AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY
BATCH 61

1. SUBJECT CLASSIFICATION
A. PRIMARY: TEMPORARY
B. SECONDARY:

2. TITLE AND SUBTITLE
A case study of India's Satellite Instructional Television Project (SITE)

3. AUTHOR(S)
Block,Clifford; Foote,Dennis; Mayo,J.K.

4. DOCUMENT DATE
1977

5. NUMBER OF PAGES
~~73p.~~ 75p

6. ARC NUMBER
ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
AED

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*

9. ABSTRACT
(EDUCATION R&D)
(COMMUNICATION R&D)

10. CONTROL NUMBER
PN-AAD-648

11. PRICE OF DOCUMENT

12. DESCRIPTORS

13. PROJECT NUMBER

14. CONTRACT NUMBER
AID/ta-BOA-1060 GTS

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

Not for Distribution

PN-AAD-648

(AED)

A CASE STUDY OF INDIA'S SATELLITE INSTRUCTIONAL TELEVISION PROJECT (SITE)

Dr. Clifford Block, Dr. Dennis Foote and Dr. John Mayo

January 1977

Dr. Foote and Dr. Mayo participated in this study under contract with the Academy for Educational Development and the Office of Education and Human Resources, Bureau for Technical Assistance, Agency for International Development.

TABLE OF CONTENTS

Page

PREFACE

DESCRIPTION OF THE PROJECT 1

INTRODUCTION 1

PROJECT GOALS 1

PARTICIPATING INSTITUTIONS 2

PLANNING 2

OVERVIEW OF MAJOR PROGRAMS 3

HARDWARE 4
The ATS-6 Satellite 4
Indian Earth Stations 5
Community Reception Stations 5

SOFTWARE PRODUCTION 6

EVALUATION AND RESEARCH 7
Formative Evaluation 7
Summative Evaluation 8

LOGISTICS 9
Village Selection and Equipment Deployment 9
Maintenance 9
Utilization Support 10

THE KHEDA LABORATORY 10
Kheda's Objectives 10
Description 11

FOLLOW-ON ACTIVITIES 11

COSTS 12
Total Costs 12
Hardware Component Costs 13
Other Cost Data 13
Interpreting SITE Costs 13

OBSERVATIONS 15

OVERVIEW 15

TECHNICAL FEASIBILITY 16
Quality and Reliability of the Reception 16
Maintenance 17
Summary Observations: Technical Feasibility 18

Page

PROJECT MANAGEMENT AND OPERATIONS. 19
Innovative Management Techniques. 19
Primacy of Social Objectives. 21
Involvement of State and Local Governments. 21
Public Placement of the Television Set. 22
Effective Use of Indigenous and Outside Expertise. . 22
Summary: Project Management. 23

THE PRE-EXISTING CONTEXT. 24
Trained Manpower Pools. 24
Strong Existing Institutions. 24
Summary: Advantages of the Indian Context. 24

THE PROJECT ENVIRONMENT. 25
Sustained Political Commitment. 25
Salience of the Project. 25
The Technological Timetable. 25
Adequate Funding. 25
Clear Institutional Responsibilities. 26
Lack of Precedents. 26
Autonomy of ISRO. 26
Summary: The Project Environment. 27

PROGRAMMING: DESCRIPTION AND RESULTS. 29
Community Broadcasts. 29
Effects of the Programming. 29
Audience Size and Composition; Village-to-Village
Variation. 30
In-School Programs. 32
Teacher Training Program. 33
The Kheda Programming. 35

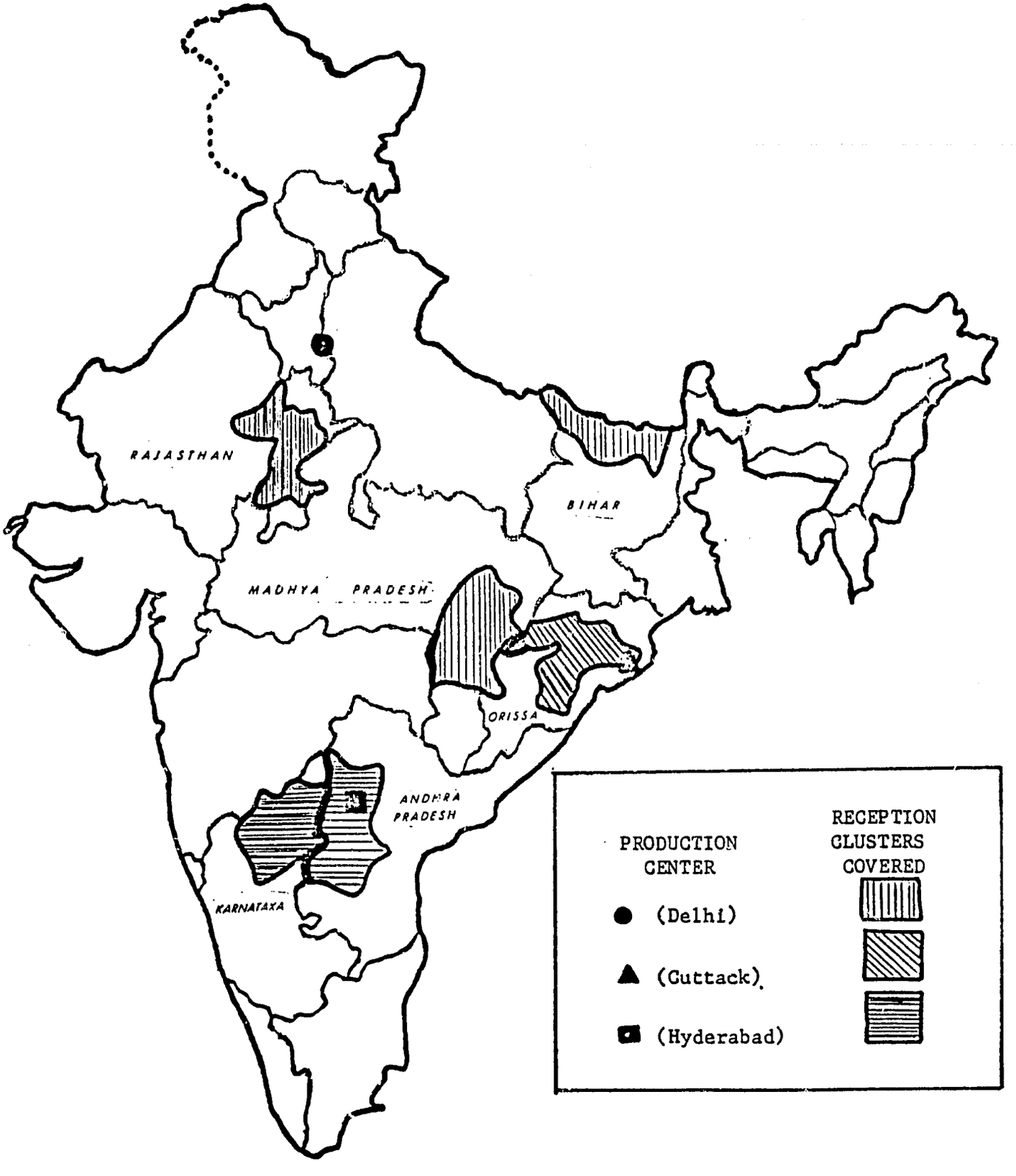
PROGRAMMING POLICY AND DECISIONS. 38
Refining Program Goals and Strategies. 38
Precise Definition of the Audience. 38
Goal Definition. 39
Programming Decisions. 39
Attracting an Audience. 39
Content Mix: Entertainment vs. Instruction. 40
Decisions on Specific Program Content. 40
Viewer Reaction to Types of Programs. 42
Summary: Programming Policy and Decisions. 45

ACCOMODATING LOCAL DIFFERENCES. 46

RESEARCH ISSUES. 51
Research Policy. 51
Research for Program Production. 53
Research Methodology and Procedure. 56

	Page
INDIRECT EFFECTS OF THE SITE EXPERIENCE.	60
Development of the Electronics Industry.	60
A New Rural Focus for National Television.	60
An Experienced Manpower Pool.	60
Knowledge of Rural Programming Techniques.	61
Confidence in Indian Capacity.	61
OPEN QUESTIONS.	63
SATELLITE VERSUS TERRESTRIAL BROADCAST.	63
TELEVISION VERSUS OTHER MEDIA.	64
OPEN BROADCAST VERSUS ORGANIZED VIEWING GROUPS.	65
COMMUNITY RECEPTION VERSUS PRIVATE RECEPTION.	66

SITE PRODUCTION CENTERS AND RECEPTION CLUSTERS



PREFACE

This paper summarizes observations made of the SITE project in July and August 1976 during its last weeks of operation and just after its cessation. The purpose of this visit was to take a serious and objective look at this extraordinary project, in terms of lessons useful for planning and policymaking in similar endeavors around the world. It was in no sense an evaluation, but rather was an opportunity to make observations, by a team whose members have observed, planned or evaluated many other major educational technology projects in the developing world and the U.S., including the U.S. experiments with ATS-6.

The team had long and forthright discussions with many of the leaders and participants in SITE, and is very grateful to the Government of India for that privilege. Discussions were held with dozens of professionals throughout India, with much time spent at the Indian Space Research Organization (ISRO), in Ahmedabad. Observations were made of two of the three main program production centers for SITE, those in Delhi and Hyderabad, together with the specialized ISRO-run production centers in Bombay and Ahmedabad. Community broadcasts and teacher training programs were observed in six villages, in several different areas of India; one member earlier had made observations in another region. The educational programs and their evaluation were reviewed with the National Center for Educational Research and Training (NCERT).

Our appreciation goes out to all those, and they were many, who gave of their time, their insights, and their experiences. Our special appreciation goes to those senior officials who made this observational visit a particularly rich experience, namely: Professor E.V. Chitnis, ISRO, Director of SITE; Professor Yash Pal, Director of the Space Applications Center; and Dr. P.V. Krishnamoorthy, Director of Doordarshan, the national Indian television service.

The members of the team: Dr. Clifford Block,
U.S. Agency for International Development, Washington
(Until September 1976, also Visiting Scholar, Stanford University)

Dr. Dennis Foote,
Institute for Communication Research
Stanford University

Dr. John Mayo,
Institute for Communication Research
Stanford University

DESCRIPTION OF THE PROJECT

INTRODUCTION

On the 18th of September 1969, the United States National Aeronautics and Space Administration (NASA) signed a Memorandum of Understanding with the Department of Atomic Energy of the Government of India. That event marked the beginning of a foresighted experiment in the use of community broadcast satellite technology for national development. The experiment was called the Satellite Instructional Television Experiment (SITE). It used NASA's Applications Technology Satellite - Six (ATS-6) to broadcast development-related programs which were received for one year (1975-76) on special inexpensive community TV receivers located in about 2400 rural villages in six of India's poorer states: Andhra Pradesh, Bihar, Karnataka, Madhya Pradesh, Orissa, and Rajasthan.

We will begin this report with a description of the main features of the experiment -- including its goals, implementing institutions, hardware, main programs, evaluation activities, and logistics. We will then go on to a lengthier section of observations about the projects, including further details on some of its more important aspects and our own comments.

PROJECT GOALS

India's goals for the SITE project were spelled out in the Memorandum of Agreement. The general objectives were to:

- Gain experience in the development, testing and management of a satellite-based instructional television system, particularly in rural areas, and to determine optimal system parameters.

- Demonstrate the potential value of satellite technology in the rapid development of effective mass communications in developing countries.

- Demonstrate the potential value of satellite broadcast TV in the practical instruction of village inhabitants.

- Stimulate national development in India, with important managerial, economic, technological and social implications.

India also had specfic instructional and technical objectives. The instructional objectives included contributing to family planning efforts, national integration, general school and adult education, teacher training, and improving agricultural practices, health and hygiene, and other occupational skills. The technical objectives were to:

-Provide a system test of broadcast satellite TV for national development.

-Enhance capability in the design, manufacture, deployment, installation, operation, movement and maintenance of village TV receivers.

-Gain experience in the design, manufacture, installation, operation, and maintenance of broadcast and/or distribution facilities to the extent that these were used in the experiment.

-Gain an opportunity to determine optimum receiver density, distribution, and scheduling; techniques of audience attraction and organization; and to solve problems involved in developing, preparing, presenting and transmitting TV program material.

PARTICIPATING INSTITUTIONS

The major participants in the SITE experiment have been: the Indian Space Research Organization (ISRO), formerly part of the Department of Atomic Energy and now part of the newly created Department of Space; Doordarshan, the new agency in charge of television in India, formerly part of All India Radio (AIR); the National Council for Educational Research and Training (NCERT); and the United States National Aeronautics and Space Administration (NASA). India was entirely responsible for the ground equipment and for the preparation and transmission of the television programs. The U.S. responsibility was limited explicitly to putting the satellite into position and making it available to India for a one-year experiment.

PLANNING

The SITE project was based on years of deliberation and planning, much of it predating the Memorandum of Agreement that formally brought the project into existence. As early as the summer of 1967, a team of Indians came to NASA to investigate possible ways of providing television to all of India. An experiment in using terrestrial television to disseminate agriculturial information to eighty villages outside of Delhi was begun in January of 1967. The experiment, called Krishi Darshan, was done to learn about teaching through television and or-

ganizing a rural television system. On the U.S. side, a 1966 White House Interagency Task Force recommended that NASA utilize its planned experimental communications satellite program not only for technical experiments, but also to make possible pilot projects in development applications in countries such as India. In 1968, an AID-funded study in India delineated the possible applications, characteristics, and costs of a satellite television system for India and compared that, favorably, to a terrestrial system.

A National Satellite Communications Committee (NASCOM) was established in India in 1968, and recommended the SITE project to the Cabinet in February of 1969. In 1969 and 1970, ISRO conducted three planning studies in cooperation with Hughes, General Electric, and Massachusetts Institute of Technology's Lincoln Labs. Specific planning for the SITE project intensified with the establishment of a SITE Management Office in the Space Applications Center (SAC) of the Indian Space Research Organization in 19 . Selection of SITE villages was begun in November 1973. The ATS-6 satellite was launched by NASA in May 1974, and, after a series of U.S. health and education experiments, was loaned to India for the SITE experiment from August 1, 1975 to July 31, 1976.

OVERVIEW OF MAJOR PROGRAMS

SITE broadcasting regularly reached 2,332 villages. Their size varied from 600 to 3,000, with an average of 1,200 inhabitants. Thus, about 2.8 million people had daily access to SITE programming.

There were several distinct programs in the SITE experiment. The largest consisted of development programs aimed at a general adult audience in the evenings. The television receivers were located in public buildings, schools, or panchayats (local government offices) and were usually placed out-of-doors, requiring the audience to sit on the ground in front of the set. The audiences almost invariably included men, women, and children from a variety of caste, religious, and socio-economic groupings. The evening broadcast lasted a total of 2 1/2 hours and consisted of a daily 1/2 hour national news program in Hindi and twenty minutes to an hour in each of several local languages, as well as Hindi -- Oriya, Telegu and Kannada.

The second largest program was directed at an in-school audience of children aged 5 to 12. They received a variety of programs intended to enrich their knowledge, rather than teach the basic curriculum. These programs included a heavy emphasis on science education. They were broadcast each school day for 22 and one-half minutes in each of the four languages. Teachers were supplied in advance with "teacher guidance notes" containing synopses of the programs and activity suggestions, and with wall posters summarizing important points made in the programs.

The third major program was carried out during school vacations when teacher training programs were broadcast during the in-school program time-block. They conveyed a new approach to science education, and they differed from the other SITE programs in that they were part of a larger multi-media course that also involved instruction by radio, print materials, and trained monitors assigned to each village.

