CHAPTER 13
Same Language Subtitling for Literacy: Small Change for Colossal Gains

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Same Language Subtitling (SLS) refers to the idea of subtitling motion media programs in the same language and script associated with the audio track. This apparently small change in certain popular cultural programming contexts on television and cinema, especially, film songs, has shown enormous promise for literacy skill improvement among neo-literate and in generating interest for literacy on a national scale. Overwhelming support for the technique has been found in several field tests in Gujarat, involving both literate and neo-literate people. A controlled experiment with school children has demonstrated that SLS leads to reading improvement because it whets people's interest in singing along and knowing the lyrics. The effectiveness of SLS lies in reading skill improvement being a subliminal by-product of widely popular entertainment. The SLS approach can be implemented easily in several regional languages. As compared to the enormous amount of money spent by the National Literacy Mission and State level agencies on post-literacy with poor returns on investment, the resource commitment involved in SLS is ridiculously low and the potential gains, phenomenally high. Yet, the idea has caught the imagination of few national-level policy-makers in media and education. While the main focus of the study was on SLS for film-song programs on television, implementing SLS in a CD-ROM and television context with songs of social change was further explored.

1. Ashok Joshi and Kanu Patel have also contributed to this paper.

Introduction

If the masses of people in India are to benefit from the dizzy pace of developments in Information and Communication Technologies (ICTs), the country requires a good infrastructure, both in terms of "hard" and "soft" dimensions. For instance, let us consider one of the most promising ICT—the Internet. Just as telecommunications is the "hard' infrastructure necessary for the Internet revolution, literacy is a critical aspect of the "soft' infrastructure that will fundamentally determine the extent and nature of such a revolution. At the turn of the millennium, even if the telecommunications infrastructure in India were to enjoy total coverage at high bandwidths, the worldwide Internet would hardly be able to include in its web a small fraction of India's population due to literacy and language barriers. Only half of the adults in the country are literate.

Speculatively, only half of the literate may be literate enough to be able to take advantage of text-based matter in books or on the Internet. Another major impediment is that English predominates on the Web. Even two of the most spoken languages in the world, namely, Hindi and Bengali can hardly claim a trifling byte of the cyber world. Thus, if there is to be a widespread information revolution in India, the top priority has to be universal literacy, at levels that are adequately high to enable direct benefits to people. Simultaneously, information riding on ICTs would need to be in vernaculars. This chapter is about using television, an increasingly ubiquitous communication technology in India, for the development of a "soft" infrastructure for the ICT revolution.

Same Language Subtitling

Same Language Subtitling (SLS) refers to the verbatim replication of audio and text, in the "same" language. From the viewers' perspective, the text they see and the sound they hear reinforce each other in perfect synchronization. For instance, in SLS the audio track in Gujarati would find its reflection in Gujarati text on the screen—no translation, no transliteration, just plain and simple, word for word copy of audio and text. Subtitling has almost always been trapped in a translation mindset or used for providing additional information. Subtitling in the "same" language is, to a certain extent counter-intuitive. It is at times used by advertisers to reinforce their message, but is rarely employed in regular media programming.

The SLS technique has been implemented in two different communication technology contexts to subtitle songs. The aim is to create an environment for the subliminal improvement of literacy skills in everyday media interaction and in educational situations. SLS has been found to contribute to the development of literacy skills in experimental settings. The experiments underscore the potential contribution that the SLS concept could make toward national literacy development in a lifelong or continuing education sense. A

sustained effort has already been made to concretize the idea by implementation in film based songs. The second method to use SLS for literacy is in "Stills in Sync," in songs of social change. The idea has been implemented in technology but field tests have not yet been carried out.

While the efforts of the National Literacy Mission (NLM) have made a noteworthy contribution to increasing the number of neo-literate[2] through the Total Literacy Campaign mode (Athreya and Chunkath 1996), its post-literacy and continuing education initiatives have not been able to address the very serious problems of skill erosion and relapse. Many literate in India relapse into illiteracy due to a lack of practice opportunities in everyday life. The evaluation Report of the Expert Group (National Literacy Mission 1994), commissioned by the NLM itself, made several important observations: (a) fragility of literacy achievements leading to relapse is as serious a problem as the lack of widespread literacy; relapse could be as high as 40%; (b) women constitute two-thirds to three-fourths of the adult neo-literate resulting from Total Literacy Campaigns; and (c) the problems of illiteracy, and by extension, relapse, are most acute in the Hindi heartland. The report adds further, "literacy will have to be connected to everyday existence in very concrete and sustainable ways." Learning contexts would have to make a transition from "guided learning to self-reliant learning." The use of SLS can be rationalized on the basis of these observations.

