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THE ROLE OF INSTITUTIONAL RELATIONSHIPS IN COMMUNICATION TECHNOLOGY TRANSFER: A CASE STUDY OF THE INDIAN NATIONAL SATELLITE SYSTEM (INSAT)

by

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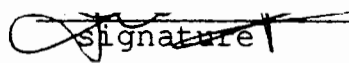

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ABSTRACT

Faith in the developmental potential of information and communication technologies led to the deployment of a multi-purpose communications satellite, the Indian National Satellite System (INSAT I). This is a study of the role of institutional relationships in the transfer of satellite technology to India and its consequences in two separate areas, broadcasting and telecommunications. Critical examination of documents, interviews with individuals in INSAT-related institutions, and personal experience at the community-level formed the basis of uncovering the institutional relationships and their consequences in terms of the promise and performance.

It was found that the power and influence of development- and education-oriented agencies are constantly undermined by competing institutions which have successfully shifted the focus of broadcasting and telecommunications towards a commercial, industrial and urban orientation. This shift has consequently enhanced the participation of global and big Indian industries in communications hardware and software: The role of international agencies is shown to be crucial in this process.

The Indian space programme is now poised for the indigenous manufacture and launch of communication satellites for INSAT II. However, in terms of using this technology, India has not displayed enough versatility or inclination to follow through and implement policies that benefit the majority of the people. Though the satellite was intended to deliver broadcasting and telecommunications directly to communities, lack of political incentives for the states, jurisidictional conflict over programme content, and lack of market incentives for the industry have prevented rural communities from having adequate access to these media.

This study concludes that when a technology is transferred from a developed context to a developing context it carries with it a range of institutional values and requirements that may not be compatible with the host nation's objectives. Therefore the gap between promise and performance persists. Incentives for various economic and political institutions within and outside India play a more decisive role in determining the use of communication technologies for unintended purposes. An understanding of INSAT institutional relationships is shown to be a first step towards the formation of suitable communication policies in India.

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DEDICATION

To my parents.

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THE RESEARCH PROBLEM AND METHOD

Technical limitations of extending communication services, especially, mass comunication in India resulted in the Satellite Instructional Television Experiment, SITE, and later the Indian National Satellite System, INSAT. SITE and INSAT were major communication projects for India and have led to a different set of policies and practices than those that were originally stated or intended. What implications these policies have for India and how they came about is the focus of the dissertation.

1.1 The Research Problem

Using INSAT as a case study, this dissertation will examine the role of major institutional relationships in the transfer of satellite technology to India and their consequences in two separate areas, telecommunications and broadcasting, especially television. Since information and communication technologies such as satellites are designed, developed and deployed in a few industrially developed nations as part of an overall industrial strategy, the consequences associated with technology transfers in general can be anticipated. Specifically in the context of INSAT comparisons have been made to the green revolution in India which bypassed the poorer sections of the society and accentuated the inequalites between the rich and the poor.

The transfer of satellite technology to India was based on high hopes for achieving desired socio–economic goals. The experience so far has been that the actual benefits to the intended audience, the bulk of the rural population have been far less than anticipated. This thesis is an analysis of the gaps that exist between the promise and performance of satellite technology in India. The analysis is specifically directed to explain how and why these gaps exist by examining the structure and role of major political and economic institutions in decision making at various levels. The major questions to be addressed in this dissertation are:

1. What are the institutional relationships that led to the transfer of satellite technology from the US to India?
2. What factors led to the transition from an experimental (demonstration) phase, SITE, to an operational satellite system, INSAT, in India?
3. What are the consequences with regard to two major applications of INSAT, telecommunications and broadcasting?

Satellites act as an apex communication facility that can lead to the introduction and expansion of communication technologies such as television, computers, facsimile systems and so on. Their capacity to integrate the related technologies into a communications network is what extends the scope of the study to examine some related forms of communication and information transfer that can take place and what impact such transfers have with regard to the declared objectives of using satellite communication for rural development. Some of the recent policies in India with respect to INSAT raise questions as to the original intent of INSAT and the ends they are now serving. However, these policies give only a direction because the implications of such policies have not yet been studied critically. Analyzing the institutional relationships that lead to the changed policy framework for sateflite technology in India is a major task of this study.

Because SITE and INSAT involved major investment in satellite related technical and software support, it is important to understand the basis of the decisions regarding choice of technology and its applications. Since INSAT became operational there have been significant changes in terms of a massive expansion of television to cover the entire nation, evolution of information networks, and a boost to the electronics industry, particularly the TV industry.

Changes in the policy approach came when the government, sometime in 1984 (post-INSAT period) began to go beyond the 'sacro sanct' framework of the Industrial Policy Resolution, (IPR), 1956, as far the development of communications infrastructure was concerned. The main thrust of the policy was to recognise the changes in communication technology. According to M.S. Sanjeevi Rao, a Deputy

Minister, Electronics, in Mrs Gandhi's cabinet: " the broad interpretation of the IPR, for the development of communications infrastructure had become necessary because of the rapid advances in technology and the increasing standardisation of telecom equipment with well defined terminal interfaces." According to Sanjeevi Rao this change needs the help of the private sector because it would "obviate the situation where we, at a later date, may either be unable to produce the basic equipment or import such equipment or not meet the legitimate demand of the communication sector."[1]

However an anonymous analyst argued that what the Deputy Minister meant by private sector was foreign private sector's enlarged role in the area and not Indian private sector because only the transnationals command the "technology and interfaces."[2] This policy offered the multinationals increased equity in the public sector undertakings in the communications field either directly through and in collaboration with selected Indian big business houses who can "inspire confidence among the multinationals" about the security of their investment in the Indian market. The recommended arrangement was a "tripartite collaboration arrangements between Indian public and private sectors and the multinationals."[3]

In the context of INSAT, it is crucial to examine these changes and how they occurred, because they have a bearing on many social policies in India. For example, since INSAT was started, there has been more emphasis on announcing industry related policies and less priority for community viewing sets or public telephones in rural areas. Since the focus has shifted to a contradictory priority, viz. second channels for urban TV centres, dismantling existing rural transmitters to provide additional facilities for cities, strengthening studio facilities, provision of more telephone lines in cities etc., it is relevant to study how this shift occurs and who decides on these policies. A study was therefore needed to understand the policy framework in which new technologies are introduced in the first place and how they were applied for various uses in different contexts. What methodological approaches would allow the conduct of this study? Obviously a choice can and should be made, and this dissertation is based on the choice of studying institutional relationships and their consequences.

1.2 Methodology: Institutional Relationships

The introduction of satellites in other countries for developmental purposes and their subsequent shift towards competing uses have been analysed recently in the case of Morelos satellite system in Mexico[4] and Brazilian Satellite System (SBTS) in Brazil[5]. In the case of Morelos, based on historical reconstruction of events, the influence of domestic and foreign economic, scientific-technical, political and cultural factors over time have been analysed. The Berrego and Mody study argued that Mexico is an illustration of how a sophisticated communication technology can be adopted without an appropriate policy or vision: "The source of the problem is not the technology, or the foreign sales person, but the domestic power structure in the adopting nation that perpetuates the dependency relationship...with the transnational corporate manufacturer of satellites."[6] In the case of Brazil, it has been shown that though historically the original plan was to use the satellite for social applications, Brasilsat system after its launch provided only an additional telecommunications link to the terrestrial system. This transition has been attributed by Nettleton and McAnany to the politics of planning process which has decided how the satellite is going to be used in development efforts:

> The greatest obstacles to full utilization have been political and institutional factors, which have limited the horizon for new applications appropriate for the satellite. On the one hand, commercial applications such as data communications have run into formidable barrier because the attempt to introduce private enterprise into a sector dominated by the state monopoly, Embratel, has generated political resistance. Moreover, Embratel's institutional planning process emphasizes engineering issues, rather than the creation and development of new services and markets for the satellite. On the other hand, social services have been stymied by the lack of an appropriate institutional base, and the lack of political will at the national and ministerial levels to fund and implement them.[7]

This approach suggests it is desirable to make a critical analysis of INSAT as a communications infrastructure by evaluating technology policies and decisions and their institutional relationships. In order to fully understand the process and consequences of technology transfer, it is necessary to recognise that impact studies that deal only with social and learning behaviour of individuals as a result of exposure to the communications media are limited in that they ignore the power relations. It has been noted that "changes in institutional structure, the centralization of economic and political power, domination, and the

incentives of vested interest groups in the communication/information sector have received inadequate attention."[8] An examination of these issues will help us to raise critical questions that challenge the status quo and direct the use of technology for desirable socio-economic goals. These goals, as many studies have pointed out, should be based on national realities. Hence a detailed examination of these institutional relationships in a particular context is considered crucial. How can this be done? Mansell outlines an approach based on her study in Canada.

> ...is a form of institutional analysis , i.e. the study of economic and governmental institutions, their structural relations to one another and their incentives. This approach facilitates examination of historical and dynamic changes in political and economic relationships... in the case of the communication/information sector, an institutional methodology directs research to the characteristics of government policy and industrial policy and industrial perfomance, the structure of domestic and international markets, and the incentives that are predominantly responsible for public and private sector decison making.[9]

This approach emphasizes the fact that there is no neutral position with regard to technology and that policy incentives among the powerful interests do create a conflict in the realization of socio-economic objectives for a majority of the population. All of this has to be identified through institutional analysis.

The focus will be more on analysing INSAT as an institution that is influenced by national and international interests that conflict with the 'socio-economic' objectives of India. Some of the basic questions about the institutional relationships are:

1. Who were the significant players and actors, including institutions, national and international; What were the incentives involved for the institutions that collaborated in SITE and INSAT;
2. What implications did the interests of these agencies have for the communication policies in India;
3. How did institutional relationships affect the broad social objectives of equality, rural uplift, and alleviation of the problems of the weaker sections.

Since this dissertation ends with certain policy recommendations, the research plan operates within the framework of recognising INSAT as an apex institution with many interlocking institutions, each operating to safeguard and further its own interests. It is very difficult to arrive at any conclusions

without examining the institutions and their interrelationships. Following INSAT there has been an expansion of television service and the introduction of related technologies. Their consequences have to be analysed to examine their impact on developmental goals and adequate access to the majority of the rural population. Since the consequences are related to decisions in the first place, the study will focus on all the major institutional factors involved in the introduction and subsequent use of satellite technology in India.

1.3 Data Collection

INSAT institutions at the national and international levels were identified through documentary research preparatory to the field visit in August 1986 between August and December 1986; to follow up research on the institutions, interviews with key policy makers in the introduction and application of satellite technology were conducted. Scientists at the Space Applications Centre, Ahmedabad provided answers to many of the questions regarding the formative years of SITE and the transition to INSAT. To understand the consequences in two separate areas, telecommunications and broadcasting, various institutions were selected for interviewing decision makers. Newspapers and journals, especially the ones published in India have provided useful information to monitor the developments in the telecommunications and broadcasting sectors and overall policies and progress of INSAT.

1.4 Chapter Outline

Since the study is being conducted within the broad area of institutional relationships that affect international technology transfer, case studies that specifically address these relationships in agricultural, machine tools and industrial technology transfers have been presented in Chapter II. These case studies will provide a methodological guidance to understand the institutional relationships in INSAT and also demonstrate their significance for the gap between promise and performance of technology. The fact that technologies are designed, developed and deployed by particular social forms for particular political and

economic purposes has been demonstrated through these case studies.

Chapter III specifically analysed institutional relationships in the US where satellite technology was developed, with a view to explain the transfer of satellite technology to India. The military, industrial, commercial and international institutional incentives that prompted the design, development, and deployment of satellite technology in the US and the competition and conflict in this process have been presented in a contextual perspective.

The institutional relationships within India that prompted the choice of technology and their articulation of socio-economic objectives for INSAT have been analysed in Chapter IV. The analysis reveals the key role played by Sarabhai and the the conflict between the Defense and Atomic Energy Departments in India to control the electronics industry. Satellite technology and television expansion for development were used as a strategic device by Sarabhai and his colleagues to wrest control of the development of electronics in India. UNESCO, Ford Foundation and a number of other institutions played a key role in advocating television for India and satellite technology as the option.

The telecommunications application of INSAT has been analysed in Chapter V. It has been established that despite the potential of the satellite for rural telecommunications, it is being used more as a supplementary link to the existing network and is being used for information networking. The consequences of greater participation by the transnational corporations in Indian software industry and the links of Indian industry with foreign data bases have been analysed in this chapter.

Considering the fact that a major application of INSAT has been the nationwide expansion of television, its uses for entertainment purposes have been analysed in Chapter VI. The consequences of greater participation by outside agencies in TV software production and its effects on inhouse and small producers have been analysed. It has been established that despite the enormous revenue that Doordarshan (Indian television) gets from these programme, the promotion of consumer and advertising oriented values is in conflict with the egalitarian objectives of many social programmes in India. A brief description of the increased control and unabashed use of television for political purposes in India is

provided in this chapter.

Developmental and educational instituions have been analysed in Chapter VII. Their incentives and the consequences of using high technology oriented educational support materials have been addressed. It has been demonstrated how the institutional conflict between the Central and State governments can affect the accessibility of the rural masses to community TV programmes. Further, it is clear from this study that the question of creating an appropriate community viewing programme in the rural areas has not been addressed or resolved adequately.

A synthesis of the study is provided in Chapter VIII and policy recommendations are suggested based on the study. Strengthening the developmental support for utilising the full potential of INSAT and adequate access of the rural areas to the communications media are the main policy recommendations that emerge from this study.

CHAPTER II

INSTITUTIONAL RELATIONSHIPS IN INTERNATIONAL TECHNOLOGY TRANSFER: CASE STUDIES

In chapter I the problem of satellite technology transfer was located within the broad area of international technology transfer with a view to emphasize the fact that the mechanism of technology transfer, especially in an advanced technology such as satellite technology, involves institutional relationships. In this chapter, institutional relationships in the broader area of international technology transfer will be explained through the support of case studies in agricultural, industrial and communication technology transfers. The relevance of these studies to the case of INSAT is based on the bridges that exist between industrial and agricultural technology transfers and communication technology transfers. Alan Hancock describes this connection in a succinct manner:

> Until recently, concern over technology transfer has been confined primarily to technological and economic spheres. This observation applies both to international technology transfers, which are dominated by foreign investment and aid, and to internal transfers between LDC (less developed countries) science systems and the production sector. As a result, some of the wider issues which relate to technology transfer, particularly its sociocultural impact, have been largely ignored. While this situation applies to any industrial or agricultural technology transfer, it is particularly relevant in communications and broadcasting, since the product carries a message, which may affect in fundamental ways both the direction and the forms of the development process; it may also influence directly viewer/listener perceptions and attitudes.[1]

Therefore it is necessary to understand the role of institutional relationships in international technology transfer and demonstrate these relationships through specific case studies which would provide a good basis to examine the role of institutional relationships in INSAT technology transfer.

2.1 Case Studies in Technology Transfer

Because of the inter-institutional relationships in information and communication technologies, the process of communication policy formation is essentially competitive. Since all these institutions do not have the same power, the policies are formulated on the basis of the relative strengths and weaknesses of

the institutions involved. As a result, the consequences may not be exactly what is desired or expected by the developing countries. A few case studies of communication and non-communication technology transfers will illustrate the decision-making process and its consequences to the host countries. Four case studies have been selected to illustrate this:

1. Adoption of a North American color TV standard in the Andean Pact countries;
2. Deployment of a communications satellite in a few countries in the Pacific region;
3. Transfer of machine tools technology to India; and,
4. Agricultural technology transfer and the resulting creation of a University in India.

Case studies (1) and (2) reveal institutional relationships and consequences specifically in the area of communication technology in two important developing regions of the world, Latin America and the Pacific region. Case studies (3) and (4) deal specifically with India and are intended to reveal the institutional relationships in non-communication areas such as machine tools and agriculture. All these case studies, reveal the importance of the institutional and relationships involved in technology transfer and the gap between promise and performance. The common threads running through each of the cases are explained at the end of the chapter.

2.2 Case study 1: Color TV in the Andean Region

The introduction of color TV and the adoption of a particular color standard in the Andean countries of Chile, Bolivia and Peru illustrates how national elites and international (government and corporate) pressures influence the formation of communication policies.[2] The process of introducing color television in the Andean region began with a collective decision by the Information Ministers of the Andean Pact countries to carry out feasibility studies on various aspects of color television. Though there was some concern by the Andean representatives that color technology was a luxury which poor countries could ill afford, there were international pressures from a few developed countries and their TV equipment manufacturers that were prompting these countries to introduce it. At the national level, the pressures came from the bureaucrats who were already exposed to color television through satellite

transmissions. For example, in Peru, "astute" marketing strategies were used by TNC suppliers who donated color receivers to high level bureaucrats which understandably had substantial impact on further discussions.[3]

Advocacy for color TV at the national level resulted from a desire for modernization among television managers. The eagerness of the TV engineers to try new technologies, and a desire to catch up with the "industrial countries' standards," regardless of local needs, created an initial interest in color TV. After numerous feasibility studies and protracted discussions, the issue was no longer whether color TV should be introduced or not; all parties agreed that it should be introduced. The issues became when and what kind of a system should be adopted. Technical studies conducted by all the countries had suggested that the North American System, NTSC, was not convenient and that the PAL system was technically superior. The two powers in the region, Argentina and Brazil, had variations of the PAL system as well as compatible TV manufacturing industry. Adopting a different color standard clearly reflected local fears of being dominated by their neighbouring countries. It was rationalized that a different color standard would not only act as a barrier for the flow of foreign TV programmes but would also limit the sale of TV sets manufactured in these countries.

The international pressures to introduce color television in the Andean region included the active participation of governments whose TNCs had enormous incentives to push for color TV technology which would translate into the sale of TV sets, programmes, and other support services. All the major industrial countries—Japan, US, France and West Germany—exerted pressures. Except for Japan, which possessed the capability to manufacture TV sets suitable for different standards, all the other countries were interested in the adoption of their respective color standard. France, for example, offered a soft loan to Peru in exchange for its color standard, SECAM being accepted.(The reasons for France developing this standard have been mentioned earlier.) Once this offer was rejected, the Embassy countered with an even more attractive package comprising a 80 percent equipment and a 20 percent training component. France had also sponsored a tele-education project. In Bolivia, the National Council for Higher education had introduced NTSC at the Universities in agreement with an American educational

institution. Its report to the officials concerned favoured NTSC. Philips was interested in the PAL system because it felt it could control the receiver supply and therefore it brought real pressure to bear on some engineers. Meanwhile, the Bolivian-German Chamber of Commerce and Telefunken were both interested in one standard for studio recording and another standard for transmission. An internal report mentioned that TV sets could be supplied from their subsidiary in Brazil, yet knowing that Bolivians did not want to open their borders to Brazil, they strategically avoided discussing this alternative. However, the Bolivians had requested technical cooperation from the US and accordingly a representative from the American Commerce Department prepared a document in which for obvious reasons he favoured NTSC. According to an "internal memo" the Bolivians regarded this recommendation as having being thrust upon them.

The decision to introduce color television in the Andean region was clearly a product of national and international pressures. International pressures operated on the right assumption that Latin America is no longer the "mere backyard of the US." Other advanced countries are challenging US domination and desire both a share of the market and influence in the region. In the end, the choice of NTSC rewarded two major contenders, Japan and the US. For the US, it was a continuation of its influence in the region[4] and for Japan, which possessed the capability to manufacture TV sets for different standards, it was an expansion of its electronics market. In addition to such pressures, an element of internal conflict surrounding the decision-making process was apparent in Peru's adoption of NTSC.

Peru was the only country in the region that had a "reasonably comprehensive" communication policy in the 1970s: "Broadcasting was considered as an indispensible means to reach ... illiterates and carry out educational reforms." The telephone and telegraph networks which were owned by foreigners were appropriated by the state in 1969, and a national agency, National Enterprise of Telecommunications, ENTEL, was created. Television, first introduced in 1958 as an educational experiment inspired by UNESCO, was by 1971 dominated by private stations (all but one) with an advertising-oriented emphasis. By 1974, through a series of developments, various state entities controlled the media and a central agency, the National Information System (SINADI), had been created. The creation of SINADI was a

compromise to satisfy the leftist and conservative military factions of the Army. During Valesco Alvardo's rule the color television issue was not raised; there was no doubt at that time that color TV was a luxury. However, after Alvardo was overthrown, the new government responded to the Andean Pact intiatives by discussing the issue of color television.

Satellite transmissions had introduced color to a few people and SINADI felt that such transmissions should be banned. At the same time it wanted to capture the Latin American markets through the export of color TV programmes. At the decision-making level, conflicts between the minister and his technical experts existed. The minister favoured NTSC, because he thought it was superior, while the technical body favored PAL because it was considered to be technically superior. Japanese experts had penetrated the telecommunications department and the Japanese External Trade Organisation acted as a channel to provide specialized information about color television. The Federal Republic of Germany and France were also interested in introducing color television because both had developed color TV standards. TV manufacturers such as Philips, wanted to transfer the PAL system and utilize its branch plants in Argentina and Brazil to supply TV sets. The Peruvians feared the power and influence it would afford Argentina and Brazil if PAL was introduced. Consequently, Philips, sensitive to Peru's fears, did not want to push its technology very forcefully. Overlooking the technical superiority of the PAL system, NTSC was accepted in the end because the US consulate intervened and pushed for NTSC.

The adoption of a particular color TV standard in some countries of Latin America reveals the role of institutions and actors in the decision-making process and how such decisions reflect the comparative power of different institutions. Bascur has demonstrated how the technology was acquired (transferred). She has noted that in this particular case, the decision-making processes were not 'problem oriented.' "The decisions came from a desire for modernization among television managers and the eagerness of engineers to try new technologies ... Apart from this, decision-making processes were also triggered by ministers' and other decision-makers' inability to resist pressures from suppliers and agencies in the industrialized countries ... the process consisted mainly of reacting to stimuli created by interested foreign parties."

Bascur's study is important for our understanding of communication technology transfer as communications industries (high tech) are located in a few industrial countries and owing to a variety of factors, these countries have enormous incentives to transfer these technologies to the developing countries. Whether these technologies can address the problems of a developing nation becomes irrelevant as the transfer process is more often guided by narrow national elite concerns and international commercial and political interests.

2.3 Case Study 2: PEACESAT–Institutional Relationships

The distinctly political aspects of communication satellites are evident in the Pan Pacific Education and Communication Experiment (PEACESAT) project in some regions of the Pacific. They can be understood if we look beyond the hardware considerations and include institutional aspects. It is the insitutional dimension which shapes the political character of the technology. These aspects become evident in the hierarchical structure of the project, relationship to other institutions, and the unstated objectives or the hidden agenda of the project. Plant incorporates these relationships into his analysis of PEACESAT.

PEACESAT was intended to link 17 different locations in the Pacific Islands and the Pacific Rim through an audio–conference link. Christopher Plant examined the extent to which PEACESAT was appropriate to the development process of the Pacific Islands. Through a critique of modernization, development, and diffusion approaches, the author has established that it is necessary to go beyond these conventional approaches which analyse the impact of communication technology upon a given social structure merely in terms of whether people move from traditional means of subsistence to an increased dependence on industrial mode of organization. The audio–conference link established through PEACESAT was intended to improve upon the conventional approaches by focussing "on 'two–way' telecommunications systems which were seen as able to prevent the economic and cultural imperialism that 'one–way' systems had promoted."

This 'new paradigm' still ignored the institutional questions of ownership, control, and social structure. By adopting a "core-periphery" analysis,[5] Plant revealed the underlying institutional relationships.[6] For example, John Bystrom's role, as initiator of the project, has been analyzed in terms of his background. His background in speech communication, his association with two White House Task forces on educational technology and the use of satellites in developing countries, and his experience in drafting Public acts are indicative of the interest and expertise he brought to the project. Bystrom was well aware that for technical reasons, PEACESAT's ATS-1 was in a geo-stationary orbit over the Pacific ocean. He was also aware that the ATS-1 was the only non-military satellite capable of pursuing his interests in education and telecommunications. This, coupled with the fact that he had worked in the Pacific region during War, led to the selection of Hawaii as the central location for the project.

Plant found it difficult to ascertain a well-articulated statement of objectives for PEACESAT. However, according to Bystrom, the satellite was intended to demonstrate the benefits of telecommunications technology to the needs of sparsely populated and less industrialized areas of the world. These objectives were based on the perception that an inadequate communications infrastructure constitutes a barrier to community development. Accordingly PEACESAT was also intended to link individual institutions of higher education and extend health education services in the Pacific basin.

Institutionally, PEACESAT was organized hierarchically at four levels: NASA; the principal investigator; the local sponsoring institution, licensing authority, and the Terminal manager; and the user. In terms of establishing PEACESAT terminals, different regions had to interact with their telecommunications authority in order to get licensed. For example, Papua New Guinea, a former UN protectorate under the Australian administration, could not get a license even though there was an interested manager. In order to assess the support from many countries in the region, Bystrom wrote to all the ministers of communications or their equivalents seeking their feedback and ultimately their support for PEACESAT's demand for frequencies at the World Administrative Radio Conference (WARC). There were different responses to Bystrom's communication. Only Hawaii and Tonga supported the request while Australia and New Zealand were non-committal. Fiji was concerned that

despite good intentions, PEACESAT was adversely affecting the revenue of Fiji's telecommunication agency. It was also seen as a threat to the growth of a regional telecommunications system and therefore Fiji refused to support PEACESAT's requests for frequencies at the WARC. Similar views, though not expressed as clearly as Fiji's, were expressed by the Soloman Islands.

The further development of PEACESAT initiatives in the 1970–73 period reveals the nature of the conflict. While more terminals were being established, the threat to PEACESAT came from NASA itself which felt constrained in terms of its mandate from the Congress to restrict its activities to an experimental nature only. PEACESAT was becoming more of a service than an experiment which impinged upon NASA's mandate, particularly for the ATS–1, to provide an audio link for the Rocky mountain experiment using ATS–6.

By analysing PEACESAT at three different levels—technical, institutional, and developmental—Plant concluded that the technical aspects of the experiment can be considered a success. As a technical experiment, it was a success beyond doubt. As a demonstration, it was effective in terms of conveying the idea of its possible applications to a public with little specialized knowledge. The people of the Pacific Islands were privileged to have been part of such a demonstration for such an extended period of time. However, there is a danger in considering a technical system to be a neutral and, somehow apolitical phenomenon:

> All technologies are devised by particular social forms for particular social purposes. Equally a "technology" must be regarded as comprising both a hardware and an institutional component, both of which are inevitably designed for use by interests in a particular manner and for particular purposes. As a consequence, technologies are by no means readily transferable across cultures, since much more than the hardware component of the technology gets transferred with the subsequent risk of undesirable consequences vastly outweighing the desirable consequences because of very different social and cultural circumstances.[7]

The major question that arises out of PEACESAT is whether the transfer of technology embodied in INSAT leads to similar undesirable consequences. In order to more fully understand INSAT's technology transfer, it is necessary to examine a few case studies in areas such as agriculture and machine tools in India because they are related to development strategies pursued after independence.

2.4 Case Study 3: The Green Revolution and the Creation of a Agricultural University (UPAU)

The Green Revolution was marked by substantive technological changes in the cultivation practices of India; it was not simply a process of diffusion of new agricultural practices. India, for example, incorporated a range of innovations involving national and international linkages that began with the identification of agricultural underdevelopment as a problem, followed by a more particularized definition of that problem, and arriving at seemingly satisfactory and feasible solutions. It was commonly held that by increasing food grain production, with a view to generating a surplus, the building of a modern nation could be realized. Unfortunately, the ability to implement such a vision was severely wanting. Although the government had adopted the idea of an agricultural research centre as the basis for improving and increasing agricultural production, they were faced with an existing post-colonial infrastructure opposed to their needs. The existing infrastructure was more suited to cash crops which served the interests of the UK rather than the Indian people. The governments' challenge was to raise the production of essential crops such as rice, wheat, and millets rather than foreign-controlled plantation cash crops such as tea, jute and cotton. The production of rice and other cereals was largely controlled by small farmers who farmed primarily for subsistence rather than for market consumption. Mobilizing these farmers to increase production was thus perceived to be a major task of rural development. It was in this context that the Indian government took an active role in the Green Revolution. To this end they sought scientific and technological assistance from the US and other developed countries. Implicit within this assistance were First World models of development. It is within this paradigm that the creation of the Uttar Pradesh Agricultural University at Pantnagar (UPAU) should be viewed.[8]

The design of the University itself, according to Paul Brass, "represented a large-scale institutional transfer of technology, for it was explicitly modeled on the pattern of land-grant institutions to combine agricultural education, research and extension at a single center."[9] Though it has made important contributions to the Green Revolution throughout India, it has also had some unfortunate consequences such as campus unrest, labor problems and the pursuit of research that ignores the realities of rural

economy and politics in north India. These consequences call into question the value large scale technology transfers of the kind involved in the Pantnagar university.

The significant differences between UPAU and the land grant colleges in the US upon which it was modeled were ignored. One of the major renferences was the existence of strong farmer constituencies in the US which enabled the government to integrate activities to suit its purpose. Such a constituency was absent in UP. Thus, the UPAU became a creation of government planners, *solely*, with limited government constituent interaction:

> A farmers' constituency and farmers' association preceded the formation of the US agricultural colleges and experiment station, which arose partly in response to their demands and to serve their interests. In UP no comparable constituency existed when UPAU was founded. The UPAU is a creation of government planners and bureaucrats, scientists and politicians, working under the guidance—not always followed—of foreign agricultural specialists, all of whom thought they knew or knew how to find out what the peasants of UP needed to become productive, efficient farmers.[10]

The agricultural farm that was developed within the UPAU opposed some of the existing customary forms of social organization in rural north India such as the patron-client relationship of the landlord and his tenants. The values of the scientists working at UPAU, presented a further conflict. The scientists believed, for example, that extension of new agricultural practices and technologies should be implemented first by rich farmers and, that it would subsequently "trickle down" to the subsistence farmers. This did not occur.

At the foundation of UPAU was the belief that its graduates would return to the rural areas and apply their skills. However, many of the graduates did not do that. Instead they preferred to join either the government or other institutions. Further overcommercialization of a seed farm within UPAU let the market rather than the needs of the subsistence farmers dictate price. Consequently, social conflicts also arose. These conflicts emphasize the need for anticipating and evaluating the undesirable consequences of transferred technologies within varying institutional frameworks. Many observers in India compare the problems associated with the Green Revolution to the communications revolution brought about by the use of satellites and the like. Whether such conflicts will occur remains to be seen. A study of INSAT may reveal the nature and consequences of technology transfer that are involved.

The creation of UPAU is one of the many aspects of the spread of green revolution in India. Though the role of external agencies has been noted in this specific case, it should not lead us to believe that the green revolution and its consequences are due only to external factors. The structural changes brought about through existing agrarian reforms (and their abuse) had led to a situation where the affluent farmers sooner or later would have acquired these technologies in any case. These issues have been addressed by others.[11] The significance of this case is to recognize the emergence of particular classes and interests which stand to gain the most from technology transfers unless the technologies are deliberately used in the interests of the majority of the people.

2.5 Case Study 4: Machine Tools, the Experience of the Hindustan Machine Tools

Since Independence India has slowly gained the status of a newly industrializing country. Industrialization has been regarded as an integral component of its planning and development strategy. Beginning with the Industrial Policy resolution of 1956, India has pursued an active policy of industrialization through the acquisition of technologies from the industrialized nations such as UK, France, US, Japan, Western Europe and the Socialist Bloc countries. This policy has already been criticized for some of the consequences it has engendered.

Since these consequences cannot be generalized for all kinds of industries or countries, it is important to examine individual cases. A recent case is the study of Hindustan Machine Tools (HMT).[12] HMT, as a public sector undertaking has been analyzed in the context of a mixed economy which includes an active private sector. While public sector undertakings are under constant attack in India for their non-competitive behaviour, HMT is considered a success story among the few successful public undertakings.

The emergence of a "public sector" in the Indian machine tool industry has been ascribed to four separate factors: in 1947 the government found a huge stock of war material which included machine tools and the "War Disposals Utilization Committee" in 1948 suggested among other things the establishment

of a machine tool factory; the partition of Punjab had lost eight important machine tools factories; a demand that the private sector could not meet; and, the Kashmir war heightened the necessity of machine tools for defense needs. Once a decision to set up a machine tools in the public sector was made, a Swiss firm Oerlikons was selected in preference to a Czechoslovakian firm because the Swiss firm had experience in ordinance factories in India. The decision to build a public sector machine tool plant was officially confirmed in 1949.[13]

As a successful undertaking that has acquired and absorbed technology, HMT has been analyzed as part of the debates surrounding technology transfer and development. In India, 95 percent of technology transfers have occurred in the private sector where there is often a conflict between profit motives and national interests. Despite elaborate mechanisms to regulate the flow of foreign technologies, the results have not been encouraging because so little emphasis is placed upon improving technological management capabilities. Whether to import the technology to suit the level of skills available or to develop the skills to meet the level of technology is a choice often overlooked. HMT, by developing skills to the level of the imported technologies, was able to successfully overcome the problems associated with technology transfer. In addition, HMT had the advantage of being in a product line that enabled diversification. Such flexibility is not possible in process industries such as steel, fertilizers and petrochemicals where the technology transfer is fixed. In the case of HMT, however, even though flexibility existed, it was the farsightedness of the management that enabled the company to diversify its operations from lathe manufacturing into printing presses, tractors, watches and lamps and lamp chains.

HMT began manufacturing machine tools in 1953 through a collaboration agreement with a Swiss firm, Oerlikons.[14] Within a few years it was able to revise the collaboration agreement to include a few technical areas only. This revised collaboration allowed the company to develop its own strategy of management and support policies. The technical foundations laid down by the Swiss firm emphasized training, quality and dignity of labor, which is regarded as an integral aspcet to HMT's success. Interestingly, HMT's experience with the Swiss in the area of machine tools and the Japanese in watches incorporates two different approaches by the collaborators:

> If the Swiss approach was to bring greater equality between themselves and the trainee, the Japanese approach emphasised dependency. One practice adopted by the Japanese during training was a booklet for daily reporting. In this book they recorded all events of the day and this was used by the Japanese to check whether proper communication had been established. This somehow reinforced the teacher-student relationship well known in Indian tradition whereby a student adopts a submissive role.[15]

The recession in the machine tools industry in the mid 1970s forced HMT to diversify its interests into other areas. In acquiring the necessary technology the company ran into some problems. For example, it wanted to enter into lamp and lampchain manufacture and sought collaboration from some of the TNCs in India that were manufacturing lamps. There was internal opposition within HMT to this project on technical grounds, specifically a hesitancy to move into new areas. In addition, the Chairman's efforts to get the collaboration from the TNCs was not very successful. Coincidentally, however, during the then-Prime Minister's visit to Hungary, a local company, Tungsram offered to collaborate with India in the area of vacuum technology necessary for the manufacture of lamps. HMT decided to pursue this offer but met with severe opposition from the Planning Commission which refused its request four times before finally authorizing the clearance. The opposition was engineered by the TNC lamp manufacturing lobby in India. In similar cases, the acquisition of technology to manufacture "Special Purpose Machines" with US collaboration and electronic watch manufacture with Japanese collaboration has also met with opposition from within the country rather than outside. This opposition originates primarily from political considerations which are polarized along either capitalist or socialist ideologies. This opposition is also based on the jurisdictional disputes among various agencies such as the Department of Electronics, the Industry Ministry, the Finance Ministry and the Cabinet secretariat.

The success of HMT is more attributable to management practices related to the acquisition and implementation of technology rather than to the development of technology itself. However, it is with the development process rather than the mere acquisition and implementation of the technologies that political and commercial considerations first arise. (The case of agricultural technologies illustrates this.) Though largely overlooked, the extent to which these considerations played an important role in the development and transfer of satellite technology to India is a major concern of this dissertation.

2.6 Common Threads in the Case Studies: Institutional Relationships

There is a common thread running through international technology transfers and these case studies allow us to arrive at the following conclusions.

1. Technologies do not arise in a vacuum. They are the outcome of institutional relationships at all stages of technology design, development and deployment and reflect the particular social, political and economic arrangement of the context in which they develop.
2. The transfer process involves the interrelationships of all the institutions that are involved in the development of technologies. In the process the relative power of each institution is revealed and an unstable hierarchy is formed. These institutions also comprise the dormant and active interests in the host nation which can then provide a congenial institutional arrangement for particular uses of technologies at the expense of what was/is desired or planned.
3. Such relationships have consequences for the recepient nation in that their problems are defined in such a way that the capabilities of project underwriters (interests and agencies that guide the design, development and deployment of technologies and associated research) evolve as a solution to the problem.
4. The lessons from agricultural and industrial technology transfers are crucial in understanding the consequences of such transfers in host nations. These lessons can be applied to the case case of communication technology transfers because we are dealing with the transfer of accompanying institutional arrangement for the production and dissemination of information, messages and ideas which make the full use of the satellite system possible.

These lessons and the fact that it is all the more essential for us to understand the role of institutional relationships in communication technology transfers underscore the importance of analysing INSAT as a case of communications technology transfer. The role of institutional relationships has to be analysed both in the context of technology design, development and deployment and the context in which it is deployed for various purposes. The following two chapters specifically address these issues to answer

two of the three research questions for this dissertation: the relationships that lead to the transfer and the relationships that absorbed the technology through a demonstration project, SITE, leading to an operational satellite system, INSAT.

