types of benefits derived by the villages.

Village name	Total no. of house holds	No of Households used the kiosks	Income generating (Rs.)	Category	Type of benefits
Pathinettam Gudi	500	300	4000	Poor and small	e-gov, Eye Care, old age pension for 10 members, agri, veterinary, e-education, astrology and internet browsing
Ualgupitchan Patti	300	150	2500	Poor	Brinjal disease, veterinary for goat, aravind eye, astrology, people are coming from near by hamlets for using this kiosk
Keezhaval-avu	900	400	10000	Poor and middle class	Birth, death, OAP, income, e-education, browsing, games, internet, widow, petitions, lottery results
Kuthappan Patti	600	300	1500	Poor	OAP, income, computer education, browsing,
Pulimala Patti	650	280	3800	Poor & small	e-government, OAP, birth, death, aravind eye care, prevention of epidemic
Thiniya Mangalam	500	400	4000	Poor, small and high	e-government, aravind, agri information, computer classes, browsing, chating
Therkutheru	850	350	2500	Poor, small	Students, email, e-commerce, OAP, avind eye care

Entrepreneurial Initiatives

At Keezhvalavu village, the enterprising kiosk operator, A. Abdul Razaak, has been able to get his neighbours to use the Net for various uses. Having learnt his marketing tricks from running a franchise computer training class for Aptech at another village, Razaak has been giving his villagers a whole range of services at cheap rates so that they get used to the concept of Internet use. Among the most popular service is e-governance, where the villagers file applications for birth certificates, death certificates, etc., through the Net. Since the Tamil Nadu Government has taken a policy decision to encourage e-governance, the villagers get a response from the Melur taluk office within two days. Once the certificate is ready, Razaak provides another value-added service. He sends his man to collect the document for them. All this at a total cost of around Rs 25, of which Rs 15 is the government fee.

The villagers do not have to lose time (which immediately translates to money for anyone who works on a daily wage) travelling to the taluk office. And they do not need to face the uncertainty of being asked to "come tomorrow" by the officials at the office.

Using the web cam on his Internet machine, Razaak has also sent pictures of moth-eaten teak leaves to the agriculture college at Ottakadai. With cooperation from the scientists, the farmer gets a diagnosis and also a prescription on the treatment.

Keezhvalavu also has an e-referral facility with the Arvind Eye Hospital of Madurai for ophthalmological problems. Earlier Razaak had invited the hospital staff to conduct a free eye camp at the village.

E-Government Applications

MIN-ARASU is a Government-to-Citizen application developed through the collaborative efforts of the Madurai District Administration, the Officials of Melur Taluk, the Madurai Division of the NIC and n-Logue Communications.

MIN-ARASU literally means Electronic Government in Tamil and ARASU is an acronym for Application for Rural Access to Services and Utilities. It is intended for the people who live in the villages and small towns of the various Taluks in Tamil Nadu. It leverages the Taluk Computerization initiatives of the Tamil Nadu Government to provide services to the people that live in these Taluks.

A. Basic Features of MIN-ARASU

- Facility to **send emails** to your Government – Your Chief Minister, Collector, etc

- **Information on all relevant Government Departments**
  The schemes they provide to the citizens with details of how to avail of each of them. E.g. eligibility for **OAP** Schemes, Loan from **DIC, THADCO**, procedure to apply for driving license, the eligibility to join in the various courses in the various colleges, etc.

- **Forms for making all applications.** These are documents that can be downloaded and filed out before printing.

- Facility to send the application to the concerned officer as a simple **email attachment**.

- **Applications for Certificates;** From the Taluk Office – Birth, Death, Income, Community, Nativity, Legal Heir-ship

- Guideline Valuation of Property, from the sub-registrar's office.

- Complaints regarding Repair of Street Lamps and Drinking Water, from the Block Development office.