Indian television has witnessed a virtual explosion of film and pop song based programs in vernaculars, especially Hindi to an extent that some channels are exclusively dedicated such programs. Moreover, song-based programs are known to attract high, across the board viewership especially among female viewers (Sinha and Parmar 1995). With the simple and inexpensive addition of SLS to these programs, one could achieve substantial literacy skill gains over a passage of time among the neo-literate masses in the country. SLS of popular song programs on television successfully creates an entertaining environment for literacy skill-based transactions. The power of SLS is not in creating "educational" programs, but in enhancing the entertainment of the existing programs. Literacy skill development is a sub-conscious by-product.

Audience Feedback

The potential and practicality of implementing SLS was underlined by the results of eight field tests conducted to gauge audience reaction in rural and urban Gujarat (Kothari 1998). The results confirm that audiences overwhelmingly preferred subtitled over unsubtitled song programs. Several reasons were offered for this preference. A majority of the people liked the idea of being able to sing along, knowing the song lyrics, and being able to follow the words better

2. A neo-literate is defined here as someone who is not irreversibly literate.

due to the complementary influence of audio and text on each other. Children, especially, evinced a tendency to overtly sing along with the help of the subtitles. The subtitling method did not prove a hindrance in terms of interference with the picture.

Figure 13.1 Children watching Same Language Subtitling film songs[3]

Controlled Experiment

A controlled and sustained experiment to evaluate the contribution of SLS toward reading skill improvement is underway for the last three months in a Gujarati medium municipal school in Ahmedabad. The subtitled Hindi film songs recorded from *Chitrahaar*[4] were subtitled. They were then shown three times a week to children in Grade IV, who do not have a formal education in Hindi, and to the ones in Grade V, who are taught Hindi in school. The three experimental groups are: A—five subtitled Hindi film songs shown in each session; B—same five Hindi film songs, but unsubtitled, shown in each session; and C—control group, sees nothing. A session comprised of five songs to mimic *Chitrahaar*. The same pre- and post-test was used to measure reading ability of unconnected words. The test comprised of 38 mono-syllable words and 20 two, three, and four syllable words each. The mono-syllable words were created to

3. Photograph by Mr. Jaladhi Pujara

4. *Chitrahaar* is the first film-song based television program of its kind initiated by *Doordarshan*. Still very popular, it is a ˚ hour program that is currently broadcast two times a week.

cover nearly all the sounds and *matras* (roughly translated as vowels) existing in Hindi. The 2-4 syllable words were taken randomly from the songs shown. Children's reading of the words was recorded and simultaneously marked for mistakes syllable-wise—on a separate sheet. After 35 viewing sessions a post-test was conducted.

The analysis revealed an improvement on an individual's syllable as well as on the entire word level. Table 13.1 shows the average number of syllable level improvement for mono to four syllable words in groups A (with subtitle), B (without subtitle) and C (control group).

Table 13.1 Average Syllable-Level Reading Improvements for Different Word Lengths

Treatment	*Mono syllable*	*Two syllable*	*Three syllable*	*Four syllable*
A: With subtitle	1.05	2.70	3.90	4.30
B: Without subtitle	0.26	1.00	2.50	4.05
C: Control group	-1.15	0.42	2.28	1.44

N=20 for each group

In a short span of three months, it was evident that SLS of film songs does contribute to reading improvement. The observations revealed that the subtitled group's improvement over the unsubtitled group is noticeable in mono, two, and three syllable words and not as much in four syllable words. Both the subtitled and unsubtitled groups did better than the control group, suggesting that merely watching song programs repeatedly, itself, contributes to familiarity with language and is reflected in improved reading skills.

Another measure of the effect of SLS is the improvement in the average number of words read perfectly (Table 13.2). This measure conveys the "step" improvements occurring and is different from the incremental syllable-level improvements of Table 13.1.

Table 13.2 Average Word-Level Reading Improvement for Different Word Lengths

Treatment	*Two syllable*	*Three syllable*	*Four syllable*
A: With subtitle	1.60	1.10	0.90
B: Without subtitle	0.23	1.14	1.23
C: Control group	0.47	0.44	-0.44

N=20 for each group

The average improvement at the entire word-level was most apparent for two-syllable words, for the group that viewed the subtitled programs. For three

and four syllable words the group difference was marginal. Both the treatment groups did better than the control group, again supporting the pattern noticed in Table 13.1.

Children in the subtitled groups were more inclined to sing. Of the 35 sessions, 25 were monitored for overt reading/singing along. Individuals in the subtitled group were observed to sing along an average of 3.5 of the 25 sessions. In the unsubtitled group, the same figure for self-induced and overt reading/singing was 1.89. Singing along occurred on its own in a context in which it was not suggested through the program or by the facilitators. In a live broadcast setting, this innate urge to sing along can be actively encouraged by the person anchoring the program.

Potential and Prospects

Both, audience reaction and a sustained viewing of these programs by children have strengthened the case for implementing SLS in a broadcast setting. This simple addition to existing film-song programs shown on television was found to enhance entertainment for the literate and the neo-literate. The enhanced entertainment has been demonstrated to invite singing along and/or reading, thus, creating greater interactivity between the television and the viewer. Ultimately, this everyday practice is expected to improve literacy skill levels as a sub-conscious process.