CHAPTER III

THE CONTEXT OF TECHNOLOGY DEVELOPMENT

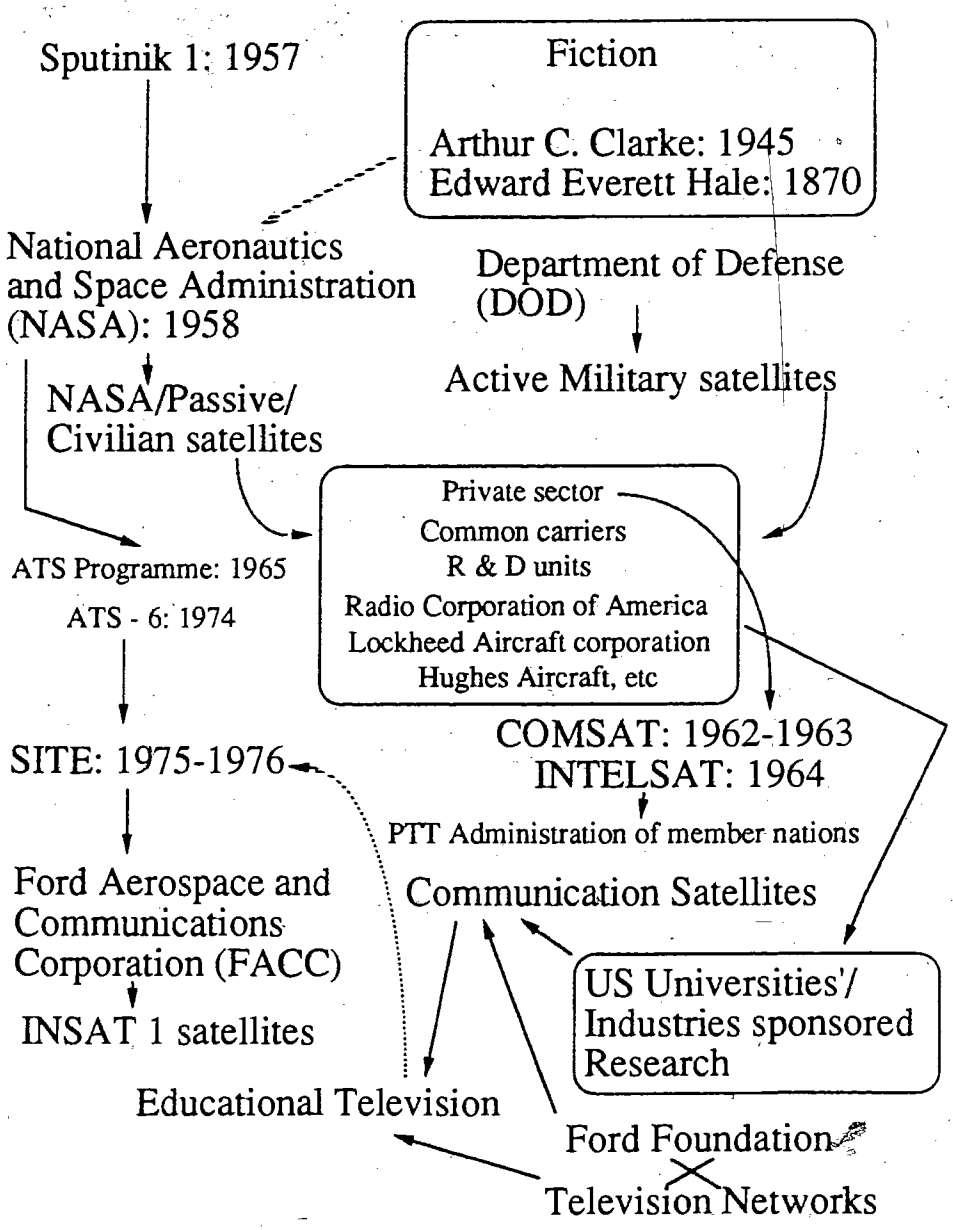
In this chapter, the institutional relationships involved in the development of communication satellites leading up to the Applications Technology Satellites will be briefly highlighted in order to provide a basis for understanding the institutional constraints associated with technology deployment in a different context. Specifically, the role of US governent, NASA, the satellite manufacturing industry, carriers, and private US foundations will be examined. This relationships have been represented in Figure 1.

Analyzing the "context" in studies of communication technology transfer is a recent development. Contextual understanding helps us to analyze the actual performance of communication systems around the world:

> The central role of national prestige, political power and economic privilege in decision making on communication (and all other national issues) is relegated to the possibility of temporary "irrational" deviance that is never explained in communication studies. Economics, political and cultural *societal* macro-level factors are treated as extra-communication variables within the purview of the sociologist, political scientist and antropologist; the communication researcher as "social" scientist seems to conceptualize communication technologies as if they performed "extra socially."Among others, reasons for this neglect of context or setting include our use of normative *ideal* "rational" efficiency and effectiveness criteria for the analysis of *actual* performance. [Italics in the source].[1]

The United States played a major role in the transfer of communication satellite technology to India, initially through the Satellite Instructional Television Experiment (SITE) and later the INSAT. Since this involved the transfer of technologies from one context to another, it is important to understand the way in which the technology originally developed and under what conditions it was transferred. This understanding will be useful in later analysing how the technology is deployed.

Figure 1: Institutional Relationships within USA



3.1 Communication Satellites: A Brief History

Communication satellites developed as part of the American space efforts in the late 1950s. The initiative to launch a national space programme through the creation of National Aeronautics and Space Administration (NASA) in 1958 came as a response to the launching of Sputnik 1 by the USSR in 1957,[2] but the idea of communication satellites pre-date Sputnik. Historians trace the origins of communication satellites to ideas contained in science fiction and Arthur C. Clarke's vision of exploring the possibilites of a global system of communications.[3] Though these ideas are important, the development of communication satellites as operational entities is due to the complex inter-relationship of various agencies and their respective interests.

The blueprints and hardware for communication satellites were initially related to a desire to establish a transoceanic satellite communication by the scientific and technical communities.[4] In addition to these ideas there were many other developments which made communication satellites possible, such as rocket technology, miniature electronics, and other devices. According to Ploman:

> Communication Satellites also developed in a very different way from that proposed by Clarke: the miniaturisation of electronic equipment made it possible to use unmanned automated satellites. Apart from the rocket technology which made possible the launching of satellites, it was the development of electronics which provided the means for the manufacture of efficient satellites and ground equipment ... equally necessary was the use of advanced computers and electronic data processing in order to define the orbit, steer the satellite and direct the antennas of the early earth stations.[5]

Apart from related scientific developments, the creation of NASA gave a definite thrust to the space programme in the USA. NASA provided the basic insititutional framework, substantial financial support and policy principles for "civilian space activities". The creation of NASA did not ensure that communication satellites would be developed in accordance with NASA's mandate and charter. The Department of Defense was also interested in the development of communication satellites. According to the division of responsibilities worked out in the early years of communication satellite development, NASA would concentrate on passive satellites and the Defense department on active satellites.[6] NASA's 1958 charter suggested a few important guidelines for communication satellites, which included a

distinction between civilian and military uses. In the applications field, however, it was obvious that both the military and the civilian sectors would have communications needs, and that both would be interested in developing a level of expertise in communication satellites. In accordance with the traditional American policy of facilitating participation by the private sector, NASA's Charter identified a role for the private sector in space sector research by "separating ... research activities and operational activities." This clarification also ensured that NASA would be a highly advanced research organization.[7]

Commercial interests in satellite communications predated the establishment of NASA. Apart from Bell laboratories, the Radio Corporation of America (RCA) had also experimented with communications satellites in the 1950s, as had the Lockheed Aircraft corporation in 1954. Bell Laboratories was examining requirements for a passive satellite system. International Telegraph and Telephone (IT&T) selected the active satellite for its later studies because they were somewhat concerned with the large cost for commercial use of the powerful transmitters necessary to establish the passive satellite connection. General Electric and Lockheed both indicated that they felt an operational system could be implemented soon.[8]

The creation of NASA, combined with a clearer role for the private sector in space activities, encouraged the major communications and aircraft industries to pursue NASA contracts for communication satellites.[9] They urged the more rapid development of a space based communication technology. AT&T and the Hughes Aircraft company started lobbying to persuade NASA to consider technology for active satellite systems based on studies conducted by their scientists.

However, NASA did not publicly express enthusiasm for satellite technology until 1960. Commercial factors were now gaining ascendency. A number of business and government studies were undertaken to explore both the economic and institutional aspects of communication satellites. Many of these studies, according to Smith, emphasised the economic justification for communication satellites.[10] NASA, at this point, was faced with complex responsibilities of facilitating satellite technology transfer to the private sector and it also had to develop satellite capability in the public interest. In addition, in

response to the Cold War, NASA felt it had to maintain its leadership role in satellite technology. This was the reason given for the "growing impetus to use the communicaton satellite as a tool to shape the US image abroad."[11] The policy which took shape in late 1960 and early 1961 emphasized proceeding as quickly as possible with the development of an operational communication satellite system.[12] The satellite technology policies that emerged were related to questions of ownership, regulation, and providing technical assistance to newly developing countries. What follows is a brief background of the developments leading up to the Applications Technology Satellite (ATS) experiments. This background is essential as it was the ATS-6 that facilitated the SITE in 1975-76, which in turn has led to INSAT.

NASA's research and development programme addressed the question of operationalizing satellite technology in which technology transfer became a major issue in the US. At least three factors were crucial to this process: establishing a market for satellites; being the first to develop an operational system; and, continuing the US tradition of transferring government sponsored research and development to the private sector, especially revenue generating technologies and know-how.[13]

3.2 NASA-Industry Relationships

As mentioned earlier, the role of private industry in the development of communication satellites was crucial. The three communication projects, Relay, Echo, and Telstar, initiated in 1960-61, reflected the balance of relationships that NASA wanted to have in dealing with the industry. These projects were initiated through three different but influential firms, AT&T, GTE and Hughes Aircraft. NASA's association was not crucial for AT&T as it had enormous resources to pursue the development of satellite technology independent of NASA. However, in the case of Hughes, NASA's contract was crucial. Without NASA's sponsorship, Hughes would have abandoned its interest in communication satellites. NASA's support had not been forthcoming in 1960-61 because the Defense department had jurisdiction over the synchronous satellite field. Smith notes that:

> NASA's development of communication satellite technology was characterised by contingencies derived from DOD and industry relationships. NASA acceptance of

> responsibility for technology development was compromised throughout these years by policy contingencies offered by the military and private sector. Executive decisions and priorities regarding US/USSR space competition, the input of military, and the interest of private industry were critical in the determination of a direction for governmental and private sector interest in communication satellites during the early 1960s set the stage for commercialisation. The next few years were crucial to the implementation of an operational system:[14]

The implementation of an operational satellite system, apart from the transfer of technology, involved questions of communications policy in the context of the new technology. The policy that evolved favoured private ownership and operation of communication satellites under appropriate guidelines.

As a result of policies pursued during the Eisenhower administration, NASA continued to lead in the development of satellites. In terms of the utilization of the technology, the private sector was to play a key role. Due to both the monopoly position and financial resources of AT&T, the sole international carrier, it "became an obvious industry partner for NASA efforts." AT&T's position as a dominant domestic carrier enabled it to seek NASA's aid to develop communication satellites. On its own, AT&T had explored possibilities with other governments (France, Britain and Germany) to provide transatlantic telephone and television service using low altitude satellites. An Office of Technology Assessment (OTA) report suggests that had the Eishenhower Administration's policies of NASA supplying technical assistance and the Federal Communications Commission (FCC) regulating such (satellite) communication under traditional guidelines continued, the technology would have developed without the creation of an institution such as the Communications Satellite Corporation (COMSAT) under the Kennedy administration.[15]

At first, the Kennedy administration maintained the same approach, as is evident in the July 1961 policy pronouncement of the President. However, the debates that ensued from this policy statement lead to The Communication Satellite Act of 1962 and COMSAT.[16] The creation of COMSAT[17] showed the Kennedy administration's strong committment to the space programme as a means of enhancing US prestige and security. The creation of COMSAT also reflected USA's interest in influencing the manner

in which satellite systems would become operational at the domestic and international levels.

In accordance with the Memorandum of Understanding between the FCC and NASA, the FCC assumed responsibility for developing communication satellite policy and for implementing an operational system through the licensing and regulation of American communication carriers. In March 1961, an FCC inquiry solicited views from all interested parties as to the best method of "ensuring that international communications common carriers and others would participate in a satellite system on an equitable and nondiscriminatory basis."[18] The responses filed to this inquiry reflected the interests of various US institutions in the ownership and operation of the satellite system. AT&T wanted to limit ownership in the system to international common carriers. General Telephone and Electronics (GT&E) favoured a limited ownership plan that would include both international and national common carriers. Lockheed Aircraft, GT&E, and Western Union advocated broader based ownership by common carriers, manufacturers, and possibly the public at large.[19]

The equipment manufacturers were opposed to ownership by international carriers because they believed that AT&T would dominate. The FCC, however, felt that a joint venture with the common carriers which did not include the manufacturers was sufficient. The FCC reasoned that the manufacturers' participation would unnecessarily build corporate relationships. Both GE and GTE filed petitions for reconsideration, but the commission dismissed their petitions and called upon four carriers only (AT&T, RCA, Western Union and IT&T) to participate in the preparation of an "Ad Hoc Carrier Committee" report. This report proposed a "nonprofit management corporation to develop and manage the satellite system on behalf of the carriers who would own both the satellites and ground stations." The committee's report met with widespread opposition leading to Administrative and Legislative debates before COMSAT was actually formed in 1963.[20] Once COMSAT's position was strengthened, INTELSAT was formed shortly thereafter.

3.3 INTELSAT, Global Communications and its Implications

Two major objectives of American foreign policy on satellite communications were to further international cooperation and to protect the national interest. These policy objectives were incorporated into the 1958 NASA Act as well as NASA's charter. Pursuant to these goals, Congress authorized NASA to engage in a programme of international cooperation.[21]

However, to maintain its technological leadership, limitations were placed on the extent to which cooperative experiments that could take place to demonstrate the potential of the technology. With these considerations NASA examined possibilities for international experimentation with communication satellites.[22]

In February 1964, the US and European nations met in Rome to negotiate the creation of the International Telecommunications Satellite Consortium (INTELSAT). In retrospect how international this creation was, is debatable. There was no Third World participation in this conference and this, according to Smith, reflected a "pragmatic approach" since more than 80 percent of international telephone traffic was controlled by the Western industrialized countries. However, as Martinez points out, developing countries criticize INTELSAT as being formed by the United States and other developed nations to "provide satellite telecommunications corresponding to their needs in the 1960s and 1970s" and not to the needs of underdeveloped countries. The criticism is based on the technical standards and "network architecture" that is involved in participating in a global system such as INTELSAT:

> INTELSAT's technical standards and network architecture were established for intercontinental telecommunications, not for thin route rural and low volume LDC users. "Equitable access" comes at a higher price per circuit. The higher prices are found in the utilization charges assessed to users of Standard B antennas, the high technical standards for INTELSAT approved equipment, and finally, the requirement (now being re-negotiated) that a country wishing to lease transponder space on a non-preemptible basis must pay twice as much as that for a pre-emptible transponder.[23]

Despite criticisms, the membership of INTELSAT has grown significantly since it was formed and now includes more than 700 earth stations in 159 countries.[24] Since INTELSAT's membership has grown

so large, it is important to ask why countries, especially developing ones, participate in it despite the dominant role played by one country, namely the US. The incentive INTELSAT offers is ownership of the space segment commensurate with a country's investment share and traffic volume. The countries are billed for the traffic and at the same time receive dividends. The earth segment is owned by a member country or its designated entity. The tariffs actually charged to the consumers are determined by the member country and this is considered as additional revenue. As a result, INTELSAT is considered as a money maker for telecommunication administrations in developing countries:

> In many cases, [developing] countries can actually receive more revenues in return—in the form of INTELSAT dividends—when they charge high tariffs to their customers. The high tariffs have the effect of reducing those countries' volume of traffic on the INTELSAT system and increasing domestic revenues, while on the global level, the expanding volume of INTELSAT network increases total system revenues which states receive as dividends. As a result, INTELSAT is often seen as a revenue producer by policy makers in many countries that are more concerned with short term cash flow and less aware, perhaps, of the long term financial and societal benefits that inexpensive and universal telecommunications services offer national development.[25]

Societal consequences of membership need to be examined critically on a case-by-case basis. Except for general remarks about the advantages of membership and criticism, of US domination, not many studies have been conducted in this area and so it is difficult to arrive at any conclusions. Nevertheless, the formation of INTELSAT is a direct consequence of satellite technology developments within the United States in the area of communication satellites and a reflection of the US desire to have a significant influence in the global communications scene. The industrialized countries that joined the system did so in the hope that they would be able to participate actively. Yet, recorded experiences indicate that these expectations, especially in the area of building the satellites and having a greater say in the technical matters of INTELSAT, have not been realized.[26]

There are other international implications and arrangements within the context of the development and deployment of communication satellite technology. Some of the problems associated with transborder flow of television programs and data and the growth of the service sector are related to these international arrangements. These issues will not be addressed in this dissertation as they are outside its scope. However, to the extent that they are relevant to the case study of INSAT, they will be addressed in the

relevant sections.

3.4 Transfer of Technology and The Applications Technology Programme

Following COMSAT, NASA's relationship to the users of communication technologies was complicated by a technology which was in a state of "dynamic" transition and by the fact that there would be an enormous market for low or medium altitude satellites forming the basis of a global system. In fact, this was a primary reason for capitalising COMSAT. NASA, however, had already begun experimenting with high altitude geo-synchronous orbit (GSO) satellites. Since the operation of the satellites was the responsibility of COMSAT, the relationship between COMSAT and NASA was crucial in determining the kind of technology COMSAT would adopt. When COMSAT decided to adopt geo-synchronous satellite technology, the US Congress began to examine the nature of funding to NASA for the development of these satellites since COMSAT (a predominantly private corporation), would be the main beneficiary of government funded assistance to NASA. Another factor which affected the policy determination of the period was the use of satellites for domestic communications. The domesitic use of satellites not been contemplated in the early years of the communication satellite given the excellent terrestrial telecommunications network in the US. However, after the synchronous satellite concept became a commercially viable alternative NASA's relationship to users, (which supposedly had been settled by the COMSAT legislation) once again became a matter for policy determination.[27] In the meantime, NASA, based on increasingly sophisticated communication satellite design, had developed a second generation of high powered communication satellites which opened up service possibilities that hinted at new market structures for their effective utilization.

In 1965, NASA decided to orient its future satellite research toward the development of multipurpose, advanced technology satellites. "Political as well as economic factors contributed to this decision." Since the creation of COMSAT, Congress had questioned the need for NASA to continue the development of communication satellites and the performance of reimbursable research under the

Advanced Syncom Program.[28] Thus in 1965, NASA cancelled the Advanced Syncom program and proceeded with the ATS series. In 1966, the first ATS satellite was launched marking the beginning of a new series of advanced communication satellites. "The satellites of this series were more powerful than earlier synchronous satellites, a fact which enhanced their applications potential. In all, seven Advanced Technology satellites were planned: ATS-1, 3 and 6 achieved complete operational status; ATS-5 was partially operable; ATS-2 and 4 failed; and, plans for orbiting the seventh (ATS-G) were dropped."[29]

3.5 The ATS Experiments

Initially ATS-1, 3 and 5 were used for scientific and technical experiments sponsored by the federal government and various universities. After completion of those experiments, NASA announced in 1969 that the still operational ATS satellites and the planned ATS-F would be made available to public and private sector users who could fund the cost of their ground segment and software requirements. Impetus for the establishment of NASA's user program resulted from congressional pressure to ensure that the public should realise the direct benefits of NASA's tax supported research and development and a growing public and private sector interest.[30]

As early as 1965, NASA, private enterprise, and the Ford Foundation[31] began exploring the feasibility of using satellites for voice or television programmes. At that time NASA concluded that the use of such satellites would not be cost effective. The Ford Foundation, however, continued to maintain its interest in satellites for educational television distribution. In 1966 the Foundation proposed that the FCC authorize the formation of a corporation to distribute television programmes via satellite and to make available free channels for educational television distribution. The Ford Foundation submitted this proposal to the FCC at a time when the commission was inquiring into a plan by the American Broadcasting Company (ABC) to establish a private satellite system for television distribution.

The Ford Foundation's interest in using satellites for educational television was based on its overall interest in public television in the US. The Foundation, along with Carnegie Foundation, was credited

with having written the "book, chapter and verse on public television."[32] The Foundation's interest in public television can be traced to the "conservative political climate of the 1950s." By creating a research arm, the Fund for the Advancement of Education and a tactical arm, the Fund for Adult education in 1951, the Foundation was able to lobby the Congress and the FCC to set aside certain TV channels for non-commercial uses. After the FCC ruling in 1952 in this regard, the Foundation focused on "station organization and activation." A network of stations across the nation was created through technical and financial assistance from the Foundation. Proposals and grants for this purpose and many other projects were carefully tailored to the Foundation's interest. By the mid-1960s, educational television had caught on in the US and the Foundation was "not quite ready to loosen its control over a movement it had carefully built since the early 1950s. A programming model and a plan for permanent financing had yet to be established. With these things accomplished, the fourth network [reference to the other three commercial networks] would be able to stand on its own." In 1966, McGeorge Bundy, a former national security adviser to the Kennedy and Johnson administrations became the president of the Foundation and he asked Fred Friendly, a CBS veteran, to become the Foundation's television consultant. This leadership was confronted with a challenge to "resolve noncommercial television's funding problems ... to establish a dynamic model for future programming." Bundy and Friendly proposed a nonprofit corporation to develop a domestic communications satellite system:

> Such a system, instead of using AT&T's telephone lines [competition and conflict] could transmit the programs of the three commercial networks at sharply reduced rates. A portion of the networks' substantial savings would be earmarked for noncommercial television. Hence the proposed satellite system would bankroll public broadcasting by providing a permanent and independent source of revenue. Moreover, by providing a means of simultaneous interconnection which noncommercial stations could afford, NET [National Educational Television] would be transformed into an authentic network.[33]

Established common carriers, particularly AT&T objected to the Ford Foundation idea, claiming that it would be inadvisable to establish satellite communication systems for specialised uses.[34] Some members of Congress were also opposed to the idea of television broadcast satellites : "Some legislators expressed fears that conventional broadcast stations would be put out of business and noted that problems of privacy and the possibility of government controlled broadcasting were legitimate concerns."[35] The

networks were also opposed to the idea "on the grounds that they would be forced subsidize a competing television network in the name of public service. The proposal threatened too many vested interests to gain speedy acceptance in Congress or at the FCC. However, the satellite plan succeeded in giving communications satellites greater prominence as matters of national policy."[36]

Meanwhile in 1965, NASA's research and development program of broadcast satellite technology was criticized by Congress: "NASA reacted by shifting its program's focus from mass television distribution to specialised communications services. This was to be the pattern developed for the duration of the ATS program."[37]

In part, due to declining popular interest in the space program, Congress reduced NASA's budget in 1968 and the space agency was forced to work out "an emergency interim operating plan". Part of the plan was to descale and reorient its communication satellite activities. NASA was also concerned about the direction an "ideal space programme" should take.[38] A number of contract studies were initiated to help design such a programme. The basic recommendation of many of these studies was that greater emphasis should be placed on practical uses of outer space. As a consequence, NASA increasingly emphasized social services applications and the participation of the end user in the design, implementation, and evaluation of individual satellite demonstrations within the ATS programme. In order to further assist agencies that were interested in participating in the ATS programme, NASA engaged in broad ranging studies on user needs and support, often contracting with professional organizations noted for their expertise in communications applications. These studies concentrated on user needs and the technical requirements of a prototype satellite flight program.[39]

According to Smith, the studies were performed without an overall conceptual framework which limited their potential contribution to the formulation of comprehensive communication policy. These studies complemented, but did not constitute, an adequate base for planning an overall program of telecommunications research development and experimentation. In general, the early studies identified areas where communications technologies could be used; they did not indicate how to devise a strategy for

developing integrated satellite communications systems.[40] The experimental programmes that were initiated as a consequence were intended to inform potential user groups of the possibility of applying satellite technology to the solution of communication related problems. This took place within NASA's concept of "Applications Technology Transfer."[41]

To summarize, the ATS series, NASA's second generation of communication satellites, focused on entirely new satellite capabilites and services such as information networking-related applications[42] The question of continued experimental satellite availability (ATS experiments) became an issue in January 1973 when NASA decided to either curtail or phase out further communication satellite experimentation. This decision was not expected to have any determental "effect on either US technological leadership in the field" or future experimentation as it was decided that "further advances in satellite communication's research and development can be accomplished by the industry on a commercial basis without government support."[43] It was in this climate that the ATS-6 was launched in 1974. After a year of experiments in the US, it was moved to a convenient location for the Indian government to conduct SITE.

It can be argued from the institutional relationships discussed in this chapter that the design, development, manufacture, and deployment of satellite technology in the US was guided by Cold War and related political considerations. Its subsequent development was guided by the prevalent institutional relationships that gave precedence to commercial considerations, which in turn protected the heavy investments in terrestrial systems already in place. Nevertheless, these considerations were challenged by the Ford Foundation which planned to establish a satellite network to support its activities in public television. This move was opposed by the commercial networks, who felt that they would be forced to subsidize a public television system under the control of private foundations. NASA, pressured by the Congress and public, took an active interest in the Applications Technology Satellites which demonstrated the uses of satellites in various contexts.[44] These relationships and the launch of ATS-6 in 1974[45] provides a contextual framework for understanding the use of ATS-6 by India to conduct the Satellite Instructional Television Experiment (SITE). The institutional relationships leading up to this experiment will be analysed in the next chapter.

CHAPTER IV

THE CONTEXT OF TECHNOLOGY DEPLOYMENT

Any substantive analysis of development problems in the Third World[1] must include an examination of developments within the so-called "first" and "second" worlds. Depending on the nature of the problem, these analyses might focus on capital, manpower, or technology. More particularly, developments in communications technologies such as direct broadcast satellites and supporting telecommunications equipment have raised a number of socio-economic related issues such as centralized control, use of the facilities for political purposes, forsaking educational objectives in favor of entertainment programmes, and not providing adequate access to the intended beneficiaries. As much as understanding the political and economic context in which satellite technology developed is important, it is equally important to understand the institutional context into which the technology is transferred. How and why was the technology transferred and what are the consequences are important questions which can only be addressed by analysing the situation in focus. In this chapter, an attempt will be made to explain the institutional relationships which led to the transfer of satellite technology from the US.

Within the framework of this study, it is important to understand the broader context[2] in which INSAT is deployed. (A broad canvass of the institutional relationships of INSAT is provided in figure 2). This provides the background necessary to analyze the consequences in specific areas of applications such as broadcasting and telecommunications.

The role of the following institutions will be examined to provide an understanding of the situation in which the technology is developed: the Indian government; Space agency and its scientific community; broadcasting and telecommunications authorities; UNESCO, Ford Foundation, UNDP and ITU. These institutions and their relationships are represented in figure 3.

Figure 2: INSAT: Institutional Relationships within India

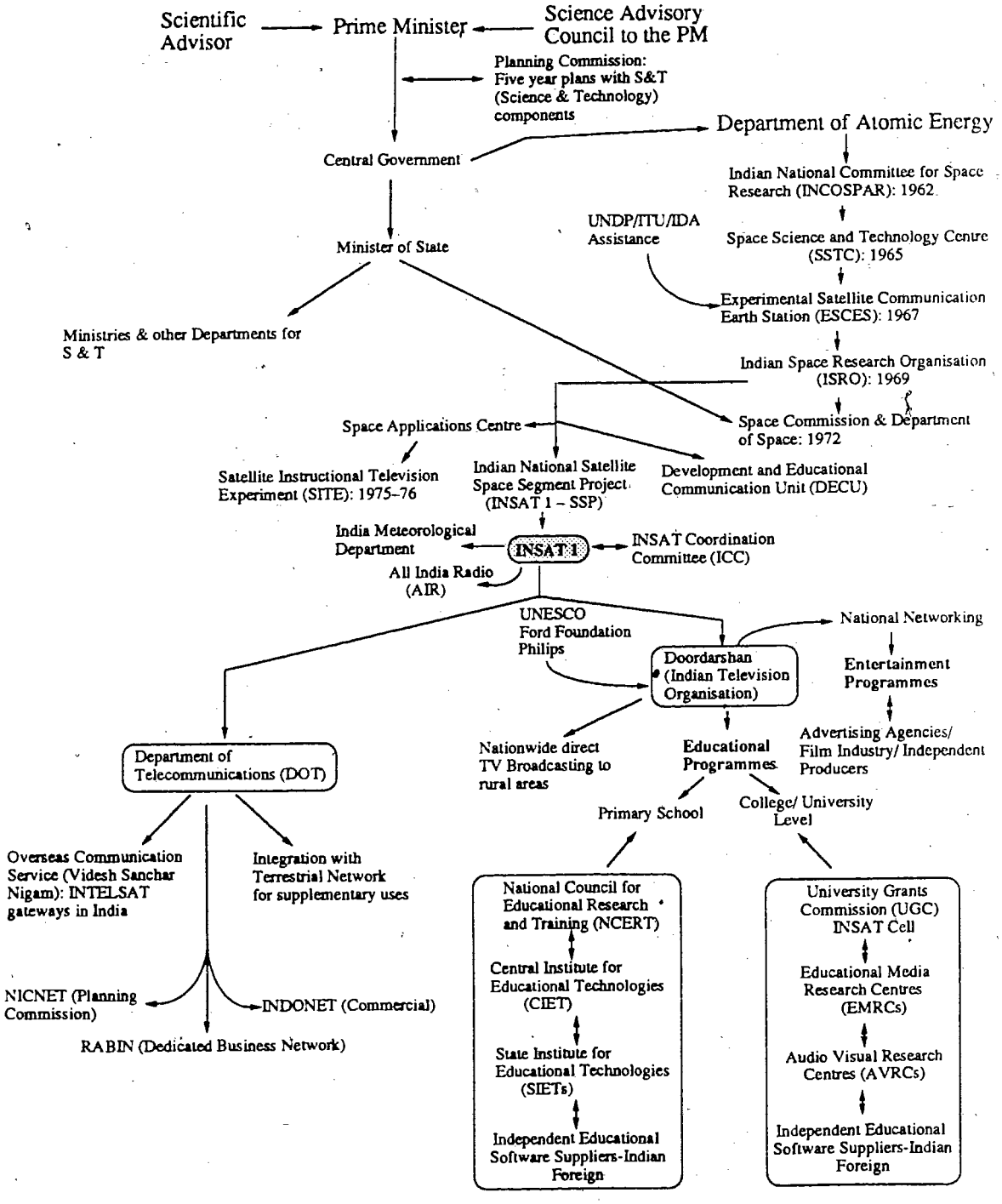
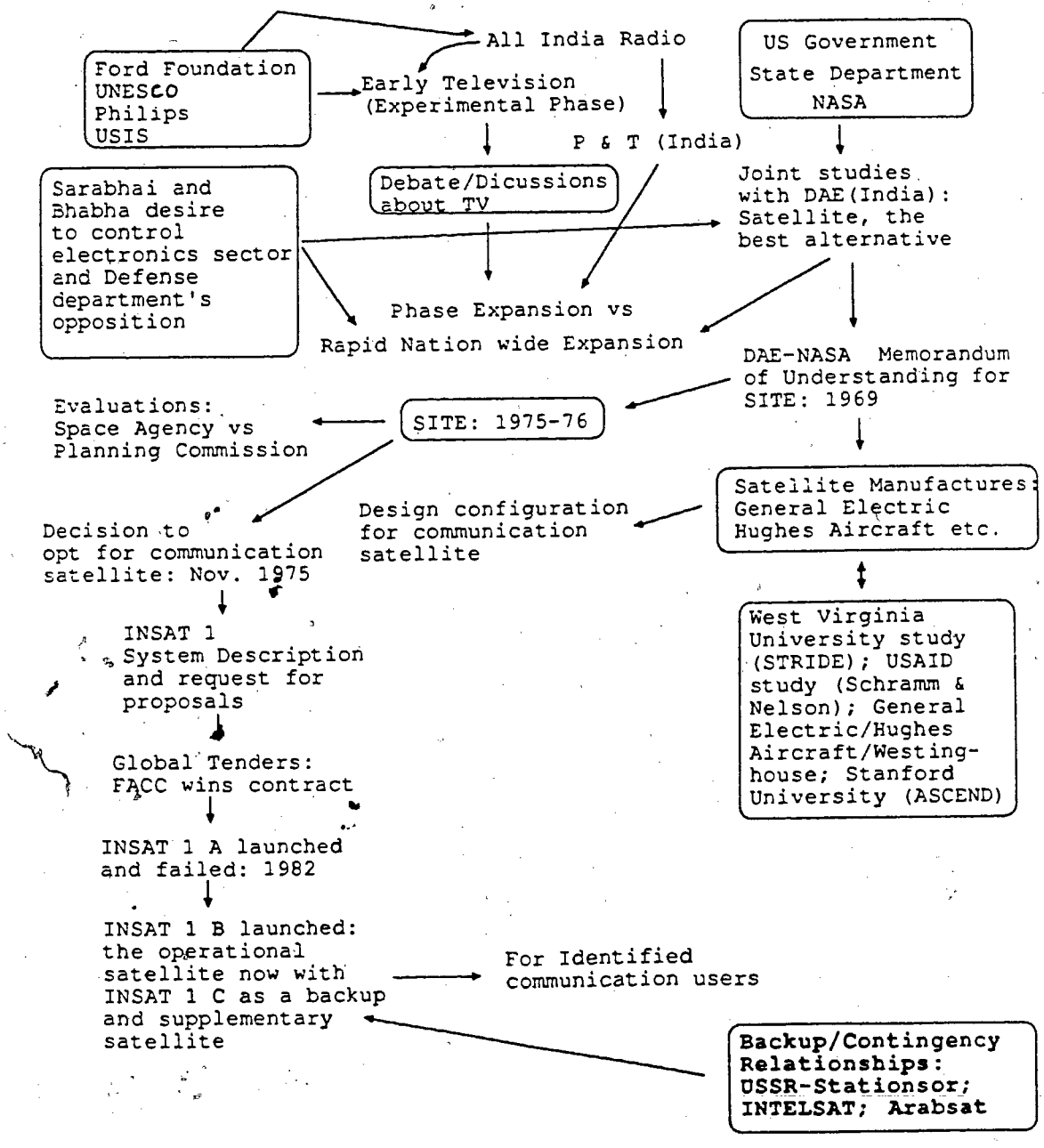


Figure 3: Choice of Satellite Technology: Institutional Relationships



4.1 Government and Communication

The mass media in India are under the implicit and explicit control of the government. Explicit control is exercised in broadcasting and telecommunications through governmental institutions such as Doordarshan and the Department of Telecommunications. Implicit control of newspapers and cinema is exercised through various controls imposed on the supply of newsprint and other raw material necessary to the functioning of these media. The specific structure of the print and cinema industry, however, is not germane to this dissertation. How government perceives communication and how it has developed its supporting infrastructure is integral to this discussion.

The perception that communication can contribute to development efforts remains very strong in India. As early as 1953, shortly after the first five year plan concept was accepted and implemented the first Prime Minister, Jawaharlal Nehru, wrote to all the chief ministers of the Indian states:

> It is no good my complaining, because it is our fault if we cannot put across to our people the magnitude of the work that is being done in India at present ... I am anxious that we should reach our people in the villages as well as in the towns with some kind of a record of the work that has been done and that is going to be done ... It is not enough to give just a glimpse of something being done. It should be a longer and more educative picture and it should be taken in mobile vans to remote villages ... By this means also, we shall produce that understanding enthusiasm that we wish to develop and, at the same time, a certain unity of outlook in our national planning.[3]

This stress on communication services in support of development continues as a recurrent philosophy in the various plan documents. This philosophy, based on the extension role of mass media in highly industrialized countries such as the US, remains deeply entrenched in Indian planning initiatives. For example, when it was realized that newspapers and cinema could not reach the rural areas due to illiteracy and lack of cinema houses, the planners turned to radio as a solution. One of the earliest experiments in India in terms of extending radio to the community is the radio rural forums first developed in Canada.[4] It was considered a "success beyond expectation" by Prof. Neurath, a Fulbright scholar. Later studies and committees have, however, noted unsuccessful outcomes: the dissolution of the forums for socio-cultural reasons as well as for want of repairs or batteries to the community sets.

Chatterjee concludes:

> Backward sections do not always derive adequate benefit because of traditional barriers in the free mixing of castes and sexes in the rural community. Women, artisans, landless laborers and Harijans are represented rather sparsely in the audience. Pre-tuning of the sets to only one particular wave length, which is generally the case, makes entertainment limited and the village listeners remain unsatisfied. A large number of sets installed, in many cases between 50 and 70 percent, are generally out of commission for want of minor repairs, replacement of battery, etc. Lack of adequate maintenance arrangement is the biggest single obstacle in the way of community listening.[5]

This suggests that it is equally important to understand the structure of rural society in which communication takes place. Agrarian relations, caste barriers, and related social problems are crucial areas which can affect development problems. The rural context is complex and mere infrastructure or transmission of messages is not sufficient to bring about changes. In this context, it is not clear what role new communication technologies can play in affecting change and improvements for a majority of the population without bringing about overall changes in the structure of the society.

4.2 Government and Science and Technology

Though satellite technology is primarily intended for communication purposes, its development in India is closely related to the three aspects of this technology: Science, Technology and Applications. To explain the framework of Space sector science and technology, a brief analysis of Indian science and technology policies will be provided. This will illustrate how the technology was transferred and how the design, manufacture and launch of communication satellites has become a major endeavor of the Indian space programme.