In addition to these major programs, there were a number of ancillary activities and "experiments-within-the-experiment". During one vacation period, the television was used for a special training program of agricultural extension agents. An experimental "laboratory" for testing programming concepts was established in the Kheda district near the ISRO headquarters in Ahmedabad. It used a conventional terrestrial transmitter covering a few hundred villages to broadcast one-half hour of national news and one-half hour of experimental programming daily. Supplementary "utilization" activities designed to enhance behavior changes advocated by the SITE programs were established in a small number of test villages. A very large program of research was also carried out.

HARDWARE

The ATS-6 Satellite

NASA's Applications Technology Satellite program is a series of experimental satellites designed to carry out technological, meteorological, scientific, and communications research. ATS-6 is the sixth in the series and represents a significant advance in technological capability. It provides a strong signal, focused into a relatively tight beam that could easily and accurately be pointed at different reception areas on the earth's surface. It is the strength of the signal that is most significant, for this makes it possible to receive TV signals from the satellite on relatively uncomplicated and inexpensive equipment. This in turn makes feasible the creation of large reception systems that can be used for broadcasting directly into rural areas, rather than depending on retransmission from urban centers. ATS-6 thus represents the kind of satellite system appropriate for communications within many developing countries, where most of the population lives dispersed in rural areas, rather than in large population centers.

For the SITE broadcasts, the satellite received the signals from earth at 6 GigaHertz and sent them back down at 860 MegaHertz. The satellite transponder (which received and retransmitted the signals) handled one video picture and two soundtracks simultaneously.

Indian Earth Stations

The main earth station for transmitting programs to the satellite was located at SITE headquarters at the Space Applications Center in Ahmedabad. This 15-meter parabolic antenna transmitted all but one-half hour of the four hours of daily broadcasts. A second, 10-meter earth station was located in Delhi. It was used to transmit the one-half hour daily national news segment of the SITE programming and to broadcast special programs for such events as Republic Day, Independence Day, and addresses from the Prime Minister and President. It also served as a backup in case of hardware failure at Ahmedabad. A third, "monopulse beacon" station at Nagpur, near the center of India, was built to keep the satellite accurately pointed if its internal pointing systems failed. These stations were all designed and built in India, using a minimum of imported parts. Their performance levels have been excellent and their reliability has been 99%.

Community Reception Stations

The community reception stations consisted of three basic elements -- an antenna to receive the signals from the satellite; a front end electronic converter to transform the signals into a form compatible with a normal television receiver; and a slightly modified television receiver. The antennas were three meter (ten feet) diameter parabolas made out of expanded metal mesh.

The front end converter was divided into a "head end" and a "tail end". The head end was mounted out-of-doors on the antenna, and converted and amplified the signal before sending it in to the television set. The tail end was mounted inside the television set, and changed the signal received from the head end into one that could be used by the television set.

The television monitor itself was basically a commercial model, slightly modified for community viewing and rural use. Seven hundred of the 2400 sets were "ruggedized" by using higher quality components, as part of an "experiment-within-an-experiment" to investigate the tradeoffs between initial cost and maintenance cost.

In the state of Orissa, an additional experiment using battery powered sets was conducted. The sets ran on 24 volt direct current supplied by two car batteries that were replaced for recharging on a regular basis by the maintenance crew.

The overall reliability of the community reception stations was quite high. After an initial break-in period that was complicated by severe flooding in many of the SITE areas, reliability of village sets was a little over 90% at any given time. About half of all breakdowns were caused by the television set, and approximately a quarter each by the front end converter and by the antenna.

SOFTWARE PRODUCTION

An enormous amount of programming had to be produced for SITE, as the satellite was available to India for approximately 1400 hours of transmission. Responsibility for making programs was decentralized into several locations. Doordarshan made the great majority of the programs in special base production centers in Cuttack, Hyderabad and Delhi. Each of these centers was responsible for the programming for specific area and language groups. All but the national program center were established specifically for the SITE experiment.

DOORDARSHAN PRODUCTION SITES, COMMUNITY PROGRAMMING

PRODUCTION SITE	LANGUAGE	USER STATES
Cuttack	Oriya	Orissa
Hyderabad	Telegu	Andhra Pradesh
	Kannada	Karnataka
Delhi	Hindi	Rajasthan
		Madhya Pradesh
		Bihar
Delhi	Hindi	All states, half-hour national program

An ISRO studio in Bombay produced a series of science education programs for in-school broadcasts to children in collaboration with NCERT. All of the experimental programs for broadcast to the Kheda area were produced at the ISRO studio at SITE headquarters in Ahmedabad. The films used for teacher training were produced by NCERT.

The SITE studios were equipped with one-inch videotape equipment rather than the usual broadcast standard two-inch machines. The use of 1" equipment resulted in a very substantial savings in equipment costs and did not result in any discernable degradation of the picture quality. Producers at the ISRO studio in Ahmedabad were able to make fairly extensive use of portable one-half inch videotape equipment for field shooting. The convenience, speed, and cost savings that this technology offered made it possible for them to do a considerable portion of their production on location.

Most of the studio facilities available to SITE were small, underequipped and understaffed. This fact, coupled with the time pressure for production, created a continuing pressure toward easy-to-produce "entertainment" programming, even when audience feedback indicated a preference for the so-called "hard core" instructional programs.

In spite of this very large program load, Doordarshan met the requirement of providing a continuing flow of new programming, on time, in four languages.

This amount of new programming exceeds that produced by each U.S. commercial television network for its evening schedule, and a U.S. network can rely on diverse program production sources and a reservoir of experience built up over several decades. Thus, meeting the demanding production schedule can be considered a major achievement by Doordarshan.

-The intended process for program production was:

*the provision of an audience profile for the producer;

*the generation of objectives for the programs in cooperation with the various ministries involved with development;

*the pretesting of some of the programs prior to broadcast; and,

*the provision of feedback about audience comprehension of and response to the programs to the producers to guide their future efforts.

While these intents were fulfilled to some extent, the sheer volume of the required production and the often adverse circumstances under which the crews had to work sharply limited the degree to which the process was followed.

EVALUATION AND RESEARCH

A very significant characteristic of the SITE project was the extent to which it involved researchers in guiding its course and studying the effects of its actions. The research staff was multi-disciplinary and totaled over 100 people. The research can be divided roughly into formative evaluation (research intended to guide decisions that must be made during the life of the project) and summative evaluation (research that assesses the effects of the experiment and that could guide the planning of future activities).

Formative Evaluation

The researchers classified their formative research into context evaluation, input evaluation, and process evaluation. In the category

of context evaluation were:

*data gathering and analysis for village selection;

*preparation of audience profiles to provide television producers with accurate information about the characteristics, culture, and habits of the target audience, and;

*preparation of needs assessment studies to identify observed and felt needs to guide the selection of topics for television programs.

Input evaluation consisted of pretesting pilot programs to gain insights that would guide program design and format decisions.

Process evaluation included a very large scale feedback system and micro-studies conducted on specific programs. The feedback system monitored the composition of the audience, their reaction to different aspects of the programs, and the nature of the viewing conditions. Feedback data were provided to producers to inform them of the impact their programs were having.

Summative Evaluation

The summative evaluation studies included two major sample surveys of program impact, a series of "holistic" anthropological studies, a program inventory and content analysis, and a number of in-depth studies on particular issues. The two major sample surveys examined the impact of the programs directed at adults and at children. They used interviews before, during, and after SITE to measure the extent of change in knowledge, attitudes, values, and behaviors as a result of SITE, and to relate them to variables that mediate the impact of the programming.

To perform the "holistic" anthropological studies, nine anthropologists were stationed in villages beginning six months before SITE and remaining there for three months after the experiment. As participant observers, they gathered data on the cultural and communication patterns in the village and on how they were influenced by the introduction of SITE television.

The program inventory and content analysis classified a 25% sample of the Hindi programs on the basis of topic and treatment to enable formulation of a program index that could be correlated with program effects. Content analysis was conducted on the programs to measure cultural authenticity, dominant themes, plots, and character-types, and the utilization of formative research guidelines in the production of the programs.

Smaller, in-depth studies were conducted on a variety of topics. One looked at the effects on the leadership role of the village elite. Another investigated adoption of television-promoted innovations as a function of economic and social class. A study was made of the impact of the SITE family planning programs. Possible alienation resulting from exposure to the television programs was also examined.

Because most of the summative research involved post-SITE data collection, few results are presently available. The findings should begin to be published during 1977.

LOGISTICS

Village Selection and Equipment Deployment

Selecting villages for participation and deploying the community reception equipment was a huge task. The available information about the population, electrification, and even location of village was found to be insufficient and often inaccurate. In order to select the 2400 SITE villages, nearly 10,000 villages had to be visited by teams composed of one hardware and one research person. About 80% of the buildings where the television was to be installed did not have electricity, even though all villages chosen were electrified; electrifying the building and delivering, installing, and testing the community reception station required at least two more trips to all the participating villages.

Maintenance

The organizational structure to handle maintenance was developed during the selection and deployment period. In each state, four locations, one headquarters and three substations, were designated as maintenance stations. Clusters of 100 villages were chosen in the vicinity of each maintenance station. Each station was staffed by a television technician and a driver, and equipped with a jeep, spare television sets, replacement parts, test equipment and telephone and telex lines to SITE headquarters in Ahmedabad. The headquarters also included the offices of the "engineer-in-charge" and the social research staff for the state, as well as facilities for more complex troubleshooting and repair work.

The maintenance system was planned on the expectation that there would be, on the average, about two failures per day per 100 sets. This level was exceeded during the early phase of the experiment, but proved accurate once conditions had stabilized.

Utilization Support

Normally, SITE programs were watched on a community receiver, but there was no follow-up on the information presented, no listening or discussion groups, and no attempt to coordinate the programming with other activities of the development ministries. A small experiment on "utilization" was carried out in five villages in each state, however. In the "utilization villages," four programs were selected each month for intensive utilization efforts. Printed materials were provided for reinforcement of the message and for additional information, and discussions and demonstrations were organized with local experts. Attempts were made to make available necessary inputs such as credit or fertilizer. An evaluation of the effects of the utilization activities is planned.

THE KHEDA LABORATORY

Most of the program production from SITE was undertaken by Doordarshan. However, ISRO established a separate studio and broadcast system in the state of Gujarat. The studio was located on the campus of the Space Applications Center in Ahmedabad, and the broadcast system used a terrestrial transmitter located in the village of Pij to cover part of the Kheda district of Gujarat.

Kheda's Objectives

ISRO had several objectives in setting up a separate "laboratory", as it came to be called. They perceived that the existence of a direct reception satellite system made it possible to broadcast the same program to the entire nation, but that there were many instances when it would be appropriate to broadcast programs of only local interest or applicability. They were concerned that the satellite portion of the SITE experiment would not provide any information about the ways in which local and national programming might best be combined. They also wished to gain experience in the use of a limited rebroadcast system that used both terrestrial broadcast and satellite reception, because that might serve as a model for later Indian television systems.

The project was also established as an opportunity to experiment in innovative ways of designing and producing programs, especially including the use of multi-disciplinary teams and the extensive use of research and pretesting in program development and production.

The objectives of the Kheda programs were to accomplish social change, to encourage two-way communication both horizontally (between villages and members of different castes) and vertically (between decision-makers and the masses), to broaden the horizons of the viewers of the programs, and to provide them with useful information.

Description

The Kheda district is a primarily agricultural area to the south of the SITE project headquarters in Ahmedabad. It is wealthier and more progressive than many, if not most, other rural areas in India, and is the home of a large and successful dairy cooperative called AMUL. There are 690 villages in the district, about 400 of which are electrified. 307 villages were equipped with television sets for reception of the Kheda transmissions, which were broadcast from a terrestrial transmitter in the village of Pij in the district.

Television sets were often located in the AMUL Dairy Cooperative building. Funding for the sets came from the AMUL Dairy, the state government, and from contributions from the villages. There was often more than one set in a village, either privately owned or placed in the panchayat. Practically every electrified village in the range of the transmitter had a set.

The program consisted of one-half hour of "national programming" transmitted from the Delhi Earth Station via the satellite to all the SITE receivers, including the Ahmedabad studio, which then relayed it by cable and microwave to the transmitter at Pij for rebroadcast, plus one-half hour of programming prepared especially for the Kheda district's needs. The local programming contained a variety of formats. About 20% was "hardcore" instruction in such areas as agricultural practices or cottage industries, 30% was children's programming, 25% were "soft-core" programs such as drama with social change objectives, etc., and the remaining 25% consisted of news, song and dance, and miscellaneous programs. The half-hour of national programming was in Hindi; the rest was in Gujarati.

The laboratory at Kheda will continue to function for several years after the completion of SITE.

FOLLOW-ON ACTIVITIES

The ATS-6 started its planned move back to the Western Hemisphere on August 1, 1976. With satellite service terminated, SITE broadcasting *per se* was finished, except for the associated Kheda programming. However, work began on a post-SITE continuation program in the same clusters, scheduled to start in the Spring of 1977. Terrestrial transmitters and new studios are being established to service this program, which will be under the sole authority of Doordarshan.

While all the SITE receivers will be used (without the antennas and front-end adapters), they will have to be redeployed because of the more limited coverage of the terrestrial transmitters. Thus, only 40% of the SITE villages will see a resumption of service. At the same time, many new villages will be added.

Meanwhile, a very high-level government committee has proceeded with planning for INSAT, an operational national satellite system providing both broadcasting and telecommunications. Should it come to pass, and the portents are positive, it might begin operation by 1980.

COSTS

Costs are always a matter of concern to project planners, but it is seldom possible to get much data from one project that is directly transferable to another. SITE is no exception. Part of the difficulty arises because a complete cost accounting is not yet available; a very detailed summary will undoubtedly be made in ISRO's final report.

Another limitation in extrapolating costs from one project to another stems from the fact that the costs of a satellite project like SITE are highly dependent on the design of the entire system. A well-designed operational system will minimize its total cost by balancing the costs of ground and space segments according to the specific project environment. Therefore, the costs of a pilot project may differ markedly from an operational one. The costs of the SITE equipment are not even necessarily representative of the costs of an operational system in India, because there will be differences in the frequency used, the satellite power available, the receiver densities planned, the programming requirements, and the maintenance demand.

Therefore, the costs data reported in this section should be interpreted with caution. They give, at best, only a rough estimate of the costs of implementing the SITE experiment, and bear an uncertain relation to the costs of similar projects in other countries and of operational projects in India.

Total Costs

India's total investment in the SITE experiment is difficult to compute. It is not clear what costs ought to be included in the system cost accounting; for example, what proportion of the salaries of teachers who participate in the in-school programming would be considered a "SITE expense"? On the more practical side, cost data are available for only the most general categories at this time. Consequently, the following figures should be taken only as general indications of the level of expense.

Total projects costs are said to have been between $15 million and $20 million. The budget for the Indian Space Research Organization's SITE activities was about $10 million, which included a great deal for engineering R&D in support of ISRO's broader technological mission. In addition to that, the United Nations Development Programme contributed $1.5 million for equipment and expertise. Doordarshan's programming efforts cost an estimated $3.5 million. The entire NCERT Teacher Training Program, including the films and the per diem of the teachers involved, cost $0.5 million.

The states incurred direct expenditures for custodian salaries, electrification programs, and secure storage boxes for the television sets. Those expenses averaged $70,000 per state, or about $0.4 million for the

6 states. These figures do not include the substantial state contribution in kind, such as transportation, staff time, etc.

The cost of the research component, the ISRO programming for Kheda, and the science program account for another $1 million. Costs of the receivers and maintenance in Kheda were borne by other organizations or by the communities.

These cost figures are substantial, and do not include everything that should be included. However, the project and the potential benefits are very large. The cost of any alternative may also be much higher. The plans for the period between SITE and the beginning of INSAT call for the use of terrestrial transmitters to cover part of the same area where SITE broadcasts were received. ISRO estimates that the cost of covering 70% of the SITE area with terrestrial transmitters will be 3 times the cost of coverage using the SITE system.