While reading skill improvement has been argued to occur through SLS, another likely outcome is the creation of a reading culture. When a neo-literate (or non-literate) sees another neo-literate or literate reading and singing along with popular songs, he/she is motivated to do the same. In the Indian rural context, where one witnesses relatively fewer reading/writing transactions, an increasing number of people are transacting with television, primarily to derive entertainment. SLS uses the reach and attraction for film-song programs on television, to create a more entertaining environment in which reading transactions can be integrated.

In all the Indian languages that have a thriving film industry, SLS can be used for literacy improvement. The scope of this project is, thus, extensive, considering that India has the maximum number of non- and neo-literates in the world. Such large numbers are only reachable on a sustained basis through the mass media. When the fractional cost of SLS is put together with its potential for mass reading skill upgradation as a lifelong process, it can be expected to attract the attention of policy-makers.

Implementation Difficulties

If SLS is to be implemented in a broadcast mode, it has to resonate with the top policy-makers in the media and education, simultaneously. So far this has not been possible either at the center (New Delhi) or in the three major states that

have been approached with some seriousness, i.e., Gujarat, Rajasthan, and Madhya Pradesh. One of the reasons for this situation is that media and education policy-making are now increasingly on independent paths. *Doordarshan*[5] is burdened with pressures to compete and raise its own resources while policy-makers in education are reluctant to pay for experimentation. Consequently, the other option seems to be to approach the corporate sector or international donors to help in proving the merit of SLS in pilot projects and then persuading policy-makers to pay for implementation. But, the international donors are equally reluctant to fund such pilot projects that require considerable commitment from policy-makers for implementation.

In New Delhi, both *Doordarshan* and the NLM have shown a lukewarm response, though slightly better response was felt at some state levels. Gujarat: *Doordarshan Kendra* (DDK), Ahmedabad, expressed interest to experiment in a live pilot project, provided the finance for subtitling and research could be worked out. However, the education policy-making in Gujarat has so far not expressed an interest in financing such an initiative unless the idea is "proven." In Rajasthan, education policy-making expressed interest, but has not been able to evoke the interest of NLM. DDK for Rajasthan, too, did not pay much attention to the idea since it lacked the commercial component. The Madhya Pradesh education policy makers responded positively, however, the discussion is yet on the preliminary stage.

The most hopeful scenario for a long-term pilot project is in Gujarat because of the willingness of the present leadership in DDK, Ahmedabad, and also the experimental and collaborative spirit demonstrated by the leadership at the Developmental Education and Communication Unit of the Indian Space Research Organisation. What remains to be done, now, is carrying out a sustained pilot project in broadcast mode. If SLS continues to show the same benefits already found in the controlled experiment, a strategy to implement it sustainably on a national scale, would have to be evolved. SLS offers colossal gains from a small change in existing television programs. This "small change" itself requires, little finance as compared to the budget of the NLM for post-literacy development. Ironically while the national scale of potential benefits to literacy through SLS may qualify for consideration by heavy-duty funding agencies, because the funding requirement itself is so minuscule, the idea may not fall under their purview.

Objections to the use of film culture for literacy skill development have also been raised as film songs come in a variety of moral hues and shades. Even though the recent turn is toward the risqué, there are numerous songs that are acceptable both visually and lyrically, to the general masses. The context for implementing SLS, as suggested, is in programs that are already being televised. This is occurring in an informal home ambience and not a formal educational

5. *Doordarshan* is national and state television. National level broadcasting comes under the purview of the Directorate General of *Doordarshan* in New Delhi. Responsibility for state level broadcasting in vernaculars falls under the *Doordarshan Kendras* in most states.

one. Merely by subtitling existing programs, one cannot dramatically alter their cultural implications. Hence, resistance to SLS of film songs on the basis that it may lead to a degeneration of values seems to be a specious argument. The battle against *filmi* culture on moral grounds has proven to be a major stumbling block for some policy-makers.

Some policy-makers seem to be uncertain as to whether the neo-literate would read the subtitles at all. But studies have established in a series of rigorous experiments using eye-ball movement tracking that reading of subtitles is an "automatic" and "mandatory" process that takes place, "independently of familiarity with subtitling and the availability of a sound track" (Van de Poel and d'Ydewalle 1999). The field tests endorsed that viewers watching subtitled programs were more likely to sing along or lip-sync. Although this fact has been strongly supported by several studies, the genuine willingness to weigh the evidence of literature and field studies against a personal hunch is often weak.

The SLS project for television inspired yet another context of songs for the integration of ICT, popular culture, and literacy development. In contrast to film songs, produced by a select few and fed to the masses uni-directionally, the "Stills in Sync" project draws upon people's creativity for people's edutainment.