Considerable resources have been invested in the development of science and technology in India, since independence. While this dissertation focuses on developments subsequent to independence, a pre-independence backdrop is necessary to provide context and continuity of analysis. According to Rahman,[6] the status of scientific and technological development during the pre-independence era could be summed up as:

1. Despite the indifference on the part of the then government, considerable apparatus of scientific surveys and research in universities and other institutions was in existence in India on the eve of independence.
2. Whatever the reason, during the first half of the twentieth century, a blueprint [for the development of scientific institutions] was also available. The A.V. Hill Report, the National Planning Committee of the Indian National Congress, and the plan formulated by industrialists had seeds for giving economic and social purpose to future scientific activities; and,
3. Most important of all is the fact that scientific developments could look to the inspiring leadership of Jawaharlal Nehru at the political level. He created a climate whereby science in India enjoyed considerable support.

Rahman suggests that the Second World War had dramatically altered the nature of science worldwide. Science had been transformed from independent scientists working in virtual isolation into a highly organized activity encompassing a network of state and private sector institutions. As a result, the social control of science became important. It was in this situation that the political leadership in India initiated measures aimed at improving the living conditions of the people while realizing that the promotion of science and technology on the widest of possible scales was essential. As a consequence, institutions in Atomic Energy,[7] Electronics and Space have been established. In addition, greater emphasis has been placed on the provision of additional facilities for scientific and industrial research through institutions such as the Council for Scientific and Industrial Research (CSIR)[8]

Though India has a history of developing technologies, its dependence on imported technologies remains very high. Not simply a legacy of the colonial policies of the British government, there are other reasons why, even after Independence, this situation has not changed. Claude Alvares suggests that by 1850 it was clear that Indian capitalists would import sophisticated machinery regardless of the consequences. This trend persisted during British rule and after 1947, 'step in your shoe' nationalists continued on the path laid out by their predecessors. Clearly, the response of the Indian government to industrial development was a "history of continuous compromise with the Indian private capitalist sector." In its compromise for industrialization, the implementation of Indian plans patterned on the Soviet industrialization model called for the purchase of technology on a large scale. Alvares notes:

> For this [industrialisation] the government found it had very often to purchase technology or turn key projects from abroad, either from market economies or from the socialist ones; in the early stages, most collaborations were sought for the electrical and machine goods

> sectors. Later, however, as momentum lagged, government found it needed technical aid in mining, petroleum, machine tools, and the production of all kind of metals and chemicals. In preparing its contracts for the purchase of industrial goods, it often gave preference to firms with foreign collaboration.[9]

The pressures for foreign collaboration have been specifically addressed in a study by Shiva Viswanathan with regard to a communication technology, radio. One of the positive aspects of the diffusion process from the laboratory to the industry in India was the potential of a research laboratory to create a market for a rugged radio. The electronics group of the National Physical Laboratory (NPL) was lead by Mr. Ramamurthy who as technical director of National Ecko had tried to produce the first indigenized receiver, "Hindustan Radio." Owing to the lack of commercial success of this receiver, Ramamurthy felt that it was feasible to concentrate on community receivers. Community receivers had gained precedence in Madras in 1939 when the government had thought of a community listening scheme. A thrust to this idea was provided by UNESCO much later for educational purposes. By 1954, the Ministry of Information and Broadcasting offered to bear half the cost of the receivers and the radio industry in India was quite keen on using this opportunity. In order to bear this cost, the Ministry felt it was essential to have a "standard performance" specification. NPL had representation on the Indian Standards Institution and the scientists were called to provide specifications. Ramamurthy, in response to this, set the process rolling and was perspective enough to realize that "radio itself had to be visualized as a part of a socio-cultural system." Based on an assessment of the conditions in Indian villages, it was quite clear that a rugged receiver was the solution. Since the villager was not in a position to own a set, community receivers were considered as ideal. Lack of electricity was a primary factor to think of battery sets. Maintenance problems etc., motivated the NPL scientists to design the receiver to withstand the conditions prevalent in the villages.

The design work between 1950-1959 at NPL was guided by these considerations. In addition to the Indian market, UNESCO had hinted at the possibility of the Latin American and African markets too. So the radio industry in India was enthusiastic and Ramamurthy had convinced them that the sets should be priced at a particular level. The industry retracted from their commitment when the finance minister

imposed an excise duty on valves and transistors (vital components for the radio industry). In 1967, CSF, a French company proposed that it would give all the technical data for the manufacture of receivers and offered two models. These models were rejected as they did not meet the conditions that Ramamurthy and his group were interested in based on Indian village conditions. Pressures from the Industrial Planning and Analysis group of the Electronics Commission to increase the sales of radio and tap rural markets shifted the focus towards the villagers rather than ruralizing the radio which Ramamurthy and others were planning. The option to help the radio industry, particularly Philips, was to argue for a new mode of transmission in the FM mode. The rugged radio project was not implemented and subequently community listening itself became a more or less extinct phenomenon.[10]

Though radio industry in India was not considered as a major industry from the government's point of view, for my analysis the experience of indigenous development of radio illustrates the industrial climate in which problems related to communication were addressed.

4.3 Early Development of Television in India

As communication satellites developed from an idea into a reality in the US, the need for communication, especially for development purposes, emerged in India through various projects and schemes aimed at improving the living conditions of people in the rural areas. It also gave rise to a perception that Broadcasting should and can serve developmental purposes.

In 1955, at the International Industries fair in New Delhi, several radio and electronic companies exhibited and operated closed circuit television. After the fair, Philips, "finding it too expensive to move the [television] equipment, sold the equipment at a nominal price to All India Radio (AIR)."[11] With absolutely no training, the radio engineers started experimenting with the new technology. In 1958, through a loan of a "film chain, two vidicon cameras, two image orthicon cameras, a microwave link and some additional equipment" from the United States Information Services (USIS), as well as a contribution of seventy 21-inch television sets and a portable generator from UNESCO, AIR initiated an experimental

television service on September, 15, 1959. Initially, the programmes were telecast for one hour duration only. Apart from studio-based programming, an attempt was also made to cover outside events through an outside broadcasting van supplied by the USIS. Additionally, two institutions, UNESCO and Ford Foundation took an active interest in sponsoring education oriented projects.[12]

4.4 UNESCO and Indian Television

The importance ascribed to mass media by UNESCO was accepted by India in order to achieve the minimum mass media facilities needed for development. Similarly when the Director General of UNESCO proposed to the Government of India that it would help organize radio rural forums, it was also accepted.[13] After a few pilot projects and their evaluations had been completed, the scheme was extended to the rest of the country. The consequences and the problems of the forum idea with respect to radio have been discussed earlier.

The UNESCO television project in India is an extension of its mandate in education and cultural matters. Though AIR (as mentioned before) bought the equipment from Philips, it had not developed any particular plan of using it. At the UNESCO general conference in Delhi in 1956, the Indian delegation requested for assistance to have educational television on an experimental basis. UNESCO's approval of this request was part of its resolution to assist member states in the fuller use of mass media for educational and cultural purposes. The TV centre was inaugurated in September 1959 and in less than a month, the government signed an agreement with UNESCO. This agreement highlighted the "neccessity of forming an Indian television network as a response to global information expansion, especially in the area of community education." Under this agreement with UNESCO, AIR received US$ 20,000 to finance production of programmes for social education, organisation of viewing centres (teleclubs), purchase of 100 plus television receivers and for evaluation of results. The $20,000 that the UNESCO gave was spent for producing programmes and buying television sets. In fact $10,500 was spent by the government of India for buying black and wiiite sets from private American manufacturers. Bhat

has noted that since these sets were becoming less fashionable in the West, several developing countries like India proved good markets for these industries.[14] Twenty programmes with telecast beginning in December 1960 and completed in May 1961.[15] This project was particularly concerned with studying the effectiveness of social education television programmes on organized groups of viewers.

To effectively measure television's impact on groups of viewers, teleclubs were organized with a membership limited to approximately 25 persons. The evaluation was conducted by the government to measure the shifts in information, attitudes, and behaviour brought about in the 418 members of the teleclubs sampled. Since this data showed a statistically significant improvement in the three aspects that were measured, it was concluded that television could be used as a medium for social education in India.[16]

4.5 Ford Foundation and its Role in Indian Television

The Ford Foundation, from its transition as a small local organization in Michigan into an international organization, has played an active role in promoting the concept of nationwide television in India. This role has not been adequately stressed in relation to the Foundation's conceptualization of overall planning initiatives in India. Rosen suggests that there was:

> certainly an implicit, if not explicit agreement between the assumptions and broad policy conclusions of the authors of the Gaither report and the assumptions underlying American foreign policy at the time. There were also great expectations, not only among the larger American public interested in foreign affairs, as to what the Ford Foundation might be able to do overseas with its apparently very large capital endowment, and there was also great interest among leaders of overseas countries in the foundation's intentions."[17]

Certainly, the Foundation's entry into India was guided by these assumptions aimed at mitigating the problems of people in other countries. In accordance with this goal and intention, John Howard, a foundation staffer established:

> a network of relationships with officials of various public agencies, American and international working in the foreign development field, including the State Department, the Point Four organisation, the United Nations and Food and Agricultural Organization; and, with the Rockefeller Foundation, another non-profit private foundation with lengthy experience in Asia and elsewhere.[18]

The US State Department officials indicated to the Ford Foundation that India and Pakistan "would welcome foundation programs." These programs, according to the State Department, would be "an indication of paramount private American interest ... which had never been manifested before and [they urged] that the [foundation's] proposals for development programs be geared to an Indian/Pakistan frame of reference." Further, it was specified in Howard's recommendation that the Foundation activities should start in village development to ward off the political crisis (i.e. threat of communism) which was "bound to come." The political crisis that was visualized was a dicontentment in the rural countryside among the peasants etc., which could lead to communism in the same manner as China. The Foundation's first director, (later president) Paul Hoffman,[19] had negotiated with the ambassadors of both India and Pakistan to send a small mission to India to explore the idea of possible foundation activities in these countries. Paul Hoffman advocated an American aid effort on the lines of Etawah in UP as the type of project that America would be interested in investing in (specifically the transformation of all of the 500,000 Indian villages into self supporting communities). The model available for this transformation was the infusion of economic aid along the lines of the Marshall plan for the reconstruction of Europe.[20]

Thus, the Foundation established a base in India in 1952 with an agricultural programme. Later, Foundation grants in support of community development projects were instrumental in expanding the Indian government's programs for developing new village institutions as well as establishing the Ford Foundation as a useful resource from the Government of India's point of view.[21]

The Foundation had established its credibility, importance, and easy accessibility to the policy makers in India by the time it took an interest in the development of television. The Foundation's interest in US public television (discussed in Chapter 2) provides a broader context within which to understand their interest in the development of Indian television and their technological options for achieving this goal.

Of special interest to Ford Foundation were "in school instructional programmes ... [which] may be said to have laid the foundation of the school TV service" in India. Kenneth Christiansen, a Foundation

consultant, stated that the Delhi School Television Project was conceived as "an innovation in education, and one which would demonstrate the usefulness of mobilizing and applying technology in meeting urgent national needs and national purposes."[22]

The experimental service that was started by AIR with the equipment it had bought from Philips was the catalyst for a general programme service. When AIR wanted to start a school service, it approached the Representative of the Ford Foundation to assist in the development of Educational television in India. In response, the Foundation sent a team of experts to visit India in 1960.[23] In the meantime, AIR had initiated an experiment with the Delhi Directorate of Education, to telecast a weekly series of programmes for the IX grade students of the Higher secondary schools. The Ford Foundation team saw this programme and also examined the physical conditions of the schools and equipment, and recommended a grant of US$ 564,000 to provide partial support to the government of India to conduct the programme for four years. The team also made specific recommendations for how the grant monies should be used.[24] The US model was even more firmly established when as part of the preparatory work, the Director General of AIR visited the US in the middle of 1960 to see a few educational television centers while finalizing the agreement with the Ford Foundation. A senior engineer of AIR was also sent to study the working of the Video tape recorder. Subsequently this equipment was shipped to India,[25] and the project began in 1961. In 1963, a Ford Foundation Mass Communication Study Team under the leadership of Prof. Wilbur Schramm visited India and recommended, among other things, a broader use of the Delhi Television Project:

> The experimental television project at Delhi should be developed and improved to become a model for the constructive use of television in India. It should be used to set standards for the later development of television and to serve as a training ground for use of television in accelerating national development.[26]

The extent to which this project played an important role in expanding television in India will be discussed next.

4.6 AIR's Plan for Television Development

AIR, with more than 25 years of experience in sound broadcasting in India had expressed an interest in determining the directions of TV in India. The experience and initiative taken by AIR in iead("4.06 AIR's Plan for Television Development")>

AIR, with more than 25 years of experience in sound broadcasting in India had expressed an interest in determining the directions of TV in India. The experience and initiative taken by AIR in introducing an experimental TV service in India (in collaboration with UNESCO and the Ford Foundation) had given the organization, especially the engineering staff, enormous confidence in matters related to television in India. It must be stressed that, when AIR first took an interest in television in 1959, there was no television manufacturing industry in India and everything had been imported from abroad.[27] The period immediately following the 1962 war with China had resulted in an acute foreign exchange crisis affecting the supply of materials for operating television. It was also the reason for TV's snail's pace growth till 1965. In 1965, Fernseh, a West German electronics company, offered a package deal to set up a second TV facility in India. The installation part of the package was vehemently opposed by the AIR engineers who cited their self-sufficient expertise in installation and maintenance. Nonetheless, this deal helped to set up a second TV facility in Delhi.

Expansion of TV received serious consideration after the Indo-Pak conflict of 1965, when Mrs. Gandhi was the Minister for Information and Broadcasting.[28] Probably this is one of the reasons that she wrote to an American friend expressing an inclination to seek help from any organization interested in family planning or increased agricultural production.[29] At the same time, it was also recognized that they must move towards creating an industrial infrastructure for TV expansion. A high powered committee, which included representatives of AIR, examined this question and accordingly proposals were invited for collaboration. Of the seven companies[30] that responded with proposals, it was the German firm that was selected because they offered:

> the best terms for collaboration in the manufacture of studio broadcast equipment. No lump sum payment for the know-how had been asked for and they were ready to buy back, on an assured basis, items manufactured with their technology. Additionally, the fact, that AIR had already in their emply plenty of German [Fernseh] made equipment worked in their favour. From the German point of view, it was somewhat like off-loading something they were already in the process of phasing out because they themselves were going in for colour TV and their other world-wide commitments could be met through the buy-back agreement.[31]

By 1965, AIR had prepared and the Government had approved a master plan for the expansion of television. The Government contemplated requesting international support for its phased expansion on a nation-wide basis. However, a committee that examined the overall performance of Indian Broadcasting at that time was displeased with this *phased expansion of TV*:

> The plan [25 year master plan of AIR] has the limited objective providing only the four cities of Bombay, Calcutta, Madras and Kanpur with television in the fourth plan. The committee [Bhagvantam Committee, a technical committee of the Ministry of Information & Broadcasting] has accordingly recommended that 1/2 KW pilot transmitters and corresponding transmission towers should be put up at existing installations of AIR to facilitate the very early inception of television in selected centres. The committee has also proposed that these transmitters should be replaced after a few years by transmitters of higher power and a full fledged service introduced. The committee also recommends that when this stage is reached, the pilot transmitters should be shifted to other centres to be taken up in the fifth plan. We do not appreciate this two stage development nor do we consider it necessary.[32]

Alternatively the Committee felt that it was necessary to have a proper survey like the one which was offered by the Nippon Electric Company under the Colombo plan for the implementation of television on a nation-wide basis. This survey was necessary for the complex goals of television development it envisaged:

> It is only right and proper that our network should be set up with the latest equipment available and kept flexible to absorb new technological developments. In evolving a long term comprehensive plan, we should take full account of the fast, even revolutionary development taking place in the field of electronics and the possibility of using communication satellites becoming available for use at not too distant a future. This implies that the plan should have built in flexibility. While we cannot on the one hand wait indefinitely for the possibility of using communication satellites to mature, we cannot overlook this possibility on the other. These two conflicting considerations however, have to be reconciled so that an early start could be made with the introduction of television.

Noting that India's technological development was not yet capable of putting a communication satellite in orbit, the committee stated that if the use of satellite was contemplated in the future, it should enlist the cooperation of the USA or the USSR and either bear the costs of the satellite or rent the satellite on an

annual basis.[33] It also laid to rest the apprehension of a few committee witnesses about the consequences of introducing television in India. The committee put its case for television in this manner:

> We are also aware of the views held by some that television is an expensive luxury intended for the entertainment of the affluent society and that it should be left alone until our plans for economic development have been completed. That this view is based on uninformed prejudice became evident when those critics of television who appeared before us appreciated in discussion, its broad concept and the immeasurable benefits it can bring, ... and became willing converts to its large scale introduction. It may not be out of place to mention that the same attitude was displayed by many in the early days of sound broadcasting. Yet there is hardly anyone today who questions its importance, utility and inevitability. So we believe will be the case with television.

The recommendation of the committee advocating television and exploring the possibility of using a communication satellite as a means to bring about large scale expansion of television is the context in which the role of the Space Sector and the transfer of communication satellites will now be discussed.

4.7 Vikram Sarabhai: A Key Player

Dr. Vikram Sarabhai (1919–1971) is regarded as the founder of the Indian space programme and it was he who was primarily responsible for initiating the Satellite Instructional Television Experiment (SITE), the precursor of INSAT. (See appendix III for a brief biographical sketch of Sarabhai). Sarabhai's interest in space activity extends from his primary interest in cosmic ray research. He defended research in cosmic rays and space in India by stating that it could be integrated into the "total scheme of priorities in the allocation of national resources." Even though his expertise was in pure science, he was also involved in the planning, organization and implementation of educational programmes, as well as industrial developments in electronics and chemicals. These fields had been stimulated as a result of space activity in advanced countries and he saw no reason why it could not apply to developing countries.[34] Perceptively, he also recognized the need for collaborative relationships with "organizations as well as scientists and technologists in foreign lands." This was, Sarabhai reasoned, a way for India to look outwards from "its encapsulated existence born out of an emergent nationalism." And though he recognized the dangers of a developing country adopting a space programme largely for its

glamour, he felt that by taking a few preventative steps "such perversion" could be avoided:

> One should ensure that nationals of the country at the operative level of the programme are sufficiently commited and are willing to stretch themselves fully before asking for help from outside. Morever one should also have a tangible demonstration of commitment at the institutional and national levels. Arnold Frutkin has discussed these questions at length. The international programme of NASA has always conveyed to me a strong feeling that these considerations are realised. The moral has relevance much beyond the field of space activities and can well be taken up by other national and international agencies connected with international cooperation and assistance for development.[35]

International cooperation and assistance (where needed) guided Sarabhai in initiating the SITE experiment. Additionally, his faith in the television medium as a development tool provided strong motivation. It should be noted that this faith in television for development bears marked resemblence to the modernisation paradigm of Daniel Lerner and others. However, save for Lerner's admission that he acted as a consultant to Sarabhai, the nature and extent of Lerner's influence on Sarabhai is unclear. Lerner notes:

> ... an Applications Technology Satellite (ATS-6) developed by the NASA leads directly into the next decade because it is already stationed over India for a challenging series of educational experiments (both educational and instructional television). For several years I was a consultant to the Director of the Indian experiment-the late Dr. Vikram Sarabhai. Under his direction, unfortunately cut short by his premature death, the Indian experiment was a brilliant example of leapfrogging process which communication technology makes possible. Given the problems raised by India's acceleration of history and its instant mobilisation of the periphery, this type of leapfrogging over the long western experience is what India needs most."[36]

According to Sarabhai's assessment, TV in India had been accorded low priority until the mid 1960s. He identified four principal factors for this low priority:

1. non-recognition of television as a powerful medium of mass communication and of its direct relevance to development;
2. inherently higher cost of televisions in comparison to radios;
3. the absence of broadband telecommunication links throughout the country, or even between the major cities, which are necessary for national programmes; and,
4. the expenditure involved in importing equipment and components for broadcasting or receiving television programmes.

In response, partly to the Broadcasting committee's recommendation for a more ambitious expansion of TV in India and based on his experiences as a member of the Bhabha committee on electronics,[37] he conducted a feasibility study of satellite technology. This study examined the cost and significance of a synchronous satellite linking together isolated rural communities and distant centers of population in India through a national system using television. In order to gain insights into how "television can be used as a direct investment [for social development] rather than a overhead," he instituted the "Krishi Darshan", a pilot agricultural TV project.[38] Parallel with this programme, a cost comparison study of four alternative systems of providing television on a national scale was also conducted. This Department of Atomic Energy (DAE)–NASA sponsored study endorsed a hybrid system *using a communications satellite* as the best option. This formed the basis for the memorandum of understanding between the Indian DAE and NASA for the SITE. (See appendix IV for the memorandum of understanding).

Sarabhai, apart from actively pursuing the use of communication satellites in India, promoted the idea as a model for other developing countries too. In 1969, when the twelfth session of the United Nations Advisory Committee on the Application of Science and Technology to Development sought to assist developing countries, it requested Sarabhai to coordinate a study. In their report, Sarabhai and his colleagues concluded that the question was not whether developing countries could afford the "peaceful uses of outer space;" rather, it was whether they could afford to ignore them. The conclusions of this committee are significant in terms of the current trends in the use of communication satellites by developing countries:

> The most significant impact is possible through the use of communication satellites for point to point communications as well as for the media of mass communications. Internationally, the technology is already widely used on a commercial basis. Without an infrastructure of good telecommunications, national development is retarded. Literacy, education and information concerning the latest innovations and techniques are essential inputs for development. Thus we regard the provision of satellite communications of prime importance to the large developing countries. Even the smaller countries can derive immense benefits by sharing a satellite on a regional basis.[39]

Institutionally, Sarabhai's ideas and influence shaped the formation of the Indian Space Programme and his views on the use of televison for rural development formed the basis of the SITE.

4.8 Communication Satellites, DAE and NASA

The creation of a National Committee for Space Research (INCOSPAR) in 1961 owes its origin to the foresight of Homi J. Bhabha and Vikram Sarabhai. Under the auspices of the Indian DAE, this committee signalled the first phase in building an infrastructure for space sector development.

While the vision to implement a nationwide TV system was a given, borne out of the lobbying by various institutions and committees, the choice of a distribution system was heatedly debated. It is well accepted that in the US, where the satellite technology developed, its use was delayed and its ramifications discussed extensively in an attempt to minimize its conflict with terrestrial communication interests. By contrast, the existing terrestrial network in India was under the control of a government agency, the Post and Telegraphs, and the terrestrial system was not developed well enough to cause any real conflict with an alternative technological choice. A conflict did arise, however, in that DAE pushed most forcefully for a communication satellite for television while the technical committee of the Ministry of Information and Broadcasting did not envisage the use of a communications satellite. The technical committee of the Ministry was influenced by the Posts and Telegraphs Department which had a mandate in these matters while the DAE did not have any mandate. The tussle was latent, probably because DAE was institutionally very powerful in terms of its rapport with the Prime Minister.

The climate in which the use of communication satellites for television came about has been described thus:

> Though the Delhi TV centre was set up in the late fifties, the fruitful point to begin our historical probe would be the mid-sixties when more than one momentous event occurred. That Delhi TV Centre commenced TV broadcasting for public viewing in the evening is one of these events. *More important is the American (NASA's) innovation of 'stationary' satellites in 1965, beginning with the launching of the 'Early Bird' of the Hughes Aircraft , and thus opening up those fantastic vistas in space telecommunications dreamt by Arthur C. Clarke in 1945.* [Italics mine] Another noteworthy event was the submission of the Chanda

> Committee Report in April 1966, making a forceful recommendation for setting up a TV system in India, thereby touching off hectic activity in preparing TV blueprints for the country. AIR's Planning and Development Unit was probably the first to emerge with a Master plan, envisaging state-based regional TV subsystems. Indian P & T Department was to develop necessary microwave and coaxial cable transmission system to provide intra-state and inter-state (or national) interconnections in the TV system. The Plan was to be executed city by city over a period of 20 years.[40]

It was further noted that "upcoming young scientists and engineers are by nature an impatient segment of any society" more so, in underdeveloped countries where scientists and engineers are eager to accomplish in a decade what took a century elsewhere. They reason that the gap between the rich and poor countries can be narrowed by 'leapfrogging';[41] that is, taking recourse to the "latest in the technology world." Dhawan feels that ISRO's scientists were not prepared for:

> AIR's gradualism with traditional techniques. Under the aegis of the prestigious and power wielding Department of Atomic Energy (DAE) they swung into action to scuttle the AIR plan. Furthermore, they took recourse to the then fashionable mode of enlisting support from foreign experts to vanquish foes at home. ISRO did joint studies with leading American corporations, such as Hughes Aircraft and General Electric. Under the inspiring leadership of the late Vikram Sarabhai, the NASA-DAE agreement for satellite TV experiment, now christened Satellite Instructional Television Experiment (SITE) was signed in mid-September 1969. Also ISRO entered into an agreement with Lincoln laboratories of MIT Universtiy in July 1970 for further studies on satellite TV for India. So, voices of dissent were silenced; the resistance from without appeared to be over for ever. The doubting Thomasses within ISRO were effectively muffled [Wing Commander of the Indian Space Research Organisation has questioned the wisdom of using satellite for direct broadcasting]. The triumph of the modernists over the conventionalists appeared total, and it was a moment of glory within the short annals of ISRO.[42]

These institutional relationships clearly reflect the power and influence of the DAE (and subsequently ISRO) to overcome resistance in introducing a communication technology. These relationships should not be viewed strictly in terms of the introduction of television alone. The goals of ISRO went beyond the medium to satellites and related developments to establish a civilian space programme such as NASA. Television was a tool to achieve their goals. The power of ISRO was further strengthened through the support it received from the US institutions which for reasons discussed in chapter II were keen on transferring the technology. At the same time, there were certain apprehensions regarding the actual transfer process in the US.

4.9 US Perception of Satellite Technology Use in India

The use of foreign experts and agencies,[43] many of them from the US, cannot be considered a mere coincidence. In the US, there was a clear perception of why and how the satellite should be used in India. A staff paper to President Johnson's task force on communication policy provides a detailed background of the SITE.[44] In 1965, NASA recognized (for reasons discussed in chapter II) that the ATS satellite series would, in the early 1970s, be available for experimentation in television broadcasting and India was recognized as an experimental situation. Nevertheless, there were certain apprehensions regarding the political implications of such an experiment. In a background document to the President's task force, it was observed in the context of Indo-US discussions, prior to the signing of the memorandum of understanding for SITE, that "High officials in the Government of India are personally interested in the satellite experiment and endorse long range plans to expand television on an operational basis." A reference was also made to the adverse experiences of the Voice of America (VOA) which had attempted to establish radio broadcast facilities in India and by the Ford Foundation which had assisted in the development of an educational television system in India. In both of these cases it was noted that there was political opposition in India to the prospect of US control of program content within the country. This issue, it was argued, would not arise in the case of the satellite experiment as the programme production would be left entirely to India. AIR, other agencies and prospective TV manufacturers were interested and involved in the preparation of the SITE. The US regarded the (Sarabhai sponsored) Krishi Darshan experiment as a direct precursor of the NASA satellite project. NASA had proposed a study by both US and Indian technicians to make certain that the cost implications of various alternatives were completely understood by India. With the concurrence of the US State Department, a memorandum of understanding was signed in 1967, for conducting this study. It was also made clear to India that the ATS experiment was only that and nothing more:

> The experimental character of the project has been emphasised at every point, formally and informally, so that India fully understands that the experiment is only that. Its planned duration is one year. India must therefore consider other means of extending the service if, as is generally expected, the experiment persuades her to continue such programming. On this point, India has been advised repeatedly that the question of continuing service would

best be discussed with INTELSAT. [emphasis added][45]

The India-NASA Instructional Television experiment (SITE) provided a "dramatic proof of the President's (Johnson's) interest in applying advanced technology to the problems of less developed countries."[46]

From this, and the number of studies that were conducted by various US agencies, it is clear that the interests of NASA, the US State Department, satellite manufacturers, INTELSAT, private US foundations, and educational institutions were involved in conceptualizing the transfer of satellite technology to India.

4.10 Response and Role of Other Institutions

There were other agencies directly concerned with the transfer of satellite technology. For example, the United Nations Development Programme (UNDP) responded to India's request for assistance in setting up the Experimental Satellite Communication Earth Station (ESCES) at Ahmedabad. The UNDP, apart from providing financial assistance (about $500,000), nominated the International Telecommunications Union (ITU) as the executing agency of this project.[47]

Simultaneous to the setting up of ESCES, the Krishi Darshan experiment was in progress. In June 1966, prior to the Krishi Darshan experiment, an UNESCO panel of consultants on space communication suggested a pilot project:

> ... the prevailing conditions in India provide an immense challenge and a spectacular opportunity both for testing techniques and demonstrating the effectiveness of the telecommunications satellite while serving the priority needs of the area through a major contribution to development.[48]

In response to this decision, a committee[49] in India endorsed the idea of an UNESCO pilot project while recognizing the need to keep itself [India] in the vanguard of the movement. This suggestion was accepted by UNESCO in October-November 1966. However, in March 1967, the UNESCO panel stated that "feasibility is no longer the main question, as studies already made have amply indicated the

practicability of using space communication" for development.[50]

The role of many international institutions, substantially influenced by NASA, in the Indian experiment has been summed up thus:

> During this general period of NASA-Indian, pre-SITE interaction, a number of international organizations provided funds to India for general telecommunications development as well as for satellite television experiment activities. Part of this funding was the result of direct NASA initiatives. NASA's enabling legislation prevented it from funding Indian ground segment and project management activities for space programmes. [emphasis added] However, because NASA officials realised that some funding would be helpful to the Indian government, the agency encouraged international development organizations to contribute to the development of India's television broadcasting infrastructure as the basis for an effective utilization of communications satellite technology. Accordingly, the United Nations Development Program (UNDP) conducted a series of studies which led to the establishment in 1971 of a television training center to educate AIR personnel in all phases of studio television production ... In addition, the Indian government received grants from International Development Agency and the Ford Foundation. Total assistance through these grants exceeded $186 million (U.S.)[51]

These national and international initiatives led the DAE to send a study team consisting of three engineers[52] in June-July 1967 to engage in discussions with NASA and CNES (France) on the technical feasibility study of launching a satellite educational television pilot project in India. This group concluded that it was possible to use the ATS-F satellite for the project. This recommendation led to the formation of a joint study group (DAE-NASA) in 1967 to study the possibility of "using a a synchronous communications satellite for TV coverage in India."[53] The group concluded that: "the most cost-effective solution for India would be a hybrid system, combining direct reception from a satellite to remote villages and reception by rediffusion via conventional TV transmitters in and around cities."[54] Shortly thereafter, UNESCO, with the concurrence of the Government of India, sent an 'Expert Mission'[55] to prepare a report on the pilot project. In 1968, as a followup to the UNESCO mission's report, an interministerial committee under the chairmanship of Vikram Sarabhai was set up. This group with representation from all the user ministries, recommended that: "India should carry out a Satellite TV experiment using NASA's ATS-F satellite. The recommendation was accepted by the Government of India and the India-USA Memorandum of Understanding was signed in September, 1969."

The actual experiment was, however, delayed until August 1975 and Dhawan noted that the delay was partly due to domestic difficulties within NASA. The US, facing budget difficulties, was compelled to slash the huge space budget and concentrate on more urgent problems such as urban decay and poverty. From the Indian point of view, the delay could be attributed to the 1971 Bangladesh war and consequent deterioration of Indo-US relations. Nevetheless, specifically for SITE, it has been argued that since the domestic preparations for the pilot project had suffered due to the death of Sarabhai, a postponement of the launch of ATS-6 "proved a boon: it gave the space agency time to regroup and get back into gear."[56]

SITE became a reality on Aug. 1, 1975 and continued until July 31, 1976. As per the memorandum of understanding, the US placed ATS-6 in an orbit that made it available for SITE, while the Indian government provided the necessary ground segment and TV programmes. 2400 villages located in six different states received TV programmes directly through the satellite. Each village was provided with a direct reception set which was located in a public building to ensure access to all the villagers. The sets were operated on a day-to-day basis by a custodian, usually the primary school teacher. The Department of Space, through a network of maintenance centres, ensured that the sets were in working order for most of the time during SITE.

Programmes intended for children and inservice training of teachers were telecast in the morning while general programmes intended for the community at large were telecast in the evening. Research was integral to the experiment at all stages: planning; village selection; programme production; evaluation; and follow up. All research reports, with the exception of the Planning Commission study, concluded that the experiment was a success.[57] It was a success, if viewed from the perspective of the performance of the technology, comprehension of the TV programmes by the viewers and the ability of the Department of Space to overcome many institutional constraints in conducting the experiment. To the credit of the Department of Space, during SITE (maybe because it was only a experiment-Demonstration) they were in a position to prevail upon the state governments and other agencies to ensure that the intended objectives were realized. At the same time, it should be pointed out, that many of the documented institutional constraints concerning SITE have re-surfaced in INSAT and will be discussed in

the later context. The purpose of this study is to understand the institutional constraints and their consequences in relation to the realization of INSAT's intended objectives. While SITE provides a useful point of reference to this study, it has limited relevance to an operational situation, INSAT; thus, its discussion will be confined to highlighting a few of the institutional relations of INSAT.

4.11 The Transition from SITE to INSAT

That plans were drawn up for INSAT even before SITE was conducted raises the question of any direct relevance of SITE to INSAT. Not only the relevance but also the validity of SITE as an (demonstration) experiment must be questioned given that the decision to implement INSAT was formulated only four months after the completion of SITE *and before an in-depth evaluation of SITE had been completed.* The relevance can be questioned based on the fact that the SITE was aimed at providing necessary experience and guidelines for decision making regarding an operational satellite. The fact that it was not becomes important for us to understand how relevant it was? The argument that SITE was necessary to demonstrate the potential of television for social education and in-school instruction was redundant in that it merely replicated earlier projects such as the Krishi Darshan and Ford Foundation school projects. Admittedly, some institutional experience in dealing with various state governments, other agencies, and problems in a rural context was gained by the Government during SITE.

The numerous joint studies conducted with US institutions confirmed that India had opted for a national satellite system. A 1970 joint paper formulated only a few months after the DAE-NASA agreement for the SITE was signed, which included setting the time-frame for INSAT as 1974-75 (based on the assumption that SITE would be implemented in 1972), contended that for INSAT, the national needs were to be matched with the "existing experience of communication satellites and that an optimum configuration could be achieved by a combination of television and telecommunications payloads". It should be noted that one of the primary emphases was the deployment of a large number of direct receiving systems for rural communications (as we shall discuss later, this is no longer the case). Based on

these objectives the INSAT system evolved. (See appendix I.) This plan also identified various user agencies and potential uses for the satellite, as well as setting a ten year time-frame for indigenously building and launching satellites.[58]

Dhawan has argued that while an attempt was made to make the Indian people believe that SITE was a mini-INSAT, this was not the case. Analyzing the INSAT, as outlined above, he noted that it would not be feasible because: "they (ISRO) did hard thinking on the hardware questions and they relied too heavily on external initiative and advice." He suggested that "outsiders were ill-placed geographically to size up the meaning of the old saying: there is unity in diversity in Indian culture."

Despite the publicity and support for the ISRO plan for INSAT, the AIR master plan was not completely forgotten and at the same time, the approach paper to the Fifth Five Year Plan (in the 1970s) was unenthusiastic about the "place of television in our planned programmes of development and social justice." This inconsistency of vision between institutions was the result of low priority accorded to television by "hard planners" in variance with agencies such as ISRO who dreamed of a communications revolution within a 1970s time-frame. In response, ISRO attempted to educate the "hard planners" through a series of seminars, thereby convincing many of the skeptics that the nation was indeed ready for a TV explosion. At the same time, considerable pressure was applied by radical economists and others who urged the government to maintain a low priority for television.[59]

AIR's plan for a phased development of television seemed more desirable than ISRO's plan for nationwide television development; it was AIR's plan that was proposed to the Parliament in 1973. This plan did not contain any provision for community viewing sets in the rural areas. Critics, responding to sociological rather than technological determinations, were not concerned with the lack of provision for community viewing sets. Rather, they questioned the very philosophy of raising, ***unnecessarily,*** the consumption of masses through "information and education," instead of supplying the urgently-needed physical necessities of life. By contrast, criticism was also levelled at the plan for permitting only the wealthy another luxury, television.

This conflict continued to centre around the supporting institutional infrastructure necessary for such expansion while doubts continued to be raised as to the ability of the medium to serve developmental goals. While evaluations of SITE, conducted by ISRO and a few other agencies such as the National Council for Educational Training and Research (NCERT), concluded that TV was useful for development, the evaluation by the Planning commission[60] concluded:

> SITE produced no rise in expectations nor it did lead to any positive change. SITE has failed to make its desired impact on its target audience. Its achievement in the hard core areas of agriculture was minimal and its failure in the area of family planning was total. In the area of political orientation the effect of TV was minimum. There does not seem to be a case for any immediate large scale expansion of TV to the rural areas based upon a space satellite.[61]

Finally, in the midst of a national [internal] emergency,[62] all previous discussions were rendered inconsequential and a decision was made to proceed with INSAT, *less than four months after SITE began.*

4.12 INSAT: A Brief Introduction

Based on global tenders the Ford Aerospace and Communications Corporation (FACC) was contracted to build INSAT 1A (the decisions to build other satellites in the I series, INSAT 1B, C, and D came in a phased manner). FACC was awarded the contract because it tendered the lowest bid in response to India's global request for proposals. There is no evidence to indicate that FACC acted in a consultative or lobbying role. The only institutional link that can be established is the interest of the Ford Foundation in the development of educational television in India (discussed earlier). However, Ford Foundation has shares in the Ford group of companies.

As it is presently constituted and defined, INSAT is an "operational space system for identified socio-economic objectives" in health, education, agricultural and rural development. It is a joint venture of the Indian Department of Space, the Indian Department of Telecommunications, the Indian Meteorological Department, AIR, and Doordarshan (Indian Television authority). The overall coordination and management of the INSAT system rests with a high level inter-ministerial INSAT Co-ordination Committee (ICC). The Secretariat of this Committee resides in the Department of Space

and it is the Department of Space which is directly responsible for the INSAT space segment facilities.