Hardware Component Costs

The direct reception stations (DRS) used in the villages consisted of three parts -- an antenna, a front end converter, and a television monitor. The individual costs are roughly estimated to have been:

Antenna	6500 Rupees	$720	(Approx. $ cost at 9/1 exchange rate)
Front End Converter	1600 Rupees	$180	
Monitor	3500 Rupees	$390	

The total cost of a DRS thus appears to be 11,600 Rupees. However, complete units are reported to have been sold "at cost" to state or government agencies that wanted them for approximately 10,000 Rupees each. The total dollar cost of a DRS would thus range from $1,100 to $1,300.

Other Cost Data

In order to give an idea for the practical value of a Rupee in India, the following figures might be of interest. The least expensive radio in India costs 60-70 Rupees, or about $7.00. The cheapest television set costs about 2,000 Rupees, or $220.00. Wages are low -- at the bottom, a landless laborer may make 3 Rupees per day, and at the top, no one is allowed to earn more than 3,000 Rupees per month, although this does not include allowances and perquisites.

Interpreting SITE Costs

There are several factors that make interpreting these cost figures difficult. A major one is the difficulty in comparing figures between countries or currencies. In India, costs of electronics hardware are

high, while manpower costs, even for highly skilled people, are low. In another country, even in an identical project, the ratio of manpower to hardware costs might be quite different. As time passes, it seems likely that the costs of the electronic components will fall and that labor costs will rise.

The SITE experiment also included a substantial amount of research and evaluation, the proportion of which will probably be lower in an operational system. Because SITE was starting from scratch, they had to produce all the programming they used during one year. An ongoing project would undoubtedly have a stock of programs from previous years to draw on. Some aspects of SITE were also crash efforts, a characteristic that probably distorts costs in two ways. On the one hand, extra costs will be incurred in getting things done; on the other, the productivity of the staff in crash programs can be at very high levels that could never be sustained in an operational program.

It must be remembered that the cost of the satellite channel does not appear in any of these calculations. The use of ATS-6 was donated by the United States. It is difficult to assign a cost to the communication channel, because that satellite offers a capability that is not yet commercially available, and because the actual costs of the ATS-6 do not reflect what it would cost to provide such a channel on a non-experimental basis.

The usual estimates used for the cost of a dedicated video satellite transponder for operational use are from $1 million to $2 million per year. However, a dedicated transponder could be used 24 hours per day, whereas SITE broadcast for only 4 hours. Thus, the costs might be proportionally lower if a buyer could be found for the unused time.

OBSERVATIONS

OVERVIEW

The remainder of this report consists of our observations and analyses of key components of the project. This has a number of interrelated elements, for we are looking at an entire system, the first large-scale development broadcasting network.

We begin with observations on the technical quality of the system. There has been speculation for a decade that community television might be unsuitable for widespread LDC use, because of maintenance difficulties in rural environments. We attribute SITE's extremely encouraging technical results largely to a flexible and well-planned maintenance system.

An equally persistent question has been whether effective management is feasible, for broadcasting systems so large, in the context of underdevelopment. We conclude that SITE's management was extraordinary and examine some of its innovative features, particularly its pervasive "research and development" management style.

We proceed then to assess those unique aspects of the Indian environment that provided the manpower and institutions which made the project possible. Next, we discuss the project environment, and how it interacted with the unyielding technological timetable of the satellite to move the project forward.

As in all development communications projects, programming presented the most difficult and demanding problems. An enormous output was produced in a short space of time, some of very good, some of it less so. After reviewing programming results, we go on to an extended discussion of programming policies and decisions. There the issue of diversity looms large -- diversity among regions, villages, and socio-economic subgroups. This issue is central to satellite systems, with their broad coverage, and SITE's partially successful adaptations are of much interest. In addition, we review the difficult tasks of defining an audience, maintaining it, and stimulating it to undertake development efforts at the village level.

Research played a large role in SITE, and we focus particularly on methods for articulating research with policy and project decisions.

We go on to note some of the very important indirect effects of the SITE experience, such as the continuing rural redirection of India's national television system.

As always, there remain open questions, many now perceived more clearly as a result of SITE. We discuss a few open questions of particular significance for planners of similar projects.

TECHNICAL FEASIBILITY

Quality and Reliability of the Reception

Perhaps the most impressive outcome of the SITE project is the demonstration that the technical and operational aspects of a large-scale use of sophisticated technology can be successfully undertaken in the context of a developing country. SITE has clearly demonstrated that video signals from a satellite can be reliably received with high quality in remote villages. The significance of this accomplishment (and the amount and kind of resources that were required to produce it) should not be underestimated.

Indian Development of Hardware

From the beginning, the Indian government took the position that it wanted to assume the maximum amount of control and responsibility for the design, production, and operation of the system. One reason that the 860 MHz frequency was selected for transmission from the satellite was that the electronics required for its reception could be designed and produced in India. The design of the antenna and the front-end converter were done by ISRO (with collaboration from NASA), and the production of both was done by the Electronics Corporation of India (ECIL), a Government of India enterprise.

Television Quality

The quality of picture and voice attained in the villages was superb. Seldom was there any snow or interference in the pictures; the Indian village environment is virtually free of electronic noise. However, the voltage of the rural electrical system is sometimes unstable and caused occasional problems. The picture quality seemed subjectively to be always at least as good as and often better than that achieved by India's terrestrial transmitters.

Television Reliability

Although community reception systems performed at over 90% reliability, the actual number of sets operating on any given day was somewhat lower (about 80%) because of power failures. In their early tests, SITE engineers found that the mean time to failure of the television sets in a village environment was 200 hours for the regular sets and 300 hours for the "ruggedized" sets, a fairly accurate estimate. During the first two months of the experiment, however, much higher failure levels were experienced, and delays in repair were much longer than anticipated because the monsoons rendered many villages unapproachable.

Sources of Reception Problems

The distribution of faults was approximately 50% for the television set, 25% for the antenna, and 25% for the front-end converter. The

biggest single cause of failure may have been blown fuses caused by the very wide fluctuations of the rural voltage levels, but this problem was alleviated after the first few months of the experiment by shifting to "slow-blow" fuses which could survive the temporary power surges.

Other sources of television set failure experienced in the experiment included problems of rusting and fungus, damage by pests (including rats eating the cables from the antenna, mice eating the speaker cone, and lizards shorting out the high voltage section), and maladjustments caused by jarring in transit or tampering by villagers. The antennas had to be reinforced with braces and guy wires after flexing caused by the wind led to mechanical problems.

Maintenance

Maintenance Organization

The maintenance system required to sustain a high level of system operation was substantial. The structure of the SITE experiment was in some ways designed around the maintenance system. During village selection, four towns in each state were chosen as maintenance centers, and the participating villages were then chosen within a 40 kilometer radius of the centers. Villages up to 60 kilometers from the center were sometimes selected if they were along a roadside. The maintenance center was staffed by a technician and equipped with a jeep and a generous supply of spare parts. Each center was responsible for 100 villages, and it was a full time job (often more than full time) to keep the district's sets operational.

Repair Procedures

The maintenance procedures began with the reporting of a fault by a village. The village television custodian was supplied with postcards printed with pictures symbolizing the possible problems. When a problem occurred, he would circle the appropriate picture and send the prepaid card to the maintenance center. The technician would then visit the village, carrying spare parts, a spare television set, and test equipment. Most repairs or adjustments could be made in the village. This was a fairly simple process, because the sets were designed with plug-in printed circuit cards. The technician merely pulled out the module with the defective part and plugged in a spare. If the repair could not be made that way, the technician replaced the malfunctioning set with a good one and took the bad set in to the cluster headquarters for repair.

Reason for High Reliability

The high level of reliability attained was the result of the intensive maintenance effort. Its success was attributed to two main conditions -- the mobility provided by having a jeep at the disposal of the technician, and the ample supply of spares. It was felt to be

important to have the transportation under the control of the technician because it permitted him to do preventive maintenance at other villages along his route when he had time. The supply of spares was critical because in the vast majority of cases it enabled the technician to restore the set to operation in only one visit.

Summary Observations: Technical Feasibility

Technically, then, SITE was an extraordinary success. The reliability it achieved was certainly essential in creating public confidence in such a new service.

SITE achieved this technical success through a combination of very detailed systems planning and of rapid adaptability to technical adversity. Most important was a clear recognition of reliable reception as a major criterion, a criterion applied to set design and placement, to investment in a large network of repair technicians, and to the support of these technicians with spare parts and flexible procedures.

This effective operation could not have occurred lacking a strong institution which had entire responsibility and control of the technical operation.

PROJECT MANAGEMENT AND OPERATIONS

Several particular characteristics or decisions in the area of management had strong implications for the way the project operated. This section discusses some of those features.

Innovative Management Techniques

The structure of the SITE management in ISRO and the processes they used were instrumental in the successful implementation of the project.

Professional Managers

A management office was established that included the services of a number of trained professional managers. This office convened meetings of the SITE Management Board, which included representation of managers, engineers, and software and research experts. The Management Board was responsible for coordinating all the day-to-day operations of the project including: design, development, procurement, deployment, and maintenance of the community receivers and the earth stations; design and execution of the research plan; relations with state governments and other external agencies; and ISRO's programming activities. During the height of the project, the Board held daily meetings.

Delegation of Authority

The Management Board was characterized by an emphasis on horizontal communication and substantial autonomy in decision-making. Professor E.V. Chitnis, as SITE Program Manager and Chairman of the Management Board, had overall responsibility for the experiment. Under him were various project managers who were responsible for different segments of the whole program. Each submitted a plan, a budget, and a PERT chart for his activities. Once these submissions had been approved, the project manager did not have to seek any further permission in the execution of the project. He was authorized to expend the money and do whatever necessary within the plan as long as he met the timetable for its completion. This degree of delegation of authority is rare in the Indian context (and most other contexts). Project managers, were, however, monitored by the management staff, who kept continuous track of the progress of the different projects.

Active Monitoring

The communication in the Management Board emphasized a non-hierarchical problem-solving orientation. This was encouraged by the ISRO heritage. They were a research organization with extensive communication between professionals and accustomed to a project mode of operation in which there

was a collective commitment to a project goal and a periodic shifting of responsibilities that helped reduce bureaucratic territoriality. These factors contributed to making the monitoring activities by the professional managers in the SITE management office acceptable to the project managers. The professional managers entered into day-to-day operations in an active way, helping to identify and find solutions for potential problems, rather than waiting for decisions or problems to rise to their level. They saw themselves primarily as facilitators and problem-solvers, not as people whose role it was to intervene only when a situation had reached crisis proportions. Their activities came to be viewed in this light by the project managers as well, because of the commitment of all the members of the Management Board to the common goal.

Research and Development Orientation

The management of SITE by ISRO was characterized by a strong research and development (R and D) orientation. The project itself was conceived of as an experiment both in the use of satellites for broadcasting to community receivers and in the application of television programming to rural development. There were many sub-experiments, and an empirical orientation often seen in engineering applications was successfully applied to such "soft" areas as planning, software development, and impact assessment.

In essence, this approach makes liberal use of information gathered in trial runs, simulations, pilot projects, etc., to guide the decisions that must be made for project implementation. The orientation was a natural one for ISRO to adopt, because it was historically a research organization that used these techniques in the development of hardware systems; the R and D approach is in many ways merely a reflection of the working culture of ISRO. Yet it stands in stark contrast to the working cultures of more traditional and bureaucratic organizations, and it yielded substantial benefits.

There are many examples of the application of the R and D ethos to the SITE project. Even before the project was formally created, there were pilot projects and planning exercises on the use of television for development and on alternative television distribution systems. During the project, there was testing of everything from program formats to electronic parts to the amount of time it would take for an equipment deployment team to construct the village antenna. On a larger scale, the project is being extensively evaluated in terms of its process, acceptability, and impact.

The many experiments-within-the-experiment also arise from the R and D orientation. The entire Kheda area broadcasting activity is a series of simultaneous experiments on program formats, on production techniques, and on the use of a combination of centrally-produced and highly localized programming.

The research and development nature of SITE and ISRO, with its sense of facing and solving problems by trying out successive solutions until one worked well, seemed to challenge people, increase their motivation, and create a sense of shared problem-solving responsibility.

Other Aspects

A few other aspects of the SITE management also deserve mention. There was never any detailed formal proposal for SITE to the Government of India, so the project was free to respond to needs as they arose, rather than being locked into a fixed plan. The SITE project was given first priority within ISRO, which ensured a singlemindedness that might not have been possible if it had been assigned to an operating organization such as the Ministry of Education that would have had to administer other very large-scale programs. The scale of the SITE experiment, of course, was such that it could be managed in the non-bureaucratic, personal style that ISRO used. At its peak, the staff in ISRO working on SITE numbered eight or nine hundred. An operational program covering a larger area would require a larger staff and probably would require a more bureaucratic style of management.

Primacy of Social Objectives

It is significant that the ISRO management of SITE kept the social goals of the experiment preeminently in mind. One might have feared that a hardware-oriented organization would have difficulty keeping a focus on the ultimate developmental objectives of the broadcasts, or would let considerations of technical convenience override development criteria. But this was not the case. When SITE planners discovered that electricity was not available in 80% of the proposed installation locations for the sets they did not suggest locating the receivers in less backward locations, but instead arranged for state governments to string power lines to the buildings. When on-location shooting and program pretesting in the villages proved difficult because of hardware limitations, they developed modifications to the equipment that made it feasible. Such commitment to the accomplishment of the social goals of a project is essential if projects that include a heavy involvement of hardware are to be appropriately designed and executed.

Involvement of State and Local Governments

One key to the implementation of the rural reception network was the involvement of state and local governments. They provided resources that would have been difficult for SITE to assemble, and made available their infrastructure for some of the field activities. For example, they assisted the village selection process with transportation and personnel because the time required for SITE to requisition equipment and recruit staff would have caused disastrous delays. They also installed electrical power in the buildings that lacked it and paid the salary supplement for the state employee who was chosen as the local custodian of the set.

Through this cooperative attitude of the state and local governments, several major tasks were accomplished in a surprisingly short time -- 10,000 villages were visited and data collected in approximately one year, and electricity was installed at nearly 2,000 schools or panchayats where the sets would be located. Nevertheless, SITE personnel felt that the participation of the other organizations could have been smoother and accomplished still more if it had been begun earlier. More lead time would have permitted a more efficient organization and, perhaps more importantly, would have allowed the satellite project managers to involve the state and local representatives in a more active way in the planning of the project.

Public Placement of the Television Set

Once all of the television sets were placed in schools or in panchayats (local government buildings), there was genuine public access to the sets, independent of caste or economic status. In contrast, the sets for the earlier Krishi Darshan experiment in televised farm forums were usually placed in the houses of local officials, and the attendance that resulted often followed caste or friendship patterns.

There are two important social consequences of the truly public placement of the sets in SITE. The first is that the programming was obviously available to all, thereby demonstrating the government's commitment to the abolition of caste and to creating a new equity in Indian society. The second is that the experiment in fact induced an attendance pattern with a disproportionately high percentage of lower caste landless laborers and poor farmers. This pattern suggests that community reception of television programs can be used to reach those groups that are most needful of the assistance. This would be a significant departure from the experience of many development communication efforts, which have inadvertantly helped those who are relatively better off, in part because those who are better off have more access to the media.

Effective Use of Indigenous and Outside Expertise

The Site project followed a policy of maximum self-reliance in the use of non-Indian technical assistance. India has the advantage of having a large pool of qualified specialists in the technical and social science fields. In the engineering areas, specialized training and cooperative design activities were used during the development of the project. Members of the project staff were sent to the United States to conduct feasibility and cooperative design studies in projects with Hughes, General Electric, and the Massachusetts Institute of Technology's Lincoln Labs during the early phases of planning for SITE and INSAT. Several engineers acquired a total of 12 to 14 man-years of additional experience at NASA's Goddard Space Flight Center. These training efforts

have been undertaken with the explicit intent of building capability within India for domestic design and production of satellites and ultimately launch vehicles. Throughout the experiment, a close collaborative relationship was maintained with NASA.