Stills in Sync with People's Songs of Change

Folk songs, past and present, represent the cultural energy of a community. They are as much an echo of the deep-seated values, beliefs, and attitudes of the people as they are compasses for social change and action. Far from being a cultural energy frozen in time, folk songs are a dynamic mode of social change. The present effort focuses on cutting edge folk songs, i.e., songs that specifically address issues across the social spectrum, including, but not limited to, the environment, natural resources, sustainable agriculture, women's issues, health, primary education, human rights and child labor.

At the lower budgetary end, folk songs could be recorded on audio tapes and at the higher end, they could be shot on video or film. This project implements a visualization method that lies in between by recreating an audio-visual experience of folk songs with the help of still images (slides/photographs), song-phrase subtitles (SLS), and the song itself. The communication experience involves showing the appropriately subtitled stills in timing with the song. We will call this communication technique, "Stills in Sync" (SIS).

Several considerations make SIS a potentially useful technique. Compared to video and film, it is a relatively inexpensive approach to visually document folk songs and lends itself to participatory visualization/documentation. Through SLS, the approach draws greater attention to the lyrics and meaning while encouraging literacy skill development, memorization and vocabulary enhancement as an incidental learning process. In formal educational contexts, SIS is more acceptable than SLS of film songs.

SIS was first implemented on slides in four straightforward steps by:

1. writing down the phrases of a given song;
2. taking photographs to visualize each song-phrase with inputs from the writer/singer;
3. subtitling the photographs with the associated song-phrase; and
4. shooting the subtitled photographs individually, on slide film.

A folk song thus produced could then be shown with a slide projector and the accompanying song played on a cassette player. So far, 15 songs of change have been implemented on slides. However, the mechanical difficulties with slide projectors and the expense of duplicating songs on slide, has made it more viable to implement the songs on CD-ROM or television.

Stills in sync on television and CD-ROM: The project has veered toward creating digital audio-video files of the songs so that these may be available both on video or stored on a CD-ROM. The video is useful for broadcast on television and the CD-ROM can be used in schools and/or other contexts with access to computers, in a jukebox interface permitting song selection. Subtitling in these songs has been designed to change color in sync with the word that is being sung. This approach is thought to bring some movement to, what is otherwise, a succession of still images. From a reading improvement perspective, the still images free the mind up for the eye to follow the movement in the text's color change.

Stills in sync for plays and stories: The SIS approach can be adapted to plays and stories. For instance, one of World Vision of India's street plays aimed at increasing the enrollment of slum children in schools was documented on slide. The underlying rationale for the use of SIS is that it is a veritable task, logistically, to have the whole group of actors together, every time a play is staged. While street plays would definitely evoke greater enthusiasm the advantage of SIS is that they can be shown by just one person in a variety of contexts and far more frequently.

Research directions for stills in sync: Research will focus on the effectiveness of SIS for development communication. Specifically it will look at people to people learning of social issues, in and across village contexts. A content analysis of the songs/plays will be undertaken to learn about local priorities of social change and "development." Once a reasonable stock of songs is ready, literacy gains due to SLS will be explored in a school or adult education setting where repeated viewing of SIS is possible. An attempt is being made to broadcast the songs on television in educational and non-educational programming. Cross learning between urban and rural children, in terms of awareness about each other's expressions of change, will be assessed.

SIS presents a fertile ground for experimentation. The method has the potential to conserve local culture by providing a creative incentive to people. Simultaneously, SIS offers a way to tap people's cultural energy for learning and social action.

Concluding Remarks

Ultimately, the benefits of SLS/SIS should be evaluated by the end-users, the neo-literates in this case. Extensive field-tests have underlined a positive response by them. Ironically, the decision-makers are likely to judge the usefulness of the technique from a "literate" perspective. A neo-literate's gratification in being able to read cannot be experienced by a literate person. Hence, it would be advisable to let neo-literates have the final say on whether or not it should be implemented in a broadcast mode.

References

Athreya, Venkatesh B., and Sheela Rani Chunkath. 1996. Literacy and Empowerment. Sage Publications, New Delhi.

Kothari, Brij. 1998. Film Songs as Continuing Education: Same Language Subtitling for Literacy, *Economic and Political Weekly*, 33(39), 2507-2510.

National Literacy Mission. 1994. Report of Expert Group. Evaluation of Literacy Campaign in India. New Delhi.

Sinha, Arbind, and K. M. Parmar. 1995. INSAT Effects Study. Television and Rural Life: A Closer Look. Development and Educational Communication Unit and Indian Space Research Organization. Technical Report, ISRO-DECU-TR-106-95: Ahmedabad and Bangalore.

Van de Poel, Marijke, and Gery d'Ydewalle. 1999. Incidental Foreign Language Acquisition by Children Watching Subtitled Television Programs. Journal of Psycholinguistic Research, forthcoming.