- **Applications for Pensions** – Old-age, Widow's, Handicapped, Destitute Women's

- **Application for Loans** against schemes like Prime Minister Rojgar Yojna (PMRY)

- **Applications for Welfare Schemes** – Widow's marriage, girl-child support, building latrines, kaccha houses and chullahs

- **Market prices on a daily basis**
- Canal Timings and Amount of Rainfall on a weekly basis

B. Some Process Changes that have been made to support the services

The process changes realized through the ICT platforms are:

- modifying the applications so that they are easier to read and understand. For example, incorporating check boxes for eligibility criteria, etc
- making payments for certificates post-paid rather than pre-paid
- eliminating stamp papers and issuing receipts against cash payments.
- making the format of application forms at taluk and municipality offices uniform
- converting to the government recommended fonts for typing in tamil
- making all certificates bi-lingual

C. Tangible Benefits of ICT platforms

More than 350 applications have been sent to various Government offices through this process. This has includes petitions sent to the Collector, the Tehsildar and various other Government officials. Two emails were also sent to the CM's cell. The number of applications sent for different purposes as on 22nd June, 2002 are given in **Table 4**.

Table 4 : No.of applicants received under various categories

Type of Application	Number
Birth	186
Death	29
Pensions	66
Income	56
Community	61
Nativity	10
Others	45
Total	**453**

The Village Presidents have used the network to send complaints on behalf of their villages. Since n-Logue has provided connectivity to the Government offices at the Taluk, they are able to use this to communicate with the District Headquarters. Thus even the Government machinery has benefited from this network.

Agricultural Extension Services

A partnership with the Tamil Nadu Agricultural College and Research Institute in Melur has resulted in Consultancy Services being offered to Farmers through email & online chat between Farmers and Faculty of the University.

Other services being planned are:

- Projects by students of the university (and development of website by students through the same)
- Sharing of Best Practices, Success Stories of farmers in various parts of the state and a Farmers' Newsletter
- "Farm School on Internet" along the lines of the existing "Farm School on Air"
- Results of the work being done in futurology like projection of crop prices, Demand, Rainfall, etc
- Early warnings on outbreaks of disease, pests
- Mobile Soil Testing services with results being emailed to the farmers.
- List of dispensaries, insemination centres, private clinics in Melur
- Advice on commercial animal husbandry activities like rearing animals, feed etc.
- Online registration for upcoming training programs
- Directing animal health related queries to unemployed veterinary doctors in Melur who can attend to the same by going to the village - charged service
- Information on Aavin Cooperatives (support for milch cattle only) and
- First aid information for surgical and delivery problems through email.

Some illustrative examples are given below:

The Professors of the TeNeT Group have developed several local language applications for use in these kiosks. These include

a) email (in local language)

b) voice email (for people who cannot read, where the person's voice is recorded and sent as an email attachment)

c) video mail (video clips sent as emails)

d) chat (text and voice)

- A website has been hosted on the local server that provides local information (Melur.n-logue.net.in). This allows access to all of the above services as well as the facility to post classifieds, register for eye camps, etc.

- However, the access to the Internet is still the most promising service of all. Through this, they are able to do so much more than one organisation can facilitate.
- Exam results (Plus Two, Class 10, TNPCEE, Teacher Recruitment Board, etc)
- Information on where to apply for education after school
- Astrology, movies, music

Some typical examples of use of ICT platforms are given below:

Aravind Eye care

One of the most promising partnerships is with the Aravind Eye Hospital in Madurai. Through this, villagers can get a preliminary diagnosis of their eye problem and be directed to the hospital or nearest free eye camp if further treatment is required.

A photograph of the diseased eye is sent via web camera, if available. Further, a questionnaire available on the n-Logue web site provides a list of questions for which answers are required to be sent via a voice email.

This is sent to a senior doctor in the hospital who responds to the problem as required. He sends a response directing the patient appropriately. If a visit to the hospital is required, a letter is sent back which the kiosk operator prints out and hands over to the patient, who carries this with him or her.