Another technique used for getting technical assistance was the "expertise contract." ISRO contracted through the International Telecommunications Union (ITU) to obtain professional advice from experts at Hughes. Clearance from the Government of India was then obtained for the corporation as a whole, rather than for individual experts. This eased the paperwork and delays in getting an expert when one was needed, and made it possible for ISRO to call on the most appropriate person at Hughes for the particular need, rather than trying to arrange for a single person whose skills covered a broad range of topics. It also gave clear control to ISRO in its use of foreign consultants.

The use of outside expertise and training in the SITE project was characterized by the relatively limited use made of foreign consultants and the commitment to using the SITE experience to build the capabilities of the Indian technical community to a point of self-sufficiency in the areas of satellite and receiver design and production. These characteristics resulted in a number of benefits for India, including the design of equipment that was appropriate to the rural environment and that could be produced in India, and an improvement in the capability of the indigenous industries to meet the production needs for future Indian television and satellite projects.

Summary: Project Management

The effective management system for SITE is an important model for this kind of effort. It was based on long institutional experience with the creation of complex engineering systems. Those procedures adapted remarkably well to this enterprise, which required a quite different, widespread field operation. The "R&D tradition" in the schools is a pragmatic one, usually associated with very detailed objectives but flexible means of attaining them. From that tradition came flexible administrative and consultant-use systems, a "team" ethos more focused on the product than on the bureaucratic rule, and a continuing focus on the social goals of the activity. It brought very able people into the work and constructively tapped their energies. It is an approach worth emulating, where such traditions and training exist.

This kind of approach was possible in India because of certain advantages in the Indian context, conditions that existed prior to the experiment.

THE PRE-EXISTING CONTEXT

Some features of the context of the project were important in creating an environment in which SITE could be quickly established.

Trained Manpower Pools

At the start, India had pools of already-trained manpower in several essential fields. India had enough highly-qualified engineers that large numbers of the best quickly could be found and recruited by ISRO. In business administration and public management, the pool was much smaller, but was of high quality and included some engineers who had gone on to advanced training in management, thus making them ideal recruits for management of this enterprise.

In some fields, such as television production, the pool of trained manpower was smaller relative to the need. In such cases, more variable results occurred, but the important point is that there was some skill and experience to draw on.

Because of these preconditions, India required virtually no long-term training of specialists to carry out this massive project.

Strong Existing Institutions

The project was coordinated and (on the engineering and logistics side) carried out by ISRO, a well-established, competent and powerful institution. SITE relied for its programming on the long institutional experience of All India Radio (the television portion of which became Doordarshan after All India Radio's reorganization). No new institutions had to be created to carry out the project.

Summary: Advantages of the Indian Context

India, in addition to being a developing country, is a nation with the world's third largest number of college graduates. It has a growing technological expertise. It has some strong and experienced institutions in relevant areas. All this meant that the enterprise could start without the uncertainties and delays of institution-building and long-term training so often required. It also probably led to certain emphases in the project, such as the intensive focus on engineering R&D. Other countries, with other resources, would have gone about the development of SITE in a different way.

Beyond the general Indian environment, there were elements of the specific project environment that, in our view, had an initial influence on the shape of the project.

THE PROJECT ENVIRONMENT

There were many circumstances, decisions, and policies related to the SITE project that influenced the way the project developed.

Sustained Political Commitment

A political commitment was made to the success of this project at the highest levels of the Indian Government and was sustained throughout. The project had consistent support from high levels in the government, including the Prime Minister; that commitment helped make possible, in our view, the funding required to do the job and the solution to many problems of coordination at the interministerial and the state-federal level.

Another closely related factor was the close association with the project of Dr. Vikram Sarabhai, who was the major motivating force behind SITE until his death in 1971. Dr. Sarabhai was an extraordinarily respected figure with great intellectual and political prestige and was able to overcome through his influence and persistent advocacy of SITE many interdepartmental conflicts that otherwise might have crippled the project.

Salience of the Project

Indian press coverage of SITE was substantial throughout its development and operation. Equally important, world awareness of SITE was very great. The visibility of the project, combined with the importance of success to national prestige, must have had a strong influence on individual motivations and on institutional and political commitments.

The Technological Timetable

The time constraints imposed by the schedule of the satellite were another important factor in the project's implementation. The fact that the project had an "unslippable" starting date determined by the availability of the satellite made "exceptions to the rule" both necessary and acceptable. The knowledge that everything had to be ready on time certainly gave an extra impetus; and, the knowledge that the crash program would end in one year made it possible to sustain a high level of effort. Additionally, the fact that the project was only to last a year made "invasions" of various bureaucratic jurisdictions more tolerable.

Adequate Funding

The ISRO budget was clearly adequate for its part of the job. Although lowest-cost financial solutions were religiously sought by ISRO, at no time was there the sense that desirable activities would

have to be eliminated because of budgetary constraints. In our own review of the project, we could find nothing in the hardware-logistics system where lack of funding had seriously hindered the project's successful implementation.

The funding picture is much less clear on the programming side. Doordarshan's production staff was small, given the task, the time available, and the requirement for decentralization. The cameras and recording equipment they used were of fine quality, but their production studios were too small to comfortably handle the enormous amount of production that was required.

Overall, however, in contrast to many efforts in the U.S. and in other countries, this was a well-funded program.

Clear Institutional Responsibilities

The division of responsibility between the various organizations was successful because it was quite clear and followed logical operational distinctions. ISRO was charged with all the non-programming efforts -- selecting villages, seeing that a television signal was broadcast and reliably received and evaluating the results. Doordarshan was responsible for making almost all of the programming; ISRO operated its Kheda Laboratory quite independently and contributed to the programming for in-school broadcasts because of its special expertise in science education. NCERT took complete responsibility for all aspects of the teacher training project, except for transmission.

Lack of Precedents

The SITE project was very much without precedent, and this fact made some of the management tasks easier. It made it possible to circumvent many of the bureaucratic rivalries that often impede the functioning of interdisciplinary projects. It also infused the project with a sense of novelty and intensity that put a premium on finding fast, practical solutions. Many project employees were young and not already steeped in the bureaucracy; the fact that they did not know what they were up against may have made it possible for them to create the solutions that the situation demanded. The lack of precedent that mandated innovative responses may also have made those innovations more acceptable to other agencies.

Autonomy of ISRO

Finally, the relative autonomy of ISRO contributed much toward the accomplishment of SITE's objectives. The main management activities for the SITE project were the responsibility of the SITE management office in ISRO, which controlled or coordinated all the project activities except program production. ISRO was in a unique position to handle this

management task. It is a prestigious scientific research organization, rather than a government agency with concurrent responsibilities for the administration of a large bureaucratic program. During most of the SITE project, ISRO reported directly to the Prime Minister. When it later became a part of the government through the creation of the Department of Space, it still retained some special advantages, because the Department of Space is a part of the Prime Minister's portfolio.

Being outside the government bureaucracy immeasurably increased the flexibility and management decisions which could be implemented. ISRO's autonomy was extraordinary. It was provided with general project budgets and then given wide latitude in their expenditures. It was exempted from many of the procurement and other restrictions that apply to government organizations. Equipment and travel could be arranged for within much shorter time spans than if normal government procedures had been followed. ISRO also had an ability to recruit specialists with particular ease and on a temporary life-of-project basis.

Obviously, ISRO's previous record of achievement in space programs and their extra-governmental charter encouraged a grant of autonomy. Our judgment is that such freedom was a critical element in their success, making possible the frequent "mid-course corrections" Professor Chitnis asserts were essential to achieving project objectives.

Doordarshan, being an operational, not R&D, organization and being a key arm of the Ministry of Information, had far less autonomy in budget and personnel procedure. In some sense, it is more remarkable that Doordarshan was able to produce the very large amount of programming required of it, under these circumstances.

Summary: The Project Environment

The special character of the SITE project, with its spectacular technology and important social goals, helped produce an unusually favorable political context. Even though there was press criticism and questioning, the overriding feature was sustained political and financial support. At the operational level, the worldwide publicity about the project and its relentless timetable were powerful motivators.

After a period of uncertainty and some conflict, institutional responsibilities ultimately were made comparatively clear -- ISRO's for the delivery of the programming and Doordarshan's and NCERT's for program creation. In carrying out those responsibilities, the lack of precedent was very helpful; ISRO also had the advantage of operational autonomy.

Thus, in retrospect, it seems that SITE was built on a context that made this project special. As a result, it became largely exempt from

the funding vagaries and diffusion of responsibility that hinder so many programs everywhere. The fact that the project reached out to attempt something of real significance and vision helped generate that commitment.

The result was that the programming was produced on time and delivered reliably. In the next section, we will address in some detail the production of that programming and its observable effects.

PROGRAMMING: DESCRIPTION AND RESULTS

As we have indicated, the character of the programming varied for the several different major program applications. We will discuss the results of each separately and then, later, rather extensively comment on the programming policies and decisions that produced these results.

Community Broadcasts

The heart of the SITE program consisted of evening broadcasts to 2329 villages, representing a potential audience of several million in "clusters" in six states. Programming for each cluster consisted of a daily half-hour national program of news and cultural entertainment in Hindi and twenty to sixty minutes in the local language, depending on the cluster. The local language programs presented information in the areas of agriculture, family planning, health and nutrition, education, and national integration. In doing so, they used a variety of program formats, including direct instruction, interviews, drama, panel discussions, song and dance, puppets, and response to viewer mail.

Distribution of Programs

The programs for each language group were produced, by Doordarshan, at different sites; thus the distribution of programs across topic areas and the proportion devoted to entertainment varied. Data are available for the first quarter's programming. The percentage of programs devoted to some of the topic areas showed the following ranges:

Agriculture and animal husbandry	7% to 15%
Family planning	2% to 7%
Health and nutrition	1% to 16%
Entertainment	39% to 45%

Estimates of the proporation of repeat transmissions of programs range from 5% to 20%.

Effects of the Programming

A great deal of research data has been collected on the cumulative effects of the programming on attitudes, values, knowledge, practices, and social patterns; much of this data will be analyzed by ISRO in 1977. Some of those analyses will illuminate the question of how much fundamental change resulted from the programming. However, the chain of linkages from making the program available to seeing new agricultural or nutritional practices is a long one.

We need to consider every element in that chain while assessing the effectiveness of a project with SITE's objectives.

- The first requirement is that the program be delivered reliably. This requirement was reasonably well met.

- The second is that the programs which are delivered be watched. Success in holding viewers varied greatly from village to village; in some, hundreds watched regularly; in others, few watched after the first few months.

- The third requirement for producing change is that those who watch do so with attention, and learn as a result (either directly from the programs or through discussion, thinking and observing stimulated by the programs). Here we have little evidence on the community broadcasts, although more will be coming. Over a period of time, we do know that certain attitudes and knowledge did change, (e.g., awareness of the name of the Prime Minister), but early evidence suggests there were few very large measured changes, at least in the first few months.

- We might ask that a final, even sterner criterion be applied, namely, a change in appropriate behaviors -- i.e., the use of new methods of food preparation, the building of sanitary facilities, etc. Here only a little data was collected formally. Anecdotally, we know that in some villages new nutritional and agriculture practices were adopted as a result of SITE. But the enormously complex questions of how much, and what behavior change occurred in individuals, groups, and communities will only be partially answered by the data.

The effects expected from SITE are quite different from many media-based projects evaluated in the past, because of the massive amount of development programming presented over a long period. Thus, not only did specific programs in agriculture and other areas have specific results, but also the cumulative effects of daily village exposure would be expected to have ever-increasing impact. This cumulative effective makes impact evaluation quite different from the limited research of the past and, in many ways, more difficult.

Audience Size and Composition; Village-to-Village Variation

The most solid information now available related to attendance. We know that at the beginning in August 1975, attendance averaged over 300 viewers per community! High levels were sustained in September and October, then fell dramatically as fall agricultural activities peaked. After that, attendance leveled off at an average estimated to be around 50 to 80 per village. Thus, by the end of the year, perhaps 120,000 to 190,000 people were watching any particular night. Of course, a larger percentage viewed programs in the course of a week, since the audience changed from day-to-day. Averages, however, are misleading, for village-to-village variation was enormous. What can most accurately be said is that there were large groups of viewers (up to 200) regularly to be found in some villages and only small groups, of ten to fifteen, in others. In terms of engaging viewer interest

and time, SITE was thus much more successful in some places than in others.

Overall, development programming reached a very substantial number of villagers in the course of time; however, the TV programming did not appear to become a center of community life, but instead was viewed selectively. Initial fears that the character of village life might be too rapidly and profoundly changed do not appear to be supported.

There are, from available data, some suggestions as to what caused the great village-to-village variation. Among the determinants seem to be: the occupational mix of the village vis-a-vis the program content -- market villages, made up of traders and craftsmen, had less attendance than farm villages; remoteness -- distant villages had better attendance; and set location -- where the set was placed at a distance from the village center, attendance was lower.

During the first three months of broadcast, the audience was composed of 48% men, 24% women, and 28% children, on the average. There was considerable variation between states, with the range for the first three months covering 35% to 56% men, 17% to 30% women, and 18% to 40% children. More recent figures are not yet available. The number of women attending is encouraging. People of all castes attended, but the lower castes and landless laborers seem to attend in greater numbers than their proportion of the population would lead one to expect.

The number of children faithfully attending was something of a surprise since initially little of the programming was directed toward them. (India's previous rural TV programming, which was organized around discussion forums, tended to exclude children.) As SITE progressed, more children's programming was produced in response to this situation. This phenomenon might lead to major long-term effects on the Indian village that transcend the effects on the adult population.

Audience Reaction to Programming

Overall audience reactions to the programming are somewhat difficult to specify, since both the audience and the programming varied from cluster to cluster. However, a few generalizations are possible on the basis of feedback information from the first quarter and other data sources. The audiences almost universally preferred instructional programs and programs with a message to purely entertainment programs. They liked the instructional programs better and felt they were more useful. Language difficulty and high rate of delivery seemed to be significant problems for parts of the audience with some programs; repetition of such programs does not appear to improve the comprehension. The audience seems surprisingly discriminating for a group with so little previous media exposure. They distinguish between programs that are useful and programs that they enjoy, and the time spent watching television is directly related to how much the viewer likes the programs and sees them as useful. Because of language problems and lack of interest, the Hindi language national programming is the least well accepted category of programs.

In-School Programs

For one and one-half hours per day, the satellite programming was directed to an in-school audience of primary school students, between the ages of 5 and 12. Programs were broadcast in four languages, for a total of 22 1/2 minutes in each language. Each day's broadcast consisted of two approximately ten minute segments separated by a short music bridge or filler section. The television lessons were chosen to widen the horizon of the children by familiarizing them with facts and matters ordinarily beyond their observation and experience.

The general objectives of the children's program related to the learning of:

- community living skills, such as cooperative work
- basic skills in numeracy, literacy and "techniracy"
- hygienic living habits
- aesthetic sensitivity
- the process of societal modernization.

Programs were broadcast on 200 days. Approximately half were enrichment programs on science education. They were produced by an ISRO studio specially set up in Bombay for that purpose. The science programs were dubbed into local languages before broadcast. The remainder of the programs were produced in the local languages by the regional base production centers of Doordarshan. None of the programs were directly related to the school curriculum of the various states.

One teacher in each SITE village was trained in the operation of the television set and in how to utilize the television lessons and relate them to the child's environment; he in turn was expected to train others. Teachers were supplied with copies of "Teacher's Notes" about each of the programs prior to its broadcast and were encouraged to do preparation and follow-up on the programs, but there was no organized attempt to ensure that they did so. "Wall Papers" covering some of the content of the science education programs were also supplied on a monthly basis.