CHAPTER 14
Inmarsat Experience in Village Telephony

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Recognizing the commercial and social benefits of telecommunications, an increasing number of governments have declared provisioning of telecom access in rural and remote areas as a social service obligation of telecom operators in their respective countries. In fact, provisioning of telecom access in far-flung villages and other remote areas is expensive to install and maintain, and the traffic volume is low. Telecom operators are, therefore, looking for newer technologies which are cost effective for use in such areas. Inmarsat large antenna mini-m systems provide cost effective means of providing global telecom access in areas which are far removed from terrestrial switching centers and where traffic is expected to be low. Inmarsat, in cooperation with Indian Department of Telecommunications, carried out a pilot project to demonstrate this system. The system has been found to be technically and commercially viable for such areas. The telephone systems in the pilot sites have been used by the villagers to derive commercial benefits besides making personal calls.

Introduction

The linkage between tele-densities and national Gross Domestic Product has been recognized worldwide. The International Telecommunications Union has estimated that 1 percent investment in telecommunications results in 3 percent increase in Gross Domestic Product. International Telecommunications Union studies of tele-densities in developing countries shown that these low tele-densities, are deceptive as the majority (70 percent to 80 percent) of the total telephones are located in urban areas having a population of only 20 percent to 30 percent, while the remaining 70 percent to 80 percent of population shares 20 percent to 30 percent of telephones.

An increasing number of countries are recognizing the benefits of provision of telecom access in rural and remote areas as a part of universal service obligations. The Government of India made universal service obligation one of the main objectives of the 1994 National Telecom Policy. There are about 607,000 villages in India of which 300,000 are yet to be provided with telecom accessibility. The Government, through policy announcements and through the draft of the new telecom policy, has reiterated its priority to cover the remaining villages in the Ninth Five Year Plan (1997-2002).

Provision of telecom access to rural and remote areas is expensive, of low use, and geographically difficult. It is, therefore, required that telecom operators judiciously select a technology that is cost effective and easy to maintain.

Technology Used

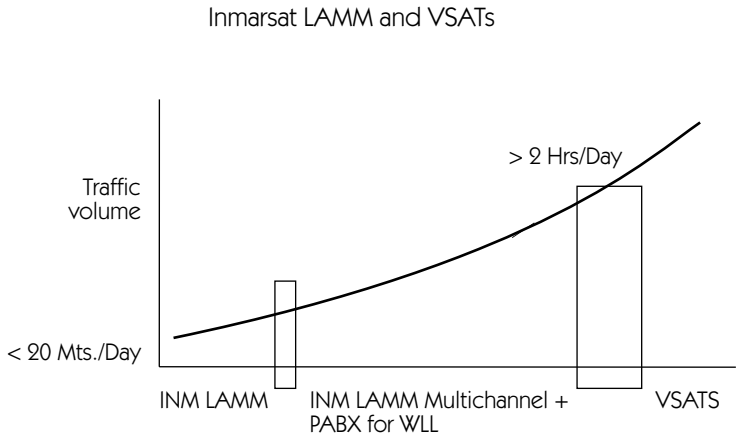
For the selection of appropriate technology the factors to be considered are the geographical location, its remoteness from the switching center, the anticipated traffic volume, and the capital and operating costs. The technology options available are Terrestrial Lines/Cables, Multi Access Rural Radio, Wireless Local Loop and Satellite. Villages that are closer to the switching centers can easily be covered by terrestrial and cellular systems; the places which are located between 5 and 25 kms (3.13 and 15.66 miles) from the switching center can best be covered by microwave systems like Multi Access Rural Radio and Wireless Local Loop, while places located beyond 25 kms (15.63 miles) from the nearest switching centers and those in hilly areas can best be covered through satellite based systems.

Distribution of Telephones between Urban and Rural

	Population (million)	Percent	No. of DELs ('000)	DEL (percent)	DEL per 100 persons
Rural	627.1	74.2	530	10.5	0.08
Urban	217.1	25.7	4545	89.5	2.1

(1991 Census)

Figure 14.1 Distribution of Telephones between Urban and Rural Areas



Source: VILCOM Satellite Communications and Traffic Management Services

Figure 14.2 Inmarsat LAMM and VSATs

Inmarsat Large Antenna Mini-M System

The International Mobile Satellite Organization (INMARSAT) has been providing highly reliable communication services worldwide for over two decades. Its Large Antenna Mini-M system is suitable for providing communications in rural and remote areas. To demonstrate the technical and commercial viability of this service in the provisioning of Village Public telephones (VPT) in rural and remote areas, the Department of Telecommunications, Videsh Sanchar Nigam Limited and the Inmarsat jointly conducted a pilot project, under a memorandum of understanding signed in April, 1997. Under the pilot project, 13 VPTs were installed in a wide geographic variety of village sites throughout India, including hilly areas of Jammu and Kashmir, the deserts of Rajasthan, remote villages in Uttar Pradesh, and in coastal areas of Maharashtra and Andhra Pradesh.