Agricultural pest management

This is the success story of a farmer, whose life changed course with the E-agriculture application. More than 50 villages in Melur taluk (about 25kms. from Madurai in Tamil Nadu) are connected to the Madurai Agricultural College and Research Institute, by n-Logue's wireless network. Dr.G. Selveraj, Head of the Rural Extension Department, coordinates the backend support from the Agricultural College. Villagers can e-mail their agricultural queries to the College and receive an answer via chat/e-mail/net meeting.

Ulagapichanpatti was the first village to send a query regarding a problem with lady's finger (bhendi/okhra), one of the main crops of the village. Last year, practically the entire village lost their crop due to an unknown disease. This year the problem persisted and the leaves and vegetables started turning whitish- yellow in color instead of being

dark green. Even proven remedies failed to work causing concern to the already despondent farmers.

A family who had lost their crop last year, came to know about the Chiraag Internet Center (kiosk) through the door-to-door campaigning of young Suganya, an enterprising 18 year old who had set up the Center with a loan. An e-mail from Suganya informed the College of the bhendi problem. Suganya was asked to send a picture of the crop/vegetable, which she promptly did, using a web cam. A swift reply from Dr. Selveraj identified the problem as "yellow mosaic disease", known to affect bhendi in that area.

The farmer was instructed to spray a Boron and Nitrogen solution on the affected crop. About a week later, the farmer was excited to tell Suganya that the new leaves and vegetables were fine and bright green. A trip to Ulagapichanpatti the very next day confirmed the "miracle".

Before **After**

Fig 7 : Visible results after using the ICT facilities

Eventually, the entire village came to know about this solution and almost all farmers used this technique and saved their crop. From the same village, the kiosk operator also sends mail and photographs of cotton, brinjal and chillies, on behalf of farmers who frequent the kiosk. Two Assistant Professors of horticulture appointed as expert resources answer such queries along with Dr. Selveraj. After seeing this success of this kiosk operator other village kiosk operators also started sending e-mail to the Agricultural College and are excited about the prospects!

Animal health care

The veterinary doctors have been able to identify “curled toe paralysis” in the photographs below caused by B-complex deficiency through kiosk and suggested medical drops along with home-made remedies such as feeding rice polish and husk to the hen.

Fig 8 : Curled toe of a hen

Before having access to such services, villagers had to travel to the veterinary doctor's clinic and bring him to their village for consultancy at a minimum cost of Rs. 150-200. Many times a qualified doctor would not come and his medical assistant would be sent instead. Through the Internet, help is received without even having to leave the village.

Communication through e-mail

"Mothers are going to walk up to that computer and say: 'My children are dying, what can you do?' They're not going to sit there and browse eBay." By Bill Gates

1) Muthupandy, a school teacher working in Eritrea in Africa, could not believe his eyes when he received an e-mail from his village, Pathinettankudi, in the interiors of Madurai district in Tamil Nadu. He sent a message to the `Chiraag' Internet kiosk operator at the village to confirm that the mail was actually sent from his village. Muthuswamy, father of Muthupandy, a farmer at the village, the opportunity of corresponding with his son through e-mail from the village itself meant many benefits. First, instead of the earlier once-in-a-month communication, he could send and receive a message whenever he needed to do so. Two, it saved on costs and time, which was required earlier to travel to Madurai city to send e-mails.

2) Mr.Manoharan, who runs the Chiraag Internet Center at Uranganpatti village in Madurai district, used email to bring relief to a widow in his village, who had nowhere to turn for support. The lady, Mrs. Ranjitham, became a widow three months ago when her husband, the late Mr. Pon Ram Chandra Bose, lost his life in an accident while working as a construction worker.

   Mrs. Ranjitham, did not know where to go or what to do when the family ran into financial problems. Then someone advised her to seek compensation from the Saudi Arabian Company for her husband's death but she had no idea how to

contact anyone there. This came to the notice of Manoharan of the Chiraag Internet Center and he suggested to Mrs. Ranjitham to try sending an email to the Consulate of India in Jeddah regarding this.