The INSAT plan envisages two series of satellites: I and II. INSAT 1 A, B, and C have been launched. When INSAT 1A failed in 1982 due to technical reasons,[63] the INTELSAT and Statisoner (USSR) satellites were used until INSAT 1B was launched in 1983. Owing to problems experienced by the launching agencies, NASA and Ariane (the European Space Agency), India could not launch INSAT 1C till July 1988. A few days after launch it experienced a problem resulting in "loss of about half of the payloads/house-keeping equipment."[64] This problem with INSAT 1C has shifted the burden to INSAT 1B which for nearly five years has been the only satellite in orbit. A single satellite in orbit contradicts ISRO's plan of having two satellites, a primary and a backup. The current status is that INSAT 1B is reaching the end of its life and INSAT 1C is only working to half of its capacity owing to technical problems. Expectations are high for INSAT 1D due to be launched by early 1990.

4.13 Summary

In summary, it can be said that there were considerable pressures both inside and outside India to expand television. However, there was a conflict regarding the choice of siderable pressures both inside and outside India to expand television. However, there was a conflict regarding the choice of technology needed for TV expansion. This conflict was resolved in favour of communications satellites. While a considerable amount of planning and foresight went into the transfer process, it revolved primarily around technological and hardware issues. Yet, India's transition towards a domestic satellite has sometimes been compared, too simplistically, with other countries, most particularly, Indonesia, which adopted a similar technology within the same time-frame:

> In contrast, [to Indonesia] Indian policy on satellite communication has been closely linked to comprehensive development policy and planning. Discussions started as early as 1960, mainly on the initiative of the well known scientist Dr. Vikram Sarabhai ... Together these efforts laid the foundation for INSAT, a national satellite programme for telecommunications, radio, ... Despite all difficulties encountered through inter-departmental rivalries and incomprehension, joint departmental planning and co-ordination have been major considerations as has the intention of achieving self-reliance in manufacturing, and institutional and managerial autonomy.[65]

Though it is widely acknowledged that the transfer of satellite technology to India from the US took place through a careful definition of the problem and an exploration of various technological options to solve the problem, it can be concluded that it was guided more by the powerful desire of the Indian Space Research Organization to design, develop, manufacture and deploy communication satellites. Television was a means to achieve this end. The initiative it took in conducting pilot projects in the use of television, even though it did not have a mandate and the numerous activities it sponsored to convince the decision makers to choose satellite as the basis for expanding television supports this contention. All India Radio which had developed its own plan for a phased development of television in India had to give it up in the wake of the powerful campaigning done by ISRO.

CHAPTER V

CONSEQUENCES OF INSAT: TELECOMMUNICATIONS

The telecommunications application of INSAT cannot be viewed independently of the overall telecommunications scenario in India. The low priority for telecommunications in India shifted towards a greater recognition of the importance of communication and the deliberations prior to the seventh five year plan (1985-90) accorded a high priority for telecommunications. This was stimulated, in part, due to the international attention under the aegis of the World Communications Year, 1983. By analyzing the institutional relationships embedded in INSAT, this chapter will examine what telecommunications expansion means in a Third World situation and the compatability of satellites for achieving developmental goals.

The relationships described in this chapter are intended to explore: the colonial basis of telecommunications development; planning and development of telecommunication; technology choice and the nature of competition and conflict involved; the reasons for choosing satellite technology for telecommunications; and the consequences of these developments.

5.1 Colonial Pattern of Telecommunications Development

The telegraph had proved to be an effective means of communication in England and North America by 1840 and there was a lobby in England to establish it in India. Accordingly, the Court of Directors of the East India Company asked Lord Dalhousie, the Governor General of India to investigate this possibility. He proposed trunk lines from Bombay to Madras and other important routes which were accepted by the Board. Coincidentally, an assistant surgeon in the Bengal Army, O'Shaughnessey, had independently taken the initiative to conduct telegraphic experiments in Calcutta, even as Samuel Morse and others were laying telegraphic lines in America. Thus, Dalhousie put him in charge of laying the foundations for telegraph communication in India.[1]

Telegraphs quickly became a tool of the colonial power and proved useful in putting down the Indian rebellion of 1857. This provided the British with the rationale to accord the development of telegraph communication in India the highest priority. More generally, the British administration perceived communications development as integral to the retention and extension of control. The steps initiated to retain and extend control included the "three great engines of social improvement": railways; postal system; and, the telegraphs.[2]

By 1883, Headrick notes that access to the communications network had been extended to the entire population through a system of main telegraph centres and post offices which delivered the telegrams through the regular mail system. Even though the telegram rates were much lower than rates in England and North America, the costs were prohibitive for all but the Administration and the Indian middle class. Although the Telegraph network had expanded widely by the time India had gained Independence,[3] the expansion of telephone service was much slower than elsewhere, even though it had been introduced in India shortly after its invention.

The extent to which these developments helped India achieve its post-independence development goals is debatable and lies outside the scope of this dissertation. Nevertheless, the foundations laid down by the British in focussing on a particular pattern of communications development with a heavy bias towards the metropolitan areas has continued even after 1947.

5.2 Indigenous Planning for Telecommunications: Early Attempts

One of the early attempts in planning for various developmental sectors was the constitution of a National Planning Committee in 1938.[4] Various sub-committees were constituted to examine different areas. A sub-committee under the chairmanship of Sir Rahimtulla Chinoy examined Communications (Posts, Telegraphs, Telephones and Radio) situation.

The Secretary of this sub–committee noted that, in many developmental areas, the National Planning committee Chairman, Jawaharlal Nehru, was in a position to set norms for development within a particular time–frame. And yet, in the case of communications he did not give any guidance. Thus, the sub–committee had to evolve its own convenient targets. These targets included: a post office in every village and a telephone and radio for every 10,000 persons. In giving the reasons for setting these targets, the sub–committee stressed the importance of communications in terms of cultural contacts, trade, domestic economy, political progress and economic development. In each area, the sub–committee reiterated the importance of communications. For example, on communications and economic development, the committee noted:

> The spread of information with regard to the available raw materials, technical aids, scientific discoveries, tools and machinery, transport, banking and other facilities, labour and market conditions governing the principal items of production and commerce, are indispensible, if all the effort which National Planning implies for the development of the economic resources of the country are not to be wasted, or the benefit of such development is not to be monopolised by a microscopic class. For this purpose, moreover, it would not be enough to consider the Communications service as an agency for conveying the individual's correspondence with his friends, relatives or business associates. The State must develop on its own hook all modern means of communication and information throughout the country as an integral part of the National Plan, not only to arouse the people to their country's potentialities, but also to enable them to join consciously in the concerted mass effort to raise their own standard of living, and improve their outlook on life.[5]

It was within this framework of economic development that the committee examined the status and future developments of communications. Though this committee undertook its study before independence, the fact that Jawaharlal Nehru was the Chairman lends importance to its impact for post–independence planning endeavors.

In assessing the relative advantages of different forms of communications, the committee recognized the benefits of the telephone in comparison with the telegraph and visualised a situation in which the telephone call would essentially replace the telegram. Additionally, the perception that the telephone density in India was very low compared to other countries strengthened the case for the telephone. According to the committee's plan, they suggested the possibility of renting long distance facilities to meet the needs of large business and industrial corporations. This long distance network was also visualised for the use of newspapers and news agencies. Although the committee did not have any

specific plan for television, it indicated that a long distance telephone network would be helpful when television becomes "an economic proposition for the average citizen."[6]

The development of telephone before independence has been described as rudimentary even though telephone had existed for more than one hundred years in India.[7] According to Brudenius, the telephone situation in India was a reflection of British colonial rule, in which "the telephone system was designed primarily to meet defence needs and help upholding law and order." Colonial priorities resulted in a dependent situation after independence as far as the acquisition and development of telecom technology was concerned. Since the existing system was of British design, it was decided that the necessary "know-how" on which to base future expansion should be acquired from Britain. Accordingly, a strowager type of telephone technology was acquired.[8] The pattern of technology acquisition following independence has raised a number of questions concerning the general nature of telecom development in India. The suitability of different technologies for telecom is polarized between indigenous and imported technologies. This question will be analyzed in a subsequent section to provide a better understanding of choice of satellite technology for telecommunications.

5.3 Planning and Priority for Telecommunications in India

A retrospective analysis of telecom development in India indicates that the expansion of telecom has been consistently less than adequate. The gap between the demand for telecom services and its supply was indicative of inadequate investment. Telecommunications development was not regarded as a priority and one of the reasons for this was the perception that priorities such as Agriculture and Irrigation needed greater resources and attention. In addition, telecom, especially telephone, was considered a luxury. According to D.K. Sanghal, former secretary to the Department of Telecommunications, the generally-held perception was that the primary need of the people was food, water and shelter; telephone development could wait. Some Planning Commission members held that India should learn to live with deteriorated telecom services, reasoning that telecom development would only aid the migration of people

from rural to urban areas. Another member of the Planning commission felt that telephone was a consumption item of the rich and "at best deserved the same priority as the Five Star Hotels." Sanghal is of the opinion that these perceptions were directly responsible for the limited allocation of resources for telecom development.[9]

But this requires an allocation of resources within the institutional framework. Quite simply, additional funding for telecom development is of dire necessity. This funding has to be provided by the Ministry of Finance through budgetary support. If there are budgetary constraints, it has been suggested that additional funds can be raised by the government through public borrowing or through the banking sector. A former director of the Post and Telegraphs (P&T) board feels that "given the will the Indian bureaucracy and top financial managers of the economy have the requisite expertise to work out the ways to raise the necessary funds."[10] However, this begs the question: what incentives does the banking industry expect in return for providing the necessary resources? Generally the banking sector tends to support commercial projects which basically conflict with developmental objectives.

Resource mobilization at the national level, however, is not enough. In addition, the capital and technology intensive nature of telecom has placed substantial pressure on India to seek foreign exchange financing. According to available figures, this requirement has, in the past, has averaged between 12–15% of the total expenditure for telecom development. The World Bank group, the Overseas Economic Fund of Japan and other bilateral arrangements have been the major sources of this foreign exchange funding through loans and other forms of assistance. These relationships are inherently problematic as their shifting political and economic priorities are not always India's, and they can engender unhealthy dependencies. But Tallo expressed the opinion in 1983 that though the funding from the World Bank group cannot be depended upon on a consistent basis, this is not particularly problematic:

> ... due to change in polling of USA towards the World Bank group and entry of China as a member country of World Bank, the contribution from this group may not be as substantial as in the past. But part of the assistance will continue. The foreign exchange assistance on bilateral credits would, however, be avialable from many countries. India has the necessary credit worthiness and almost all major developed countries of the world are prepared to do business with India in Telecommunications by offering matching aids. So, Indian telecommunications need not have any worry about the foreign exchange mobilisation

required for its massive expansion programme.[11]

Too often, India's planners have shared Tallo's shortsightedness by neglecting the long-term impact of foreign assistance. It is unfortunate that the long-term debt problem has not been a major concern when seeking foreign exchange for telecom expansion.

In the early 1980s, with the onslaught of advanced and competing communication technologies, telecom was re-prioritized and promoted by national and international agencies as the "mission link" in the development process of Third World countries. (This is somewhat analogous with the experience of radio in the 1950s and television in the 1960s). The Maitland Commission for World Wide Telecommunications development concluded:

> Our study of the role they (telecommunications) can play has persuaded us that telecommunications can increase the efficiency of economic, commercial and administrative activities, improve the effectiveness of social and emergency services and distribute the social, cultural and economic benefits of the process of development more equitably throughout a community and a nation. We have no doubt that any further research in this field will corroborate our view.[12]

The commission reinforced the prevailing view in India which had made a strong case for telecom development as a major priority. These revised goals are reflected by Prime Minister Rajiv Gandhi:

> [that] the use of technology in day-to-day life made all the differences between the developing and developed countries. The same held good for different areas within a country. [in this context, he said] the rural areas were backward because industrial revolution had not reached there. If they were to catch up with the modern world they have to jump that stage. Anyone who thinks otherwise had a vested interest in keeping them poor for political or ideological reasons.[13]

Based on this official definition of development, three layers of science efforts towards achieving excellence have been identified: "missions," "thrust areas" and "blue sky (fundamental research)". Telecommunications is one of the five mission areas along with drinking water, oil seeds, removal of illiteracy and vaccination of children. A characteristic feature of these mission areas is that immediate results are expected.[14] Discussions, prior to the formulation of the seventh five year plan in India, reflected these revised goals and the subsequent approach paper projected a budget of nearly Rs 12000 crores for telecom expansion. However, the actual allocation was only one third of this amount. (see

table 1 for allocation to the communications sector.) Yet, this allocation far exceeds previous allocations. Clearly telecom expansion is now a priority item for India and as such the issues surrounding the implications of telecom development in a developing context become important for this dissertation. It is in this context that the relationship between INSAT and telecom should be understood.

5.4 Choice of Technology: Competition and Conflict

The development of telecommunications sector was reserved for the state sector under the Industrial Policy Resolution (IPR) 1956. As a legacy of the colonial influence, the Indian government did not have much choice but to import technology from the UK in the initial phase of development. In keeping with the general industrial policy, the choice of technology and import decisions were centrally controlled. In the mid-1960s India imported technology and components from Belgium for the manufacture of a Crossbar switching system. The import proved useful as the Indian engineers were able to gradually integrate the technology by progressively developing a component industry and, by 1981 only 12-15% of the components only were imported. In the early 1970s electronic switching systems were introduced based on the technology developed by the Indian Telecommunications Research Centre (TRC). In 1979 it was decided that future expansion of telecommunications would be based on electronic switches. Despite the availability of indigenous know-how, the Ministry decided to import the technology and the explanation offered was that the Indian know-how lacked the expertise to produce the technology in large quantities. The decision to opt for electronic switching brought into the scene another player, the Department of Electronics. Though small compared to the huge Post and Telegraphs Department, it enjoyed enormous power as it was the Prime Minister's portfolio.

In 1980 the P&T department floated global tenders for setting up two factories for the manufacture of electronic switches. This decision eliminated TRC's participation as the tender was for digital technology and TRC technology was analog (the original tender was for analog; it was subsequently changed to digital). This tender attracted the TNCs and the decisions that followed clearly proves how

Table 1 : Communications, Information & Broadcasting: VII Plan Allocation

Sub Sector	Allocation (Rs in millions)
Telecommunications	401.00
Indian Telephone Industries (ITI)	33.50
Hindustan Teleprinters Ltd.	2.422
Overseas Communication Services	14.655
Monitoring Organisation	1.423
Postal Services	29.50
Sound Broadcasting	70.00
Doordarshan	70.00
Information and Publicity (including films)	
(a). Centre	7.151
(b). States	9.084
(c). Union Territories	.706
INSAT 1 A & B	.203
INSAT 1 C	3.778
INSAT Space Segment & MCF Operations	.955
INSAT II Test Space Segment	9.396
Total	653.80

Source: Prepared on the basis of information in the Seventh Five Year Plan document. Planning Commission, Seventh Five Year Plan, (New Delhi: Government of India, 1985), pp. 243-251.
Note: 1 Cdn$= Rs 13.10 (July 1989 exchange rate).

institutional relationships operate in any given context.

The tender attracted all the major TNCs in the telecommunications sector. Ericsson of Sweden decided to boycott the tender on the ground that in three earlier cases, the P&T department had not considered their technology and also suggested that the P&T officials had influenced the decision-makers to select their competitors. The strongest contenders for the electronic switching factories were Siemens, British Telecom and the Belgian subsidiary of the IT&T. Shortly before the tender closed, the French company CIT-Alcatel made a direct offer to the government of India and this offer, apart from a soft loan of 1 billion Ffr., included discussions about military technology (Mirage aircraft and enriched uranium for Tarapur nuclear plant). The decision for the first factory went in favor of the French TNC. The

competitors protested and the government had to placate them by saying that the second factory deal was still open. The P&T favoured another technology for the second factory as it felt that depending on France or one supplier would be like placing "all eggs in one basket". Siemens was pushing hard for the second factory deal and the West German communications minister, Schwartz Schilling, visited India in early 1983 and made an attractive soft loan offer cover the foreign exchange component.[15] This did not prove useful as the French got the second contract too and the only explanation offered was that decisions are made in the larger national interests. In this sense, the Indian government decision can be viewed as a strategy to balance the superpowers and achieve its goals. The US government's attitude towards India in the area of high technology has made the availability of sensitive technologies a problem for India. Alternatively, India pursues other countries through such tied arrangements. The merits and demerits of the Alcatel deal have been analyzed for long-term consequences as the deal has many restrictive clauses that prevents India from exporting the technology to a few countries only.[16] This can be an argument, but India's goal in this particular area is more directed to meet the huge domestic demand.

Although the decision to set up the second factory using the French technology was made in 1983, the decision did not anticipate the evolution of a powerful national institution, the Centre for the Development of Telematics (C-DOT) started by a non-resident Indian, Satyen G. Pitroda in the 1983-84 period. C-DOT promised and claimed that it would be in a position to develop an electronic switch. Technology for smaller exchanges have been developed and various parties have bought this technology. C-DOT's arrival on the domestic scene had resurfaced the conflict over CIT-Alcatel technology for the second factory at Bangalore. According to newspaper accounts, C-DOT technology has finally won the battle and it will be the technology used for the factory. This decision was taken in May 1989 after several years of conflict involving various institutions such as the DOT, DOE, the Ministry, and the labour unions of ITI Bangalore. This decision also coincides with the formation of a Telecommunication Commission which apart from taking major decisions in other areas will act as a single window agency for technology development and acquisition.[17] This insight reveals the nature of institutional relationships that affect the telecommunications sector of which satellite technology is an integral part.

The INSAT 1B system has been in operation since 1983 and, with the launch of INSAT 1C by the European Space Agency, Ariane, last year, the space segment now has both a primary and a backup satellite. As a Department of Space (ISRO) concept, INSAT 1 are multipurpose satellites designed to incorporate three applications—telecom, broadcasting, and meteorology. This design is based on joint configuration studies conducted by ISRO and varous US manufacturers. Clearly, this design was influenced by the US satellite manufacturers. The telecommunications configuration for INSAT was based on the INTELSAT IV satellites[18] without the consultation of the Department of Telecommunication. Rather, potential telecom use was presumed by the ISRO. Even the decision regarding the Experimental Satellite Communication Earth Station (ESCES) at Ahmedabad was made and pursued by the ISRO. The extent to which the user agencies shared the ISRO vision for satellites is not clear, except in the case of television expansion where AIR clearly opposed ISROs vision. In retrospect, the opposition of AIR had a significant P&T factor as it would have laid the terrestrial system. Whatever the opposition might have been, it was coercively resolved by the powerful institution, ISRO. And when the decision was made to opt for an operational system, global tenders were invited and only two firms responded. Since FACC's quote was the lowest, it was selected. Yet, FACC has had a "hard time keeping within the cost budgets as well as the time targets."[19] After the INSAT 1A and B experience, FACC's contract for INSAT 1C was much more than earlier satellites. (INSAT 1A and B cost the nation $37 million each in 1982-83; INSAT 1C cost $57 million in 1988). The delivery schedule has been such that INSAT 1C, which was to be a backup for INSAT 1B, was launched only last year, five years after INSAT 1B was launched. (The delay was also due to the limited availability of launch vehicles.)

The Planning Commission is said to have given clearance for INSAT based on its projected economic returns. Telecommunications was the only user agency presumed to possess the potential to recover the costs incurred. Based on projected usage by different agencies, the INSAT costs were apportioned and accordingly Telecommunications was allocated 50%. In order to recover these costs, the telecom department has to earn at least Rs 1 crore per month through satellite circuits alone. This means

supporting commercial projects only. From a developmental perspective it seems that deriving commercial revenues should not be the main goal. Unfortunately, this seems to have been the major consideration. Even Sarabhai was quite clear about this:

> P&T [now DOT] can utilise the services provided by INSAT for mainland domestic communications as well as for communications to our isolated islands. The most important usage commercially would be for carrying point to point communications traffic between the four major centres viz. Bombay, Calcutta, Delhi and Madras. The same transponders used for this could be assigned on a time shared basis, for interconnecting remote stations on multiple access systems.[20]

As we shall see later, however, full realization of INSAT potential, even for commercial enterprises such as designated telecommunications systems, is restricted by the fact that the C Band configuration of INSAT conflicts with the microwave system which has used this band extensively.

The dormant conflict between ISRO and the Department of Telecommunications resurfaced when INSAT 1A failed due to technical reasons. It was in this context that observers started questioning the "go it alone" attitude of ISRO. The design configuration chosen for INSAT 1 was such that it required the state of art sub-systems. This decision contradicts the usual method of selecting proven technologies only. In the case of INSAT 1 it is noted:

> ... when one has to make a long-term choice of technologies which will form the mainstay of the communications network for the country in an operational context. This malady was aggravated due to the stance of the Department of Space which believes that they and they alone, are responsible for making important choices, and do not value the years of operational experience that the other participating agencies like Posts and Telegraphs Department, Doordarshan, All India Radio and India Meteorological Department have acquired.[21]

This was most evident when senior user agency personnel expressed dissatisfaction with INSAT 1A's failure. Consequently, DOSs "bullying stance" was diffused (to some extent):

> The space scientists and engineers always paraded expected spacecraft reliability figures and treated all other ignoramuses in this sophisticated game. But they had no place to hide after it was proved that the Indian built ground stations—using wholly Indian manpower and facilities —proved to be far more reliable than foreign built spacecraft built in accordance with the design/specifications of the DOS [ISRO].[22]

An important consequence of INSAT 1A's failure was the independent strategies adopted by the user agencies. DOT quickly responded by renting some transponder capacity on the INTELSAT satellite.

In the case of Doordarshan, they urgently ordered the new equipment necessary for use with INTELSAT as well as pressing existing microwave links into service to complete the network. These responses substantially re-ordered institutional relationships relating to INSAT.[23] The relationships were re-ordered in the sense that earlier the Space agency would decide and the user agencies informed about the potential etc., When INSAT 1A failed, the user agencies such the DOT decided that they could develop contingency plans and explore other avenues of using satellite for telecommunications.

This post mortem of the decision making process seems to indicate that the related agencies had an overwhelming desire to participate in the decision making process and ISRO ignored them. Both broadcasting and communications ministries did not even have ministers of equal ranking as the ISRO had for it directly came under the Prime Minister. However, Hudson provides another interpretation for lack of participation by the P&T in the process. Being convinced that in any case there would be a satellite, their only concern was to control it rather than conducting any system design to meet national telecommunication needs (all the experimental satellites had been under ISRO's control).[24] This indicates that the institutional relationships can change over a period of time. When the technology was in the process of selection, the space agency used its persuasion because it had certain goals. However, the actual use of the technology and subsequent developments are determined by the user agency which has its own priorities which can be very different from that of the institution responsible for the introduction of satellite technology.

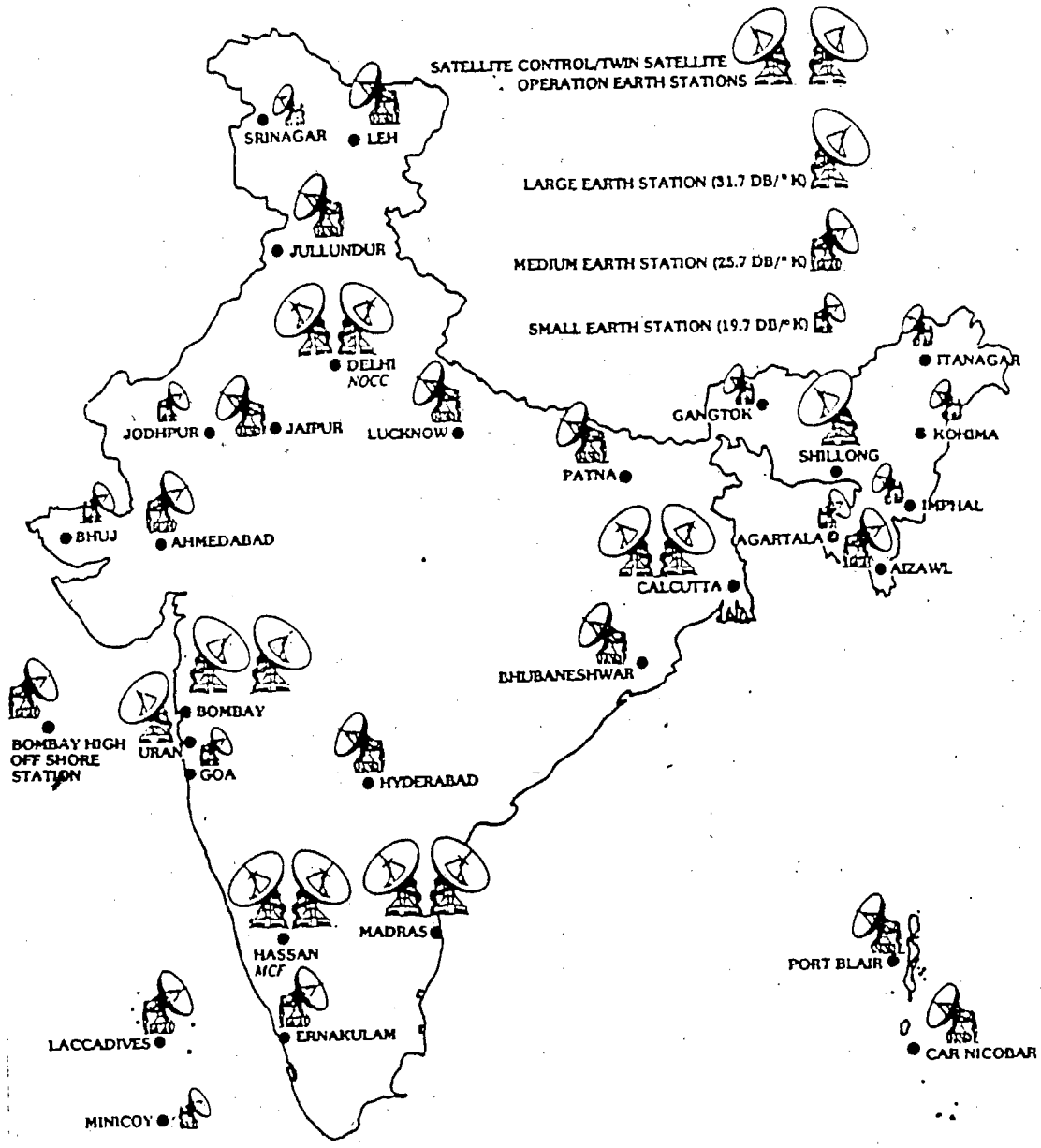
5.5 INSAT Telecommunications Objectives, Developments and Consequences

The INSAT-1 telecommunications capacity (see figure 4 for a map of INSAT's telecommunications ground support) is used by the user-ministry for:

> (a) supplementary use on important, long distance trunk routes providing a portion of the total capacity thus resulting in better reliability and flexibility besides greater immunity from breakdowns and natural disasters.
> (b) remote area, short-term/interim and emergency communication services.[25]

The transponder capability of INSAT has helped the DOT to derive 3956 circuits. Out of these, 3756

Figure 4: Telecommunications Map of INSAT



Source: Department of Space, Indian National Satellite System (INSAT), (Bangalore: Government of India, 1983), p. 27.

circuits link 13 major towns while only 200 circuits link remote areas.[26] Considering the average seven-year lifespan of a satellite, and given the fact that INSAT-1B was India's only satellite the "loading of circuits" within a given time -frame became a matter of great concern and a committee was set up for the optimum use of INSAT (it should be pointed out that optimum use in this context refers only to the technological aspects of loading the circuits). During discussions with DOS officials this "concern' was raised. According to these officials it was not simply a matter of satellite and earth station readiness; "there are considerations of traffic requirements in a long haul multi-transmission media mix and integration of satellite circuits with the terrestrial plant—a working one."[27] Therefore, it is clear that the mere availability of a satellite does not ensure its optimum use. The supporting infrastructure is of enormous significance. At the same time, it calls for a "versatile" use and planning for the use of technology in a developing context. Robin Mansell points out that these (terrestrial) considerations, "which are now believed to be necessary are really a reflection of the US carriers original interest in ensuring that satellites could never challenge their terrestrial networks."[28]

The optimum use of INSAT telecommunications capacity has another related (technological) problem. One way of realizing INSAT's technological potential is the utilization of rooftop antennas, especially for business needs. There are problems regarding this use. G.K. Gupta, Deputy Director General (satellites) in the DOT, explains:

> The C-band frequency spectrum of the INSAT-1 series has also been substantially exploited in terrestrial microwave links in the country and, as such, the engineering of the satellite links requires a very careful and meticulous approach with a view to avoid problems of mutual frequency interference. This aspect assumes a great significance in meeting the requirements of the customers for provision of roof top earth station terminals, particularly with a view to solve the 'lastmile' problem i.e. avoiding dependence on the terrestrial endlinks from the earth stations to the users premises. This problem is, however, expected to be largely overcome through extensive co-ordination and case by case examination of the earth station siting.[29]

This problem, particularly, throws some light on the choice of parameters for INSAT. The C-band of frequencies are considered appropriate for a situation in which the number of earth stations is relatively small. This frequency is economical in terms of the satellite cost if the number of earth stations is limited. Beyond a certain number of earth stations the terrestrial costs would outweigh the economies obtained in

the satellite component. In order to have the desired dispersed access in India, it is necessary to have more number of earth stations than INSAT can afford due to the frequency limitation. Technical experts have argued that the choice should have been the higher frequency KU or KA bands. Though the cost of the satellite would be high, it can accommodate a number of earth stations. The choice of a C band for INSAT's telecommunications applications has long-term consequences in terms of the (restricted) services it can provide for certain regions only:

> By opting for the C-band as a carrier frequency, the Space Commission and the Electronics Commission have committed themselves to a situation wherein access on the ground would be limited, since the expandibility of the network would be constrained by the possibility of diseconomies setting in beyond a point. The location of the earth stations would be constrained by the necessity for ensuring a minimum number of users for each, so that the relatively high unit investment on the station could be paid back. This again would be a factor that would tend to limit access to telecommunications facilities to areas of relatively high population densities and per capita incomes ... the primary consideration underlying the recent series of decisions seems to be that the most valuable protestors must be placated.[30]

Despite these problems, the DOT has decided to proceed with this plan of "linking the major commercial centres, and dedicated exclusively to enterprises that take out a subscription to it." Muralidharan has argued that this again "typefies the approach of setting up a parallel system to enable metropolitan subscribers to bypass the problems of telecommunications planning and networking in the country as a whole."[31] This business network also offers incentives to the public sector undertaking, Indian Telephone Industries, (ITI), which has entered into technical collaboration with Equatorial of the US for manufacture of rooftop antenna dishes.[32] Demand is guaranteed according to the seventh plan proposals of the DOT. The DOT has proposed a "sophisticated parallel telecommunications network for the Industry.":

> In this [business] network, a subscriber will be connected by either optical fibre or radio telephone to a nodal exchange/ switching centre. The switching centres would communicate nationwide through rooftop microwave/satellite terminals. Equipment would be provided for each subscriber through the special switching centre. The estimated capital investment would be around Rs 1.50 to Rs 2.00 lakhs per subscriber. In case of voice transmission cost would go up further.[33]

In 1986, when the DOT proposed the business network, the Confederation of Indian Industry (CEI), representing industries from various sectors, conducted a survey and organized a series of meetings

in various cities, to assess the response of the its members to the proposed network. The response of the industry, apart from highlighting the need for such a network, revealed that a separate institutional arrangement in the private or the joint sector was needed for its management. The survey revealed that though voice capability was desired, the need for data, facsimile and other non-voice requirements was quite high.

Owing to these pressures the DOT has finalized the Remote Area Business Message Network (RABIN). It has been engineered primarily for users located in remote areas and envisages installation of earth stations to work with satellite based packet switched network using INSAT. To hasten the process, the DOT has decided to import the Master earth station, the heart of RABIN from Equatorial Company in the US. The project expected to cost Rs 15 crores will cater to about 1000 subscribers and in due course it might go up to 1500 subscribers. The premises-oriented earth stations will be manufactured by ITI Equatorial Satcom Ltd., Bangalore. By March 1989, 60 firms had registered themselves with DOT for this services. There are certain conditions which must be met before this service may be taken advantage of: constant supply of electricity or power; dust-free environment; and, air-conditioned accommodation. Given these conditions, the main customers are likely to be the fertlizer companies, coal mines and corporations, especially in the public sector.[34]

Apart from playing a major role in the creation of RABIN, CEI is very sensitive to the developments in Indian telecommunications both from a service and an industry perspective. When the DOT was only allocated one third of the funds it had requested, CEI recommended various alternate means of resource mobilization. The CEI was willing to raise the necessary funds provided it was given an opportunity to participate in the telecom sector in India.[35]

5.6 INSAT and Information Networks

The notion of information networking—the storage, processing, and retrieval of information—which has developed in India is a direct consequence of INSAT. At the foundation of this notion is the computerization of information (or informatics) which is being actively pursued in the country through liberal policies aimed at promoting the use of computers in various sectors.

The notion of networking, apart from the availability of supporting technologies such as computers, modems etc., is closely related to the availability of public data network in conjunction with the telephone system. The DOT has planned a packet switched public data communication network for this purpose. Airlines, railways, and a few coporate users have expressed interest in this facility.

In terms of scope, the most "ambitious networking plan" in the country is the National Informatics Centre's planned network, NICNET: " ... proposes to link State with Centre, district with city, and turn the crawling piles of paper into a smooth, swift information stream that serves the government's every need." A Rs 100 crore project owes its origins to the experimental network implemented during ASIAD. The network is based on a system of four super computers, imported from Japan, located in New Delhi, Pune, Hyderabad and Bhubaneshwar. These super computers will be linked to minicomputers at 16 state capitals through terrestrial and satellite links which will in turn be linked to district level micro computers through micro earth stations hooked to the INSAT IB. INSAT IB or satellite links were chosen as the terrestrial links are not considered to be reliable. Using a satellite, though expensive, is according to the DOE, a guarantee for 100% delivery system. According to Vijayaditya, who is spearheading the NICNET system, the network is a "backbone structure for consistent information at the right time, from one identified source." He expects that at the district level there will be problems of "attitudinal adaptation" which can be overcome through training and orientation programmes.[36] User groups such as the Planning Commission were not sure as to how exactly they will use the NICNET. [37] However the control of NICNET was recently shifted to the Planning Commission from the Electronics department.

The Computer maintenance corporation of India (CMC) is planning another network, INDONET, for commercial purposes, and wants to create links to international networks and databases. Similar links have led to transborder data flow (TBDF) debates in other countries. National and International links no doubt provide interactive links but interaction by itself does not ensure that the benefits will accrue to the nation. Canada, experiencing an enormous transborder flow of American information is a case in point. The socio-economic implications of such flows are less than beneficial to the receiving nation. India has essentially ignored the long-term consequences of transborder flows by perceiving only the immediate benefits *as a (potential) exporter*. They recognize only the foreign exchange they can earn through software exports. However, the foreign exchange needed to enhance, upgrade, and installing the necessary hardware far outweighs any perceived benefits.

The dominant advocacy of "open skies", the free flow of information, has become an important policy option with the changes in telecommunications infrastructure as a result of INSAT. This is evident in recent policies regarding software exports. The existing policies are intended to benefit the software industry in India, an industry that has recently emerged as a major institutional force in the country. The industry's (software companies backed by big industrial houses) position was strengthened by the introduction of a software policy which, apart from providing incentives to the industry, articulates the government's extensive support for software exports through a firm committment to provide the necessary technological configuration. In addition, the policy outlines guidelines for the efficient use of satellite technology in India in the export of software. These guidelines incorporate some security arrangements through new institutional arrangements and though the protection of the national interest has been built into the guidelines the arrangements for supervision and regulations have not been sufficiently defined.[38] Allowing the Indian software industry to export 100 percent of their productions (if they desire) is intended to provide enormous incentives to the Indian industry. This is undermined by the accompanying requirement that these companies provide for their own production equipment. The production equipment in this area refers to complicated hardware systems which have to be imported under certain rules and regulations which makes it difficult for Indian software companies.[39] This is, in fact, a

disincentive to a domestic industry unable to raise the necessary foreign exchange for this equipment. It unfortunately provides incentive to multinational corporations such as Texas Instruments with the requisite foreign exchange and marketing capabilities.[40] Critics have indicated that the strategic importance of software should be the consideration for any policy. An analysis of the software policy in India has indicated that "by opening the Indian market to international competition at a time when the industry is still in its infancy, would effectively mean the end of the industry in India ... When the basic skills themselves would not exist, talk of higher-end software and value added products would be quite meaningless. The industry would also lose the few remaining skilled people in the field.[41] This apprehension is based on existing rules and regulations and indications are that they may change to provide more incentives for Indian software companies.