An evaluation of some aspects of the in-school broadcasts was conducted by NCERT and ISRO. The evaluation focused on overall effects resulting from continual exposure to the in-school programs, rather than on learning gains from specific broadcasts. The evaluation looked only at grades 3 and 5, and used a variety of measures to assess changes in the behavior and cognitive development of children and in the behavior, attitudes, and teaching strategies of teachers.

The evaluation results were summarized by NCERT in the following way:

HYPOTHESIS OF SITE IMPACT	FINDING
Children will have better language development	Supported
Children will seek more information	Supported
Scholastic achievement will improve	Not supported
Children will ask more questions and have better interaction with the teacher	Not supported
Attendance of children at school will increase	Not supported

The negative findings on the last three hypotheses should not necessarily be interpreted as failures of the program. The evaluators felt that factors such as level of agricultural activity and economic well-being had much more influence on school attendance than did the students' interest, which they had hoped would be increased by the in-school broadcasts. Scholastic achievement was measured by the standard tests administered in each state on the content of the school curriculum (which had not been taught by the television programs), so it was not surprising to find that the programs had not influenced scholastic achievement. The in-school broadcast evaluation also found that teacher attitudes toward the programs were warm and positive, and that teachers in non-SITE villages were eager to receive the broadcasts.

It is interesting to note that the goal of improving classroom interaction -- that is, creating a less authoritarian atmosphere with more give and take between the teachers and the pupils -- was also a goal of the teacher training programs. The evaluation of that program had shown that teachers did encourage children to participate more in class, but that encouragement had not actually changed the amount of interaction in the classroom. Accomplishing changes of deeply entrenched practices may prove to be a very long process.

Teacher Training Program

The teacher training program of SITE was developed by the National Council for Educational Research and Training (NCERT). The responsibility for the design and coordination of the project was given to the Center for Educational Technology, an institute of NCERT, which worked in cooperation with ISRO and the State Departments of Education. The program was an intensive 12-day course for primary school teachers in science and science education, that used daily television and radio programs, activities,

printed materials, and tutorials to provide in-service training to active primary school teachers during school vacations. It was later repeated as a 15-day course.

The objectives of the training were limited and well defined. The objectives were related to a science education program previously developed by NCERT. They were:

- To familiarize the teacher with the pedagogical techniques (e.g., discovery learning) of the science education program;
- To upgrade the teacher's understanding of the content of the science syllabus;
- To familiarize the teacher with the textbooks and teachers' guides prepared by the NCERT for grades 3 to 5 and adopted/adapted by the states;
- To familiarize the teacher with the primary science kit prepared by the NCERT, and,
- To show how effective teaching materials could be improvised even when a full kit is not available.

The television programs illustrated the educational techniques of the new Science Education Program. Radio was used to provide enrichment and to increase motivation. Activities were suggested to improve content knowledge and to give examples of simple experiments that could be conducted in primary school classrooms. Printed materials provided additional content and enrichment information. Finally, and importantly, a trained teacher-monitor was present to provide clarification, reinforcement, additional information, and to handle administrative matters.

Training of the teacher-monitors was done in several stages to prepare the number that would be required (400 in each state). First, NCERT organized and ran training sessions for 10 "resource persons" from each state. These resource persons then organized and ran 10 training sessions for 40 teachers each to produce the 400 teacher-monitors for each state.

Each teacher-monitor then recruited ten teachers to attend the training program at each of the 400 SITE villages in each state, for a total of 4000 teachers per state. In this manner 24,000 teachers were trained in each training cycle. The training program was run twice, so a grand total of approximately 48,000 teachers were trained in this fashion. (While this number is large in absolute terms, it must be kept in mind that there are roughly 1,750,000 primary school teachers in India; this was, however, a substantial proportion of the teachers in the six SITE clusters.)

Preliminary results from an NCERT evaluation of the first cycle are already available. Teachers in 2 of the 6 states showed significant gains

in science knowledge. Classroom observation of some of the teachers after the course showed significant improvement in the use of teaching aids, the performance of experiments, and in encouraging children to participate in class. They had a positive attitude toward the training program and preferred the television above all the other media in the program, although the evaluators attribute this finding to the novelty effect of the medium.

There are several very important characteristics of this program that should be pointed out. It was unique among the SITE programs in that it was designed and executed by an agency directly concerned with the content and viewers of the programs. In other SITE programs, the involvement of the relevant agency or ministry by the TV producers for the subject matter often seemed peripheral. Ministries often gave initial guidance on topics, but continuing significant inputs to the content on the integration of the television programs into the agency's overall plan of activities were rarely seen. In this case, however, NCERT designed the whole training project, produced the films that were shown on television, and had complete responsibility for the content of the rest of the course. Such a high level of involvement is probably necessary to ensure that the programs broadcast over a system like SITE are fully integrated into the goals and activities of the development ministries.

The teacher training course was a multi-media course in which television's role, while important, did not stand alone. Experience with similar projects in other countries has shown that if the learning and behavior change goals of the program are to be realized most effectively, it is often critical to use additional communication channels (especially interpersonal channels) to supplement and reinforce messages carried on broadcast media. There were limited attempts to do this in SITE in-school broadcasts and in the small-scale village utilization experiment, but the NCERT program was the only one that made thorough and systematic use of all the communication channels it could involve.

Other significant features of the NCERT programs were the clarity of their television programs' objectives, and the fact that they fit into an overall program plan. In contrast, much of the programming from other portions of the SITE experiment seems lacking in specific goals or integration into larger plans. To be sure, the NCERT teacher training program had an advantage in this regard; it was aimed at a clearly defined, homogeneous audience of motiviated professionals who were taking an intensive, short-duration course. But the advantage of having clear goals should not be overlooked.

The Kheda Programming

The Kheda Laboratory was only a small part of the overall SITE project, but it merits special attention because it served as a testing ground for experimental programming approaches. For this reason, a few of the types of programs developed there will be described.

Several very innovative approaches were used in some of the programs. One local affairs program (called "Vat Tamari" or "Your Views") made extensive use of one-half inch video equipment to facilitate communication between villagers and bureaucrats. Because of the portability of the equipment, it was possible to tape people in their villages, where they felt comfortable and could point out examples of the problems they faced. The villagers could review the tapes immediately, even viewing a replay on the minature screen in the eyepiece of the camera if there was no full-size monitor handy. The program could be played for the bureaucrats without the delay that would be associated with film processing, and the reaction of the bureaucrat could be taped for presentation to the villagers. The half-inch videotape equipment was originally used for this because there were no facilities for processing film in Ahmedabad, but when its advantages in terms of immediacy and flexibility were discovered, it was recognized that use of half-inch videotape made possible an entirely different type of program than film could have provided.

The Vat Tamari program led to a number of successes in terms of resolving complaints that the villagers had. In one case a road was repaired; in other cases, a Post Office was installed, a bridge was constructed, and schools were expanded. Of course, the real success of the program will come if the villagers gain self-confidence and assertiveness in dealing with the government and begin to do it without the stimulus of the program.

Another series of programs gave instructions on how to engage in handicrafts that could provide cash income with a low capital investment. The interest that this program generated showed the Kheda producers that knowledge alone was not the only barrier to becoming involved in one of these crafts -- the villagers did not have even the minimal capital required for buying equipment and materials. In response to the expressed needs, the ISRO staff helped arrange a special credit program through a local bank to enable villagers to get started in business. This series provided an excellent example of the importance of getting continuous feedback about how well the system is working, and of the need for having coordinated support activities to ensure the success of the programs.

A third serial used a multi-disciplinary team approach to programming for specific social objectives. The series itself was an example of the system's responsiveness to feedback -- when the feedback studies showed that children were a large portion of the audience, it was decided that special programs should be developed for them. To deal with these needs, a team composed of a producer, an evaluator, a specialist in child development, and script writer was formed and given the task of cooperatively designing and producing a series. After discussions among themselves and with representatives of the related ministries, they set out to design a series that would increase self-reliance among rural children. They tried to specify objectives for the kinds of changes they wanted to produce among the children, and produced a program for pretesting.

It is at this point that the value of multi-disciplinary teamwork dedicated to the empirical development of programming and to producing behavioral changes in the viewers became very salient. The results of their pretesting led them to believe that their goal was too general to be understood by their audience, and that they would have to re-evaluate their plans and redefine the goal to something that could be accomplished by a single series of programs. If there had not been an integrated effort by a multi-disciplinary team to develop a series that was truly effective, it seems likely that production of the original plan would simply have gone forward unchanged. Instead, they selected the encouragement of improvisation among children as a subset of the original self-reliance goal that could adequately be formulated in behavioral terms and that was of manageable size to be attacked in a series of programs. They then respecified objectives and began developing, pretesting, and producing programs. The programs encouraged children to make things and engage in independent constructive activities by suggesting activities and showing how they can be done using locally available scrap materials. The team continued to work together, designing the content and formats of the programs, pretesting scripts, and revising the programs before production. The techniques that they have followed here have also been successful in other instructional television contexts, and are an excellent example of how non-traditional approaches to television production can be applied effectively to television for rural development.

PROGRAMMING POLICY AND DECISIONS

Having examined the overall results of the several kinds of programming, we now turn to observations on one of the sources of those results, the policies and decisions that were made about programming.

Refining Program Goals and Strategies

The experiences of the SITE project have made it possible to refine a number of questions about the design and effective conduct of such a project. Many of the initial design choices had to be made without enough knowledge to guide the decision, or even without awareness that a choice was being made. However, the SITE experience has illuminated some of these choices and in many cases made it quite apparent that implicit differences in goals underlie the different alternatives. In most cases there is no "correct" choice, but it is important that the differences be made explicit so that informed choices can be made. A fundamental set of issues concerns audience definition and the matches between the project goals and the techniques used to accomplish them.

Precise Definition of the Audience

There is a real question about whether it is possible to do effective instructional programming for a general audience. The initial SITE approach seemed to be to use the "rural poor" as the conceptualization of the target audience for the community broadcasts. "Rural poor" covers a broad range of people and levels of development, however, and it seems difficult to devise programming that is simultaneously applicable to the entire group.

In SITE, there seemed to be a tendency to put a priority on information about agricultural practices that could be adopted by small farmers. This is a reasonable and attractive option, since the possible effects of such programming are highly visible (and valuable) increases in the rural areas' productivity. At the same time, such programming has obvious implications for the economic gap between the landless and the farmers. This may and may not be an acceptable consequence of the attempt to increase agricultural productivity -- that is a matter that must be decided at a policy level. The important point is that it will not be recognized as a possible consequence unless there is a clear conception on the part of the project designers of exactly what they want to do to whom. Deciding to program for the "rural poor" is one thing, but choosing between trying to serve the needs of the landless laborers or trying to increase agricultural productivity is quite another. Since most of the same programming cannot effectively serve both groups, what may appear on the surface to be a decision about programming content actually has strong implications for the broad effects of a successful project. Different streams of programs directed at specific groups might be more effective, but more information about attendance patterns and a cohesive strategy for audience attraction would certainly be required.

Goal Definition

Refinement of the project goals into more specific statements also makes it easier to make tactical decisions about the most appropriate means for accomplishing the ends. A variety of approaches were used in the programming -- some of it was informative, some taught skills, some attempted to motivate the audience, and some merely provided entertainment. With a clear conception of the goal, a strategy for attacking the problem can be formulated that permits a deliberate use of these different types of programs to accomplish the overall goal. This sense of an overall strategy for the content and format of the programming was lacking in the SITE experiment, which appeared to explore a wide variety of goals (as may be very appropriate for an exploratory year).

With a clear vision of what is to be accomplished, it becomes easier to make decisions about such topics as: whether to try to achieve a sustained attendance by a large, regular audience, or try instead to achieve some other attendance pattern; what role the entertainment programming should play; what other combinations of media to use in addition to the video; and whether to modify programming to suit those who attend if they are different from the originally intended target audience. The choices among means will then be more appropriate in the sense that they can contribute more efficiently to accomplishing a well-defined goal, and the goals themselves will have become more appropriate for having been made explicit and well articulated.

If future activities build on this valuable year and take on increasingly focused objectives, one of the implications would seem to be that decisions about program objectives will have to be made at a level other than that of the individual producer, whose concentration is necessarily on the specific objectives of single programs or of short series.

Programming Decisions

The managers of SITE confronted a complex set of policy decisions surrounding programming. These decisions had to be made in terms of best initial judgments. An additional complication was that the expectations and viewing habits of that audience changed, as it became more familiar with television.

Attracting an Audience

A basic issue is the degree to which the programs needed to be specifically designed to entice viewers, of various types, to attend regularly. Two main motives for attendance were assumed: the first, to gain useful information; the second, to be entertained, either by the programming itself or by the social occasion created by the community viewing situation. The managers were also well aware of a third motive, curiosity; this turned out to be very powerful, initially.

The initial novelty effect, which brought out viewers at first, may have lulled the SITE programmers into a sense of security about audience turnout. We were told by the Doordarshan producers that they believed it

was not fundamentally their obligation to attract an audience through the programming, that other factors were far more important determinants of viewing habits. This is, of course, a pivotal assumption. Since continuing audiences were assumed, the year of broadcasting gave little understanding of the program and scheduling characteristics that would attract and sustain village audiences, since there was no systematic attempt to manipulate those variables toward an objective of increasing audience size.

Content Mix: Entertainment vs. Instruction

A series of decisions had to be made on the amount of programming time to allocate to instruction and to entertainment, as well as allocations within each category. The producers were quite aware that large audiences could have been created by the same strategy used in the U.S. and other countries -- that of having the bulk of programming be escapist mass entertainment, such as the Indian romantic film so popular in that country. They rejected that option and aimed instead at creating a substantial core of programming which would facilitate important development objectives. Theirs was, by choice, a more difficult course, and one unusual in broadcasting experience. The end result was an estimated 40% to 50% of entertainment programming, consisting largely of regional dance and music. At this point, there is no data to suggest whether this is the most effective mix of information and entertainment; it would require systematic variation of the two to provide really useful data.

Allocations of the instructional time across various content areas varied from cluster to cluster quite markedly. Such decisions were made by individual program managers and producers at each production center. While understandings of local needs affected these allocation decisions, they were also influenced by the interests and productivity of individual producers. We were not able to determine that a systematic allocation had been made, beyond a recognition that a variety of sectors had to be represented.

Decisions on Specific Program Content

Program producers had to make continuing decisions as to the content and objectives of each program. In doing so, producers at each center worked with experts from substantive ministries, who helped define program objectives in agriculture, nutrition, etc. Since those objectives vary from locality to locality and at various times during the agriculture season, a good deal of localized fine-tuning would have been ideal; however, the preparation of programs well in advance of broadcasting limited the possibility for such responsiveness.

Some content did not relate to the concerns of specific ministries, but instead to broad national social problems, such as the breaking down of caste barriers in the village, widow remarriage restrictions, religious

prejudice, and hereditary rural debts (which were officially abolished by decree during SITE). In these cases the producers worked with consulting social scientists from nearby institutions.

Coordination with other Communication Inputs

Little attempt was made to coordinate the TV programs closely with other ministerial efforts, such as the work of local development officers, by means of radio broadcast, organized listening groups, etc.

This was a fundamental strategic choice. It is well known, from communication research, that such multiple-reinforcement efforts are more successful in producing changes in attitudes and practices than are single-medium approaches. They are also more difficult to accomplish. The organized listener group strategy, such as was used by the radio rural forums in India, in which Dr. P.V. Krishnamoorthy, Director of Doordarshan, was a pioneer, is particularly difficult to sustain on a continuing basis. The "Krishi Darshan" experiment, prior to SITE, tried to organize groups of farmers around community TV programs, and often had difficulty in maintaining the involvement of local discussion leaders who were central to the scheme.