After conducting a web search to find out the email ID of the Indian Consulate in Jeddah, the kiosk operator at Uranganpatti typed out the letter for the widow and sent it. After 15 days of anxious waiting, the widow received a parcel in the post which had some documents that needed to be filled along with a letter requesting for some other certificates to be attached and couriered back to Jeddah. The letter also had a reference number and an email ID of the Welfare Department of the Consulate, which deals with such matters. Manoharan sent a confirmation receipt to this email ID stating that they had received the postal package and would courier the required documents within one week. Mrs. Ranjitham received an email reply for this mail and she could not express her happiness! She paid Rs. 30 for the entire service.

After another week, a final authorization document was received by Mrs.Ranjitham, which required signatures from the External Affairs Department in Chennai. Once again Manoharan helped the widow send this to Chennai through courier. One full month after sending the first email to Jeddah, Mrs. Ranjitham and her family received a compensation of Rs.1, 30,000. For Manoharan, the tears of gratitude in her eyes were enough for all the work that had gone in.

3) The village of Pulimalaipatti in Melur Taluk. V. Kanimozhi, a woman from the same village running the Internet Kiosk in that village. In June 2002, a few people in the village caught chicken pox and soon, due to the lack of precautionary measures, the disease spread to others in the village. By mid July, almost 200 people in the village were affected and the disease had reached epidemic proportions.

   Kanimozhi sent an SOS to the Block Development Office and the Taluk Office via email in the hope that one would respond. She even sent a mail to the Chief Minister's Cell! The message she sent was:
   "In our village for the past one month, people are suffering from chicken pox. The total population of the village is 5000 and this disease is spreading to everyone. We request you to kindly help us." "From June 20th chicken pox has been spreading in this village and it has already infected nearly 200 people and still it is spreading. I kindly request the Collector to help us."

The response was prompt. The Tahsildar, BDO and Health Department officials came to the village with a team of doctors and nurses.

Dr. Sridhar, the main doctor went from house to house administering vaccinations, tablets and medicines. The next day, he sent the Madurai Medical College Lab technicians to administer blood and water tests on all patients. This was again done by going from house to house. The results were sent back to the villagers by email and thus all the patients were cured and further spread of the disease was averted.

Conclusions

ICT has been pivotal in getting masses in the rural areas aware of the latest technological innovations and how these technological innovations be used for eliminating the rural poverty and generating sustainable incomes [4,5]. This project shows us how the low cost technological innovation in telecommunication be used for providing rural connectivity. The technology used in Madurai was CorDect WLL, which was incubated in IIT-Madras and it was successfully implemented in Madurai.

The innovative ICT platform developed by IIT-Madras is significant in bridging the digital divide between rural and the urban India. The highlights of this project are, namely:

- Early adoption of the ICT by the users
- Technology transfer from the incubator at IIT-Madras to the rural areas for the benefit of the masses.
- Entrepreneurial help for building of infrastructure and trust amongst the rural community.
- Facilitation in sharing of knowledge at the local level
- Training of the local people for further enhancement of their skills and for generation of sustainable income levels.

The major lessons one can derive from the experience of designing and implementing an ICT platform have been the following:

- The project was a well conceptualized one. The locations were carefully selected. The kiosk operators were trained well. Training local people after careful assessment of communication abilities helped in the early adoption of the technology.

- Selecting a low cost technology option that has a low operating and maintenance cost helped in the rapid diffusion of the technology. Though the technology was new, the entrepreneur took risk by selecting a new technology but made sure that it worked in a rural environment. The technology selected was robust and reliable.

- When one has to implement a large network there is a need to have a public private partnership. Conceptualizing a large community initiative through such an arrangement needs consideration of all customer needs and developing a network of experts who could answer the queries.

- Selection of people to operate the kiosks was done carefully. In a rural setting trust is a crucial element needed for creating and sustaining relationships. Trust is an enabler or creator of a virtuous cycle of relationships.

Designing and implementing large rural networks require considerable amount of planning. Local participation is one the basic prerequisites for the success. The technology diffused as it was a low cost option. Public-private partnership is good organizational form for implementing ICT platforms for rural communities on a large scale [6]. Entrepreneurial orientation has been a major contribute that lead to the success of this platform.

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