Another factor that will affect INSAT's technological potential are the developments in INTELSAT, of which India is a member. Recently INTLESAT has discussed the possibility of providing a range of services on a global basis. The incentive, particularly for developing countries, is the return on their investment in INTELSAT. However, INSAT's limited ability to provide only domestic service is affected by the technological capability of Indian earth stations to receive both INSAT and INTELSAT signals, may tilt the balance in favour of global institutions that have a comparative advantage. This has grave implications for the indigenous production of information within India. It signals a move away from independence and towards the retailing of foreign software. An Indian firm may act as an intermediary in both information and book publishing for global institutions such as the National Technical Information Service (NTIS) of the US. The NTIS representative in India acknowledged the merits of the software policy, but he declined to discuss the incentive he derived from the collaboration arrangement.[42] Bascur has argued that such arrangements are insensitive to the socio-political impact of the large scale import of foreign-based educational, technical and financial information ("crucial information") in any country but more so in a developing context.[43]

The import of software is not only costly in socio-political terms, but is also economically prohibitive. Haravu, an information scientist working for a public sector enterprise in India, states that

data-base searches are essential in providing information for potential R&D projects. Yet, more than 50 percent of the cost for a dialog data-base search was for the connect time, output, and involved foreign exchange.[44] Were more Indian companies to avail themselves of this service, the drain on the national economy would be substantial. This constant demand for information by the Indian industry (banking, finance, etc), particularly from the West, and the compatability of the technological options such as satellites, has implications in terms of international trade and tariff legislation. While India and Brazil continue to argue for the "free flow of information" without any accompanying trade and tariff barriers it is unclear how long they can resist the powerful US and Japanese lobbies. The US has a major stake in the inclusion of information services into GATT and has recognized this by establishing a firm relationship between services and "the promotion of an efficient, innovative telecommunications and information sector."[45]

The intentions of using satellite communication for telecommunications are for developmental purposes as they can make the services available to the rural and remote areas. In this regard Satellite communication has the potential to assist the development process. Equally, satellite communication can also increase the potential of international actors in the services sector to penetrate Third World markets. Though it is fiercely argued by Pool and others[46] that concerns regarding the flows of information across national frontiers are not well founded because there are a range of technological options available to neutralize any repercussions, initiatives by countries such as Sweden in regulating data flow[47] and, institutions such as the OECD formulating privacy guidelines, indicate that all nations, particularly developing countries, and institutions have reason to build safeguards regarding national data and its flows. Karl Sauvant has argued that this is not a solution: " ... the issue is not whether to insulate developing countries from the changes triggered by telematics and TDFs [transborder data flows] but to examine their implications in order to allow countries to prepare themselves for change and to take steps appropriate to their situations and policy objectives."[48]

Telecommunications development in Third World countries is of paramount concern. While developing countries cannot be discussed en bloc, it may be useful to examine them on a case-by-case

basis.

The pattern of telecommunications development, choices made in the context of INSAT have been discussed. Although the use of INSAT for telecommunications is of a supplementary nature, certain direct applications for information networks at the national and international level makes it a crucial telecommunications infrastructure. The consequence of INSAT telecommunications application has been more of an integration of India through networking through which information flows and less impact in terms of providing basic access to telecommunications in the rural areas.

CHAPTER VI

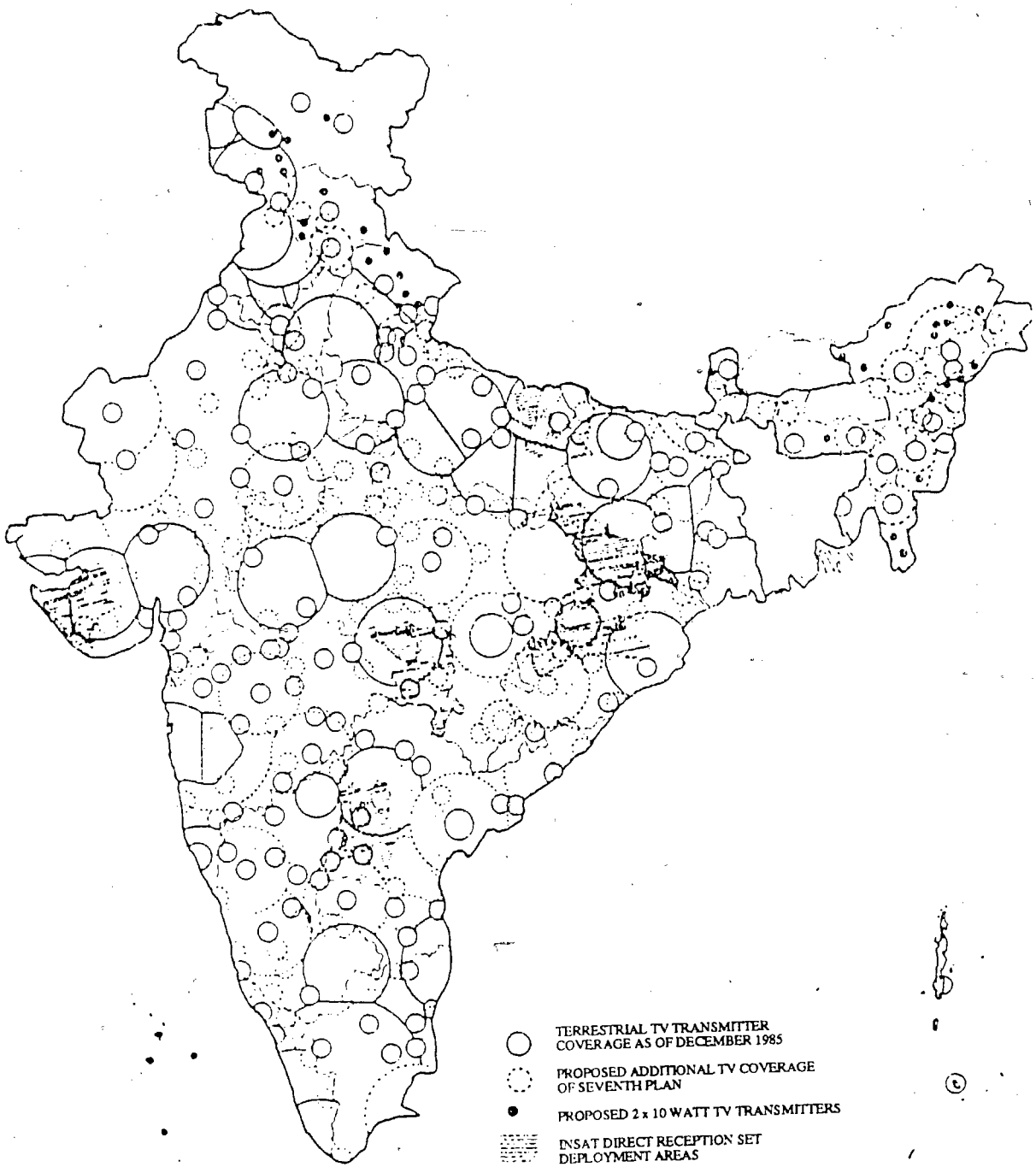
CONSEQUENCES OF INSAT: ENTERTAINMENT TELEVISION AND INDUSTRY

In chapter IV the institutional relationships involved in the telecommunications application of INSAT were examined. In this chapter the institutional relationships involved in the broadcasting applications of INSAT will be analyzed. The analysis is confined to television *only* as it is television that is wholly dependent on INSAT for its present level of coverage in India (see figure 5 for INSAT TV Utilization plan), whereas in the case of radio, INSAT merely provides a technological link among the existing local stations for national broadcasting.

The relationship between Television and INSAT will be divided into two main areas: hardware and software. Hardware includes the support facilities such as transmitters, related broadcast equipment, and the receivers, while software incorporates management, organization, and content of television broadcasts. Within the software classification, distinctions can be made between community-based programmes (i.e. educational)/ developmental programmes, and entertainment programmes. The analysis in this chapter will examine the institutional relationships involved in television as they relate to entertainment programming. (Community reception and related software issues will be dealt with in the subsequent chapter.) For obvious reasons, hardware and software cannot be analyzed in isolation. Therefore it is important to understand the institutional relationships in the hardware sector as they relate to television programming before proceeding to analyze TV software.

The role of the following institutions and their relationships are examined in this chapter: Defense and the Atomic Energy sector; TV manufacturing industry; the Government; Doordarshan; the TV software industry; and the advertising industry.

Figure 5: Expected Television Coverage Through INSAT by 1990



Source: Department of Space, The Indian National Satellite (INSAT) System Report for January 1985-March 1986, (Bangalore: Government of India, 1986), p. 10.

6.1 Hardware: Electronics and INSAT

The pre-SITE period during which the use of satellites was being contemplated was an important phase in the development of electronics industry in India. It was a period when India was recovering from the Indo-Pak conflict and during which the government of India had assigned the task of formulating and executing policies of import substitution in the electronics sector to the Ministry of Defense:

> The Ministry of Defense was charged with the task of ensuring that India could obtain access to electronics through a combination of import substitution and new linkages with external sources of supply and production. Also the Ministry of Defense was expected to be the single largest source of demand for sophisticated electronics through the mid 1970s. Finally, the only major public sector enterprise involved in relatively sophisticated areas of electronics production, Bharat Electronics Limited (BEL) was already under the Ministry of Defense. Given its prior work in electronics and its overall institutional influence, the ministry was able to resist the initial effort to place responsibility for electronics in what would have been a relatively neutral Ministry of Industrial Development ... and instead the Defense Ministry's Department of Defense supplies (ministry's unit active in import substitution policy) was given authority for execution of the Bhabha Committee report in June 1966.[1]

Clearly, the Defense Department wanted and was given control over the development of the electronics industry. However, other institutions such as Atomic Energy Commission (AEC) were also interested in electronics promotion and development, particularly television. Grieco contends that the AEC feared that if Defense Department controlled electronics, it would also indirectly control the atomic energy programme and, I would add, the direction of the atomic energy programme vis-a-vis satellite technology. The Department of Atomic Energy had, by then, already inititated measures for the production of electronics equipment needed for its programmes. A "compromise" was finally reached between the agencies. It was agreed that the responsibility for electronics development would remain in the Defense Department, but its policies would be guided by a new "Electronics Committee of India" composed of S. Bhagvantham (Defense Ministry), Vikram Sarabhai (AEC), and a representative from the Ministry of Communications. However, this committee did not lend any definite direction to the development of electronics in India. This was primarily the "result of a continuation of the struggle which had begun in 1966 between the Ministry of Defense and the Atomic Energy Commission." The AEC continued to

challenge the Ministry of Defense's predominance in Indian electronics because the AEC's (ECIL) share of electronics, and thereby their influence was far less than the Defense Minsitry's (BEL).

This conflict also affected the industrial strategy for electronics development. The Defense Department favored international linkages for electronics production in the form of joint ventures and 100 percent foreign ownership ventures. Either way, they argued the short-term requirements would be ensured and independence would, finally, be its long-term consequence. The AEC argued that this was was only a short term solution. They maintained that while BEL functioned very successfully on the basis of strong international linkages, ECIL could not because the Defense Department prevented extra-agency linkages through licensing and import controls. Of specific interest to this dissertation is the manifestation of this conflict in the production of television receivers.

In the late 1960s, ECIL requested permission to import test equipment and components to build prototype television receivers. The Department of Defense rejected this request due to a conflict of interest; at the same time, BEL was seeking to enter into a licensing agreement with a Japanese enterprise to produce television sets in India. It is not clear whether the collaborator exercised any influence in this decision. For this, and many other reasons, AEC sought to break the stranglehold of the Defense Department. Between 1968 and 1969, officials of the AEC, Department of Atomic Energy (DAE) and the Tata Institute of Fundamental Research (TIFR) began to discuss ways and means to seize authority of Indian electronics.[2]

A mechanism by which Sarabhai sought to control the electronics sector was the "National Conference on Electronics" in March 1970. The purpose of the conference was "to identify and eliminate the factors contributing to [the] retarded growth of the professional electronics sector in particular, and to discuss and focus attention on the problems facing the electronics industry generally."[3] The gist of AEC's argument, one which the Defense ministry could not dismiss, was that "new governmental institutions were needed for Indian electronics policy. According to the atomic energy officials the new institutions should centralise governmental power and also give recognition to the fact that *electronics involves*

dynamic, complex technology, that is just the sort of technology that was already being mastered by the AEC and the DAE." (italics mine)[4] It should be noted here that the technology which was being mastered included communications satellite technology.

The conference's impact was felt in June 1970 when the government announced the formation of a Department of Electronics whose portfolio would be held by the Prime Minister. In February 1971, the Electronics Commission (since disbanded) was mandated to formulate and oversee policies which would foster an indigenous electronics industry. The Department of Electronics retained responsibility for day-to-day activities within the electronics sector and this established the AEC's preeminence in electronics development, and more particularly in the development of both satellite and television technology,[5] it was not until INSAT that a substantive incentive was provided to implement a national television industry.

6.2 Television Industry and INSAT

In its infancy, television was officially limited to educational and developmental programming in India. As a result, the television industry in India did not have a profitable market to draw upon. This limited market also resulted from the crawling pace of the medium which was initially restricted to Delhi and then later extended to only a few other metropolitan centres.

Indian television was officially limited to government-produced educational and developmental programming not particularly conducive to stimulating a market for television sets. From an industry-perspective, even INSAT, as it was originally conceived as community oriented programme, was not anticipated to provide substantial impetus to their market. Even the limited market in the metropolitan centres was not sufficient enough to develop a wider manufacturing base.

However, the launching of INSAT 1A in 1982 coincided with the preparations for Asiad (November 1982) sports extravaganza. Asiad's requirement for professional coverage in color convinced

the government to introduce color television in India. Additionally, the desire to present Asiad to the nation caused the government to embark upon a nation-wide expansion of television through a network of Low Powered Transmitters (LPTs).

This decision to introduce national transmissions caught the TV industry off guard and the demand for television sets in the wake of Asiad far outstripped the supply. The government responded by liberalizing baggage rules to facilitate the entry of television sets from abroad and also adopted a policy of buying semi knocked down (SKD) and completely knocked down (CKD) television kits from the international market for distributing to the television industry in India.

The existing television industry was in a position to only manufacture black and white (B&W) television sets with more than 80 percent of the components manufactured in India itself. Responding to the absence of an indigenous color television industry, a major policy was announced in February 1983 which assisted in the establishment of an indigenous industry by providing funding and encouraging collaboration of TNCs. This led directly to the creation of about 380 manufacturing (color television) centres in both the organized and the small sector. (see table 2 for yearwise production of TV receivers in India.)

6.3 Incentives and Disincentives for the Television Industry

According to a study group on consumer electronics,[6] the saturation limits of urban ownership of television sets is about 80 percent of the households and in the rural areas it is about one in three households (see figure 6 for an official assessment of the population living below the poverty line). Thus a considerable proportion of rural population is left out which means that if these people have to derive any benefit from the medium they should have access and since they cannot afford a TV set, it becomes the responsibility of the State to provide the sets at least on a community viewing pattern. Why it has not done will be examined in the next chapter within the framework of the institutional relations in the development and education sector of Indian television. Based on various factors, the study group has

Table 2: Production of Television sets in India (in thousands)

Year	B & W TV sets	Color TV sets
1971	16	-
1972	31	-
1973	75	-
1974	76	-
1975	97	-
1976	144	-
1977	239	-
1978	270	-
1979	311	-
1980	370	-
1981	435	-
1982	570	-
1983	660	50
1984	1000	280
1985	1216	604
1986	2150	850
1987	3200	1100
1988	4400	1300

Source: The Economic Times Mid-Week Review Special supplement on Television Industry, April 23, 1986.
1986, 1987 and 1988 figures were obtained from "Industry Performance and Sectoral Progress" Electronics For You Annual 1989, p. 28.
Note: production of color TV sets started only in 1983. The production got a big boost due to the introduction of colour TV transmission for Asiad and the expansion of TV network following the launch of INSAT 1B.

ascertained projected demand for television sets in India will be 37 million sets by 1990. During the seventh plan period (1985-90) it is anticipated that 50% of this target will be achieved.[7] The study team concluded that the demand for CTV in India would represent at most 25-30 percent of the total TV sales in India. Therefore, the market for B&W sets in India is still considered to be attractive.

The television industry, especially the CTV sector in India, is dependent upon collaborations with Japanese and West German firms. A senior official of the Department of Electronics has warned that unless indigenization of CTV takes place, the excessive outflow of foreign exchange will reach dangerously high proportions. However, indigenization is dependent on delivery of components by the Indian component industry. The Indian Television Manufacturers' Association (ITMA) feels strongly that the

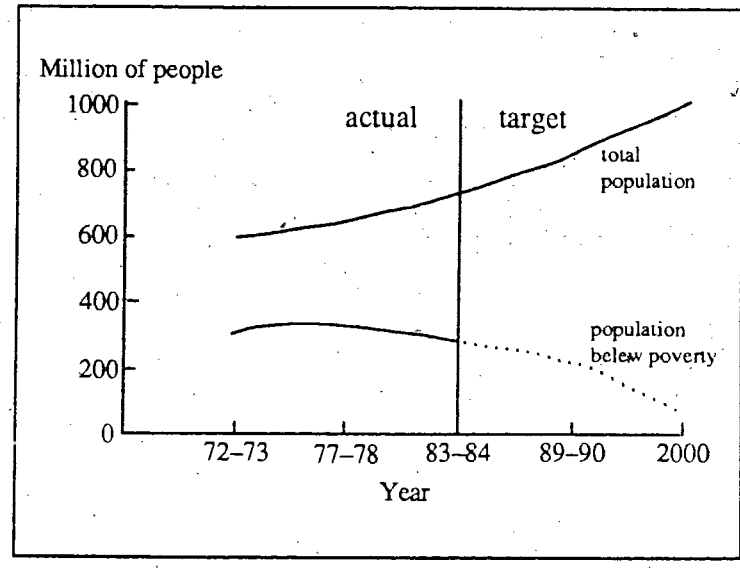
standard of indigenously-manufactured components must improve before its members can use them. While accepting the concept of indigenization, the ITMA argues that a 'zero defect' concept is essential. Nearly 600-800 components go into the manufacture of a TV receiver. If even one of the components is substandard, it will affect the quality of the receiver.[8]

The president of the Electronic Component Industries Association (ELCINA) presents a contrasting perspective. According to him, a large number of Indians working abroad bring home gifts for friends and relatives of which electronic goods "tops" the list. This is not simply a foreign exchange problem. Rather it is an embarassment to an industry that cannot compete with well-known international brands. Even though the use of foreign- brand names is explicitly restricted, international firms, through massive advertising campaigns ensure that consumers seek these brands through both legal and illegal means.[9]

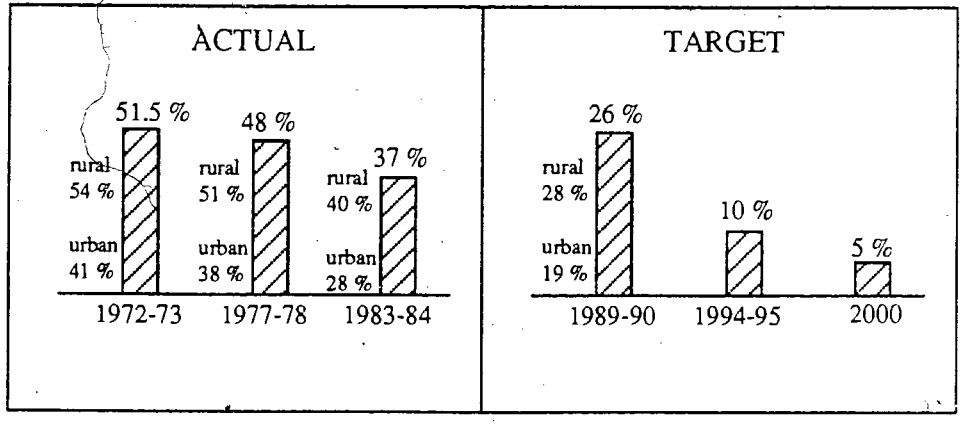
Another area of conflict lies between the smaller companies, with limited capacities to assemble, market, and sell television sets, the bigger companies which have the necessary resources to collaborate directly with foreign companies directly and also have the resources to market their product through intensive advertising campaigns: "TV manufacturers themselves are pouring money into ads to maintain thier tenuous footholds in the market; 89 of them spend a minimum of Rs 40 lakh each annually, 14 spend between Rs 40 lakhs and Rs 1 crore and seven of them spend above Rs one crore. Last year TV makers alone spent a total of Rs 31 crore on advertising, most of it through Doordarshan."[10] Since the price of television receivers manufactured by the bigger companies is quite high (see table 3 for the price of TV sets in one city). A government agency, the Electronics Trade and Technology Corporation (ET&T) is using experience gained during the Asiad to supply television kits to the small companies. The only condition for supplying these kits is that the price should be around Rs 5500 per set (which did not succeed due to the tax structure for the TV industry.) In addition, ET&T educates the public through an advertising campaign which contends that a basic CTV should not be prohibitively expensive and that the multiple features claimed by the larger manufacturers are irrelevant in the Indian context (see figure 7 for ET&T advertisement). According to ET&T, the scheme of supplying kits to the TV industry was a success. However, one manufacturer has pointed out that many of the small manufacturers buy the kits

Figure 6: Official Assessment of Poverty in India

Population below poverty level in INDIA



Population below poverty line in percentage terms



Source: P.K. Basu, "Challenges of India's Poverty Alleviation: Community Development Strategies", Ashis Gupta ed., Canada-India Opportunities, (Calgary: The International Centre of the University of Calgary, 1988), pp. 126-127.

Table 3: Price List for a few Color TV sets and Dealers' Profit Margin

Model (Brand)	Dealers' Price	Dealers' Margin	Retail Price	Production (1988)*
BPL...	Rs 11291	Rs 1000	Rs 12291	89579
Crown...	11300	1000	12300	50950
Sony...	12000	1000	13000	21176
Weston...	10064	1200	11264	33990
Dyanora...	12870	1000	13870	25622
Bush...	11750	750	12500	42938
Nelco...	13300	1100	14400	26581
Videcon...**	12790	1000	13790	72000
EC...***	11122	511	11633	39446
UPTRON...***	11585	1000	12585	47690
Soli daire..****	15560	1200	16760	37405

*The annual production figures are based on information presented to the Parliament on May 9, 1989. For details, see Electronics For You Annual 1989, pp. 47–50.
**Production figures for 1987.
***Public undertakings.
****The latest technology, picture in picture (PIP) model.
(Prices are for remote control models. Non remote or "core" models are about Rs 1000 less than remote control models). The annual production figures are for all the different models that these companies manufacture.
Source: Prices supplied by MECO, a leading TV dealer in Hyderabad on request. These prices were in effect on 31-3-1989. The annual budget 1988-89 has imposed taxes on certain type of television sets and the retail prices have gone up since then.

and then resell components to a network of shops specializing in spare parts.[11]

The situation has changed quite dramatically as the annual budget for 1989-90 indicated. The Finance Minister, S.B. Chavan, justified certain changes to the excise duties levied on the electronics industry as an attempt to: " ... to discourage low priority imports which go towards the consumption of the upper income groups. *Kit culture- based consumerism* is not the objective of our industrial and trade policy and must be discouraged."[12] These measures were intended to give a "greater stimulus to the process of indigenisation." within the television manufacturing industry:

> The Members of the House are aware that television has offered considerable entertainment to our people. It would be in the fitness of things that television viewers who derive such entertainment should contribute more to the resources of the Government and thereby to the programmes of national development. At present black and white television sets of screen size exceeding 15 cm and up to 36 cm are completely exempted from excise duty. While continuing the exemption for such sets, I propose to increase the excise duty on the picture tube of such sets to Rs 200 per tube. Black and white television sets of screen size exceeding 36 cm attract excise duty of Rs 300 per set, I propose to increase the rate to Rs 500 per set. As regards colour television sets, the present duty is Rs 1500 per set of assessable value of more than Rs 5000. This duty structure has led to some valuation disputes. Some high value sets have also entered the market. A review of the duty structure is therefore called for. I propose to fix the duty of Rs 2500 per set with remote control and Rs 4000 per set having the facility of picture in picture.[13]

In response to the budget, the television manufacturers have changed their tune crying that "the increased price of black and white television sets alone, would have an adverse impact on educational and family planning programmes."[14]

As has been previously stated, there is not a discrete separation between hardware and software. As Asiad experience demonstrated in 1982, software concerns overlap hardware concerns. Thus it is imperative to examine the institutional relationships involved in the software sector, particularly the institutional relationships involved in television as they relate to entertainment programming.

6.4 Software: Entertainment Television and INSAT

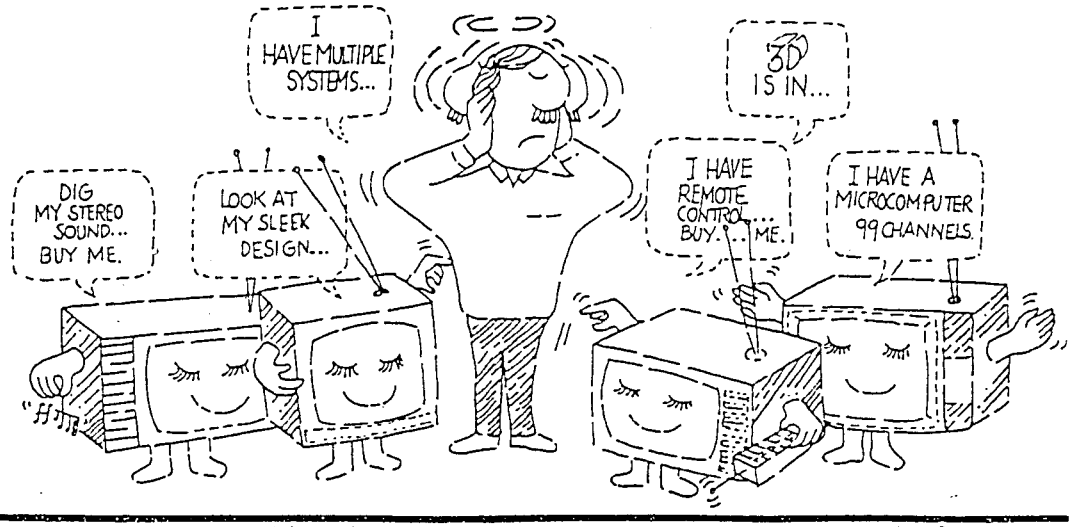
The problems related to the expansion of television in a developing context centre around the role of the medium in serving identified socio-economic objectives. From the beginning, Indian TV was intended as an educational medium. Subsequently, financial constraints caused the medium to depend more on advertising support:

> It had already been decided to extend television to the major cities on the excellent ground that TV was essential for accelerating development, modernisation and social change. This was the period of interregnum in the Five year plans of India as the country was struggling to get over the expenses of the 1965 Indo-Pakistan war and the 1966-67 drought. Money for TV from the public coffers was scarce and had therefore to be found by introducing commercials and eventually sponsored programmes.[15]

However, this was seen as a major threat to India's stated television objectives:

Figure 7: A Copy of the ET&T Advertisement

THE 'FACTS' YOU'VE HEARD



THE TRUTH YOU'VE NOT!

Features that add to price but not to performance.

India uses PAL-D CCIR system in TV transmission. Other systems like SECAM and NTSC will never be used in this country and so A MULTIPLE SYSTEM is just an empty name that adds to the price of your Colour TV (CTV) without giving you any benefit.

An expensive MULTI-CHANNEL SELECTOR offering upto 99 channels is of no practical use as we have only two channels for transmission and are unlikely to have more in the near future.

STEREOPHONIC AUDIO only pushes up the price of your CTV, but it is of no use, for transmission in India is not in stereo.

If your CTV has only a VHF tuner then ensure that your CTV has AUDIO-VIDEO input and your VCR has AUDIO-VIDEO output. This will give you better quality pictures than the use of a UHF-VHF converter between the UHF output of VCR and your CTV antenna socket.

ELECTRONIC TUNER is more useful with UHF transmission but we do not use UHF in India and are not likely to. The Very High Frequency (VHF) transmission used in India is equally well received via a Turret Tuner (Also called a Mechanical Tuner).

A REMOTE CONTROL device is a convenience but it does nothing to improve the quality of the reception or the clarity of the picture.

So you see, your high-priced CTV costs you more for NO extra benefit.

Fancy attributes cost you more!

3D TV, for instance, is impossible because transmission is not done in 3D. All that you get is a simulated optical illusion.

SEVEN-COLOUR SYSTEM or WONDERCOLOUR is just jargon. All colour TV s work on one and the same principle of three basic colours, Red, Green and Blue while all other colours are derived from these basics.

A BRIGHTER PICTURE is possible through increased Extra High Tension (EHT) voltage for picture tube. But this increases health hazards due to X-Ray radiation and reduces the life of the picture tube.

Standardisation is for your benefit

The Govt. of India have standardised the 51 cm size colour picture tube. So if your CTV has the 51 cm tube, you have no cause for worry as replacements are easily available for years to come at a reasonable price fixed by ET&T. On the contrary, if your CTV has any other size of tube or a proprietary colour picture tube of 51 cm like Trinitron you could be in trouble because replacements are both expensive and difficult due to severe restrictions on import of non-standard picture tubes.

For the doubtful privilege of being different, you would end up paying more in the long run with a dead TV for want of spares.

STOC approval a must for CTV s

All models of CTV are required to be tested against a specified minimum standard by the Dept. of Electronics, STQC. Ensure that the model you buy has STQC approval. This assures you user safety and satisfactory performance.

Care and work culture are more important

The best of colour picture tubes will not make a good CTV unless they are backed up by careful and accurate designs, circuits, assembly and testing. Such care can be ensured ever by a small scale manufacturer who maintains quality standards.

ET&T

A Government of India Enterprise

CORPORATION FOR CONSUMER CARE

Source: Copy provided by ET&T Office in Hyderabad.

> ... refusal to have commercial television is a very safeguard that we will not go the way of Western television. Generally, if the television organization has to draw its income from the people who want to sell their goods, then they naturally insist on the maximum entertainment value for the programme they sponsor. So long as sponsoring of programme on television is not allowed, we can say, there will not be commercial television in our country.[16]

This fear, also shared by some social scientists,[17] was not shared by the Doordarshan which, from the beginning, has accepted advertising support rationalizing that it made for better programme production.

TV advertising has now come to mean private sector programme production with the advertising industry emerging as a major institution in the development and production of sponsored programmes. Strongly resisting opposing views the advertising industry regards commercial TV as stimulating both development and the economy. According to Bal Mundkur, who participated in a nation-wide colloquium on television, "TV is a public utility" and the fundamental interest of the diverse groups (government as owner and administrator of transmission facilities, TV set manufacturers, programme producers and advertisers) is to enable and encourage the TV set owner to keep his set switched on. And to ensure that he *accepts and believes what he sees.* [emphasis added]. Regarding the use of the medium for development, he said:

> Fortunately, the debate on the desirable role for TV has outgrown the immature stage when an educational or developmental role for TV was seen as ruling out entertainment. And, the only programming which the proponents of this role were willing to recognise as "educative" was incredibly boring; and if it is boring, it will probably educate, nobody. Thus, whether you wish to inform, educate, or entertain, you will have to give the viewer a good enough reason to do so. 'Viewer involvement and the medium's credibility' have now emerged as goals that override the earlier superficial concerns with entertainment vs. education vs. information.[18]

This advertising industry-shared perception, combined with advertising's claimed influence in the introduction of television in India contradicts the stated socio-economic objectives of the medium for development. And even when the government expanded television nationally using INSAT to realize its stated objectives, they did not anticipate the extent to which this action would provide incentives to the advertising and software industries thereby implicitly **priorizing entertainment over development.** This shift is definitely due to the institutional relationships that pushed more for entertainment. Thus the satellite, instead of being used to serve educational ends, has become a facility for national networking and

thereby providing a larger audience for the advertisers. This shift also reflects how the stated objectives of rural development, education etc., can assume less importance as there are definite reasons, one of them being the revenue potential of commercial television.

However, Doordarshan is trapped into the revenue potential of the medium and has become a major purveyor of "aggressive consumerism" through advertising.[19] The impact of this kind of advertising for socio-economic development has been discussed specifically by Arun Ghosh. Based on income and population distribution, it is estimated that there are 100 million consumers for the kind of goods advertised on Doordarshan. Majority of these consumers come from the middle class and there is "virtual explosion in the demand for luxury consumption goods on a scale never before witnessed in the country."[20] However, this demand and consumption is at the expense of even necessities: "For the middle class, or at any rate a large section of such people, this elitist type of consumption is taking place at the expense of even necessities, implying less nutrition for children, skimping on the purchase of books for the children, less assistance to one's needy relations, and a general dissatisfaction with life in general."[21] It should be noted that many TV owners do not belong to this group as they cannot afford many of the products advertised. The consequences of exposure to the advertisements have been described as follows:

> There is today increasing discontent, a sense of anger, a growing cynicism in regard to the professions of planned growth of the economy, in this large group of people. They have very naturally begun to covet the luxury consumer goods, which are, however, beyond their reach. The frustration is reflected in the rude, unhelpful, boorish behaviour one encounters ... It is not their fault; the winter of discontent has descended on the country ... People's standard of living may have improved, they appear to have improved from the way everyone is dressed, but their discontent has increased more perceptibly ... And now, the TV is a constant reminder of what one would like to possess but cannot afford.[22]

These consequences do not seem to concern Doordarshan which is examining various ways of increasing the daily TV transmission to accommodate more advertising supported programmes.

In INSAT, Low Power Transmitters (LPTs) were installed for feeding national programmes only, thereby enhancing the audience base for centrally produced programming and ignoring the need for locally produced programming. And since community viewing was not part of this expansion (except in a few states), and while the technological potential was in place for national service, the audience was

neither "national" nor representative; rather they were comprised of a privileged few. Only those households that could afford to buy a television set, CTV or B&W, would form this "national" audience. These households were almost exclusively upper and middle class (though some argue that even some slums have TV sets, it is the exception rather than a rule).[23] While the majority of the lower middle class and low income families cannot afford to have a TV set, the upper and middle class households provide sufficient incentives to the advertisers to use the medium. The rise of the middle class in India has led to the emergence of another interest group that is vocal in certain kinds of programmes. The middle class, according to Pendakur, emerged as a result of various factors:

> The generally ineffective land reform and other such laws to break the monopoly power of the propertied class in both rural and urban areas had meant a growing and powerful landed gentry. The arrival and success of new technological inputs into agriculture... had assisted further commodification of land and more accumulation of wealth in the land owning class. It meant that the sons and daughters of these newly rich rural land owners would form the core of the urbanized youth who sought education and opportunities in the cities. They would join the relatively privileged class of the bureaucratic-military and business elite of India in the seventies... Essentially, a large middle class arose in the seventies, perhaps about 20 percent of the population...they would form a formidable combination of power with the growing consumer industries and the advertising agencies in shaping state policies toward television.[24]

Thus we see that emerging classes which have the resources to consume goods and services became a factor for decision making.

6.5 Soap Operas and the Development Agenda in India

TV entertainment, which was once closely associated with film and film-based programmes, now has an additional format-TV serials and other sponsored programmes such as telefilms, sports and foreign serials and shows. Sponsored programmes, especially the serials, were inspired by the "soap opera" format, adapted from the radio to TV in the US. It seems ironic the idea to introduce sponsored serials is attributed to S.S. Gill, former secretary to the Information Ministry:

> The Mexican experiments, 'come with me' and 'come along with me', telecast in the 1970s, seemed to have influenced the introduction of soap operas in India. The former was an attempt to popularise adult education and the latter motivated people to adopt family planning methods. These were considered worthy of emulation.[25]

Scholars who have analysed the phenomenon of soap operas distinguish between their impact in the US and in Third World countries (based on their impact analysis of soap operas—Telenovelas—in Latin American countries). Telenovelas, the most popular genre of television programming in Latin America are regarded as "pro development" soap operas intended to convey "subtly an educational theme to promote development." Since its conception in 1974 in Mexican commercial television, telenovelas have attracted a large number of viewers in Latin American countries which has translated into sponsorship by multinational companies. One of the successful Peruvian soap operas, *Simplemente Maria*, was a rags-to-riches story resulting from the effective use of sewing skills and a sewing machine. The sale of sewing machines boomed in Peru and the Singer company decided to buy advertisements in the broadcasts of *Simplemente Maria* in other nations. The success of telenovelas attracted the attention of David Poindexter, President of the Center for Population Communications International, New York, who played a key role in the international diffussion of the Mexican soap opera experience. Poindexter was acquainted with Miguel Sabido, a key figure in designing these programmes for Mexico's Televisa. Poindexter was convinced that this *'Pro development soap opera technology'* could be adopted by other third world countries. Accordingly, Poindexter arranged for officials from India, Egypt, Nigeria, Kenya, and Brazil to visit Mexico city to meet with Sabido. The Indian team, led by Gill, engaged in joint meetings with their Mexican counterparts in 1983 resulting in the planning for 'Hum Log', **India's first television soap opera format serial.**[26]

Hum Log had a very long run of 156 episodes and initiated "national" Indian audience to various soap opera formats such as the cliff hanger. Other elements, such as melodrama, were not new as the Indian film industry has used these techniques successfully for years. Hum Log is clearly regarded as a success story which generated a new genre of Indian TV programmes. It also facilitated the entry of outside agencies into programme production sector of television which had previously been confined to Doordarshan. Hum Log also spawned the sponsored programme in which the advertiser bears the production costs of the programme in exchange for a few minutes of advertising. Singhal and Rogers note that the "Singer sewing machines of 'Hum Log' were Maggi 2 minute noodles." Maggi is a product

of Food Specialities Limited, a subsidiary of Nestle's, a multinational company. Part of their huge advertising campaign included the sponsorship of 'Hum Log'. Noodles were not well known in India nor were many other 'quick convenience food items.' The direct association of Maggi with this programme can be seen in its growth from 1982 onwards when the production of Maggi increased from almost nothing to more than 5000 tons by 1986. This increase in consumption and its relation to the TV sponsorship of Hum Log convinced other advertisers that TV sponsorship was a lucrative concept. Food Specialities has now (1989) expanded its operations to such an extent that its advertising budget alone is Rs 16.1 crores which has created a serious competition among the Indian advertising agencies to win the account. The budget is likely to be increased when the company introduces breakfast cereals and chocolates.[27]

The excessive demand to sponsor programmes on the one available channel far exceeded the availability of air time during peak viewing periods, evenings and weekends. According to one analysis, out of nearly 1500 applications for programme sponsorship, only 28 were accepted. This process lead to charges of corruption, influence peddling, and favoritism within various institutional relationships. For example, reports in the press indicate that the manner in which Hum Log was produced and the institutions it patronised revealed favoritism to close associates of the Prime Minister, such as Dhirendra Brahmachari in whose studios, Hum Log was produced. The executive producer of the programme was the controller of programmes (commercial) who was later subjected to an investigation by the government on charges of corruption.[28] "The authority wielded by the information and broadcasting ministry is more visible and a former secretary, S.S. Gill reportedly pressed the case for Bombay movie tycoons to get a piece of action."[29]

6.6 Sponsored Programmes-Doordarshan Perspective

According to Doordarshan, sponsored programmes have twin objectives: " ... on the one hand, widening the programme production base by tapping the talents and resources outside Doordarshan and,

on the other, increasing Doordarshan's commercial revenue. Injection of programmes produced outside Doordarshan's fold also help to promote healthy competition."[30] Though sponsored programmes are lucrative, the total revenue neither goes to Doordarshan, nor is the money that it gets from the "consolidated fund" spent on improved programming. According to A.S. Tatari, Deputy Director General, Doordarshan:

> It is true that Doordarshan is earning a lot of money through advertising and sponsored programmes, but only a part of the money comes to Doordarshan, as the earning of Doordarshan goes to the consolidated fund. Whatever, comes to Doordarshan is mostly being invested in hardware requirement of Doordarshan at present. Despite various constraints, Doordarshan is trying to give its viewers better quality programmes.[31]

The involvement of the private sector has brought about a new relationship between the TV software industry and Doordarshan. Sponsors have many alternatives to choose from, including foreign serials and shows such as Academy and Grammy Awards.[32] Many sponsors have chosen TV serials. A producer or the advertising agency that backs him, is responsible to get the "pilot" approved by the Doordarshan screening committee.[33] Since the demand for TV time far exceeds the supply, the power and influence of the sponsor also plays a role in getting the serial approved.