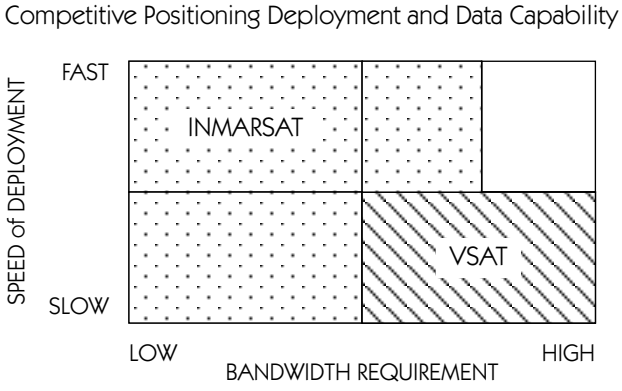


Figure 14.3 Competitive Positioning Deployment and Data Capability

The choice of technology, between Large Antenna Mini M-System (LAMM) and Very Small Aperture Terminal (VSAT), was based on the expected traffic volume. The INMARSAT LAMM system is the ideal choice where the volume is expected to be less than 20 minutes per day.

While the INMARSAT LAMM is positioned for slow and fast speed of deployment and low and medium bandwidth requirement, VSATs are normally suitable for slow speed-high bandwidth requirements.

There are considerable differences in equipment and installation costs for INMARSAT LAMM, VSAT TDMA (Time Division Multiple Access) and VSAT SCPC (Satellite Personal Communication System). The equipment and installation cost of the INMARSAT LAMM is noticeably the lowest and that of VSAT SCPC is the highest.

In terms of functionality, satellite based communication systems with handheld terminals, popularly known as the "Global Mobile Personal Communications System," is best suited for voice communication. INMARSAT LAMM system is the best choice for both voice and low speed data transfer. And VSAT based system is best for large scale data transfer.

The VPT consists of an INMARSAT Mini-M terminal, a large dish antenna for high gain (-7dBk), 50 X 50 X 1 cm, a VPT monitor with a printer and an optional solar power supply.

The pilot project successfully established the technical feasibility and cost effectiveness in the provisioning of village Public Call Office (PCOs) in remote, hilly and geographically difficult areas. The sites selected for the pilot project were a fair representation of varying environmental and physical conditions such as high altitude, deserts and coastal areas that reflect the rural hinterland of India.

Implementation Results

The setup was found to be technically suitable for providing telecom access in rural, remote and hilly areas using Large Antenna Mini-M (LAMM) terminals. The terminals were set up in a few hours and franchisees (unskilled) were able to operate the system after a brief training of a few hours. The system has been fully integrated with the Indian telecom network, including the Department of Telecommunications' tariffs that are based on the distance and duration of the call. Users of these satellite phones are thus charged on the same basis as the terrestrial based subscribers. The whole set up is transparent as far as users are concerned. The system has minimum power and maintenance requirements, and exhibits high availability (over 98 percent). Simple operation and maintenance provide a high degree of system reliability. While the pilots were up and running, the solar, UPS, and VPT call monitoring devices were all successfully integrated.

Commercially, the pilot project demonstrated satisfactory average daily utilization, a high degree of customer satisfaction, and frequent use of the facility.

Distribution of Calls

Analysis of calls from the pilot project supplemented by studies conducted by independent institutions suggested that 40 percent of the total calls made were for personal reasons; 30 percent were official, 20 percent were business and 10 percent were miscellaneous.

Benefits of Telephone Facilities

To users: The benefits of the use of telephone facilities can broadly be categorized as personal and commercial. On the personal front, the phones enabled villagers to keep in touch with their relatives and friends. Commercially, villagers used the telephone facilities to obtain information on the prices of their agricultural inputs and for marketing their products. This enabled them to reduce the cost of their inputs and increase the value of their produce by comparing the prices in nearby *mandis* (markets). Farmers covered by VPTs now are not only aware of the price of inputs but also about the latest innovations of technology such as high yielding varieties, optimum use of insecticides, pesticides and fertilizers, which have enabled them to get better yield. In becoming commercially more vigilant, villagers have reduced their dependence on exploitative middlemen. A socioeconomic "bonus" has been to create job opportunities in the rural areas related to using the VPTs.

To the government: As for government, the telephone facilities can be seen to have both, tangible and intangible benefits, including reduction of human migration from rural to urban areas and the public's traveling time and costs. Government may consider providing healthcare and education through tele-medicine and tele-education facilities, and using the system to improve law and order. The VPTs have proven to be of immense help in disaster relief and rescue operations, as well as in typical situations such as religious processions and elections.

Financing PCOs

PCOs could be financed through budgetary allocation by government out of the license fee from the Basic and Cellular Services, by financial institutions such as the Asian Development Bank and the World Bank Group or through part financing by government and telecom operators. The operating costs could be covered by collection from users of domestic calls (which have been made affordable) and international calls (for which premium service is to be charged at higher rates to partly cross-subsidize domestic calls). Cross subsidization could also be done by telecom operators from other services. Government could also directly subsidize the operating costs over a limited period of time.