Coordination of inputs other than organized listener groups may, however, be a practical possibility. Tanzania, for example, has found that such coordination is easiest if centered on short-term intensive campaigns, with limited objectives, such as the use of specific local foods to meet nutritional deficiencies or the building of sanitary facilities. In these campaigns, coordination is made of whatever informational possibilities exist, which in various places may include extension workers, mimeograph newspapers, radio, community study groups, even designs on clothing materials. This kind of approach requires a focusing of effort, but recognizes that such intensive effort can and need be sustained for only a few months at a time. It does not require that local groups continue to function indefinitely. While it does not provide a model for the much more extensive information possibilities of a program like SITE, it does present a possible substrategy for the attainment of some program goals.

Production Formats

No matter what the decisions on the goals of production, scheduling, content, and coordination, the television program itself is what has impact on the viewer. We were particularly interested in the formats used to communicate to this rural audience. Because we have seen only a tiny proportion of the SITE programming, our observations must be based on statements of intention and on scattered impressions in viewing several dozen programs both on videotape and during broadcasts in villages. The ISRO Research Cell has conducted detailed content analysis and program inventories, which should be very helpful when they become available.

The cardinal principle for the information programs was to make them simple and graphic in using words and pictures villagers could rapidly grasp. Thus, when use of a locally available nutritious food was to be promoted to village women, an actual village kitchen might be filmed, along with every step of preparation. When an alternative rice planting technique was presented, the method of planting, fertilizing the shoots, spacing of the rows, etc., was illustrated by actual farmers planting their fields. In some of the programs, a careful reprise was done to reinforce and review the material.

Such programs seemed to us to be instructionally clear (at least visually, for we did not have the language of instruction). Typically, they were produced in the field on 16mm film. In our view, if the topic was of interest to the viewers, many of these programs should have been instructionally effective.

Quite another class of production was the Hindi-language news programs shown to all clusters. These programs consisted of a male and female newscaster reading the news. We were struck by the absence of illustrative material. These were "news readers" in the BBC radio sense, rather than "anchor persons" linking together a more visually interesting collage of other correspondents, film clips, and still pictures as in the U.S. tradition.

"Documentary" programs, typically dealing with social problems, were a third category. Techniques varied widely, as producers had great latitude in deciding how to approach fables or stories to illustrate the issues of taboos on widow remarriage, rural debt, et al. At other times such static techniques as interviews and panel discussions were used.

Finally, there was the entertainment category, which accounted for about half the programming. Here, regional music and dance predominated. In Doordarshan's Delhi Base Production Center, for example, a large amount of filming went on of visiting dance and music groups from throughout the country. This approach supported one of the expressed objectives of the producers, to use SITE to enhance an appreciation of the differing cultural traditions throughout the nation.

The character of any particular night's programming for a village was varied, perhaps encompassing a news-reading, folk dance and music, a field-filmed presentation of a farming technique or nutritional message, and perhaps a dramatized documentary, in a village setting dealing with a social issue.

Viewer Reaction to Types of Programs

The data we have on the reaction of the viewers to the various program types is sparse and ambiguous. However, initial survey data indicates that instructional programs were liked best. More intensive analysis of the reactions and motives of those who came, and those who did not, would be of great interest.

Our own observations of village audiences showed a considerable discrimination among programs, with viewers "voting with their feet" on program interest -- i.e., departing when they lost interest. During a dramatic presentation, few left. During "talking face" discussions or readings, many left. Once gone, the viewers generally did not return.

Experience throughout the world suggests that long presentations of talk by a single announcer and panel discussions should be minimized, as they will tend to lose an audience. Sometimes such approaches are inevitable; clearly, however, the more pictorial and dynamic a presentation, the more the likelihood of retaining interest. (This may limit how localized programming can become, since the cost of producing visually interesting programs may restrict production for small audiences, given the usual limits on local production staffs and budgets.)

There are also implications for placement, during the evening, of the more and less dramatic programs, but these are complex. On the principle that drama helps both to attract and maintain a maximum audience, it may be worth additional experimentation with techniques such as starting and ending an evening with a dramatic serial.

Program Scheduling

Experienced broadcasters have often argued that the scheduling of a particular program is as important a variable as content in determining results. Scheduling often determines whether a particular televised message is reaching the audience for whom it is intended at a time when that audience is prepared to receive it. Observations in SITE villages raised some doubts about that system's ability to deal with the difficult issue of program scheduling in a fully satisfactory way.

From observations, as well as discussions with villagers and SITE's leaders, it was clear thet the villagers were not well informed about program scheduling. The program sequences worked out by production supervisors at the base production units were not readily available in the villages. Thus, the average village viewer did not know what program he or she could see on a given evening. This sense of uncertainty and of perceived randomness in the broadcast schedule may have prevented villagers from building up loyalties to particular programs and may have been at least partially responsible for the decline in attendance once the novelty had worn off.

Specific programming techniques can be used to build up the habit of regular viewing on particular days of the week. A technique used with great success in many countries is the soap opera or continuing dramatic "serial," with stories continuing from week-to-week. Except in Kheda, this was little used, and holds promise for future programming.

Further experimentation on scheduling which is segmented by audience subgroups is clearly of high priority. It would seem worthwhile to try a

strategy where all of the programming on any particular night was directed at a particular audience -- women, children, farmers, or laborers, and substantial publicity given to that schedule by radio, billboards, and other media. Some nights would, of course, be designated for general audiences. SITE producers did schedule some specialized programs on particular days of the week -- e.g., a women's program on Monday, a children's program on Tuesday, etc., although other kinds of programs also were broadcast on the same evening. These strategies were not well perceived in the villages, however.

It would be worthwhile also to consider whether daily broadcasts might be too much, given the group viewing situation. It might be that a few nights a week of broadcasting could reach about the same viewership and permit more targeted local programming as well. Different nights might then be assigned to different language groups, as well as to audience subgroups.

It has also been suggested that programming might be concentrated during lulls in the agricultural cycle, when there is more leisure.

Television authorities everywhere have found that scheduling and programming must be a dynamic and continuing process, since viewing habits do change. In the U.S., and elsewhere, competition among broadcasting networks is the spur to that process and careful audience surveys provide continuing feedback. In the absence of such an obvious stimulus, countries like India will have to create for their own internal purpose a system of audience measurement that can tell them continually how many, and what kinds of, people are viewing their programs. SITE's feedback system performed this function during the SITE experiment, although the information was not often used to try different schedules. With such an information system, manipulations of scheduling and other programming factors can be based on empirical fact.

Diversity of Production Sources

It is also probable, in our view, that some competition among production groups may provide a long run stimulus to improving programming. While it is clear that Doordarshan is the sole authorized television broadcasting entity in the Nation, the precedents set by the ISRO and NCERT production for SITE show that it may be worthwhile for Doordarshan to share its production responsibility with other groups.

Summary: Programming Policy and Decisions

SITE presented a new set of issues to its programmers, the issues involved in maintaining an audience for an entire television network specifically focused on development. These issues transcend those involved in creating single programs or even a series of programs on development topics. Normally, audiences are habituated to viewing by commercial or public entertainment broadcasting and then are given small doses of instructional broadcasting. It is under such circumstances that most of the research used as a guide to development programming has been done.

SITE, on the other hand, had to maintain an audience with programming that was heavily development-oriented and that eschewed "canned" entertainment such as commercial films. The development programming itself thus was called upon to carry a heavy share of audience attraction and retention.

The SITE program producers felt that they had very limited power to attract an audience, given such external determinants of viewing behavior as the agricultural season and the varying social matrix of project villages. Thus, while they tried to make most of the programs as interesting and creative as possible, they did not tie their program scheduling to ratings on viewership.

Underlying the programming strategies was the dilemma of dealing both with a generalized village audience and with specific subgroups, principally the small farmer but also the landless laborer, craftsmen, women, and children. The more highly they focused a program on one subgroup, the greater the risk of boring other groups (although we found no evidence on that question). Further research on this important issue will be needed, with the fate of future programs increasingly dependent on a more precise definition of sub-audiences and of specific program objectives for them.

The SITE managers chose a broadcast strategy that did not depend upon developing and maintaining organized discussion and action groups in the villages. It is difficult to imagine them doing anything else, given the overall magnitude of their responsibilities. If the large scale of satellite activities tends to move programs toward that strategy, the implications are important, and there is a need for considering alternative strategies to facilitate local action.

While any large volume of programming is always subject to substantial improvement, as was much of this programming, two facts stand out: first, the programs succeeded in being readily comprehended by the village viewers; second, the villagers preferred practical information programs to entertainment programs. These are as good portents for the future as one could reasonably ask.

ACCOMODATING LOCAL DIFFERENCES

We turn now to a discussion of one of the most vexing problems facing satellite broadcasting systems, that of accommodating to local differences. The economy of satellite broadcasting arises from the ability of a single transmitter, in orbit, to reach a vast territory; however, the larger the territory, generally the less suitable is the same programming for the audiences reached.

The SITE distribution system made it technically possible to deliver the same signal to a large area at the same time. However, it was perceived that regional and local differences would make a single national program inappropriate in many subject areas. There are differences in agricultural practices, crops, and conditions, in level of economic and educational development, in kinds of resources locally available that could be used for new projects, and in culture or tradition. There also was the very significant problem of what languages are spoken. SITE recognized from the beginning that India was a nation of extremely diverse subcultures and planned to accomodate the programming to the different needs in a variety of ways.

Separate Programs vs. Dubbing

The SITE program producers attacked the language program in two different ways. Most of the time, they prepared separate programs for each language. This gave the opportunity to design programs appropriate to the needs of a particular area as well, because the language groups for the most part corresponded to the different regions involved in the experiment.

Because the satellite only transmitted one channel of video in this experiment, the use of different programs for different languages or regions necessitated transmissions rigidly scheduled for different times in each cluster. This resulted in a predictable set of problems that cannot really be avoided except by having more than one satellite channel, which is technically possible but considerably more expensive. The problems included: broadcasts that conflicted with the local dinner hours; cold weather in the evenings in some of the areas; time gaps between the national news programs and the local language broadcasts that meant that viewers either had to sit through programs they could not understand or leave and then return; and poor attendance during agricultural peak seasons that could not be compensated for by broadcasting less during peak seasons and more during slack seasons because of the inflexibility of the schedule.

In some cases, however, another technique was used to overcome the language problem. Programs would be dubbed with a second sound track. They were then broadcast with the two languages simultaneously, and what language viewers heard was determined by a preset switch that selected one of the sound tracks. This second technique was not popular with the producers, because they felt that the approach constrained their production style. The producers felt that the lack of "lip-synchronization" between the dubbed

sound track and the video whenever a talking face was shown was undesirable and might reduce program effectiveness. Yet they did not feel that good programs could be produced that did not include talking faces. Consequently they were very unenthusiastic about the use of the dual language track to overcome the problem of linguistic diversity. However, there does not appear to be evidence that viewers were bothered by the dual language track solution, as long as the content was of interest. The dubbing technique is used extensively by the Films Division for newsreels that are shown in Indian movie theaters and it seems quite successful in this application.

Additional experimentation with the use of multiple languages for the same program might fruitfully be conducted; substantial technical imperfection may be tolerated if the programs are instructionally effective.

Regional Differences

The variation in needs and conditions between areas must also be accommodated. Differences between regions are likely to be fairly general, such as the difference between wheat growing and rice growing areas. The regional level of differentiation was handled in SITE by the establishment of the three major Base Production Centers in different areas of the country. The base production centers produced programs for the reception clusters in one to three states, using one or two languages. The field shooting for these programs was then done in the general area for which the program was intended, and the content could be matched to the regional needs. (The use of several production centers was also helpful in dealing with the large amount of programming to be produced.)

The Limited Rebroadcast Strategy

Another method of accommodating local and regional differences was experimented with in the Kheda district. There the national programs were received from the satellite and broadcast terrestrially. They were supplemented by programs produced especially for the Kheda district by the ISRO studio at Ahmedabad. This approach makes it possible, in theory at least, to transmit programs that are of national or regional interest via the satellite system and still to develop programs that are especially adapted to very local needs and conditions.

During the early planning preceding SITE, the results of the co-operative engineering studies conducted in the United States had indicated that direct broadcast to community receivers would be most economical for widely dispersed communities, that large terrestrial transmitters would be best in the urban areas, and that some hybrid form of limited terrestrial rebroadcast of the satellite signal would be best for areas of intermediate population density. The Kheda arrangements represent an experimental use of the limited rebroadcast concept in conjunction with a local production capacity. The Kheda transmitter is 1,000 watts and was expected to give a Class A signal over a radius of 35 kilometers, but actually delivered it to a 45 kilometer radius. There are several hundred villages within this area, undoutedly more than are necessary for terrestrial broadcast to be more

economical than direct reception. The transmitting antenna has been especially developed for mounting on a microwave tower. The performance of this antenna during the year of operation has shown that it can be operated without causing interference to the microwave communications. The significance of using the microwave tower as a mount is that it saves the cost of a separate transmitting tower for the terrestrial system and makes it possible to consider a more extensive system of limited rebroadcast transmitters.

Considerations and Costs

It is the combination of the limited rebroadcast concept with a local program production facility that makes the Kheda laboratory more than technically interesting. Areas of the size covered by a low-powered transmitter tend to be homogeneous in terms of customs and agricultural needs, and could be serviced by programs that addressed their specific needs if it were possible to set up 'local' production centers to cover areas with common interests. There is some evidence that local production can be more attractive; the Kheda audiences stayed at 200-250 all year while the SITE audiences declined to about 50-80 on the average. It seems logical to assume that an increased effectiveness would be associated with greater popularity and greater attendance.

The degree to which local programming could become a reality is partly a question of economics. If the goal were to have local production in every district, more than 400 local production centers would be required. Just training the manpower required for such a large number of centers would be a staggering task. The ISRO staff estimates that it will take four years to set up and staff 10 of the larger base production units. They see the need for a minimum of 17 separate base production centers for nationwide coverage. The trade-offs are between exploiting the value of inexpensive direct reception from satellites and providing precisely targeted messages that require investment in a large number of production facilities.

Until recently, the cost of equipment for television production for broadcast has been fairly high, and the less expensive one-half inch formats have not been suitable for broadcast. However, as a part of the Kheda experiment activities, the Indian Space Research Organization has been successful in developing ways of using the inexpensive equipment for production. By using a digital time base corrector and other equipment for editing and transfer, they have been able to use material recorded on one-half inch for broadcast with no difference in quality between the half-inch and either film or one inch tape. The costs of equipment for a production system based on one-half inch tape could be dramatically lower than those based on one inch or two inch. For example, a one-half inch videotape recorder costs about $1,000, while a one inch recorder costs about $30,000 and a two inch recorder costs in the neighborhood of $100,000.

There thus seems to be considerable promise in a system using local production for limited rebroadcast centers as an integral part of the national plan for using television for development.

Optimum Size of Broadcast Units

What has SITE shown us about the optimal size and localness of such development broadcasting activities? It is clear that there are limits to the usefulness of national broadcasts in countries as diverse and as large as India. At the other extreme, numerous production centers, local enough to provide a community identity would require cumulatively enormous resources for staff and equipment. Some intermediate size levels, or else systems where development broadcasting emanates at several levels, are required.

SITE chose to conduct its news and general cultural programming nationally, and to do all of its development programming on a decentralized, common language basis. In an operational system, this would mean a minimum of about 17 production centers to cover the major languages of India, but would still omit many minority languages.

The Kheda production facility served a few hundred villages; to maintain this level of localization would require many hundreds of production centers. Kheda thus represents more of an ideal -- very localized broadcasting with a heavy investment in program production -- than a model that could be copied directly. Some compromises between these levels would be preferable to either extreme.

No clear guidelines about the optimal size of broadcast units have emerged, but several issues have been delineated by the experiment. On the basis of what we have seen, we would observe that:

- The size of the broadcasting area profoundly affects the strategy used for producing learning or social action; i.e., the larger the area, the less feasible is integration with the work of extension agents and community action groups. As size increases, administrative difficulties increase and the local appropriateness of programming decreases.