Economic incentives underlie the growth of sponsored programmes in India. Unlike the movie industry, the payment for sponsored programmes is on a per episode basis, which means that the producer and his team receive a comparative wage to the movie industry on a *regular basis* to wait long for the payment.[34] The incentive offered by Doordarshan by way of advertising time to the sponsor, is so attractive that the sponsors are willing to bear the increasing production costs.[35]

The rise in production costs is attributed to quality and the movement of talent from the film industry to TV: " A much superior quality of talent is now moving into the TV industry from the film industry. The price of talent in that industry is considerably higher; and their style of operation is also more expensive. This inflow is producing programming of superior technical quality and probably content as well."[36] In addition to the advertising time, the sponsor has the additional incentive of marketing the serials overseas where a significant "sub-continent" population resides. Some producers

also offer market rights for video viewing abroad. Government institutions such as the National Film Development Corporation (NFDC)[37] are being proposed to play an "active promotional" role for television serials because it has "excellent access to the world entertainment markets."[38]

6.7 Outside production agencies and Doordarshan

The entry of big-name film producers (eg. Sippy, Chopra) has changed television production values in terms of technology and resources. A representative of the TV Programme Producers Guild of India (TVPPGI) said that when they proposed to the government to involve the private sector in programme production, they referred only to small producers with some equipment and ability to mobilise talent. What is occurring however, is a takeover of Doordarshan by commercial interests—advertising agencies and the big names—collaborating exclusively for their own economic gains at the expense of the small producer.[39]

The film industry has the studio and related infrastructure to produce programmes on film and convert them for TV transmission. The small TV producers do not have the capital or facilities to draw upon that the film industry has. For example: the Electronic News Gathering equipment has to be procured through a state government undertaking. This policy, aimed at encouraging independent producers, was formulated because of the non-availability of video equipment in the country. About 100 licences have been issued and the equipment is supplied through a state government undertaking, which has a monopoly. The TVPPGI is dissatisfied with this arrangement; it would like to buy the equipment on its own in the international market with government concessions. And there is always the fear with the existing arrangement that if Doordarshan changes its technology (or the collaborator who supplies the complete kit to the state government undertaking upgrades or introduces a new technology), then the small producers will have difficulty working with the technology they have acquired, either for compatability or service reasons.[40] Apart from the programme production and the inter-relationships discussed, there is another aspect, audience research and the entry of the private sector.

6.8 The Rise of Audience Research Agencies in the Private Sector

Since the introduction of commercial programmes, audience research has become a major enterprise outside Doordarshan. According to one analyst, "nearly a quarter of television time is taken up by advertisement spots and over a dozen sponsored programmes which go out to a theoretical audience of 330 million all over the country on an estimated 5 million TV sets. The trouble is no one knows who is watching what, when and why."[41] The need, according to the advertising industry, is to be sure that the money spent on advertisements is really worth it. Despite Doordarshan's Audience Research Unit with a budget of Rs 20 lakhs, it is unclear why they were unable to market their services to the advertisers. Instead, a private sector market research firm, Mediasearch has gained control of the market. According to Praveen Tripathi, General Manager of Mediasearch, "a meter-based Indian National Television Audience Measurement (INTAM) system," is the solution for sophisticated feedback.[42] Developments in TV advertising are such that a "sophisticated meter-based measurement system is not only viable but necessary."[43] INTAM's arrival in India has been described as the "inevitable arrival of capital intensive market research in India."[44] To the independent producers, such as the TVPPGI, market research is a farce in India because the idea of "prime time" does not exist. There are no competing television stations to choose from.[45]

6.9 Television and the Question of Control

Broadcasting in India is under the control of the central government and the question of autonomy and decentralization has been raised a number of times. This question has also been subject to numerous inquiries into broadcasting. Irrespective of political affiliation, the tendency is to retain control over broadcasting. The control over broadcasting is exercised through article 246 of the Indian constitution which has entrusted the Parliament with exclusive powers in matters pertaining to posts, telegraphs, wireless broadcasts, and other similar forms of communication. Day-to-day control and policy matters are implemented through the Information Ministry.[46]

The government's repeated argument to retain its control over broadcasting has not deterred analysts from raising this issue. A former Director General of All India Radio (AIR), P.C. Chatterji, recently analysed the issue within the framework of the Indian Constitution. He reasoned that by guaranteeing freedom of the press, the Constitution implied freedom of broadcasting. Citing the analogy of the press, he mentions that broadcasting programmes should be "in the hands" of diverse groups thereby to ensuring access to different shades of opinion. The arguments for challenging the existing government monopoly over broadcasting are as follows:

> To have access to all shades of opinion through the medium of broadcasting is the right of every individual in India, and is provided for under the very article of the Constitution which guarantees freedom of thought and expression, and ensures a free press. No doubt a newspaper has to be licensed., but the government cannot arbitrarily refuse a licence nor can it stop a newspaper from functioning provided it does not offend against certain decencies, under Clause 2 of Article 19 ... If an individual or a group of persons, basing themselves in this Article, have the right to set up a newspaper, and if as a result there are hundreds of newpapers in the country, how can the government persist in maintaining a monopoly over broadcasting? It is true of course that the number of frequencies available for transmission is limited and they must be regarded as a scarce national resource. Broadcast frequencies, therefore cannot be assigned to any person or group without careful planning. From this, it simply does not follow that government has any right of monopoly over them. On the other hand, it can be argued that in insisting on maintaining a monopoly the government is violating a fundamental right guaranteed under the Constitution.[47]

The possibility of a different form of organization for Doordarshan is inconceivable, given the enormous benefits TV has afforded them. One of the implicit reasons for expanding television into a national network it would afford the ruling party in elections. According to one political scientist, Rajiv Gandhi's victory in the 1984 elections was due to the reach of television and its use by the government.[48] Rajiv Gandhi's misuse of the media in trying to project his image has assumed enormous significance in the wake of impending elections in Nov-Dec., 1989. The Opposition party has raised this issue a number of times and is therefore making autonomy for the electronic media, a major election promise. At the same time, it is not very clear as to how serious the opposition is to grant autonomy. Another observer summarised the government's perception of control as follows:

> In the controversy about doing away with state management, the nation seems to agree that the electronic media cannot be given over to private enterprise, which would be dictated wholly by commercial considerations at the mercy of market forces, as happens in the Indian film industry. The need to use the media for educational goals is also accepted. But after much study, debate, and argument, with commissions going into the subject, no agreed alternative has come forth. Even those who lay claim to a superior committment to freedom have been opposed to handing over the state management to an autonomous organisation, when the decision actually faced them. The fear has been that the electronic media (radio and television) might simply pass them from one form of control to another, not necessarily more desirable.[49]

Whether the demand for private control is economically-based is unclear. However, the expansion of TV has reopened the question of private sector involvement in the management of Doordarshan. This idea been mooted in two forms:[50]

- Total management of certain transmission circuits by private parties—probably the second channels in the 4 metropolitan cities (Bombay, Delhi, Calcutta and Madras)—including programming and marketing of commercial time, but subject to government of news and other sensitive programmes;
- The marketing of TV time to advertisers/advertising agencies by sole concessionaires working for Doordarshan either on a minimum guarantee or on a commission on sales.

This idea of management of transmission circuits by private parties is a decision that the government will not act upon the near future, because it has political consequences.[51] But the idea of concessionaires is a possibility, because it may involve satisfy some interest groups without any dire political consequences. The advertising industry, however, feels that such an "additional intermediary" is unnecessary:

> ... in the appointment of sole concessionaires could be achieving a certain amount of flexibility in pricing of TV time. But, this really is unnecessary. Doordarshan and Information & Broadcasting Ministry have always found the media professionals in the advertising industry ready to help Doordarshan to develop commercial practices and rates that make sense both from the buyers' as well as Doordarshan's point of view. When a well organised professional community with sound knowledge exists in the country, the device of appointing an additional intermediary to intervene in the process is entirely unnecessary.[52]

The combination of powerful institutions has transformed an essentially developmental medium to a lucrative (from the government's point of view) medium. Latent pressures from the advertising industry were applied in the formative years of Indian television. But there was a caution. The availability of the satellite and the government's appetite for revenue has led to a redirection of Indian TV benefitting the

advertising and the entertainment industry, especially the big producers in the film industry. Developmental and education matters have their own institutional dynamics which will be discussed in the next chapter.

CHAPTER VII

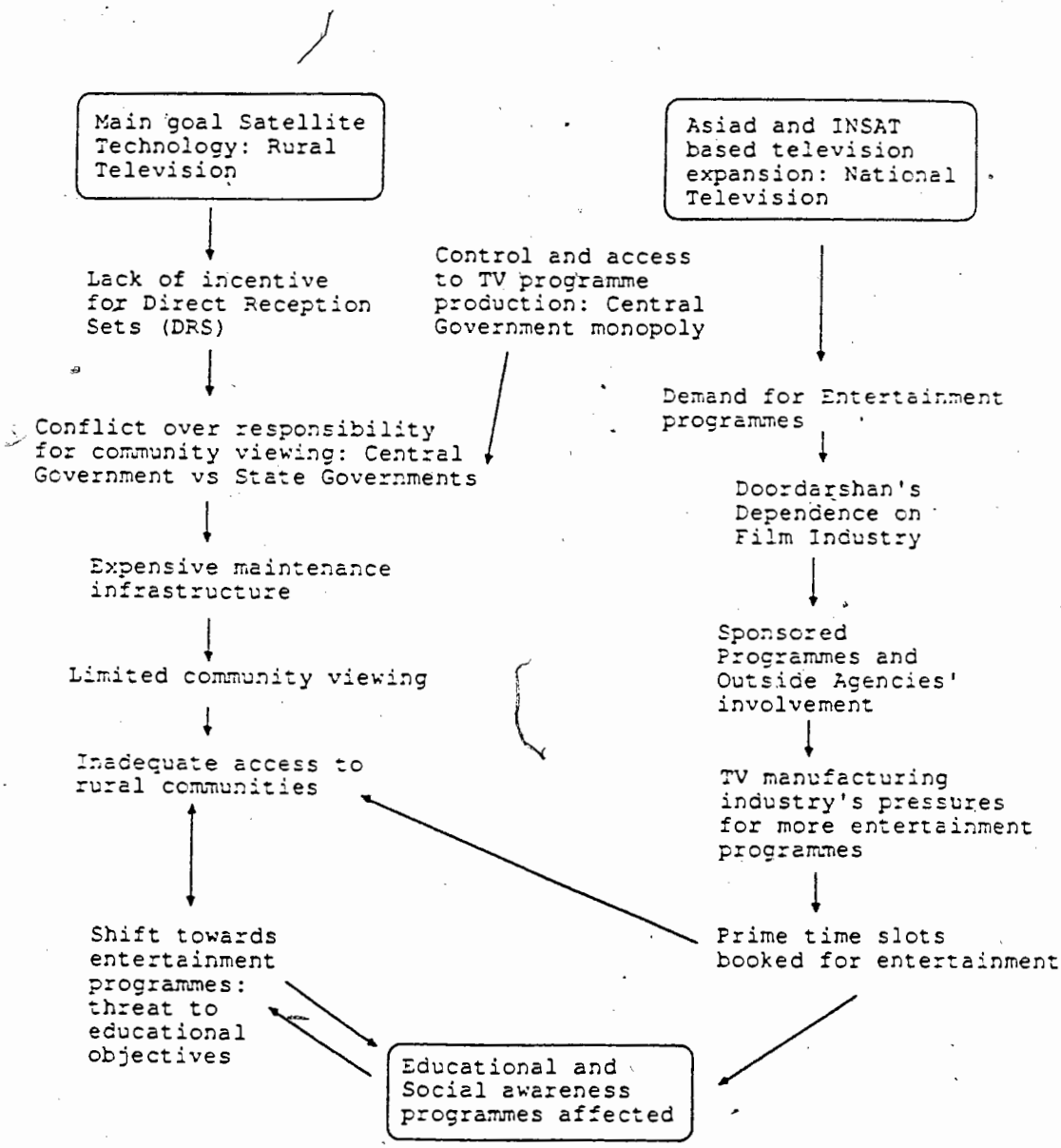
DEVELOPMENT, EDUCATIONAL TELEVISION AND RURAL TELECOMMMUNICATIONS

Analyses of the transfer of broadcasting technologies to the Third World frequently refer to the shift in the uses of medium for purposes other than originally intended. The powerful intervention of political and advertising interests is often cited as a major reason for this shift. However, it is not true that developmental and educational goals (stated reasons for acquiring technologies) are ignored. Their pursuit is often undermined by institutional relationships that were discussed in the last chapter. How developmental and educational programmes fare in such a situation is an important question that needs to be addressed. Given that the stated objective for introducing and expanding television in India was to tap its educational potential, the institutional factors in the developmental uses of television will be discussed in this chapter. These institutional relations will be analyzed with particular respect to access to television and telecommunications in the rural areas, and production of development and educational television programmes. The institutions examined in this chapter are: the DRS industry; States' and Community Viewing; Institutions involved in the production of educational programmes at the primary and university levels; and, the institutional problems that affect the impact of these programmes. (Figure 8 provides an explanation of the relationships). This chapter will also address the broader question of rural telecommunications.

7.1 Community viewing and INSAT

The price of a television set in India is prohibitive for the majority of Indians. a community viewing scheme was stressed and comparisons were drawn to the community listening experience in India.[1] Thus a plan was drawn up to provide community viewing sets to the INSAT zone villages for which certain programmes, area specific programmes are telecast.[2] Thus far Doordarshan has installed 800 Direct Reception (DRS) and 150 Very High Frequency (VHF) community viewing TV sets in the selected areas of Andhra Pradesh and Orissa and within the service areas of Nagpur. In addition, 50 direct reception

Figure 8: Institutional Relationships: Access to TV



sets were installed in Maharastra. Plans were also drawn by Doordarshan to install 100 ordinary sets in Gujarat. These plans included, in addition to these sets, "all state and union territory administrations have also been requested to provide community viewing sets from their resources and most have responded quite enthusiastically."[3] The implementation of this plan, however, is beset with some problems. One "perceived" problem is the expenditure involved in the supply and maintenance of community sets. (see table 4 for distribution of community TV sets in India.)

In the context of INSAT, it was agreed that the community sets would be installed and maintained by the state governments.[4] Pointing out the delay in implementing the scheme (it has yet to be implemented on a national level) Chawla maintains that "a practical arrangement under which the Central government bears the expenditure on the purchase of the community sets and the state governments accept the responsibility for their maintenance can be worked out."[5] This raises the question: should the state government take responsibility for installation and/or maintenance of community TV schemes? More importantly, will they? The reluctance of the majority of the state governments might be their lack of access to the medium. Ramakrishna Hegde former chief minister of Karnataka, has demanded a second channel for the exclusive use of the State governments for "mounting educational programmes in the local language."[6] This demand coupled with the reluctance of the Central government to provide such a channel has an obvious and significant bearing on community viewing schemes under state management and finance. Nonetheless, community viewing has been claimed to be success in India although the only available proof is SITE ...[7] Yet, the particular relevance of an experiment project becomes limited when compared with an operational system which involves permanent institutional relationships.

7.2 Andhra Pradesh: A Case Study

Andhra Pradesh (AP) is one of the INSAT states in which direct satellite TV broadcast service is provided under the "initial limited scheme of television utilization of INSAT I"[8] in three contiguous districts: Kurnool; Hyderabad; and Mehaboobnagar. Certain villages in these districts have been

Table 4: Location of Community Television sets in India

Centre	Location			Total
	Schools	Panchayat Ghars*	Others	
Delhi	318	—	136	454
Bombay	225	1617	272	2114
Calcutta	23	3	263	289
Madras	140	578	20	738
Jalandhar	4	187	9	200
Amritsar	—	—	—	125
Lucknow	248	—	571	819
Srinagar	236	205	138	579
Ahmedabad	740	—	—	740
Jaipur	649	—	385	1034
Raipur	—	—	—	240
Muzaffarpur	193	24	31	248
Gorakhpur	816	—	—	816
Cuttack	614	3	—	617
Hyderabad	540	365	—	905
Gulbarga	240	—	—	240
Nagpur	867	—	—	867
Rajkot	500	—	—	500
Ranchi	639	—	—	639
Total	6992	2979	1828	12164

Note: these figures are provisional. Source:Audience Research Unit, Television India (New Delhi: Directorate General, Doordarshan, 1986), p. 32.
* Panchayat Ghars is a room in a community building established by Local Government.

provided with direct reception sets by Doordarshan. When the Indian government shifted responsibility for the community viewing schemes to the states, the state governments (under the scheme) inherited a large number of non-functioning DRS.

There are a few hundred DRS in AP and, according to one obeserver, most of them are out of order and satisfactory arrangements are yet to be made. Discussions with the Bhaskara Mohan Reddy, AP state government officer[9] in charge of community radio and TV revealed that the State Government would maintain the DRS only if the broken ones were repaired at the expense of Indian government or Doordarshan that installed the DRS. Even though a central government official visited AP in an attempt

to resolve the issue, the state government remained inflexible in its demand and consequently this has not been resolved.

ECIL, one of the companies that manufactures DRS, is prepared to maintain the sets provided a contract can be reached on a per set basis per annum (it should be noted that during SITE, ECIL was the contractor for the supply and maintenance of DRS equipment). Anticipating a contract under INSAT, ECIL continued to maintain INSAT sets wherever they could, but when no contract was forthcoming (in AP) they discontinued the maintenance. In addition, audit problems was another reason for ECIL to discontinue the maintenance of DRS.[10]

S. John, manager of ECIL antenna systems observed certain problems with regard to community viewing, particularly using DRS in AP.[11] For example, when the ECIL technician would attend a maintenance call, they found that the teacher-custodians in charge of the TV sets were not available and, since many of them did not reside in the villages, it was difficult to find them despite the stipulation that the custodian should be a resident of the village. John also criticized Doordarshan's policy of placing orders with ECIL for supply and installation only. Leaving the maintenance to the state government was a mistake, he argued, because the state governments were unable to provide the test equipment and accompanying infrastructure of trained technicians.[12]

Independent of what happens to the DRS installed by Doordarshan, the AP state government has proposed an installation-cum-maintenance scheme for ordinary VHF television sets. At the time of the interview (1986) it was not clear whether the scheme would be approved or not or even how serious AP was in pursuing it. Given that broadcasting comes under central government jurisdiction, and that many state governments are unhappy with the limited access they have to the medium, community viewing may not be a high priority item for the states, including AP. However, the attitude of the state governments towards community viewing is not uniform. Differences exist among states.

The Secretary to the Uttar Pradesh (UP) Chief Minister and the Information Department outlines the UP view with regard to television:

> [As such] the use of television to communicate to the people the policies and programmes of the State which are both area specific and individual beneficiary oriented, is necessary. This requirement of the State cannot be met from Delhi and consequently we have to think of a system wherein the State capital's High Power Transmitter has a direct link with all the low power transmitters set up within the State, so that the state level programme could be conceived at the State Headquarters.[13]

The state government feels that even though the ideal situation would include TV services for each homogenous cultural and geographical region, the only viable alternative is to treat the state as a homogenous unit and uplinking all LPTs in the state with the state HPT. It has earmarked Rs 30 crores, for a community viewing scheme, which involves the provision and maintenance of DRS and VHF sets. This is intended to provide incentives to the UP State Electronics Development Corporation (UPTRON), which manufactures these sets and is in a position to maintain the DRS. While encouraging and supporting community viewing, UP anticipates a change in attitude towards family and individual viewing. Such anticipation is not without reason. There is a strong lobby to gain concessions in the electronic policy from the government of India which would allow for the promotion of family and individual ownership, thereby opening up the low income markets in both rural and urban areas.

While articulating the need for an uplink of all the LPTs in the state, UP does not raise the issue of exclusive access for the state government through a second channel, exclusive access has become an issue for at least one state in South India, Karnataka. The Chief Minister, Karnataka, Mr. Ramakrishna Hegde (who belongs to one of the opposition parties), argues, in his case for the diversification of Indian television, that there is definite case for a second channel:

> The most important policy decision which requires to be taken in respect of television in India is the creation of Second Channel. I would seek, on the basis of the existing Constitutional provisions, a channel on the television for the states, which desire it and which are prepared to bear the expenses of education through television, especially in rural areas. Wholesome entertainment in the language of the State, projecting facets of its culture, will be an added advantage.[14]

Hegde was responding to a plan discussed by former Minister of Information & Broadcasting, Gadgil, in the Parliament, to allow State governments, co-operative societies, and even private companies to set up relay transmitters (but for exclusive use by Doordarshan). However, Gadgil's plan was related more to affording Doordarshan the choice of more channels rather than allowing the states concerned to have

exclusive access.

These problems associated with community viewing have been acknowledged by certain groups and individuals. As a policy prescription, the Joshi committee has noted that community viewing facilities will never get a high priority unless they receive attention at the highest level. An institutional framework has to be created for this purpose:

> ... involving the representatives of the concerned Ministries of the Central government, the Planning Commission, the State governments, the Reserve Bank of India and other Nationalised banks, experts on rural planning and development from established institutions and representatives of peasant organisations and voluntary organisations. An adequate financial provision also needs to be made for creating these facilities in Seventh Five Year Plan." In order to solve the problems of electric supply, the committee recommended that alternative possibilities should be explored.[15]

It may be pointed out that the Planning Commission, while allocating funds for the Communications sector during the Seventh Five Year Plan (1985–1990) did not make any specific provision for community viewing in its sectoral allocations. Nevertheless, a member of the Planning Commission underscored the importance of the community viewing scheme by indicating that the scheme could be supported through increased funding made available to the states and union territories for communications in the Seventh Plan. While funding for community viewing was an implicit item, the objectives for Indian television were explicitly in development terms:

> The major thrust of the Plan relating to mass media will be to raise the level of peoples' consciousness and enrich their cultural and social life and make them better informed citizens. It will assist stepping up the pace of development of programmes and sensitize the people towards national and international events of importance. Besides entertainment, programmes covering sports, culture and fine arts will be provided. There will also be target group–oriented programmes i.e. for youth, women, children and weaker sections. Further the media will act as a vehicle of education and extension and so, narrow the information gaps faced by the people from different walks of people. It will assist in enlarging the scope of formal education through special schemes like open universities.[16]

Acknowledging that "lay people as such, that is, the ordinary households in the country, who do not have sufficient purchasing power to buy TV set, [should] be able to have access to Television", the Planning Commission once again reiterated that the only solution was the expansion of the community viewing scheme.[17]

7.3 Direct Reception Sets: An Industry Perspective

DRS was a sophisticated technology developed for direct reception of TV programmes for the ATS-6 satellite during SITE. Work on this project was initiated at the Electronics Systems Division of the SAC in 1972. The front end converter (FEC), a key component in DRS, was developed by this division while the "modified solid state TV" set manufactured by ECIL was accepted as supporting TV receiver. FEC technology was transferred to ECIL for the production of the SITE antennas. This technology is being promoted by Space Applications Centre for transfer to the Indian industry.[18] DRS provides an interesting case for institutional analysis.

The SAC claims that DRS technology has been transferred to the Indian television industry. One or two private and many public sector units, such as ECIL and Kerala State Electronics Development Corporation (KELTRON), have bought this package. The limited areas in which television reception is made possible through DRS does not provide sufficient incentives for large scale manufacturing. This is compounded by the lack of a DRS policy under the community viewing scheme. This is further frustrated by the Government's preference for public sector institutions, specifically in the selection of DRS.

Shyam Antenna System, a private sector industry that bought the SAC-DRS technology, was infuriated with the government's decision to shift away from DRS technology to limited rebroadcast using VHF sets. Based on SITE experience, this had not been anticipated. Having improved the SAC-developed DRS technology through imported critical components,[19] this entrepreneur is developing systems suited for industrial townships located beyond the current limited rebroadcast transmission range as well as housing societies desiring direct reception. The advantage of his system, Mohapatra claimed was the the availability of all Doordarshan programmes from Delhi, including the national programme, and the potential for a cable network for non-broadcast media such as video for entertainment. (Cable systems within a multi-storey housing complex for daily and weekend entertainment, are becoming familiar to residents in Bombay, Ahmedabad and other cities).[20] Mohapatra also criticized the adoption of

a C band configuration rather than a KU band configuration for INSAT because, as a result higher frequency, reception is not possible. This choice has been justified thus:

> As far as the choice of frequency band of the BSS was concerned, the early studies had focused on use of 800–900 MHz because use of 860 MHz was proposed for SITE. However, in the light of the new BSS allocations resulting from the 1971 World Administrative Radio Conference (WARC '71), the studies in post WARC '71 period finally focused on the use of the 2.5 GHz ("S") band for BSS because the 12 GHz band was not considered immediately practical.[21]

The desire by Mohapatra to have a KU band configuration may have more to do with International developments in which powerful satellite consortiums such as INTELSAT are in a postion to deliver programmes produced outside India. (The technical implications of choosing a C band in terms of the optimum use of satellite has been addressed in Chapter IV).

7.4 Doordarshan, Development and Education

The phenomenal expansion of television in India since 1982 demands a renewed commitment to the development and educational objectives of the medium. To this end, a working group was appointed in December 1982 to prepare a "software plan for Doordarshan taking into consideration the main objectives of social and economic development in the country and to act as an effective medium for providing information, education and entertainment." The committee submitted its report in 1984 and although the report has been tabled in Parliament, no definitive policy seems forthcoming. Nonetheless, its basic thrust, the Nehru–Sarabhai approach, is critical to an understanding of the institutional relations that exist in software, specifically as they pertain to the development and educational uses of television in India.

Doordarshan produces programmes intended specifically for the INSAT areas.[22] INSAT, as utilized by Doordarshan, intend: "to provide nationwide direct TV broadcasting to rural communities in the fields of education, social awareness, health and family welfare, rural development etc. The other objective was to use INSAT for relay of television programmes (National Networking) by a large number of terrestrial transmitters which do not have any facilities for production of programmes."[23]

Doordarshan produces area specific programmes in Agriculture, health, and family planning aimed at a general, adult, rural audience and intended to fulfill development objectives. On the other hand, education programmes are more formal and are intended for specific target groups such as primary school children and college students. They are not inhouse productions but are produced by the Central Institute of Education Technology (CIET) and University Grants Commission (UGC). As well, educational TV programmes complement existing curricula as part of the educational system in urban and semi-urban areas, whereas the development programmes are specifically related to the community viewing scheme.

P.V. Sateesh, a producer who was actively associated with rural programme production in the Andhra/Karnataka cluster during SITE, is now[24] a senior producer with the Doordarshan centre, Hyderabad. According to him, the sharp focus of rural television was dissolved immediately afer SITE and may have had something to do with Mrs. Gandhi's political career at the time. (In 1975, the Allahabad High Court found Mrs. Gandhi guilty of election malpractices and consequently, there was a demand for her resignation. An internal emergency was declared.) The intensity of setting up a transmitter a day and the enthusiasm for the Asiad games shifted the focus of television from a rural to an urban orientation. Additionally, the lack of a software policy was another problem. And the advent of sponsored programmes shifted the focus to an almost unrecognizable point in which Sateesh contends that "Doordarshan sold itself to these interests." The training and infrastructure created during SITE had been a motivation for producers working in rural television but it is being eroded. One of the reasons for this is a low morale among the Doordarshan production staff as a result of outside agency competition. Specifically, the Doordarshan employees lost incentive because outside agencies were allotted prime telecast time. As well, the equipment available to Doordarshan (Hyderabad) staff, especially in the INSAT areas, was inferrior to the equipment available to outside agencies or even Doordarshan (Delhi). In addition local contributions were marginalized in comparison to Doordarshan (Delhi) productions. (See table 5 for a comparison of time given to different agencies). In addition the hierarchy and related problems in Doordarshan restricted the mobility and initiative of inhouse talents.

Table 5: Programme Composition by Television Centres/Agencies

Production Centre/Agency	Average Duration in %.
Delhi	51
Bombay	4
Calcutta	3
Madras	1
Lucknow	*
Jalandhar	1
Srinagar	*
Bangalore	1
Trivandrum	*
UDK Delhi	1
Cuttack	1
Hyderabad	1
Nagpur	*
Rajkot	*
Ranchi	*
Ahmedabad	*
Gorakhpur	
Sub–total	65
Production from other Indian sources.	
Sponsored	26
Feature film/ Chitrahaar**	2
Films Division	1
Other Indian Sources	1
Sub–total	30
Production from Foreign sources	5
Miscellaneous items	*
Total	100

*Indicates less than 0.5 %

**Chitrahaar is a very popular programme based on song and dance sequences from feature films.

Source: Audience Research Unit, Television India, (New Delhi: Directorate General, Doordarshan, 1986), p. 28.

The producer recalled SITE, when he and many of his colleagues had joined the organization and they had shared an orientation for rural television with a homogenised attitude towards programme production. Each person concentrated on different areas such as agriculture, health and family planning. With that experience, the production staff improved. However, with the changes instituted under INSAT fresh recruits were put in charge of INSAT development programmes. Lastly, ISRO researchers had an influential role during SITE. Under INSAT, however, the research staff has been absorbed as part of Doordarshan. As a result, the research staff has been reduced to conducting surveys as opposed to providing significant information to the producers. Agriculture was an area where he had observed significant changes. The producers prefer to work with the Agriculture Department, with their bias towards the rich farmers, rather than being sensitive to the needs of the marginal farmers. This sentiments have led the producer to a radical conclusion: in order to have an impact, the concept of limited broadcast should be applied. The sets should be programmed to go on and off the air only when the intended programmes—development and educational—are telecast.[25]

The views of the producer were amplified to some extent in the Doordarshan (Delhi) office which coordinates the activities of the ASPs. It was stated that programme production in Doordarshan goes well beyond development and educational issues and yet are produced within the existing framework of rules and regulations. While it is quite easy for other agencies to criticize Doordarshan, their personnel do not have the same kind of flexibility and resources to produce field-based programmes as those not constrained by these institutional limitations. Rawat, INSAT programme controller, was responding to a criticism of Doordarshan programmes in comparison to the rural programmes of DECU for the Kheda region. He complained that Doordarshan pays about Rs 600,000 (it should be noted that this amount is only the Doordarshan's share of the total expense) to DECU for producing internationally acclaimed Kheda programmes[26] while his staff, with limited facilities, produce similar programmes which go largely unnoticed. The key is publicity: SAC/DECU people are good at it and: Doordarshan is not.[27]

7.5 NCERT and INSAT

The use of television and other audio visual technologies for educational purposes have been institutionalised at various levels. At the primary level, programming has been entrusted to the Central Institute for Education Technology (CIET), a department within the National Council of Educational Research & Training (NCERT). NCERT was formed by merging several separate Government educational departments in 1961 as it was felt that "the development of education in India would depend very much on a coordinated attack on all aspects of education." An influential American team known as the "Columbia Teacher's College Group" assisted in the development of NCERT from its inception.[28] CIET was formed by the merger of two units of NCERT in 1984. Krishna Kumar has argued that NCERT was "born in an era of innocence"[29] in the sixites when the meaning of development was simple: "gradual transformation of the newly independent colonies like India into Western-like nation states. This appeared to be an achievable goal under the aegis of international, particularly American, aid."[30] It was in this climate that in 1962 USAID initiated major programmes in educational theory and practice to set the "newly established NCERT on its future track." It is within the framework of NCERT that CIET is playing a major role in the use of INSAT for primary education. The Joint-Director, M.M. Chaudhri, was involved in the development of science programmes for rural children during SITE.[31] According to Chaudhri, education of rural children between the ages of five and thirteen, becomes the prime target for the application of educational technology. A typical village school has limited facilities: "one or two rooms, verandah and a courtyard, some black boards and furniture ... and an inadequate number of teachers with little training. Seldom do they have any library and never any laboratory." (see table 6 for an understanding of physical conditions in primary schools in India.) Rooted in the belief educational technology for development, CIET explains that the "thrust of education lies in not asking people to change but in providing them media and skills to see their problems and provoking them continuously to think for solutions, all of it as a scientific process."[32]

Table 6: Physical Conditions in Primary Schools (All figures represent proportion in % to the total number of primary schools in India)

States	Perm. Bldg.	Drink. water	Lava tory	Black board	Play ground	Li- brary	Literacy in %: 1981
Andhra Pradesh	45	41	5	48	51	30	29.72
Assam	07	33	22	21	44	4	28.15*
Bihar	24	28	02	49	16	4	31.39
Gujarat	74	51	23	100	64	65	43.75
Haryana	87	65	37	77	80	87	35.84
Himachal Pradesh	12	38	05	66	59	77	41.94
Jammu & Kashmir	23	34	06	85	40	44	26.17
Kar nataka	72	23	04	85	46	40	38.41
Kerala	78	87	79	93	69	59	69.17
Madhya Pradesh	51	24	07	51	46	7	27.82
Maha rastra	64	47	13	80	49	37	47.02
Orissa	23	26	23	50	34	9	34.12
Punjab	55	79	32	43	68	49	40.74
Rajastan	65	53	15	64	46	39	24.05
Tamil Nadu	70	65	24	87	78	82	45.78
Uttar Pradesh	71	44	15	54	48	23	27.40
West Bengal	20	48	16	71	41	53	40.88
India**	47	41	15	60	47	29	36.12

*1971 figures.
**Includes smaller states and Union Territories.
Source: K. Krishna Kumar, "Close Look at Primary Schooling" in The Hindu February 24, 1985.
Literacy figures in Times of India Annual and Directory, 1984. p. 265

Chaudhri noted that the production of educational software is a "complex exercise involving subject, audience and media mix.":

> It is also difficult to prepare software which transcends the rigid boundary of textbooks and makes learning fascinating and enjoyable. How to prepare audio tapes for the blind or for the teaching of language, music or freedom movement? How to prepare video cassettes

> which can be for the out of school children and yet be equally meaningful for the school? ... How to tell the teachers about the use of computers or sensitise them towards the ecosystem? These are some of the experiments CIET is engaged in and dubbing them in various Indian languages."[33]

The production of educational software often incorporates institutional mixes. UNDP, UNESCO and UNICEF are collaborating with CIET to give a boost to its programme of development.[34]

In a recent review of ETV at the primary level, it was noted that despite the "much publicised high-tech incursion into education", the Government has not been able to get closer to the commitment to universalize primary education. Parvati Menon has argued that the failure to do so constitutes one of the "most serious indictments against a government that has remained in power for over four decades."[35] Apart from the lack of basic physical facilities in primary schools, especially in the rural areas, there is a very high drop out rate (by second grade 50 per cent of the students drop out, more so in the Hindi speaking belt) at the primary level itself. It is this "solid backdrop" against which many of the educational technology schemes have been conceived and are being implemented. The "INSAT for Education" programme which was launched in 1984 had not achieved its goals so far. According to NCERT, satellite TV serves only 80 of 770 million people in the country and the only way more people can be served is through community TV sets. The number of such sets for the programme is only 4600, "less than a drop in the ocean." At a Children's Educational Video festival in Mysore (July 13-17, 1989) many of the problems affecting the educational programmes were reviewed. Apart from problems of suitability of timings etc.,[36] there was a conflict between CIET, the central agency that coordinates the programmes and the State Institutes of Educational Technologies (SIETs) that actually produce the programmes. The SIET personnel consider themselves as "poor cousins" of the CIET staff as their pay, facilities and prestige are not equivalent to CIET. In addition to these problems, the values and educative content of the programmes have a significant bearing on the child's education.[37]

Some observers have expressed concern about non-formal education and, more specifically, about the use of education technology: "In an ethos where full time schools do not see it as their business to find out why certain children remain absent, it would be impossible to imagine non-formal centres to

have any kind of accountability. To recognize them as an alternative to primary schools will mean bidding farewell to the hope of ever having a functioning, accountable, system of elementary education."[38] And, in a developing context there is also the problem of availability of the medium, in this case, television.[39] According to one analysis the emphasis on non-formal education and on educational technology is due to to some "very vigorous propaganda by Western experts of Third World education."[40]

The advocacy of television for education in India needs to be examined in relation to the advocacy of other electronic media for educational purposes, including computers and videos. Television is often used as a case to justify the use of high technology media. This is evident in the government's resolve to educate all children up to the age of 11 years by 1990 through educational technology. The dependence on this technology is said by some to ignore the "socio-political factors responsible for past failures in this domain.":[41]

> What world does our educational advisor inhabit that he can on the one hand talk of 40 per cent of our schools having single teachers, no permanent buildings, no blackboards, of 70 per cent having no libraries and on the other hand almost in the same breath, talk of establishing video libraries, network systems ... in tackling the problems of mass education? Does he not know, for example, that a typical school has a monthly allowance of Rs 3 for postage, so that if we want feedback from teachers ... we must provide them with postage paid cards."[42]

If the trend of developments in India is any indication, then it is quite evident that the universalization of education will be attempted through "electronic technologies" which will create a dependence on sophisticated technology with all its attendant consequences.