Conclusion

Inmarsat Large Antenna Mini-M service is a low cost, easily maintainable, quickly implementable solution for providing highly reliable satellite based communication in rural and remote areas. This technology is being increasingly used or planned to be used in many developed and developing countries. Countries that have used or are planning to use this technology include Australia, Nigeria, Morocco, Sudan, Brazil, China and India. This technology provides a very cost-effective solution for meeting the objective of universal service obligation in rural and remote areas. To keep tariffs low, however and to keep the services commercially viable, the system needs some help and support in the initial years from respective governments, telecom operators and financial institutions.

CHAPTER 15
Multipurpose Electronics and Computer Centers: Promoting IT-Centered Maintenance and Employment in Rural Areas

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Since 1995, the All India Society for Electronics and Computer Technology has been implementing an All India Coordinated Programme to set up multipurpose electronics and computer centers in rural and tribal areas of the country. The program, jointly funded by the Department of Electronics and the Department of Science and Technology, is being implemented in ten states. Today over 600 training, servicing and production centers have been set up under this program, and a large variety of training and servicing modules have been prepared in the vernacular languages. Entrepreneurship in the field of electronics and information technology has also been nurtured. Interesting new possibilities related to Village Information Centers, Village Communication Centers, agricultural electronics applications, Geographical Information Systems and medical electronics maintenance have come up. A national organizational structure is now in place. Ten regional centers have been set up with the support of the Department of Electronics in collaboration with the National Centre, which is being run by the All India Society for Electronics and Computer Technology. This paper reviews the impact of the All India Coordinated Programme, draws some conclusions regarding implementing the rural centers and finally suggests future directions for the centers.

Key Ideas

The focus has to be rural: The major thrust of the developmental programs has to be on the rural areas since that is where more than three-fourths of the Indian population resides. Of the 50 major cities, 500 districts, 5000 blocks, 3000 watersheds, 100,000 *panchayats* and 700,000 villages in India, the focus of the

All India Coordinated Programme (AICP) focus is at the block, watershed and *panchayat* levels.

The rural centers have to be multipurpose: The rural intervention in electronics and information technology has to be multipurpose in order to yield optimum results. As far as possible it should undertake training and servicing of technologies such as computers (hardware and software), consumer electronics, electrical items, telecommunications and other support services like institutional and programmatic linkages.

Table 15.1 Application Areas for Multipurpose Centers

Computers	Hardware: maintenance, installation, support
Computers	Software: development, installation, maintenance, support, marketing
Consumer electronics	Audio, video, household appliances, servicing, marketing support
Communications	Telephone instruments, STD-PCO, battery chargers, exchanges, MARR equipment servicing, installation, maintenance
Electrical items	Power supply items, pumps and motors, household appliances, electrical wing
Support services	Software development, training, institutional and programmatic linkages

While establishing a center the following should be kept in mind.

Start with training: Starting with training has several advantages. It creates awareness about the center and also about the technology, and makes the center self-sustaining from the very beginning.

Multipurpose: A single activity like production may neither render a rural center economically viable nor put the technology to optimum use. Therefore the centers have to be multipurpose. "Training-cum-Servicing" coupled with "Production" can produce optimum results.

Effective linkages: The center has to link up with rural institutions, such as educational institutions, banks, development departments, *panchayats*[1] and health centers.

Innovative: The center should be innovative in its choices of courses, training methodology and marketing peculiar to the circumstances of the area.

Sustainable: The center should be sustainable within a short (2-3 years) time period.

Language: As far as possible all the training material has to be in the regional language.

1. *Panchayat* is the elected body of five senior members of the village, responsible for the effective functioning of the village

Methodology for Setting Up a Multipurpose Electronics and Information Technology Center

Setting up a center requires initial financial support and linkages with other institutions.

Cost, on an average, of setting up a center has been around $4,760 (Rs 2 lacs), which includes a computer laboratory, an electronics and electrical laboratory, software, and furniture. Recurring costs the first year are around $3100 (Rs 1.33 lacs). This includes manpower, rent, and consumable items.

Steps to Set Up a Center

This begins with a preliminary survey, data analysis and selection of a nodal point, and then proceeds to procuring and installing equipment. Household and market surveys are conducted typically in parallel with setting up the servicing and production functions of the center. Centers then diversify into other areas and institutional activities. They become viable in their second year of operation.

Interlinkages with Institutions

Various organizations/departments are now linked to the centers providing support services. These include, to name a few, the state Electronics Development Corporations, the National Open School, the Indira Gandhi National Open University, NABARD, Departments of Rural Development, and voluntary organizations like the Society for Rural Industrialization, the Center for Quantitative Research, and the Institute of Vocational Training.