- The areas covered by the larger two base production centers were at the upper limits of what could appropriately receive common programming in some topic areas. The largest, Delhi, produced for clusters in three states. No larger (or more heterogeneous a unit for general program production and dissemination would seem desirable. In terms of creating effective programming which serves to involve an audience, a smaller geographical unit would be more desirable, but alternatively, such tailoring to local conditions might be dealt with through different scheduling or programming techniques.

- Geographic decentralization of production is clearly beneficial. One could profitably decentralize production among institutions as well. The Ministries of Health or Agriculture may be the best qualified groups to produce programs on those topics.

- Sharing of programs, when appropriate, would reduce production pressures at the regional and local levels. National programs, or excellent programs produced for local or regional use, could be dubbed into other languages and used in appropriate areas. This approach could meet specific program needs, raise the overall quality of programming, and serve as models for raising local production standards.

- The unit sizes in SITE were too large for a component of local action to be organized by the central unit. If India had institutions that reached into the communities to guide local activity, as political action units have done in China and Tanzania, it might be possible to take advantage of the extra effectiveness associated with organized listening groups. We suspect that lacking such groups, the best that can be done is the use of the "campaign" approach described earlier, where cooperation is focused on very specific goals for short periods of time. The organized listener group approach may fall to other media, where district-level administration and production of information is possible, as with rural radio.

RESEARCH ISSUES

The SITE experiment was distinguished by the extent to which it deliberately included research and evaluation in the processes of implementing the project. Some of the reasons for this have already been mentioned -- SITE was, after all, an experiment, and it was housed in an empirically oriented research and development institution. The involvement of research has provided many benefits. The major payoffs have been to provide a wealth of information about the functioning of the project, to identify issues that will have to be resolved for effective design and operation of other such projects, and to set a precedent for the role of research in future projects.

The type of research that was conducted was quite varied. It included: audience profiles and needs assessment studies to determine the context within which the project was to operate; pretesting of pilot programs; evaluation of the processes through which the project accomplished its effects, by collecting feedback and conducting micro-studies of specific programs; a summative evaluation of the project's effects by measuring the impact of the programs on children and adults; use of participant observers to conduct "holistic" anthropological studies; and conducting small sample in-depth studies, a program inventory, and content analysis of the programming. The scale of this research effort was impressive; for most of the project, over 100 people were involved in the collection and analysis of the data. More than half of these people were data gatherers stationed in the rural areas.

Research for Policy

The purpose of involving research in a significant way is to be able to make informed decisions about project structure and operations. It is thus imperative that the relationship between the research and policy formulation be given careful consideration.

The research has, for the most part, been of considerable use to the project and to planners who are designing India's future satellite communication activities. In fact, many of the things that might now appear to be shortcomings of the research effort are actually issues that have been brought to the surface by the answers that were provided during the experiment.

Synchronization of Research and Policymaking

One need that has been highlighted by the SITE experience has been the need to synchronize the evaluation process with the decision-making process, and vice versa. It often seemed in SITE that the major decisions about how to proceed or whether the nation ought to commit to this type of program were made before results of the experiment could be analyzed and discussed, thereby diminishing the potential value of experimentation.

Policy Orientation for Research

Similarly, the researchers and the policy makers must take each others' requirements and orientations into account, and focus the research on policy issues. The critical thing is to make a clear and direct linkage between the research activity and the kinds of information that are needed by the project planners. This requires not only researchers who are policy oriented and willing to exchange some methodological precision for the opportunity to give timely guidance to planners, but also an empirical orientation on the part of planners, who must see such information as a vital part of project development and who will actively help in formulating questions and in being foresighted enough that the research information is made available before decisions have to be made.

Most people trained in social science research have a fairly academic research background. When the relation between the research activity in the project and the policy or planning questions that need to be answered is not clear, researchers tend to fall back on their training and interests for guidance about how to proceed. Not surprisingly, this often leads to research that is more theoretically than practically oriented. (This is not to denigrate the value of theoretical research; real world projects such as SITE often make excellent laboratories for developing or testing theories. But such activity is not the same as research that will give pragmatic answers to questions about how best to structure an activity.) It is important to distinguish between the two in order to maximize the value of research efforts and keep a situation from developing in which research intended to answer very practical questions acquires too academic an orientation.

Often the difference is just a difference of perspective or approach. For example, one might ask whether broadcasting religious programs reinforces fatalistic attitudes among villagers. That perspective would probably result in a researcher turning to the academic psychological literature for an attitude scale measuring fatalism, and perhaps modifying it somewhat to fit the village environment.

He would compare the scores of people before and after exposure to religious programs and see whether there was a change. But such information would not be very useful for deciding whether to broadcast religious programs, because there is no indication of what significance such a change in fatalism might have for how one ought to plan programming.

Instead, one could take a slightly different perspective on the question and ask what behavior or attitude changes appeared to be the result of broadcasts of religious programming. One might then find that people liked religious programming, but that it did not seem to bring about changes in other areas of attitude or behavior. A policymaker could then use that sort of information as input when deciding whether to transmit religious programs. If behavioral changes did appear to be associated with the programming, the policymaker could evaluate the significance of the changes to the overall goals of the project, and make a much better informed decision.

Collection of Cost Data

Another essential input to decisions about how to structure a project is the cost of the different alternatives. Cost estimates are often left to be reconstructed by the management office after the project has been operating. This gives good information about what it costs to do the current activity, but with a little advance planning, even more valuable data could be generated. If different policy options for an operational system are articulated before the experiment starts, and designed into the project, separate costs can be tallied for each alternative, as well as separate effects. This combination of information is of considerably greater help in making transitions between pilot and operational projects than data on the effects alone. Research may also help establish what the likely relationship between the costs of running a small-scale experiment and the costs of a much larger project will be.

Research for Program Production

The SITE researchers recognized that the programs could be best tailored to audience needs if producers were familiar with the characteristics and environment of the audience, tested programs on representatives of the intended audience, and received information about the reactions by the audience to their programs. To accomplish this, they assembled profiles of the intended audience, pretested pilot programs, and collected feedback on reactions to and learning from the programs. Results of the pretesting and feedback were channeled to the program producers so that they could modify their practices to capitalize on the most effective approaches.

Needs Assessment

Needs assessment prior to designing the content of the programming is valuable in ensuring that the programs are well-focused and useful. Needs assessment must have a broad base of respondents. In this case, the needs assessment was restricted to asking the local development personnel what they perceived the priority needs of the area to be. This is a constructive and necessary approach; however, it alone is seldom enough. The success of development programs at the village level is often limited because the villagers see their needs in different ways from the local development workers, or because they are not able to adopt the practices that are being promoted for lack of money or access to materials, or because the practice does not fit the local conditions. These considerations must be taken into account for the programming to be successful; thus it is profitable to collect information at the grass roots level about the local conditions and perceived needs.

Information from the grass roots level can then be combined with that collected from the representatives of the development ministries and, with information about the national policies, can be used as a basis for setting objectives for the programs. Careful coordination must always be maintained between the assessment of needs among the target population and the planning of program objectives and the related activities of the ministries involved.

Pretesting

Research that was supposed to provide guidance for the production of programs was primarily of two types -- pretesting and feedback. The pretesting activities were a one-time affair at each of the base production centers, although this was more the result of equipment-related difficulties than of intent. This pretesting was done on pilot programs early in the production cycle for the base production center, before any of the programs had been broadcast, and was done on audiences that had had minimal or no exposure to television.

The pretesting activities produced information about the relative acceptability of various formats for audiences that had not been exposed to television before. This type of information (about, for instance, the confusion caused by flashforwards, the lack of success in using songs to carry primary messages in the instructional programs, and the tendency for the middle content of a program to be forgotten before the first and last segments) was used by producers as general guidance for subsequent production. However, the physical difficulties of transporting the heavy and expensive one inch videotape recorders to the field to do pretesting under natural reception conditions, and the need to have the videotape recorders available in the studio for the heavy load of program production, severely limited the pretesting done during the project. Except for the science education programs produced by ISRO's Bombay studio, where an evaluator worked full time, pretesting of programs for satellite transmissions was only done one time at each of the base production centers. Programs for terrestrial transmission in the Kheda district received considerably more pretesting.

As a result of the one time pretests at the major production centers, producers got little additional information about how quickly audiences could become used to the conventions used in television production. One suspects that an audience that has never seen television will be somewhat mystified by their first exposure, but that they can soon adapt to the new medium and respond much more predictably to conventional instructional techniques. In addition, the premature termination of the pretesting activity of the project precluded the collection of answers to much more "finely tuned" questions about vocabulary level, pacing, information density, alternative presentation formats, etc. In summary, one could say that pretesting gave some useful input about audience reaction and about problems associated with specific format choices. However, it was a slim base from which to generalize, and it gave no information about how quickly an audience might adapt to the visual conventions of television that seemed to confuse them during the pretests.

Some of the most successful instructional television efforts, such as Sesame Street, put heavy investment in pretesting and make it the cornerstone of their production effort. Frequently, pretesting of scripts alone can be a useful, lower-cost substitute for full program pretesting. If the production team has as its basic purpose producing learning in the viewer, there is great value in the process of pretesting and subsequent revision. That process requires intimate teamwork between the pretester and the production team.

Feedback

In contrast to the small amount of pretesting done, there was very extensive measurement of feedback of audience reactions to transmitted programs. After every evening broadcast, data were collected from a sample of the audience. Interviewees were asked which programs they liked least, whether they had had difficulty in seeing or hearing, whether they comprehended the content, whether they felt that the programs were interesting or useful, and other similar questions. The responses were compiled into average scores on each variable for each of the programs and given to the producers.

This procedure had a few shortcomings. The information that it produced was too general in most cases for the producers to use as a guide for changing their programs. It provided summary assessments of individual programs (e.g., "viewers rated the program 'B' in utility to them") but no interpretive information about what parts of the program the viewers found to be more or less useful. Knowing that the audience did not understand a particular program does not tell you how to produce a better one; learning that the audience felt that a program has little utility for them does not offer much guidance as to what would be more useful.

Additionally, the information came to the producers long after they had produced a particular program. It took about a month for information collected from the audience to be summarized and given to producers. But the producers usually were working two to three months ahead of the broadcast schedule, so the information they received was about programs they had last dealt with three to four months before. During the latter part of the experiment, the feedback system was modified to reduce the lag between the broadcast and the delivery of the feedback results to one week, and to include verbal (rather than aggregate statistical) reports from the data collectors about the audience's reactions to the program. However, this did not solve the problem of the two to three month lag between production and transmission, and it only partially alleviated the producers dissatisfaction with the feedback process.

One interesting result from the feedback research in this project is that information of an intermediate level of detail is often not as useful as information that is either fairly general or information that is quite detailed. For example, one would find it useful to know that in general, programs about substantive topics were liked better than entertainment programs. It would also be useful to know that in a specific program, the use of certain technical words prevented some people from understanding the instruction. However, it would probably not be very helpful to learn that Program 24 was liked much better than Program 25. All three of these types of information were collected at various times during the experiment; people involved in program production reported that the "ratings" type of data were seldom useful in helping them to produce better programs, even when it was broken down into slightly less general categories.

Using Pretesting and Feedback in Appropriate Roles

The circumstances described in the previous sections may have arisen in part because the roles assigned to the pretesting and feedback systems were in some ways reversed. The structure of the SITE evaluation differentiates between "Input Evaluation", which is pretesting of programs, and "Process Evaluation", which is collection of feedback and conduct of program -specific micro-studies.

The best use of pretesting is to make sure that the programs themselves are made to be understandable and informative. Feedback is the best way to make sure that the overall array of programming is on-target, is responsive to audience perceptions, needs, and changing circumstances. Ideally, the pretesting of programs would be an ongoing activity throughout the life of the project. Feedback and intensive studies of particular programs could then be used to provide data on how the system is operating, rather than on how well individual programs are received. Unfortunately, in this case the pretesting activities were prematurely curtailed. The feedback system was then used to pick up the slack, focusing primarily on individual programs.

As a result of these experiences, the plans for pretesting and feedback in the SITE follow-on broadcasts have been modified considerably. Doordarshan, which is responsible for the program production, has contracted with ISRO for an extensive program of formative evaluation. They plan to rely heavily on pretesting of programs, rather than collecting information about audience response after the program has been broadcast, because the information will then be much more immediate for the producer and it will be possible to revise programs prior to broadcast if the problems are particularly acute. The information that pretesting provides will be highly specific and in that way more useful to the producer than a summary rating of the audience's reactions to the program.

Feedback studies may also be conducted, but they would be somewhat different from the ones done during the SITE experiment. Rather than collect some superficial information about every program, in depth studies would be conducted on a few of the programs. These would provide data about audience reaction that includes detailed information about how the program relates to their needs and interests, and how the programming might be improved to make it fit the needs and rural situation better.

The formative evaluation will be done by specialists located at the base production centers, rather than at the ISRO headquarters in Ahmedabad. They will be able to use lightweight and easily portable 1/2 inch videotape equipment that will make the process of conducting pretests in the villages much simpler.

Research Methodology and Procedure

There are a number of ways in which choices between different methodological or procedural approaches can influence the effectiveness with which research serves a project.

Planned Variations

One way in which an experiment like SITE could provide a large amount of information for choices among alternative options for a subsequent system is the inclusion of planned variations in the original project design. SITE did this in a number of instances--for example, building in planned comparisons between standard and ruggedized sets, between battery-powered and mains-operated sets, and between villages with no "utilization" support and villages in which some support and reinforcement was provided. By using this approach, data that were collected for normal record-keeping purposes can be made to serve double duty as experimental data, and with the collection of additional experimental data, answers can be obtained to a large number of policy and planning questions.

In the case of SITE, this approach might have been used to even greater advantage in a variety of areas. For example, it was clear that resources and time for program production were limited; if a plan of systematically devoting different levels of needs assessment or pretesting to different program subsets had been followed, it would have been possible to analyze the impact data and estimate the tradeoffs between intensity of effort in program development and effectiveness of the program. Similarly, planned variations in the amount and type of liaison with the related development ministry or in the use of multi-disciplinary design and production teams could have been compared in terms of program effectiveness, cost of production, attitudes of staff, etc., without there being a very great investment in research. Such information would be of great value in planning the SITE follow-on efforts.

Small Studies

The SITE project also made effective use of a technique of running a series of small studies concurrently with the major evaluation work. The majority of these studies addressed questions of the social effects of introducing television in the rural environment. They looked at such issues as the effect of television on the leadership role of the village elite and at differences in reaction to the television-promoted innovations as a function of economic and social class. This technique could very profitably be expanded to include small studies directly related to questions of immediate policy interest. For example, planners of SITE follow-on activities could use information about the amount of simple maintenance activity that village television custodians could do if they were given some training, spare parts, and something like a picture-diagrammed troubleshooting guide. It would also be very valuable to know why those who have never attended the television transmissions have not done so, and why those who stopped attending have ceased to come.

Since some of the SITE programs seemed to be telling the villagers things that many of them already knew, it would be worthwhile to find out what the villagers' knowledge levels are in specific areas when planning a series of programs in that area. These types of small, ad hoc research projects seldom

need a great deal of methodological rigor or large sample sizes to provide the information that is needed. They can be conducted with a small staff, and a report that addresses the policy question can be written much more quickly than if a full scale effort is mounted.

Planning for Data Integration

Most of the SITE studies were discrete units, with wholly separate data collection and analysis. In many cases, this is the most logical way to proceed, especially when doing a number of small studies as has been recommended here. However, data collection for different studies can be planned so that the data are capable of being easily linked together when appropriate for further analysis. For example, data from the feedback activities are rightly collected in a completely independent process from the data for the program inventory and content analysis studies. Yet the pairing of the two data sets can provide a whole range of valuable additional analysis possibilities, because the effects and acceptability of programs can be analyzed as a function of their characteristics, such as topic, treatment, cultural authenticity, dominant themes, and the utilization of formative research guidelines in production. With only a small amount of forward planning, a file structure for the data can be created that will make the linking of different data sets for analysis a simple task.