7.6 Higher Education and INSAT

The use of satellites for development and education has been at tertiary (college/university) levels. The use of television for tertiary education is an extension of the general belief in the benefits of television for education. It is important to understand the institutional relationships within INSAT as they relate to tertiary education.

E.V. Chitnis, former director of SAC, traced the use of educational technology for higher education from INSAT to a limited experiment conducted during the APPLE (see chronology for a description of this phase) phase of satellite development in India.[43] A course on satellite technology was offered at the Post-graduate level. Under INSAT, SAC decided that UGC should be persuaded to initiate higher education in a similar manner. The Chairman of UGC was informed that since satellite time was in great demand, UGC should seize the opportunity. Thus, the chairman agreed to mesh UGC plans into the INSAT time frame.[44] Another report suggests that mere availability of transmission time is the main reason for starting the UGC television programme: "In a meeting held in the Ministry of Education in February 1982, where a representative of the MIB was also present, it was indicated, interalia that when INSAT will become operational it will be possible to ensure transmission time of one hour everyday in the afternoon on programmes for higher education."[45] Usha Vyasulu Reddi, a coordinator for the Osmania University Audio Visual Research Centre (AVRC), in the UGC higher education project provides a different perspective on the genesis of the project and its consequences:

> Despite appearances to the contrary, it was not the educational objective that preceded discussions as to the utilisation of the satellite system for education. The availability of time prompted the planners to examine ways and means of exploiting the new medium. Many of the decisions were taken without the inclusion of educational technologists or communicators in the decision making process. The result was that a system was set up by those who believed in the omnipotence of the media to deliver the messages effectively. The sad reality is that the models of media omnipotence which were developed in the 1930s have been discarded in the very countries of their origin as not reflecting the reality of either the media or the reality of the society. In the absence of clear goals at the outset of the project, planning is ineffective. The goals of higher education project were not clearly identified until after the broadcast of programmes had commenced. Formative research to identify the priorities of the system, the shifts in emphasis over the years, the strengths and weakness of the universities was not carried out. *Decisions relating to the allocation of resources, location of media centres, choice of time for telecast were not taken on the basis of the criteria as to the institutions most capable of doing the job but based on other factors best left unmentioned.*[Italics mine] The result: centres with hardware capabilities have problems of software and vice versa.[46]

Though the availability of satellite time prompted the UGC to launch this scheme, there were problems with the available time slot. Morning slots were allotted exclusively to primary education programmes and a breakfast show. The afternoon slot was allotted for UGC programmes but could not be guaranteed. The vice chairman of the UGC has stated that this time slot is greatly hampered by

international cricket matches and other "pressing" national telecasts.[47] At the moment, the UGC hour coincides with colleges' lunch hour and as inconceivable as it might seem, the caretakers are reluctant to switch on the sets as it is their lunch time. The repeat telecasts in the late afternoon are no more appropriate as they occur after the students have gone home. This may, however, assist those few students who have sets at home, but since the broadcasts conflict with their leisure time, it is not clear whether they watch the programmes or not.[48]

Quite recently, it has been found (based on a survey) that even though 58 per cent of the students have indicated that they have seen the UGC programmes, only 17 per cent watch the programmes frequently. Additionally, Commerce and Arts faculty students are not inclined to watch these programmes due to the preponderence of science topics. In another study, the researcher found that the telecasts were not viewed in any of the colleges contacted for the study. The reasons given were: power failure, lack of prior information, and unsuitability of telecast time. Accessibility to television was another factor, especially in the rural areas. This study found that in the urban areas, 85 per cent of the respondents had a TV at home, and in the rural areas it was less than 20 per cent.[49]

7.7 Higher Education—Software Aspects

In India, experience has shown that hardware aspects of satellite technology are well developed and the accompanying institutional mechanisms are firmly established. It is the software aspects, that is the content of the programmes, that are crucial to the effectiveness of television as an educational tool. While the rationale and objectives of the UGC content are well laid out, the implementation leaves much to be desired. The problems of implementation are mainly of an institutional nature.

These problems arise primarily from the selection of centres from competing institutions. The incentive for these institutions or the Departments is one of status. The criteria for selection is unclear but E.V. Chitnis, a key policy person, noted that the selection was made on the basis of an assessment of the respective institutions' production abilities.[50] However, a coordinator, as noted earlier, has stated that

the selection was based on factors that are best "left unmentioned."

Under the UGC scheme Educational Media Research Centres were constituted as larger production centres with a greater capital investment and audio visual research centres (AVRCs) were planned as "user agencies, providing viewing, library, and support facilities for the various faculties in the respective universities." This distinction is no longer valid, however, as AVRC productions are almost on par quantitatively, with EMRC's. This situation highlights the dyanamic tension with institutional relationships juxtaposed with the mandate that remains static. Frequently, institutions are more receptive and adaptive to the contigencies of development than are the rigidly defined parameters of government policies.

Implicit within UGC, was the assumption that there would be an efficient coordination of resources within the universities. Personal experience in one of the Universities has shown that despite having production facilities a few feet away, departments were not in a position to share this facility in a mutually beneficial way. This being the case, it is not surprising that many departments within a university aspire for their own facilities even though it means duplication of facilities and expenditure of scarce resources.[51]

For the provision of educational software, an apex institutional mechanism has been established within the UGC. This institution co-ordinates the overall production of programmes from the various production centres.[52] Coordinators of all these centres meet regularly to discuss problems, review policies, plan future productions, and resolve ongoing problems. Within the Universities, the coordinators are directly responsible to the Vice Chancellors of their respective institutions. While this institutional arrangement might appear highly bureaucratic and constraining, a project coordinator, contended that "although it may not appear so, the system is highly flexible and sensitive to the needs of both education and broadcasting."

Reasons for the Problems

At each production centre the structure and management of the centre also reflects a lack of manpower and hardware planning: "AVRCs are underequipped, EMRCs are overequipped. In terms of hardware support, they are conspicuous by their absence in the smaller centres (AVRCs) while in the larger centres (EMRCs), they are underutilised."[53] In addition, an overemphasis on academic requirements rather than on production skills by the Universities is found to be too constraining for many. The talented are primarily attracted to the private sector. Even those who work for universities often use the experience to move to other lucrative and more glamorous jobs.

During my field study I observed that related institutions in the education sector were interested in building hardware configuration for producing software. In response to an overwhelming demand, UGC requires outside input and thus, "liberal allocations are made so that programmes could be made even by private organizations and freelancers (Rs 10,000 for a slot of 20–30 minutes duration). The condition however, is that all time copyright for the production vests with the EMRCs."[54] Again this emphasizes the highly technological and capital intensive of software production. In addition to engendering an increasing hardware dependence, there is a growing dependence on imported software.[55]

The emphasis on science programmes provides incentives to outside agencies such as the Open University (UK), and educational networks such as the South Carolina Educational Network (US), to supply tapes from their existing collection, especially for science education. "A well known problem for many development education projects is the need for appropriate training. Merely to make available the technology is not enough, since staff have to be trained in the production of the requisite materials, in both educational and the technical senses." In 1985, for example, the lack of indigenous material and a shortage of trained persons forced Indian users to rely on materials produced abroad.[56]

The dependence on foreign programmes is also due to the popularity of these programmes. A content analysis, "Message system Analysis of UGC's Countrywide Classroom", has compared the formats of Indian and foreign software. It was found that about 40 per cent of the Indian programmes were

produced in studios and another 32 per cent in classrooms or laboratories. The format was almost exclusively lecture-oriented. By contrast, foreign programmes, were produced primarily outdoors. The study also found that there was a low motivation among the students to do something based on these progammes.[57]

The use of English in all UGC programmes is another problem area. It should be noted that English has been the medium of instruction in Indian higher education for historic reasons (i.e. the relationship between England and India). The continuation of English as the language of choice has something to do with the multiplicity of languages in India which have persuaded the Indian authorities to retain English as the "lingua franca of electronically disseminated education." According to Amritavalli, the real problem is not a choice between English and some other language for this is no choice at all. The major problem is that of linguistic proficiency; a semi-proficiency that makes it possible for television narrative to be followed adequately, or adequately enough, just will not suffice when the material being broadcast is expository. Until the problem of linguistic proficiency is solved, if ever it is, it is essential that a presentational style be adopted which does facilitate comprehension."[58]

The use of INSAT for higher education is not simply a case of using an existing facility, INSAT. It reflects a belief in the use of new communication technologies and is intended to give a boost to the concept of distance education in India with a heavy emphasis on new communication technlogies. A taskforce drawn from different institutions in India, and comprising representatives from the British Council and US Educational Foundation in India, enlarged their terms of reference related to INSAT-1B to include new and modern technologies.[59] Explaining the impact of new technologies of communications and computers, the task force stated that the "transmission of information may cease to be the main function of a teacher." The teacher would continue as a "demonstrator of skills" and "cultivator of values and attitudes:"

> Full time formal education is not the right way for larger enrollment of students. Further, the requirements of knowledge and skills of masses would need diversified channels of short and long term courses of vocational, professional and cultural education. Information Communication network can be effectively used to educate large number of aspiring students. This will require exploiting potential of new technologies and developing distance

education technology.[60]

The use of INSAT 1B, therefore, is oriented more towards non-formal education and the adoption of new information and communication technologies. However, non-formal education can also mean the global integration of education. This global integration has implications for the nature of national education imparted in a developing context. It is necessary to be sensitive to these implications and adopt suitable policies to mitigate the over-dependence on technology-centred education.

7.8 INSAT and Rural Telecom

Satellite communication was extended to the remote and isolated areas for the first time in 1980 when five remote areas were linked to Delhi and Madras through the INTELSAT satellite. Since then, even with the availability of INSAT, the use of satellite for remote/rural areas has not proliferated. Major contributing factors include the high cost of the earth station and the priorities of the Department of Telecom (DOT).

In 1983, Nayak, a senior official of the Telecom board in India stated that "for a developing country like India, the telecommunications development has largely been [utilized] in answering to the demands in urban areas."[61] Reasoning that "rural development will not be meaningful without integration of rural telecommunications expansion," he justified the government's formulation of rural telecommunications development by saying, "government has drawn rural telecommunications development plans as part of the total programme." The basis for various measures are "typical of the universal thinking in the minds of planners and economists."[62]

The International Telecommunications Union (ITU), one of the key institutions, shares this arguably "universal thinking" on rural telecommunications. Ironically this "universal thinking" does not extend to the definition of a rural zone. The ITU argues that a rural zone is not based on population alone:

> Scarcity of power, lack of locally available qualified technical personnel, severe climatic conditions, difficult topographical conditions, economic constraints are all features of a rural telecommunications environment.[63]

By contrast, criteria for a rural area in India are no different than for an urban area: population; employment patterns; and population densities. This suggests that the Indian government is not sensitive to the particular conditions of the rural areas.[64]

A task force, appointed by the P&T board, conducted a study which revealed that the rural population cannot afford a telephone as an item for personal consumption; telecommunications traffic generated in rural areas is generally short distance; the major users are those in the trade, business, commerce, and banking sectors; and, calls for personal emergencies were not significant. In light of these findings, it is not clear how the task force identified the basic components for rural telecommunications as:

> Long distance public telephones to provide access to the telecommunications service to rural population and rural subscribers telecommunications network to meet the demand from individuals, organizations and other agencies.[65]

Satellite communication for rural development in India is more closely associated with remote rather than rural area communication. Only those areas that "are normally inaccessible and are extremely difficult to interlink by conventional terrestrial means" are regarded as satellite link worthy. Unfortunately this limited vision of satellite capabilities contradicts the very reasons for adopting the technology in the first place which was partially to overcome inadequate terrestrial based technology. As a result, the location of earth stations for INSAT has placed too much emphasis on cost-effectiveness and remoteness in specific areas rather than its general applications for all. This emphasis does not account the full potential of communication satellites which are *are cost insensitive to distance: "The cost of reaching a remote community is virtually the same as reaching nearby communities."*[66]

Indeed the constraining factor is the provision of an appropriate earth station configuration to fully realise the potential of the satellite. Technological developments such as small earth stations make it possible to both harness the potential of the satellite and meet local needs within an appropriate

configuration. Based on Kaul study and its Indian "rural reality", the criteria has been formulated that "that no one should be more than 5 km or one hour's walk away from a telephone."[67] This is not, however the "rural reality". It totally disregards the P&T task force study that stated: telecommunications traffic generated in rural areas is generally *short distance*. And yet, Kaul argued: "Viewed only in the context of India, telecommunications service is meaningful only in terms of long distance communication, in other words, rural–urban–rural communication. In adopting the 5 km hexagonal spatial distribution approach Indian telecommunications planners have already recognized that rural households' need is to have an access to telecommunications network and that that they have no use or little use for lines for making local calls."[68]

If the villagers have little need for making local calls, then this begs the question: what kind of need do they have for long distance calls?[69] According to the task force, it is the "tertiary" (business, commerce and banking) sector that has a greater need for long distance communication. Quite simply, this would enable the urban sector to access additional markets.

The role of institutional relationships analysed in this chapter reveal how and why problems in the area of developmental and educational television remain despite the necessary infrastructure. Educational programmes have to compete for suitable slots and community viewing is embroiled in the Centre–State relationship conflict. What could have been an active industry, the DRS, was killed due to the shift in priorities and nature of television expansion. In rural telecommunications despite the potential of the satellite to provide basic access, the urban and industrial orientation have made these objectives secondary.

CHAPTER VIII

CONCLUSIONS

The transfer of technology is generally associated with high hopes by the recepient country for achieving social and economic benefits. But the actual benefits often fall far short of what is anticipated. The Indian experience with satellite technology is no different. This dissertation is a comparison of the promise and performance of satellite technology, and is based on an analysis of how and why the performance deviated far from the promise. This concluding chapter is a synthesis of the insights presented in previous chapters.

Based on case studies in technology transfer and specific analysis of the Brazilian and Mexican domestic satellite systems, the structure and role of political and economic institutions in decision making were considered important for analysing the INSAT situation. Accordingly three questions were central to this study: the transfer of satellite technology; the transition from an "experimental" (demonstration) phase to an operational situation; the consequences of INSAT in two major applications, telecommunications and broadcasting-television.

8.1 Role of Institutional Relationships in Technology Transfer

The design, development, manufacture, and deployment of communication satellites in the US have shown to be a product of political and economic institutional relationships. The political considerations in the context of the cold war were crucial in the establishment of a civilian space agency, NASA, in the US. Subsequent developments up to the evolution of the ATS programmes took place within the framework of giving priority to commercial considerations and the interests of dominant carriers such as the AT&T. This policy was clearly intended to protect the interests of well established terrestrial communication systems. Satellite manufacturers, therefore, did not have sufficient incentives within the US. Harold A. Rosen of the Hughes Aircraft Company responded to this situation by projecting satellite technology as

useful for developing and poor nations:

> Of the many ills that beset mankind, the most serious result from the grave and increasing contrast in living conditions between the poor nations and the rich, and the bitterness it engenders. Advances in technology during the recent decades have worsened rather than alleviated the situation contrary to our hopes and expectations. There now exists, however, an opportunity to help them participate in the communications revolution made possible by satellites. A satellite system for mass education could make a substantial contribution to the enlightenment of the human race.[1]

In stating his case, Rosen also indicated that the delay on the part of the US to use satellites for education, domestic, or foreign purposes was not only due to the "natural resistance of educational and communications establishments to change, but also from a widespread overestimation of costs and difficulties involved in establishing a satellite distribution system."[2] The use of satellite for educational purposes was initially focused entirely on television. Schramm has explained the reasons:

> ... it is reasonable to assume that the chief contribution of communication satellites to education will be to deliver educational television. A satellite could, of course, deliver educational radio, or it could hook up classroom consoles to central computers for programmed instruction. But the capacity of computers for time-sharing does not now justify their use for offering computer assisted instruction to such a large number of schools as would be served by a satellite; and the educational contribution of satellites to educational radio would be less spectacular than what they add to our ability to deliver television. Furthermore, given a choice most educators would prefer to teach with television, where they can use both sight and sound. Therefore, it is likely that educational satellites will be chiefly *television* satellites. [Italics in the source].[3]

Regarding the efficacy of TV as an educational medium, evidence culled from more than 1000 research papers on the subject was summarized to make a case for the medium.[4] Implicit within these research findings is a belief in the neutrality of the medium and the assumption of a supportive classroom structure in the Third World.

The Indian policy makers responded by reductively reorienting their focus by rationalizing that universal education could be achieved by simply having a distribution system in place. This was and remains the reason for an increased use of new technologies, including television for education purposes. Erroneously they believe that the medium alone is expected to fill the void of suitable educational facilities especially in the rural areas. Apart from the fact that community viewing facilities are still inadequate, (owing to the institutional problems addressed in chapter VII), the myth that mere production

of programmes and creation of audio visual centres will solve the problems still prevails. This study has shown why and under what conditions the community viewing centres function effectively. A good model of community viewing experience exists within India. One major recommendation that emerges from this study is that apart, from being made responsible for community viewing, the state governments should also be given the necessary incentives to ensure that communities in their states have access to the medium. For example, the resentment of the Andhra Pradesh government towards providing community viewing merely because the state government does not have any incentives in terms of programme content is a case in point. The experience gained during SITE should be used for an operational context.

8.2 Institutional Relationships-The SITE Phase

Developments in the US with regard to satellite technology had a direct relationship with SITE in India. All the key players in the US, NASA, the satellite manufacturers, the Ford Foundation and a few US universities had participated in various studies and experiments related to satellite technology. Apart from the stated goals of international co-operation and altruism, the interests of the various US institutions can be identified by their respective domestic agenda. For example, the Ford Foundation's philosophy of non formal education and the use of television to achieve this goal is rooted in a particular context, the US. The role of Ford and Carnegie Foundations in the rise of US public television is considered more than nominal. Engelman has argued that the Foundations' roles reflect the philosophy of their founders: " ... The objective of fostering a sense of community among all strata was rooted in Andrew Carnegie's 'gospel of wealth.' The desire to exploit the 'great technology' of television reflected the technocratic perspective grafted onto the old faith, as did the 1966 [Ford] satellite proposal."[5] The Foundation's support for an educational television project in India is an expression of this interest. The "success" of this project in a few schools in Delhi was used to make a case for educational television in India. Similarly, the joint studies of the Indian Department of Space and NASA to determine the appropriate technological configuration for a nationwide TV distribution favoured satellites over terrestrial systems based on comparative costs.[6] The case for TV as an instructional medium in areas such as

agriculture was based on a pilot project in the Delhi region. The project was considered to provide "opportunities to developing nations" for the use of communication satellites.[7] However limited these experiences were, they nevertheless formed a basis for advocating TV. International agencies such as the UNDP, ITU, and UNESCO were also actively involved in promoting the transfer process. For the UNDP, satellite technology in India was perceived as a step towards creating the necessary industrial infrastructure, particularly in the electronics sector. UNESCO saw the technology as a realization of its goal of trying to achieve the minimum mass media norms for development. ITU was concerned with the allocation of frequencies without creating a conflict. Nevertheless they had almost no resources to contribute to the project.

The main question confronting India in the late 1960s, according to Sarabhai, was not whether the nation could afford a system but whether it could afford not to have a system.[8] Sarabhai's arguments were also based on a strong case being made internationally for the use of technology in development and education. It has already been pointed out in earlier chapters that there was a slow and gradual movement towards television in India in the late fifties and early sixties despite pressures from the advertising industry. This gradual movement was based on a strong conviction that television would invariably lead towards a system incompatible with India's development goals. The Chanda committee report on broadcasting contains references to this apprehension. There was considerable resistance for the expansion of the medium and a powerful intervention was needed to overcome this resistance.

Broadcasting was administered by All India Radio which automatically nurtured television in the experimental phases. The technical staff of AIR had developed a certain confidence with TV technology and were keen on developing it in a phased manner. Reference has already been made to the master plan of AIR and its relationship to other institutions, particularly the space agency. A major cleavage formed between phased development and an immediate solution to expand TV on a national scale. The space agency was powerful enough to persuade the government to experiment with the satellite and strengthened their case by arguing that the phased development plan of AIR was urban-oriented and did not make provision for community viewing.[9] The Indian space agency was influenced by NASA which

itself was being pressured to use space technology in the social sector within the US. Specifically in the case of ATS-6 experiments in the US, Robert Filep has noted:

> To assume that these experiments were designed years in advance of the availability of the Applications Technology Satellite, Number 6 (ATS-6), would be incorrect. Rather, they developed rapidly as a consequence of the sudden attention toward the use of space technology in the social sector ... The selected satellite further limited flexibility as it was in the final production stages and did not allow for significant modifications. Therefore, the development of program content in the area of social services required adaptation of the experiments to technical constraints.[10]

The consequences of US participation in the transfer process had to be addressed by US institutions because of the potential for political ramifications. The Rostow Task Force raised this issue in 1968 based on India's opposition to the location of a powerful Voice of America Transmitter in Calcutta in 1962[11] and the Ford Foundation collaboration for ETV in 1961-64.[12] The task force concluded that since top level bureaucrats, Indian scientists of the DAE, and prospective TV manufacturers were interested in technology transfer, any opposition should not be heeded.

SITE was important in the transfer process because it led to the creation and realignment of existing communication institutions in the country toward television. It also became a reference point for any discussions of the developmental use of television. Nevertheless, SITE experience, should also be looked as an instrumental means by the Space agency to push satellite technology into India. Eapen has argued that SITE was clearly based on a technology push strategy. The factors leading to the Indo-US agreement reflected the continued faith in technology and a promotion of "communication as a missing link in development, especially by technology pushers."[13] Evaluation of SITE based on a recognition of rural realities and values have yielded different results in comparison to research conducted by the space agency with a mandate to develop the technologies. For example, an agency evaluation based on a regional study notes:

> The impact of communication technology on recipient cultures, requires closer scrutiny, especially when the technology does not slowly evolve from within but is deliberately introduced from without. SITE exploded the myth that facilities, if made available will be used, or that they will be used in the way that is intended. When new media are introduced, they appear to fit into existing communication and behavioral patterns rather than radically altering them. Irrespective of the stages of development of particular villages, permanent values of leadership status and structures stay. And it is clear that the rural population

perceives media as entertainment rather than instruction.[14]

SITE demonstrated the applications of satellite technology for rural development, and also proved to be an useful medium in projecting the personalities and programmes of the then government. This is important because the experiment was conducted during the internal emergency imposed in 1975 by Mrs. Gandhi when the opposition leaders were jailed and all civil liberties were suspended. In addition, during this emergency the mass media, especially the electronic media were misused: their advantage for political purposes became evident to the government.

8.3 The Transition from SITE to INSAT

In retrospect, SITE's relationship to INSAT can be viewed in two ways: independently and analogously. The relationship can be viewed independently because plans for INSAT were discussed and formulated independent of SITE by the Space agency. SITE was only an experimental phase: the extent to which the SITE should have been the basis for the decisions regarding an operational system is debatable. K. Narayanan of the Space Applications Centre argued in 1986 that this decision was made not only due to the success of SITE, but also to ensure that a parking spot in the geo synchronous orbit was available: " ... spurred by the success of ... SITE and by the need to protect India's position in the Geostationary Orbit that was rapidly getting crowded, the Government took a decision in 1975 that there will be a satellite component in the country's communications network."[15] While it seems clear to me that evaluation of SITE was definitely not a factor in the INSAT decision made less than four months after SITE began in 1975, it must be noted that the developing countries under the leadership of India (much to the resentment of the US) have challenged the traditional manner in which frequencies for the use of satellites have been allocated by the ITU.[16] Notwithstanding these technical matters of resource allocation, it is my contention that detailed evaluation and analysis of the SITE should have guided this decision. While it did not, it is not too late to critically reassess SITE as analogous to INSAT: to analyse the SITE evaluations and conclusions and to investigate whether they could have formed an adequate basis for the

decision to proceed with INSAT is of particular importance to decision-makers and others. Though SITE has been described as an experiment, it was not exactly an experiment. It was a demonstration of an advanced technology in a third world context. Decisions which were subsequently made with regard to INSAT clearly prove that SITE had very little relationship with INSAT and its evaluation reports did not have much meaning for policy making.

The question then is whether decisions could have been made from such evaluation reports. Specifically there were two major studies and they had conflicting findings. Not merely a case of two conflicting reports, they were prepared by two influential agencies in India, the SAC and the Planning Commission. The Planning Commission plays an important role in the allocation of funds while SAC's primary interest is in space-related technologies. The SAC termed the experiment a "success" while the Planning Commission did not consider it to be (the institutional reasons for these differences have been noted in chapter IV). Similarly a comprehensive review of all the major SITE studies has suggested that the Planning Commission's conclusions were based on certain criteria only and that they had overargued their case.[17] However, the Planning Commission study did point out certain problems in the extension philosophy that was closely tied to SITE. For example, they found that during the first six months of SITE the villagers contact with change agents (village level workers and block development officers) was negligible. 81.11% of the workers and 94.7% of the block officers did not have any contact with the villagers.[18] It should be pointed out that this low contact was not entirely due to the reluctance or negligence of the officers; it was mainly due to the fact of the villagers' overall avoidance of government officials or outsiders. This avoidance was in part an attempt to escape the possibility of being sterilized through the intense family planning campaign (this campaign was a key factor in the ruling party losing the general elections in 1977). It also is part of a long caution held by villagers toward government officials. Scholars who have looked at the evaluations of both SAC and the Planning Commission conclude that the Planning Commission's study was a "critical study" while the SAC study was "pro-SITE literature."[19] The Planning Commission's findings delayed merely the approval of the TV ground segment for INSAT despite a strong case by the Space Applications Centre through a systems study.[20] Approval for

the ground segment for TV and subsequent expansion finally came about for reasons other than developmental purposes. It was a sports extravaganza, ASIAD, which provided the decisive impetus.

Once a decision to adopt a satellite for operational purposes was made and implemented in 1982, the use of the technology for purposes other than those originally intended resulted from institutional relationships. While it is difficult to assess clearly intended purposes or objectives, this problem is not unique to this dissertation alone. McAnany, based on a review of Third World communication, observes that "objectives are a slippery reality."[21] They are slippery because "the successful application and significant deployment of communication technology in formal and non-formal education depends more on the contextual and structural factors of the particular setting than on the planning and design factors."[22] Success can then be defined as the achievement of defined project goals or the positive consequences of the intervention, defined or not. This becomes apparent in the case of INSAT too. If the "intended socio-economic" objectives of SITE or even INSAT remain the only criteria, then the project can be declared successful or not depending on whether we view it from a technological or broader perspective. Viewed technologically, it was considered successful by the space agency to the extent that these projects were able to realize their objectives. Viewed more broadly, the projects were not successful, as the dissertation has shown. In concurring with this conclusion, however, one must not ignore the intervention that takes place in the successful or unsuccessful realization of these goals; objectives tend to change over time in response to a dynamic reality. There was a significant difference between SITE and INSAT in the articulation of objectives. While SITE documents specifically declared their objectives, INSAT documents only alluded to their objectives very broadly. The SITE documents were more clearly defined in the early stages of planning because they were formulated to sell the idea to the decision maker. These clearly defined objectives combined with Sarabhai's personal relationship with the Prime Minister were enough to convince the decision-makers to opt for the satellite. The culmination of these developments led to INSAT. The consequences in telecommunications and television will be addressed next.

8.4 Telecommunication Applications of INSAT and Consequences

This study addressed the issue of telecommunications while keeping in mind the multipurpose nature of the satellite. Contrary to the experience of the developed countries, India did not encounter opposition from terrestrial telecommunication interests. If one reviews the arguments put forth by different agencies in the mid-sixties it is clear that satellite technology was considered more appropriate for the developing countries. In the case of INSAT, it is very difficult to assess its use for telecommunications purposes independent of the overall telecommunications system in place. The satellite circuits are integrated with the existing terrestrial network. Since the existing network is urban based, the use of INSAT for rural telecommunications cannot be adequately assessed although various studies have indicated that satellite technlogy offers the possibility of extending services to the rural areas. However, INSAT was primarily designed to carry heavy route traffic among the major cities and isolated regions. It was not designed for rural telecommunications nor as a means of providing basic facilities to the villagers.[23] Nevertheless INSAT is being used to facilitate industrial growth in remote and backward areas by providing voice and data links through small roof-top dishes (the RABIN system). The Confederation of Indian Engineering Industry, a strong lobby group for the private sector, was influential in implementing this system. In 1985, the group argued for a 100 percent use of the satellite by the private sector.

Another use of INSAT is for information networking such as NICNET and INDONET. NICNET is based on the assumption that the faster and more efficient organizing, updating, and timely dissemination of government information to various agencies at the central, state, district, and block levels would be useful in decision-making. Since it is just now being implemented, it is too early to draw any conclusions about the consequences of the network. However, it has been observed that despite the availability of technologies and necessary information at the field level, it does not follow that the effects of bureaucratic hierarchy on development will be eliminated. Indeed it may be an additional means of control from above! INDONET is intended for commercial purposes and the domestic network has been

proposed to facilitate interaction with national data bases and, more particularly, with international data bases through INTELSAT. The implications of this interaction for India have yet to be studied in depth. However, the experience of one public sector company in gaining access to international data bases, demonstrates that a substantial amount of foreign exchange will have to be spent for the access. Additionally, there is the matter of national control over the nature of information that is available. Expanding the telecommunications infrastructure also renders it vulnerable to pressures to throw open the national services sector for international participation. This is already evidenced by the US pressure to allow US insurance companies to provide services in India. Although India has categorically rejected this request stating that it is an internal policy matter,[24] it will become increasingly difficult to resist this pressure in the long run given that the supply of crucial components for defense, space, nuclear and telecommunications sectors in India are dependent upon US export policies. The Indian government is aware that the US government can easily apply existing domestic laws to restrict high tech exports in the name of national security. India's experience with the nuclear energy programme in the past and, more recently with super computers, lends further evidence of the dependence of India upon international technology transfer.

8.5 Television Applications of INSAT and Consequences

Intervention to reorient the use of a mass medium for political purposes can take place at the highest level as is the case with Indian Television today, a situation that has been analyzed by many writers. More recently it has been noted that in the wake of general elections towards the end of 1989, the ruling party has resorted to the unabated use of the medium for political purposes (reference has already made to the SITE phase and the internal emergency when the mass media were misused and also abused) and to some extent is even prepared to incur the wrath of the sponsors and advertisers who are angry that their programmes are being cut or postponed to make way for propaganda.[25] This blatant use of the medium for political purposes has forced the opposition parties to recognize the need for autonomy of electronic media to prevent such misuse. These proclamations of autonomy for the electronic media by

the opposition parties are also suspect as they did not grant autonomy to the media during the brief period (1977–80) when they were in power.

Apart from political motivations, intervention also takes place for commercial purposes. Although much can be said about the developmental uses of the medium for education purposes in India (a highly questionable claim), it is necessary to understand that there are powerful institutions within India that have a vested interest in the entertainment sector. The film, advertising, and consumer goods sectors, for example, recognize the benefits that TV provides. As well, the government's appetite for revenue is satisfied by allowing more advertising–supported entertainment programmes. (See table 7 for annual advertising revenue for Doordarshan.) This is reinforced by the recent announcement that daily TV programming will be increased from 14 to 19 hours. And while the Joshi Committee made a strong case in 1985 for reducing commercial programming (or totally banning advertisements as Indonesia has done), they failed to recognize the fact that Indonesia had banned advertisements, especially in the rural areas, twice. On both occasions the decisions were rescinded owing to commercial pressures.

The advertising agencies in India, spurred by their growth, are forging international links. At least ten major advertising agencies in India have agreements with foreign agencies, most of them US based. (See table 8 for the collaboration arrangement of Indian advertising agencies.) Such collaborations, if viewed narrowly in terms of existing laws in India that restrict repatriation of profits generated in India, are devoid of any incentives for the foreign collaborator. However, if one looks at the broader context in which more and more multinational high tech and food processing industries are participating in India, these collaborations become significant in shaping the advertising messages and values. The example of advertisements for "Maggi two–minute noodle" and its association with a new genre of TV programming in India has already been discussed. These collaborative relationships can also mean business for the Indian agencies from the clients of their foreign partners. This occurred last year in the case of the Colgate–Palmolive account in India. By collaborating with a foreign agency that had acquired the parent company's account, the Indian agency was also able to retain the Colgate account.[26] Similar associations have been noted in the area of market and audience research.

Table 7: Commercial Revenue for Doordarshan

Year	Gross (in million Rs.)
1976	0.077
1977	0.207
1978	0.497
1979	0.616
1980	0.807
1981	1.127
1982	1.589
1983	1.979
1984	3.143
1985	6.228
1986	2.193
1987*	12.720
1988**	15.241

Source: Audience Research Unit, Television India, (New Delhi: Directorate General, Doordarshan, 1986), p. 44.
*Figures presented in Lok Sabha on Aug. 30, 1988.
**Figures presented in Lok Sabha on Mar. 14, 1989.
Note: 1 Cdn$= Rs 13.10 (July 1989 exchange rate).

Development- and education-oriented institutions such as the NCERT, UGC and the SAC are constantly battling for appropriate TV slots to present their programmes. In fact, the UGC hopes to have a separate channel on INSAT II.[27] Despite the influence of these agencies in their respective fields,[28] they are forced to settle for slots that are inappropriate for their target audience. They are also forced to persuade the government to educate the rural poor: "The main problem is that nobody wants to take on educating the poor in the rural outback in an age of commercialism. The private sector is interested in sponsoring programmes, but only for urban children with parents rich enough to buy the sponsor's toys and other wares."[29] Quality and relevance notwithstanding, it is not as if development and education programmes have been completely neglected or sacrificed in relation to commercial programmes, it is only that the government has to be constantly reminded of their intended goals.[30] That is why this study has addressed the specific relationships between policies and outcomes within each development- and education-oriented institution. It should be stressed here that the policy of creating infrastructure for

educational programmes should not be confined to merely programme production centres and acquisition of hardware. Efforts should be made to ensure that the timings are suitable for the intended audience and a congenial atmosphere prevails for the audience to watch these programmes.

The expansion of television and its uses for political and commercial purposes with a low priority for educational goals forces us to raise an important question: in whose interest was television expanded? Pendakur suggests that the "material (politico-economic) basis for this vast expansion of state controlled television" was due to the special interest of Mrs. Gandhi in television.[31] Was this interest mainly for "propagandizing the viewers with the myth and magic of the ruling family?" The daily news and current affairs programmes on television did give one an impression that this may have been the reason. However, there were other interests and reasons: the ineffective land reform movement and related measures had not broken the monopoly power of the rich land owners in the rural areas; the green revolution had "assisted further commodification of land and more accumulation of wealth in the land owning class"; consequently, the movement of the sons and daughters of the rich in the rural areas to the urban areas added to the class of the privileged "bureaucratic-military and business elite of India in the seventies."; Pendakur has argued that this large middle class elite, about seventy per cent of the population, which was ready for many consumer goods was also ready for color television and higher quality television programmes. This middle class formed a considerable pressure group and helped the growing "consumer industries and the advertising industries in its shaping of state policy towards television."[32] The policy that emerged, as this study has shown, was a shift towards entertainment programmes defeating the stated goals of the use of satellite technology.

India is poised for the indigenous manufacture and launch of communication satellites. In this regard, the space agency and the government of India can claim success. What began as an experiment has led not only to an operational system but also to the development of an industrial infrastructure for the manufacture of the satellite and supporting technologies. While the manufacturing base of the Indian television industry, albeit with the active cooperation of TNCs especially Japanese, has been widened, there have been criticisms with regard to its impact on indigenization and small scale industry.

Table 8: Leading Indian Advertising Agencies and their Transnational Affiliates

Indian Advertising Agency	Transnational Advertising Agency
Rediffusion	HDM (jointly owned by Dentsu, Eurocom and Young & Rubicam)
Hindustan Thompson Associates	J. Walter Thompson
Clarion	D'arcy, Masium, Benton and Bowles (DMBB)
Sobhagya	NPC (Japan)
Speer	Foote, Cone & Belding
OBM	Ogilvy & Mather
Chaitra	Leo Burnett
Trikaya	Grey
Tara Sinha Associates	McCann Ericson
Sista's	DFS Dorland
R.K. Swamy Associates	Batton, Barton, Durstine & Osborn
Jaisons	Dentsu
Everest	Saatchi & Saatchi
Lintas	SSC & B
Contract	J. Walter Thompson

Source: "The Foreign Hand", Sunday, July 10–16, 1988. p. 56.

Contradictions are especially seen with regard to the fate of direct reception set technology which was developed in the SITE phase and should have been the basis of television expansion in India. The institutional relationships that restricted the transfer of the DRS technology to the Indian industry have also been noted, the result of the "unexpected" shift on the part of the government of India towards the encouragement of "ordinary" TV sets.