Experience in Block-Level Centers

The AICP was funded by the Department of Electronics and the Department of Science and Technology. The program was designed to set up ten block level multipurpose centers as nodal points in ten states. In addition, a large number of 'entrepreneurial' centers were to be set up on a self-financing basis. Supporting course-ware and training material were produced for the centers, and 10 percent of the total funds were provided by government.

Of the 633 centers established under the AICP, over 420 are in rural areas. The largest number of centers are in Madhya Pradesh (495) followed by Maharashtra (44), Uttar Pradesh (36), Rajasthan (20), Bihar (11), Orissa (9), Gujarat (9), Andhra Pradesh (3), Tamil Nadu/Pondicherry (4), and Kerala and Delhi (one each). Each center provides direct employment to 4 to 5 persons (as trainers and technicians) and indirect employment to another 2 to 3 persons.

For this, the center has to invest about $3,570 to $4,760 (Rs 1.5 to Rs 2.05 lacs). The centers generate employment for over 2,000 persons. The annual turnover per center on the average is about $2,380 (Rs 1.02 lacs). The total network turnover is around $1,428,571 (Rs 614 lacs).

To enable the centers to be multipurpose, most of the technical material for training, servicing and production has been developed in local languages. The training modules include training material on computers and electronics in Hindi as well as in the regional languages. Service manuals in Hindi include literature on servicing audio-video and telecommunications equipment. Production "profiles" include the production of audio-video equipment, electronic hobby kits and project plans to set up small scale electronic and electrical production units.

Various activities are conducted at the centers including training, services, and production. Training includes audio-video repair, electric/electronic repair and use of computer applications. Certificates and diplomas are offered in electronics and computer applications. Training (the use of computers) is provided to bank employees, members of *panchayats* and other elected bodies, women involved in specified programs and schools in. About 60 percent of the students are based in rural areas, of which, 3,490 are males and 1,425 are females.

The production unit of a center includes the production of power supply items, entertainment electronic items, Desk Top Publishing and screen printing, and word and data processing. Services offered are in software development, hardware maintenance, communication centers, information technology (IT) applications, artisan development and consultancy.

In addition to employment opportunities, the centers have shown to be beneficial in other ways as well. For instance:

- Over 20,000 school children are being trained under the computer literacy program.
- A *panchayat* planning information system for 20 *panchayats* of one watershed is under development.
- Maintenance centers have been set up to provide telecommunications services.
- Core groups on agriculture and medical electronics have been formed.
- Various new roles, such as becoming employment bureaus and community libraries are emerging to enhance the effectiveness of rural centers.
- Centers act as retail outlets for electronic consumables.

Conclusions

The following conclusions are offered resulting from implementing these centers:

- A multipurpose approach with regard to block/sub-block level electrical-electronics-computer centers turned out to be an important and appropriate concept. Besides training, the centers have to take up servicing and production activities. Within the training segment too, there is a demand in areas other than electrical-electronics and computer fields.
- It is difficult to organize production in rural centers without a continuous support system.
- There is demand for designing short term courses directly related to various vocations. An example is training programs for the repair and maintenance of the STD/PCO telecommunications equipment.
- There is a demand for certifying existing skills.
- Production work can be facilitated by preparing production profiles, production and testing documents, and providing sourcing for small entrepreneurs.
- Instructions in Hindi or the regional language play a vital role in teaching technical subjects.
- The training package on electronics entrepreneurship was helpful in orienting prospective entrepreneurs and in setting up new multipurpose centers.
- Networking of the centers is required to share information and resources.
- Greater participation of women in the centers should be encouraged.
- Some centers have found new roles for themselves as Village Information Centers.
- Maintenance of specialized computer and communications items require strengthening support systems and a higher training input.

Linkages with Other Voluntary Groups, Government and Public Bodies

The All India Society for Electronics and Computer Technology (AISECT) has linked the centers with voluntary groups, government departments of science and technology, electronics, telecommunications, non-conventional energy sources, state electronics corporations, industries, education, *panchayat*, women and child, and health, as well as with agro-industries, banks, schools and colleges.

Rural Electronics Entrepreneurship Development Programme

The AISECT has been conducting an Electronics Entrepreneurship Development Programme to motivate and mobilize rural youth to set up their own training

and service centers. It also guides youth in methods and means to obtain financial support from various institutions.

Spread over ten days, the program includes sessions on the world and the Indian scenario of electronics and information technology, entrepreneurship, identification of local needs, market surveys, procedures involved in obtaining assistance, management, accounts, roles of a center, establishing a center, and linking it with various organizations.

Future Directions

The multipurpose electronics and IT centers described here provide a possible model for replication in all 5,000 blocks of the country. It is more useful at the block and sub-block level where IT is not widely diffused. The center's financial viability and utility have been shown in over 600 centers. Further expansion would require institutional support and strengthening of the national as well as regional centers. The AISECT is developing a model for IT based *Panchayat* Resource Centers, which can act as a basis for knowledge based planning and management in rural areas. Plans are underway to double the number of centers, many of which will become Internet Service Providers.