Effectiveness Measures vs. Attractiveness Measures

As future feedback and pretesting work is carried out, the researchers will have to break some new ground to serve the project optimally, for they will have to deal both with the ability of a program to attract and hold an audience and with its ability to teach. Much of the academic tradition in pretesting is based on classroom use of media, where an audience is assured, and where the focus in on instructional effectiveness. A largely separate tradition, used largely in entertainment media, measures audience enjoyment. The village broadcasting element of SITE requires, first, that people watch and then that they learn. Some rather shrewd measurement systems for optimyzing both will need to be developed.

Rigorous Methodology

The methodologies that have been developed for academically respectable social science research reflect a need to reach a very high level of certainty and exclude nearly all possible alternative explanations of an observed phenomenon. They also need to be impervious to criticism from colleagues who may wish to challenge the findings. For these reasons, academic research requires a strict adherence to a rigorous interpretation of scientific methodology. However, such methodology is often slow and expensive, and may not fit a project's needs. The time factor makes the input too late to affect the project's actions, and the expense limits the amount of research the project can afford.

Such rigorous methodology has appropriate applications, but project research need not be restricted to that level of rigor. The output of research

for projects does not have to be expressed in terms of statistically significant differences to be useful to the project planners and inplementers. Planners should decide what the risk entailed in taking the wrong path is, and use that as a basis for determining how substantial an effort and how rigorous a methodology should be applied to a particular research question.

Often subjective information that would be extremely difficult to support statistically will be as useful, or even more useful, and it can be gathered much more quickly and less expensively. What is important is that the researchers keep alert to the possible misinterpretations which the rigorous methodology has been developed to guard against, and make the planners aware of what conclusions can legitimately be drawn from these data. No doubt such loose methodological practices will occasionally lead to erroneous conclusions. The possibility of getting considerably more information for the same investment ought to outweigh the risks as long as the level of rigor applied to the data collection is made a function of the importance of the decision.

INDIRECT EFFECTS OF THE SITE EXPERIENCE

A program of this magnitude can have broad and lasting effects that spread beyond the confines of the project. Indeed, certain such effects were explicit goals from the beginning. Some long-term indirect effects may even surpass the direct effects of the programming.

Development of the Electronics Industry

In planning SITE, many decisions were partially determined by the commitment to build Indian capability and experience. The electronics industry was one of the beneficiaries of that commitment. SITE equipment was designed by ISRO engineers to be produced domestically with the twin goals of minimizing the proportion of imported parts and minimizing the overall cost. While the SITE equipment was not produced on a large enough scale to have a large impact on the electronics industry (for example, SITE's 2,400 television sets were part of an annual national production of about 95,000), it did provide some valuable experience in handling the new technology and coping with the rural environment. The main benefits for the industry were not technological ones, but were related to experience and confidence. Some of the lessons learned were simple, having to do with the kinds of environmental conditions that equipment designed for rural use would have to endure.

Some of the experience that was gained was more general. According to Mr. Srinivasan of the Electronics Corporation of India, Ltd. (ECIL), which built the antennas, monitors, and front end converters for ISRO, they gained valuable management experience in meeting heavy short-term demand, using standard building blocks to make similar products, reducing costs, and solving unique problems.

A New Rural Focus for National Television

The SITE experience has altered the future direction of India's national television service, Doordarshan, toward developing major, special services for rural areas. The terrestrial follow-on to SITE will see the creation of a new television programming service, specifically for villages, covering much of the area previously served by the satellite broadcasts. This approach to utilizing the resource of television for rural development is a landmark departure for any nation.

One indication of the extent of the new rural focus is a recent decision to locate some of the production centers for the SITE follow-on in smaller cities, rather than in major cities, in order to increase their responsiveness to rural needs. This, together with the experience gained in producing programs for these viewers, shows exciting promise for the future.

An Experienced Manpower Pool

Longer term benefits arise from the creation of a manpower pool of

skilled and experienced people. The contributions made by SITE to the development of the electronics manpower have been largely indirect, but real ones. Valuable experience has been gained in coping with sophisticated electronic devices in a rural environment. ISRO staff gained a great expertise relevant to future satellite activities. A Limited Rebroadcast Van (LRB) incorporating a mobile 15-foot antenna and 100 watt transmitter was developed for demonstrating the capability of satellite transmission. A compact Outside Broadcast (OB) van is being prepared to permit recording of programs in remote locations. Advances made in the use of one-half inch video equipment for broadcast may revolutionize the Indian television industry and could eventually result in the production of one-half inch video equipment in India. The people involved in accomplishing these feats represent an enduring asset that India can call upon for further development projects. The ISRO technical team will largely remain at ISRO. Although they will work on other projects until INSAT becomes a reality, this managerial and programming experience will be, in theory, available to INSAT.

In software production and formative research, there have also been real contributions made in establishing an ongoing resource for future Indian work. Aside from the new institutional direction of Doordarshan, an important effect has been the experience gained by several dozen producers in creating agricultural, nutritional, and other programs that communicate to Indian villagers. The availability of such a cadre is of course absolutely essential to future operational programs. The ISRO experimental producers, involved with Kheda, will continue to work at the forefront of "production (R&D)" as the Kheda laboratory continues.

The skills and experience of the extensive evaluation staff will also continue to be available as a result of Doordarshan's contract with SITE's key formative evaluation personnel. As they develop an operational formative evaluation system for all SITE follow-on production centers, their usefulness will grow.

Knowledge of Rural Programming Techniques

As a result of the collective experience and emphasis on formative evaluation in programming, we expect that the quality of programming for the rural areas will continue to improve. The quality of programming has made impressive strides since the early experiments at Kriski Darshan, and equally large post-SITE gains might be anticipated. Indian television has moved from an intellectual awareness that programs must communicate to rural audiences to a set of procedures for keeping themselves on target.

Confidence in Indian Capacity

The confidence of those in India charged with conducting this massive program is now high, because of two factors: its largely successful outcome; and the decision from the beginning to do as much as possible without outside technical assistance. The success is therefore fully their own.

Uncertainties about the future revolve around questions of project detail, not of whether such programs can be managed. This sense of confidence, and the example it sets for other countries, may well be the most important outcome of the project.

OPEN QUESTIONS

There are several implicit choices in the SITE project that even the extensive research system will not be able to shed much light on. These are the choices to use a satellite rather than terrestrial broadcast facilities, to use television rather than radio or some combination of media and to use open broadcasting rather than to broadcast to organized listening groups. Some of these choices were mandated by special circumstances in the case of SITE, but they all have effects that should be examined for the sake of future planning activities. This section will discuss the issues and some of the experiences from SITE that reflect on them.

SATELLITE VERSUS TERRESTRIAL BROADCAST

In the case of India, an overriding goal for what came to be the SITE project was to reach the rural areas with television for development. Preliminary studies showed that a satellite channel could distribute the signal less expensively to rural areas than could terrestrial transmitters, and coverage could be attained more quickly. One effect of the use of satellite transmission directly to rural areas was that the usual urban orientation of programming was avoided. In cases where a television system grows from serving high population density areas out to serve the less densely populated rural areas, the content almost necessarily reflects the urban interests. This is not surprising; after all, the largest, most vocal, and articulate audience is in the cities, the producers are urban, and the precedent of programming for urban tastes and needs will already have been set. What the satellite does is make it technically possible and financially feasible to go directly to the rural audience without first serving the urban one. This creates the opportunity to program solely for the rural needs and establish a tradition of television in the service of development, instead of simply entertaining the urban elite.

Another effect of opting for the satellite is that it introduces a technological inclination for central programming. This is both an advantage and a disadvantage. It is an advantage because it makes it possible to deliver the same program to the entire nation at the same time, and because with a large audience, more money can be spent on developing high quality programs without incurring larger per-viewer costs. It is a disadvantage because there are only certain types of programs that will have universal applicability. For many topics, regional differentiation will be absolutely necessary. In some cases, highly local differentiation will be required if the program is to be appropriate.

SITE dealt with this problem in several ways. The time on the satellite was divided among the different regions and programs were prepared specially for each region. This, of course, reduced the time available to each region. Some of the time, one program was prepared with two audio

tracks so that the program could be understood by people of different language groups. This required that the content of the program be designed so that is was applicable to both language areas. It also influenced production techniques, because of lip-synchronization problems.

In the Kheda Laboratory experiment, a terrestrial transmitter was used to broadcast both national satellite programs and special, highly local programs. This alternative, the use of hybrid satellite and terrestrial transmission system to deliver both national and local programs seems to be a promising compromise between the advantages of satellite transmission in reaching rural areas and the disadvantages in terms of making local programming difficult. However, it introduces an additional cost for the terrestrial transmitters and the additional production facilities for the local programs.

Other, more mundane effects can also be attributed to the choice of satellite over terrestrial technology. Because of the strict deadlines imposed by the schedule of the satellite, the project received a strong sense of urgency that no doubt increased the efficiency of the project staff. And because the satellite is a high prestige item it was probably easier for the project itself to be accepted than it would have been for a more conventional technology.

TELEVISION VERSUS OTHER MEDIA

Radio is already available in the rural areas of India, and for literates there is a large selection of newspapers and magazines. What are the trade-offs between using these media or some combination of them versus relying solely on television? At the most fundamental level, the television obviously allows information to be communicated visually, which may prove to be a significant advantage in communicating with an illiterate audience. However, there is no information available about the extent to which the SITE programs made use of the visual aspects of the program to communicate, or about what proportion of the information could not have been easily communicated without pictures.

The reliance on television did have other effects. The differences in cost between television and radio, for example, in all areas -- cost of receiver, cost of preparing programming, cost of transmission per unit area covered, etc., -- indicate that the ultimate cost of an operational radio-based system, either satellite or terrestrial, would be considerably lower than that of a television-based system.

The cost of the satellite television receiver was high enough to limit the scope of the project to a relatively small number of locations.

On the other hand, because the cost of the satellite television receiver in essence limits the number of receivers, the television system creates an economic imperative for community viewing, which may be an advantage for other reasons. This same imperative might not apply so strongly in a terrestrial television system, because the cost of a conventional receiver is not beyond the means of the middle classes or small organizations. It would certainly not apply to a radio-based program. The potential significance of community viewing will be discussed in a later section.

Besides the limitations imposed by the cost of the receivers, television has other pragmatic restrictions. For all practical purposes, television is limited to villages that are electrified. Despite the success of the mini-experiment using battery-powered satellite television receivers in Orissa, a large-scale implementation of this technique does not seem likely, because the resources required to establish and maintain the battery system are considerable.

Additionally, unless a more reliable television set can be built, a television system will probably also be limited to villages that are fairly accessible by road on a regular basis. The SITE program managed to maintain a very high proportion of operational sets during the experiment in spite of a relatively high failure rate. They did this by choosing villages that were accessible and by operating an intensive, fast-responding, and highly mobile maintenance force. The cost of such intensive maintenance for difficult-to-reach villages would probably be prohibitive for an operational system.

Another possible argument for choosing television over other media is that television might be better able to draw and hold an audience than other media. There was certainly novelty effect in the introduction of television to villages where it had never been seen before; this resulted in very large initial turnouts. These initial attendance rates could not have been sustained (in the extreme cases, attendance was in the thousands) but the long-term attendance was somewhere in the range of 5-10% of the local population on any given evening, and a larger percentage of the population must have been reached because different people attended each night. Thus, the television does seem to have reached a significant number of people and to have sustained a reasonably large audience even after the novelty had presumably worn off.

Television seems to have more appeal than other media to planners as well as to the audience. It may be that a television project stands a better chance of getting implemented than do less exciting technologies.

OPEN BROADCAST VERSUS ORGANIZED VIEWING GROUPS

Experience in similar projects has shown that organized viewing groups with an explicit orientation toward discussing and/or acting on the television messages increase the effectiveness of the programming in bringing about changes. For all but a few of the SITE villages, there

was no attempt to arrange any organized activities or groups in support of the television messages. The establishment of such groups in 2,400 villages would have been an enormous undertaking, and obviously the task would only become larger in an operational system. There is no information from SITE as yet about the relative payoffs in those few villages where they did provide for some utilization support. If the difference in results is large, it might well be worth organizing reception groups regardless of the difficulty. If the difference is small, careful analysis would be required to decide how to proceed, because some differences might be due to inadequacies in the way utilization efforts were structured or run. The decision would not be an easy one. Even if optimally structured groups could make a moderately large contribution to overall effect, the cost and effort involved in organizing and supporting those groups on a nationwide basis still might overwhelm their advantages, or might cause the proposed project to be so unwieldy that it would never be implemented. Further investigation will be required to resolve this issue, and it is likely that new strategies will need to be developed.

COMMUNITY RECEPTION VERSUS PRIVATE RECEPTION

In the SITE project, community viewing was necessitated by the costs of the technology involved. However, even if future technologies make possible a system of private viewing, it is not clear that the potential advantages of community reception should be given up. For one thing, although unorganized community viewing might be less effective than viewing in organized groups, it still may be more effective than private viewing, because of the increased chance for informal discussion and social reinforcement of the messages. Another distinct advantage is that community viewing helps to solve the problem of differential access on the basis of wealth. In the SITE project, the receivers were located in schools or community buildings that were equally accessible to people of all castes and economic levels. In fact, the lower castes and economic levels seemed to attend SITE broadcasts in disproportionately large numbers. This offers a potential way of circumventing a frequent undesired outcome of development projects, namely, that the well-off benefit more from the information or technique presented than do the poorest.

The physical phenomenon of group viewing has both advantages and disadvantages. It may stimulate informal discussion and thereby increase the effectiveness of the programming. The "social event" nature of the viewing may serve as a motivation for some people to attend who would not view the programs in private. But the gathering together of people may also distract attention from the programs. Many of the viewers in SITE villages carried on conversations while attending the television broadcasts. During less interesting portions of the programming, the buzz of conversation could even compete with the sound coming from the television set. Whether this interfered with absorbing the content of the programs by either the talkers or by others who wanted to listen is

not known, but the possibility that group viewing could interfere with learning is clear. At the same time, individual home reception, if feasible, would undoubtedly reach many more people. For quite some time, radio will be the only medium inexpensive enough to be widely available in homes. A joint use of community television and of home radio broadcasting for development purposes would appear to be the system which could achieve maximum development impact. Indeed, some experimentation might be attempted in transmitting the audio track of selected TV programs (dramatic shows, news, etc.) on radio simultaneously or at another time. More importantly, one medium can be used to alert people to important programs on the other medium and to reinforce lessons across the two.

There is no definite answer to the questions presented in this section. In many cases, the decisions about what to do might well be based on other factors than ones strictly concerned with effectiveness at getting across the content of the programs. For instance, one might feel that the advantages gained from the mixing together socially of people of all castes outweighed the possible loss of effectiveness of learning caused by the distractions of the group situation. Or the decision about whether to use a satellite for development purposes might well be made in concert with a decision to use satellites to expand the telecommunications capability of a nation. Or television might be chosen as the medium for a development program because it seemed "inevitable" that television would be introduced in a country, and this represented a way to hasten its introduction and put it to good use at the same time. None of these questions have clear answers; they are matters for further experimentation and open discussion.

The remarkable result of SITE is that these questions have been transformed from academic issues to very practical ones, as it has shown us that large-scale development broadcasting can be a reality.

SITE has helped answer three of the basic questions asked for the last decade about satellite development broadcasting. Can so necessarily large-scale an enterprise be managed in a developing country? Yes, at least at the population coverage level of several million people, and with the skill and commitment of those who managed SITE. Can regional diversity be accommodated in a satellite system? To a substantial degree, yes, through a mix of national and more localized programming, with both program sources using the satellite. Can maintenance of village receivers be made reliable enough to create confidence in viewers? Clearly yes, if the villages are accessible and if the maintenance system is a serious priority. Thus, while questions remain in designing a development communications system to serve a heterogeneous society, SITE has made an enormous contribution to our understanding.