Satellite technology is also credited with stimulating the growth of the computer software sector in India, an industry with a very high potential for export-oriented growth. This perception is based on the availability of a large number of trained engineers who can generate software for various purposes. Liberal policies for the manufacture of computers and supporting telecommunications policies to facilitate transmission are sought to resolve the constraints of technology. For example, "software technology parks" with export facilities through satellite links have been established in different regions. These

incentives are aimed at strengthening the software sector in India. The extent to which these incentives actually help Indian firms is debatable at this stage, particularly in view of the entry of multinational telematic firms such as Texas Instruments into India.[33] (Texas Instruments was the first company in India to be allowed direct access to its corporate head office in Dallas through the INTELSAT network.) In terms of resources alone, Indian firms may find it difficult to compete. Software exports now form 0.12 percent of total electronics production in India and are expected to grow as a major export oriented industry.[34]

8.6 Conclusions and Policy Recommendations

International technology transfer is not neutral. It is not simply a gadget or a tool that is transferred; consequences result from its various and unique applications. These applications are initially shaped within the institutional framework of the country in which the technology originates and provide powerful though distorted images of the incentives that exist.[35] Commercial television, computer networking, centralized control of and access to information, and the push for the services sector are a few examples. This is not to suggest that India did not have the option of using the satellite exclusively for rural television as it had during SITE. But in order to do that a deliberate policy was needed which could successfully resist and overcome institutional pressures for other purposes. These uses were attractive in the short term: political control; more commercial revenue; a boost to the consumer electronics sector; and information networking etc. This could ultimately engender regional conflicts, alienate the urban and rural poor, greater dependency on high tech items and consequent trade offs, and result in predictable information flows with more incentives for institutions outside India. These concerns have been expressed by a few authors in the past, but have been ignored or neglected amidst an overwhelming and persuasive case for satellite technology. The space agency has continued to lament the loss of direction in the applications of the technology and their spokespersons have continuously criticized other agencies for ignoring the developmental potential of the technology. However, it is often forgotten that the space agency is in the process of designing satellites to suit the very same institutional needs they had previously

criticized.

However ideal the intentions of the scientific community were, INSAT has shown that institutions with enormous stakes in different uses of the technology have powerfully intervened. These interventions can only be neutralized by the implementation of policies aimed at preventing such interventions in the first place. Moreover, the Indian scientific community cannot ignore the inherent bias in imported technology towards the particular culture and economy in which it developed. Satellite technology is a case in point. It was primarily intended to serve a centralized private and public sector for commercial and administrative purposes. Educational and developmental needs were given low priority. While it is true the Indian scientific community had faith in the promises of this technology, the performance has been far from what was desired.

Policy Recommendations

The introduction of satellite technology in India and consequent applications in telecommunications and television have proved how the shift can occur from stated goals through the intervention of powerful political, commercial and economic institutions. There have been certain benefits by way of a nationwide expansion of the medium, the emergence of a television industry, growing recognition of information as a resource and establishment of networks to ensure their flow. But these benefits outweigh the loss from the shift that has taken place away from the stated goals. A better utilization of INSAT could be achieved through the following policies that emerge from this study:

1. Strengthening the community viewing situation by cutting across political considerations at the Central or the State level is essential and has to be addressed. Unless there is a deliberate policy, rural access to the medium cannot be ensured.
2. The telecommunications expansion has meant increased facilities for the urban areas and the growth of information networks. While India (along with Brazil) has recognized the implications of creating infrastructures that lead to a greater integration into the capitalist world economy, it has to be sensitive to the nature and kind of information that flows in and out of the country. However

attractive software exports may appear to be, their long term consequences for the infant industries in the domestic sector should guide the policies with regard to the entry of TNC software companies into India.

3. Similarly, the creation of NICNET to organize and distribute information at the government level should lead to a better availability of information to the people rather than further bureaucratization of the development process.

4. The transfer of satellite technology to India has no doubt led to the emergence of a domestic television and telecommunications industry. However, the participation of TNCs in this activity is quite high. Liberal policies for television have not yet led to significant benefits for India. Future policy options should ensure that the phased indigenization programme is in fact carried out and not just used as a ploy for further concessions to the industry.

INSAT I should be considered as another "experiment" with its own mistakes that can be remedied. While the indications are that is less than likely that the design configuration of INSAT II has been "fixed" to accommodate the competing interests that gained precedence during INSAT I,[36] it is, even now, not too late to change the design of the system to incorporate the cherished and, I might add, realizable socio-economic objectives of ISRO and the Government of India.

PART B

APPENDICES

APPENDIX I: THE INSAT SYSTEM

The first generation Indian National Satellite System System[1] (INSAT I) represents India's first step towards implementing operational space systems for identified national requirements. INSAT-1 is a multi-agency, multi-purpose operational satellite system for domestic telecommunications, meterological observation and data relay, nationwide direct satellite TV broadcasting to augmented community TV receivers in rural and remote areas, and nationwide TV programme distribution for re-broadcasting through terrestrial transmitters.

The INSAT System is a joint venture of the Departement of Space (DOS), the Department of Telecommunications (DOT), the India Meteorological Department (IMD), All India Radio (AIR) and Doordarshan. The overall co-ordination and management of the INSAT system rests with the high level inter-ministerial INSAT Co-ordination Committee (ICC). The ICC consists of secretaries of the Ministries/Departments of communications, economic affairs, information and broadcasting, space and civil aviation with Secretary, Department of Space as its chairman. The key functions of the committee are:

1. Co-ordination and monitoring of the implementation of the project, both Space- and Ground-segments, to ensure efficient and timely execution,
2. Co-ordination at the operational stage, with a view to achieve maximum efficiency and utilisation,
3. Planning future developments,
4. Consideration of problems relating to orbit frequency coordination of the INSAT system. The Wireless adviser to the Government of India is an invitee to the meetings of the Committee on matters concerning frequency/orbit coordination.

Programme director, INSAT is the secretary of the committee. The Secretariat of this Committee resides in the Department of Space. The DOS has the direct responsiblility for establishment and operation of the INSAT space segment facilities.

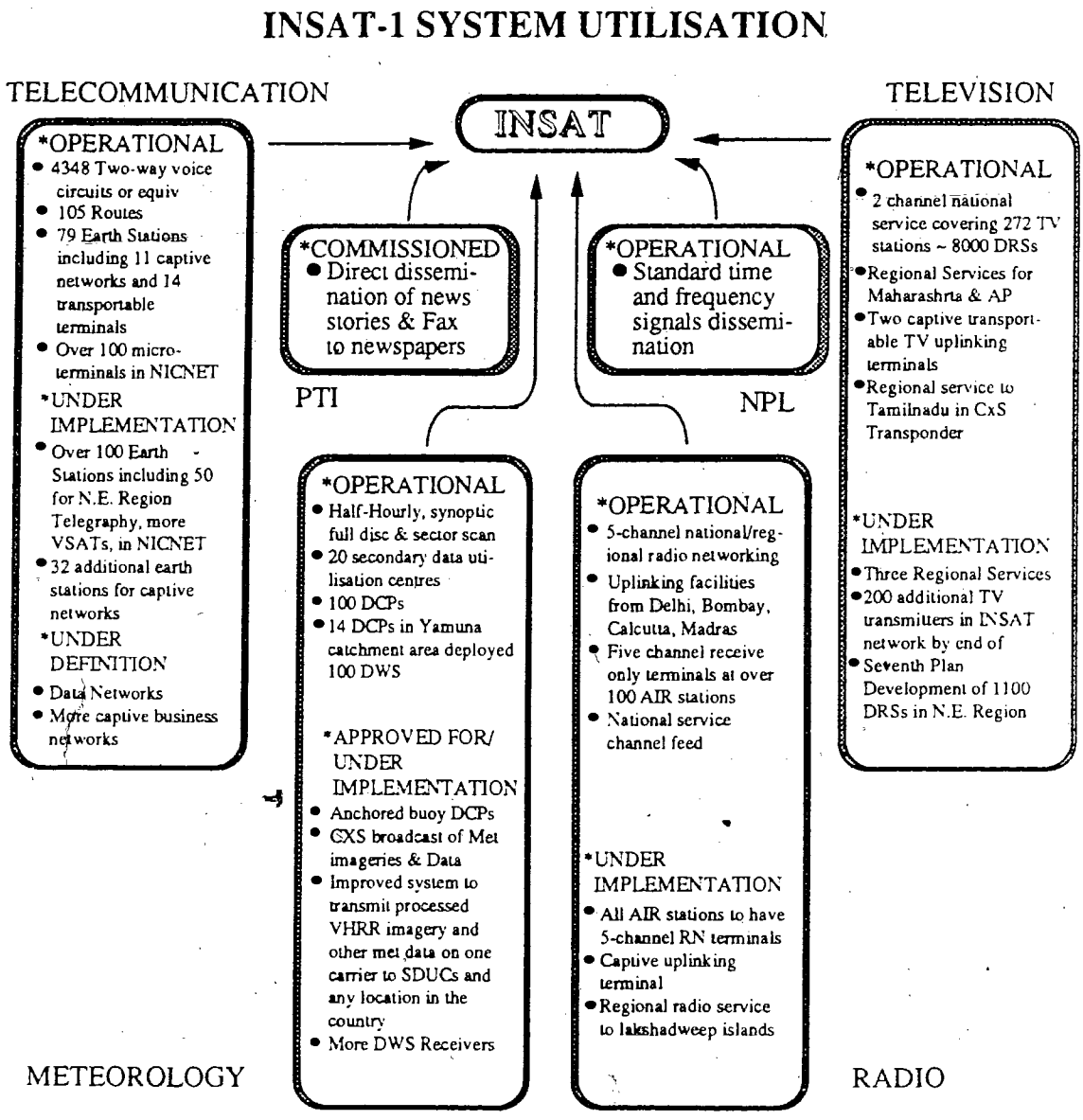
The INSAT 1 system was envisaged with a space segment consisting of two multi-purpose satellites, one as the primary satellite providing all services and the other as the major path satellite providing additional Fixed Satellite Service Utilisation and also certain on-orbit back-up capability. The INSAT-1 satellites are built by the Ford Aerospace Corporation of USA under contract with the DOS. The INSAT 1B satellite, launched in August 1983 and now in its fifth year of operational service is operating as the primary satellite from 74 degrees E longtitude.

The initial INSAT-1 space segment configuration was expected to be completed with the launch and operationalisation of INSAT-1C. However, a few days after the launch, INSAT IC developed problems and can only be used at half its capacity. A fourth INSAT-1 (INSAT-1D) satellite was intended to ensure availability of the requisite space-segment capability and capacities during the transition from the first generation INSAT-1 to the second generation INSAT-II series in the early 1990s. The launch of the INSAT-1D scheduled for June 29, 1989 could not take place as a crane hook broke loose and impacted the satellite while being hoisted on to the launch pad.

Each INSAT-1 satellite provides the following capabilities (for a schematic representation of INSAT Utilization, see figure 9) over its individual seven year in orbit design life:

1. Twelve national coverage telecommunications transponders of 36 MHz (earth to satellite) and 3710-4200 MHz (satellite to earth).
2. Two high powered national coverage TV broadcast transponders operating in 5855-5935 MHz (earth to space) and 2555-2635 MHz (space to earth) frequency bands, each capable of handling one direct broadcast (community reception) TV channel and five low level carriers for services like radio programme distribution, disaster warning etc. primary coverage area. These transponders also support the dissemination of certain disaster warning and standard time and frequency signals.
3. A VHRR instrument for meteorological earth imaging with visible (0.55-0.75 mu meter) band channels with resolutions of 2.75 and 11 km, respectively with half-hourly full earth coverage and sector scan capability.
4. A data relay transponder with global receive coverage with a 402.75 MHz earth to satellite link for

Figure 9: Schematic Representation of INSAT Utilization



Source: Department of Space, Annual Report 1988-89", (Bangalore: Government of India, 1989), p. 12.

relay of meteorological, hydrological, and oceanographic data from unattended land and ocean based automatic collection cum transmission platforms.

In the early 1990s, the foreign procured and foreign launched INSAT-1 space craft will be gradually replaced by indigenously developed second generation (INSAT-II) spacecraft which will eventually be launched from India by the Indian Geo-synchronous satellite launch vehicle (GSLV). The operational INSAT-II space craft are to be preceded by two INSAT-II test space craft to be launched in 1990 and 1991, to demonstrate and flight test the indigenous design and the engineering of INSAT-II space craft before pressing them into operational service.

APPENDIX II: A BRIEF NOTE ON DATA COLLECTION AND LIST OF INTERVIEWEES

Based on the institutional methodology discussed in Chapter I and the importance of context in Chapter II, it was decided to identify INSAT institutions at the national and international levels. Institutional relationships leading up to the transfer were reconstructed using documentary research. Wherever possible, efforts were made to reconstruct the developments through the actors. This was possible in my interviews with the the scientists at the Space Applications Centre, Ahmedabad. To understand the consequences, individuals representing a range of interests and stake in the INSAT programme were selected. The Institutions were selected through discussions with the Supervisory committee prior to the field trip in 1986. At the field level, further improvements were made with regard to the nature of questions etc. Data was collected between August–December 1986. The rapport established with various institutions during this period proved useful in updating the information during the analysis stage of this study. This is crucial in a situation where significant changes are taking place with regard to the use of technology etc. Newspapers and Journals, especially the ones published in India have provided useful information to strengthen the analysis. Seminars and Colloquia at SFU, following the field trip improved the analytical framework for the study. A list of persons interviewed for the study is provided with a view to help other researchers who may like to pursue the issues addressed in this dissertation.

List of Persons Interviewed in Connection with the Study[1]

Note: These persons were interviewed to get a broad perspective of INSAT I: technical; application; software; commercial; developmental; industrial; and, policy issues related to the telecommunications and broadcasting applications of the satellite.

A.W. Khan, Professor, Indira Gandhi National Open University (IGNOU), New Delhi.

Aarti Raina, Sub Editor, TV & Video World, Bombay.

A.V.S.R.K. Sarma, Manager (Dev & Engg.), Gujarat Communications & Electronics Limited, Baroda.

Amol Palekar, Film actor and Producer of TV serials.

A.K.Sinha, Scientist, Development and Educational Communication Unit, (DECU), Ahmedabad.

Anmol Vilani, Ford Foundation, New Delhi.

Bunny Reuben, Film Publicist and writer, Bombay.

Binod C Agrawal, Scientist, Development and Educational Communication Unit (DECU), Space

Applications Centre, Ahmedabad.

B.S. Bhatia, Manager, Kheda Communications Project (KCP), Space Applications Centre, Ahmedabad. KCP won the inaugural IPDC/UNESCO Prize for Rural Communication.

B.S. Govinda Rao, Additional General Manager (Terrestrial Systems), Indian Telephone Industries Limited (ITI), Bangalore.

B.S. Subbaramaiah, Satellite Group, Transmission R&D, Indian Telephone Industries Limited (ITI), Bangalore.

Bhaskara Ram Mohan Reddy, Deputy Engineer (Radio and TV), Government of Andhra Pradesh, Hyderabad.

Babu, Manager, Electronics Trade and Development Corporation, Hyderabad.

Balajee, freelance TV reporter, Doordarshan, New Delhi.

Dr. Sira G. Rao, General Manager, Switching & Phone R&D, Indian Telephone Industries Limited (ITI) Limited.

Dr. D.B. Rauthan, Engineer SF, INSAT I SSPO, Indian Space Research Organisation, Bangalore.

Dr. M.V. Pitke, Centre for Development of Telematics, (C-DOT), Bangalore.

Dr. Pawan Sikka, Principal Scientific Officer, Department of Science & Technology, New Delhi.

Dr. E. Balagurusamy, Chairman, Computers and Information Technology Division, Institute of Public Enterprise, Hyderabad.

Dr. M.V. Warlu, Manager, Marketing, Consumer Electronics Group, Electronics Corporation of India Limited (ECIL), Hyderabad.

Dr. (Mrs) M. Dharmamba, UGC INSAT TV Project, Mass Communcation Research Centre, Jamia Milia Islamia, New Delhi.

Dr. (Mrs) Andal Narayanan, Communications Consultant and Researcher, Bombay.

Dr. Poornima Vyas, Assistant Project Officer, UGC INSAT TV Project, Mass Communication Research Centre, Jamia Milia Islamia, New Delhi/

E.V. Chitnis, Adviser, Space Applications Centre, Ahmedabad. A vocal critic of the disorientation of TV medium for non-developmental purposes.

G.K. Gupta, Deputy Director General (DDG-Satellites), Department of Telecommunication, New Delhi.

H.S. Rawat, Controller, INSAT Programmes, Doordarshan, New Delhi.

Jai P. Singh, Director, Satellite Communications Programme, Indian Space Research Organisation,

Bangalore.

Julie Chatterjee, Senior Editor, Technocrat, Bombay.

Jayantha Sen Gupta, Manager-Sponsored Programmes, Rediffusion Advertising Pvt. Ltd., Bombay.

James Greig, Special Assistant, The Commonwealth of Learning, Vancouver, BC, Canada.

K.P.K. Kutty, Deputy Chief Editor & Deputy General Manager, United News of India, New Delhi.

K. Naryanan, Group Director, SAE, Space Applications Centre, Ahmedabad.

K.S. Karnik, Director, Development and Educational Unit (DECU), Space Applications Centre, Ahmedabad.

K. Viswanath, Manager, Training, Development and Educational Communication Unit (DECU), Ahmedabad.

Kalyanram, Engineer, Space Applications Centre (SAC), Ahmedabad.

K.E. Eapen, (former) Chairman, Department of Communication, Bangalore.

Kapil Chandra, Vice President, Constellate Consultants, (P) Ltd., New Delhi. They are the agents for NTIS (US) Publications.

Krishnam Raju, Chairman, Suchitra Electronics Ltd, Hyderabad. A leading component manufacturing company that has recently started a picture tube manufacturing plant. An active member of the Electronics Components Association of India (ELCINA).

Lynn de Souza, Media Superviser, Ogilvy Benson and Mather, Bombay.

Mario Pereira, Executive Editor, TV&Video World, Bombay.

M.M. Chaudhri, Central Institute of Educational Technology (CIET), National Council of Educational Research and Training (NCERT), New Delhi. Associated with major policies with the use of Educational Technology at the Primary level in India.

Mrs. Vinod Mishra, Research Assistant, UGC INSAT TV Project, Mass Communication Research Centre, Jamia Milia Islamia, New Delhi.

N.V. Satynarayana, Managing Director, Informatics (India) Pvt. Ltd., Bangalore.

Narender K. Sehgal, Ministry of Science and Technology, Department of Science and Technology, New Delhi.

Nandini Lakshman, Assistant Editor, AdWorld, Bombay.

N.K. Mohapatra, SHYAM Antenna Electronic (P) Ltd., New Delhi.

Nargis Abraham, Reader, Department of Communication and Journalism, Osmania University,

Hyderabad.

N. Srinivasan, Senior Director, Confederation of Engineering Industry, (CIEI), New Delhi.

Nishat Ahmad, Producer, PTI Television, New Delhi.

P. Sudarshan, Chairman, Technology Transfer & Director, Budget & Economic Analysis, Indian Space Research Organisation, Bangalore.

Prof. G. Ram Reddy, Vice–Chancellor, Indira Gandhi National Open University, New Delhi.

P. Panikar, Manager, Technology Transfer and Consultancy, Space Applications Centre, ISRO, Ahmedabad.

Praveen Tripathi, General Manager, MediaSearch, MARG, Bombay.

P.V. Sateesh, Producer, Doordarshan Kendra, Hyderabad.

Piyush Bahl, Executive Officer, Confederation of Engineering Industry (CIEI), (Southern Region), Bangalore.

P. Unnikrishnan, General Manager, Press Trust of India Limited (PTI). PTI is one of the major newsagencies in India and is playing an aggressive role in trying to associate with Doordarshan in the area of news and current affairs programmes.

Patanaji, News Editor, Doordarshan, New Delhi.

Rajendra Mitra, Research Assistant, UGC INSAT TV Project, Mass Communication Reseach Centre, Jamia Millia Islamia, New Delhi.

R. Amritavalli, Department of Radio, Television and Cinematography, Central Institute of English and Foreign Languages, Hyderabad.

Ramraj Nahata, Indian Motion Pictures Producers' Association (IMPPA), Bombay.

Suresh V. Kibe, Manager (Research) Satellite Communications Programme Office, Department of Space, ISRO Headquarters.

S.S. Nair, Regional Manager, New Video Limited (Sony Collaboration), Bombay.

Sashi Kumar, Chief Producer, PTI Television, New Delhi.

Surinder Kapoor, Visnews and an Active member of the TV Programme Producers Guild of India (TVPPGI), New Delhi.

S. John, Manager, Senior Manager, Electronics Corporation of India Limited (ECIL), Hyderabad.

Sanjeev Thomas, Researcher, Doordarshan and a member of the INSAT village selection group, Hyderabad.

Satyen Gangaram Pitroda (Sam G. Pitroda), Adviser to the Prime Minister on National Technology Misssions and Chairman (newly constituted) Telecom Commission.

Sundar T. Vachani, Chairman, Weston Electronics, New Delhi. An active spokesperson for the Indian Television Manufacturers' Association (ITMA), a lobby group for the TV industry (big and medium) in India.

Sekhar, freelance reporter, Doordarshan, New Delhi.

Venu Goel, Engineer (Satellites), Department of Telecommunication, New Delhi.

Vajendra Maslekar, Company Secretary, Karnataka State Electronics Development Corporation Ltd., (KEONICS), Bangalore.

Vilas Deshmukh, Systems Analyst, Dataline, Bombay.

V. Ramachandran, Personnel and Adminstrative Manager, Texas Instruments (India) Pvt. Ltd., Bangalore.

Vijayaditya, Coordinator, NICNET, Department of Electronics (NICNET was recently shifted to the Planning Commission).

Y.N. Chandrasekharan, Lunar Radios, Hyderabad.

APPENDIX III: SARABHAI-BACKGROUND

Vikram Ambalal Sarabhai was born on 12 August, 1919. His father Ambalal, founded the family business. The family business grew into an industrial empire and now it is believed to be on the decline. One magazine profile described the Sarabhais in this manner:

> The Americans have the Rockefellers, Indians have the Sarabhais. Both are families with immense wealth and large corporate empires and contributions to society that go beyond the world of business. Both have given generously to charity, contributed to the arts, figured in the world of politics, stood for taste and distinction. The Sarabhais have, of course operated on a much smaller scale than the Rockefellers. Friends of Mahatma Gandhi, Jawaharlal Nehru and Indira Gandhi, labor leaders, builders of some of Ahemdabad's finest and proudest institutions, contributors to science and dance, creators of the priceless Calico Museum, the Sarabhais have been princes among merchants and merchants among princes.[1]

Vikram Sarabhai had his early education in Ahmedabad. None of the Sarabhais has gone to school. Being privately educated at home, they have gone directly to University. He then went to Cambridge (England) where he did his Tripos in Natural Sciences in 1939 from St. John's College. On his return home, he joined the Indian Institute of Science in Bangalore, attracted by the genius of Sir. C.V. Raman. M.G.K. Menon recalled[2] that Raman had moved from Calcutta to Bangalore to initiate work in new areas of nuclear physics and cosmic rays and for some reasons, including lack of support, had not been able to initiate the work. Sarabhai filled some of the enthusiasm by working in the area of cosmic rays. Sarabhai was influenced by Raman and Bhabha. Menon suggests that this influenced much of Sarabhai's work in science and technology. From IISC he returned to Cambridge and did work on photofission at the Cavendish laboratory and got his PhD in 1947.

It is said that he was interested in science from his early age. Menon says that "for him science was not to be just a part of a liberal education, to fit him for a career in business, industry or administration." He acquired the "industrial experience and business acumen" in the textile and chemical industries with which his family was associated. He set up a group to work on cosmic ray variations. "In his efforts to grow an institution of pure research in Ahmedabad, he was joined by Professor K. R. Ramanathan, who developed research groups in areas of ionospheric, radio and atmospheric physics."

This formed the Physical Research Laboratory.[3] "As the Tata Insitute of Fundamental research was the cradle of Indian atomic energy programme, Vikram Sarabhai made the Physical Research Laboratory the cradle of the Indian Space Programme.

Menon remarks that the lives of Bhabha and Sarabhai were similar in many respects. They both died young (56 and 52 respectively). Each of them belonged to well-to-do and well-known families. Each could have chosen commerce for a career, but decided to do otherwise. Though the early inspiration for both was pure science. With the passage of time, they both became aware of "the powers of science and technology as an instrument for social and economic changes." Bhabha put India on the nuclear map of the world and Sarabhai put India on the space map of the world.

Sarabhai's interest in cosmic rays has something to do with space. Prior to 1957, cosmic ray intensity variations were studied by means of ground based equipment and it was done on a world wide basis through co-operative efforts such as the International Geophysical Year. The coming of the space age changed the orientation to make direct studies. Sarabhai was interested in this and he studied them deeply on the several occasions when he was a visiting Professor with Professor Bruno Rossi's group at the laboratory for Nuclear Science at the Massachusetts Institute of Technology (where he had a standing invitation).

His interests in space and the idea that it could benefit mankind enabled him to transform the idea into an institution.[4] For example, his interest in modernising textile industry helped him to found the Ahmedabad Textile Industrial Research Association (ATIRA). In 1962, he helped to found the Indian Institute of Management at Ahemdabad since he felt that the rapid growth of India to an industrial power would demand management skills of a high order. In the areas of science and technology he set up the Thumba Equatorial Rocket Launching Station, under UN auspices. He also set up the Space Science and Technology Centre at Trivandrum and the ESCES at Ahmedabad.

The reasons for locating PRL in Ahmedabad which became the cradle of Indian Space programme, according to Joshi is that Sarabhai had already established a small laboratory at the 'Retreat' (his home)

where he was doing cosmic rays research as a part of his study. There were no scientific research laboratories in Gujarat in those days. In addition, his explanation was that 'No plant grows under a tree' implying that even though labs and institutions were already there in other parts of the country, it was necessary to start and build institutions elsewhere. In this Joshi notes that "the potential for growth and the initial nurturance needs of the new activity—cosmic ray research— was his central concern in his choice of location rather than the umbrella of established reputations of other institutions."

According to Kamala Chowdhry,[5] Sarabhai was a man of many dimensions, an outstanding scientist deeply concerned about development, an institution builder of excellence in many diverse fields. He was a "pragamatist and a Gandhian in the real sense of the word."

> He had no patience with those who preached that developing nations must proceed step-by-step in the same order as did the more advanced nations. There is no hope, he said for those who wish to advance step by step following outmoded methods. He advocated the use of the best people and the best knowledge available to deal with the complex tasks of national development. He used to say that constraints on development are not scientific and technological but social and human. Throughout his life he tried to utilise science and technology with appropriate social systems. You cannot have twentieth century atomic energy or space research with nineteenth century industry or antiquated systems of management and organisation.

He created networks of natural and social scientists and encouraged them. He always wanted to seek new ways and new institutional arrangements. With M.S. Swaminathan and IARI he planned a nuclear centre for agriculture. He also started a joint venture with IARI, AIR and ESCES to evaluate the effectiveness of television as an instrument for mass communication to implement measures for increasing food production. His approach to research, technological development and industrial collaboration was to emphasise self-reliance and self-sufficiency. He was against acquiring 'black boxes from abroad' but wanted a national capability. 'Trust, mutuality, collaboration' describe Sarabhai's working style. Sarabhai was influenced by Gandhiji's philosophy of non violence and the emphasis on means in achieving goals.

> Underlying his contributions to science policy and development were his sense of values, of what is right and wrong. In the policy choices he made there was a commitment to moral realities, a concern for mutual interests and mutual well-being, an affinity to truth and non-violence and, this, at another level, was what science meant to him.

Sarabhai died in Trivandrum, South India, on Dec. 30, 1971. According to New York times (obit reference),[6] Sarabhai was put in charge of organising space research in 1962. Because of his private wealth, he accepted only a token salary in his government posts of one rupee a month.

APPENDIX IV: INDIA–U.S. SITE AGREEMENT

Basic Purpose[1] To conduct an experiment in the use of ATS–F for direct broadcasts to rural community receivers and limited rediffusion through VHF transmitters of Indian Developed Instructional TV programme material.

General Objectives

The General Objectives of the experiment are to:

1. Gain experience in development, testing and management of a satellite based instructional television system particularly in rural areas and to determine optimal system parameters.
2. Demonstrate the potential value of satellite technology in the rapid development of effective mass communications in developing countries.
3. Demonstrate the potential value of satellite TV broadcasts in the practical instruction of village inhabitants.
4. Simulate national development in India, with important managerial, economic, technological and social implications.

Instructional Objectives

The Indian instructional objectives are in the fields of family planning, agriculture, national integration, education, teacher training, etc.

Indian Technical Objectives

1. Provide a system test of satellite TV broadcasts for national development.
2. Enhance capability in the design, manufacture, deployment, installation, operation, movement and maintenance of village TV receivers.
3. Gain experience in the design, manufacture, installation, operation and maintenance of broadcast and or distribution facilities to the extent that these are used in the experiment.
4. Gain an opportunity to determine optimum receiver density, distribution, and scheduling, techniques of audience attraction and organisation, and to solve problems involved in developing, preparing, presenting and transmitting TV programme material.

USA Technical Objectives

1. Co-ordination of frequencies;
2. Programme Production;
3. Transmission from earth station to satellite;
4. Installation of direct receivers;
5. Development of evaluation plan and its execution
6. Dissemination of results of Experiment.

US Responsibility

Provision of experiment time on satellite for approximately one year.

Indian Scientific Responsibilities

1. Develop, provide and maintain inservice the ground segment of the TV satellite experiment system that will carry out the technical objectives of the experiment.
2. Develop and utilise ITV programme materials that will carry out the instructional objectives of the experiment.
3. Develop and implement a mutually acceptible experiment evaluation plan.
4. Prepare and publish interim progress reports at six month intervals and a final report within 18 months of the end of the experiment.
5. Make available trainees for such training as may be agreed between programme managers.
6. Receive, record, reduce and analyse such ancilliary engineering data as may be agreed between programme managers.

US Scientific Responsibilities

1. Place into geostationary orbit an experimental Applications Technology Satellite (ATS-F), position it within view of India after a period of time, to be determined by NASA, but not greater than one year, and maintain it on station for approximately one year. The time required of the ITV experiment, which is hoped to be about 6 hours a day, will be made available for the experiment during this period as NASA continues its own experimental effort using the satellite. It is recognised in practice power limitations in the satellite may require a reduction in the time

available to approximately 4 hours.

2. Provide to the DAE such training and consultative services as may be agreed to between Programme managers.

APPENDIX V: CHRONOLOGY OF THE DEVELOPMENT OF THE INDIAN NATIONAL SATELLITE SYSTEM

1951: In October 1951 the Scientific Advisory Committee suggested to the Government that a pilot TV station should be set up at an early date to provide an opportunity for studying the potentialities of television and training the necessary personnel for future service.

1953: Plans for the installation of a pilot station were announced by the Minister for information. The Minister is reported to have stated at that time: "Though television might appear to be a useful thing in the country, the expenses involved in installing it are very high." Therefore it was proposed to have an experimental television laboratory to find out whether television would be "within our means." Commercial interests in the electronics industry, Indian educators and broadcasters take an interest in the medium.

1958: A second hand reconditioned Closed Circuit Television (CCTV) brought to New Delhi by Philips for an industrial exhibition. After the exhibition, the equipment was sold to the All India Radio's (AIR) R&D department which began to experiment with the medium. The same year, the United States Information Service (USIS) donates a few cameras and projectors and a telecine equipment. With this AIR is able to put together India's first television centre.

1959: India's first Television Centre inaugurated. AIR signs an agreement with UNESCO and receives $20,000 to finance production of programmes for social education, purchase of 100 TV sets and organisation of teleclubs.

1960: AIR began a weekly series of TV programmes for schools. A first step towards using TV for school education. A representative of the Ford Foundation in India is approached for assistance in the development of Educational television in India. The Ford Foundation sent a team of TV experts[1] to survey the existing state and future of ETV in India. In the same year a delegation of AIR officials visited US for a detailed study of ETV projects in the US. They also visit TV centers in London, Paris and Rome.

Early 1960s: Homi Bhabha and Vikram Sarabhai "began with great foresight" an active space programme

in the country.

1961: AIR formally launched educational television for the Delhi school system. Financial assistance of US $564,000 came from the Ford Foundation. This financed the acquisition of additional equipment—a 5 KW transmitter, 700 TV sets, video tape recorders, a portable microwave link—to increase the number of transmissions from two to four per week and also provide 250 schools in Delhi with TV sets.

1962: Lack of television related industry in India, the war with China and acute foreign exchange forced AIR to manage without the needed spare parts. AIR's engineering staff demonstrated their capability to manage and tackle such situations.

1963: A decision was made to set up an experimental Satellite Communication Earth Station (ESCES) at Ahmedabad.

1963: The Mass Communication Study Team sponsored by the Ford Foundation recommended development of rural and wall newspapers and setting up of a Mass Communication Development Council. The team of experts was provided by the Ford Foundation at the request of the Government in consultation with the Planning Commission.[2] The Ford Foundation team also recommended the various measures that could be taken to use advanced technical developments in Communication. It suggested that the government of India should appoint a group of communication engineers to advise among other things, the use of communication satellites economically and efficiently.

1964: The United Nations Development Programme (UNDP) became involved for the "first" time in activities of outer space. An agreement was signed in 1965 with the UNDP for assistance totalling about $500,000 in setting up the earth station. A request for financial assistance by the Government of India for the establishment of a Centre for Training and Research in the use of Satellite Communications at Ahmedabad[3] was submitted to the governing council of UNDP. A project for the Experimental Satellite Communication Earth Station (ESCES) was approved for execution through the International Telecommunications Union (ITU).[4] The Ministry of Information and Broadcasting, Government of India, appointed a committee to examine the short term and long term goals etc., of the various units of the Ministry in terms of Government's responsibility in mass communication.

1965: A West German team visited India to instal television equipment etc. as part of a package deal

offered by the West German government to aid the development of television in India. A second studio facility at Delhi is established.[5] "Expansion of television broadcasting receives serious consideration."

1965: Consideration is also given to finding ways of creating industrial collaboration to manufacture TV broadcast equipment indigenously. A high powered committee consisting of representatives of AIR, Planning Commission and Bharat Electronics examined the question. Global tenders were invited.[6] W. Germany won the bid for studio equipment and Japan won the bid for TV transmitter equipment. Incentives for India include: no lump sum payment for the know-how; offer to buy back items manufactured with their technology; AIR already had equipment manufactured by the company (Fernseh).

1965-1966: The Committee on Broadcasting examined the question of television in light of apprehension that it would become a commercial medium and extensive support that it can play an educative role.[7] The advantages and disadvantages of using a communication satellite are discussed.

1966: The UNESCO panel of consultants on space communication meeting in Paris in June (14-15 June) suggested a satellite pilot project in India. It notes that "...the prevailing conditions in India provided an immense challenge and a spectacular opportunity both for testing techniques and demonstrating the effectiveness of the telecommunications satellite while serving the priority needs of the area through a major contribution to development." Following this an expert mission from UNESCO visited India later that year to prepare a report for a pilot project.

The question of using satellites as a medium for communication was subsequently examined in India by a committee[8] in August 1966. "The general consensus was that India should welcome a pilot project by Unesco and recognizing the fast developing technology, should keep itself in the vanguard of this movement." Based on this recommendation, the general conference of UNESCO held in Oct-Nov 1966 accepted the recommendations of the Space panel and authorised the the DG of UNESCO to undertake a study of the feasibility of launching a pilot project in the use of satellite for education and development purposes.

1967-1969: Against the backdrop of the few educational projects, Dr. Vikram Sarabhai, conceived the idea of proving the efficacy of television for development through an actual field trial. The Pilot Rural

Agricultural Television project, "Krishi Darshan" began with about 100 TV sets installed in and around Delhi on a community viewing basis.[9] The important question that remained was what should be the basis for expanding television in India—satellite based or terrestrial. The only available plan for terrestrial expansion was the AIR master plan. The experimental communications earth station proposed in 1964 was completed at Ahmedabad and began receiving satellite signals.

1967: The UNESCO expert mission to prepare a report on a pilot project for satellite communications visited India. (18 November–8 December).[10] A study team consisting of three engineers[11] sponsored by the DAE visited the USA and France in June–July for an on the spot study and discussions with the NASA and CNES in France on the technical feasibility of launching a pilot project of satellite educational television in India.[12] Simultaneously the DAE (which also had the responsibility for space research) and other government agencies such as the NASA of the US conduct studies regarding the TV coverage of the country. System studies were conducted with the help of foreign companies, institutions and space agencies. The India–USA study also known as the DAE–NASA study pointed out the possibility of conducting a limited experiment using the ATS–6 satellite.[13]

1968: As a followup to the UNESCO Mission's report, the government of India sets up an interministerial group—the national satellite communications, or NASCOM group under the chairmanship of Dr. Vikram Sarabhai[14] to look into the possible uses of a synchronous communications satellite for India.[15]

1969: Based on the recommendation of the National Satellite System Group (NASCOM), the government of India decided to conduct an experiment using a satellite. The India–USA 'memorandum of understanding' for the Satellite Instructional Television Experiment (SITE) was signed (September 19, 1969).

1970: The DAE enters into an agreement with Lincoln Laboratory of MIT for further studies on satellite TV for India.

1971–1975: SITE scheduled for 1972–73 is postponed (for reasons already discussed in the dissertation) and the experiment is likely to be conducted in 1975. Political changes in India leading upto the Internal emergency declared in June 1975 did not alter the timing of SITE but instead it gave an opportunity for the Government to use the facilities for SITE to suit its purposes.

1975 : SITE is conducted in 2400 villages in six 'backward states' of India. Instructional programmes were the main content. Extensive evaluations of the experiment are conducted by ISRO and many other agencies including the Planning Commission.

1975–1977: Four months after SITE began, the Prime Minister called a meeting at which the use of satellites for domestic communications in the country is accepted and a committee of Secretaries of different departments is appointed to go into the timing and other factors of INSAT I.[16] Following this the government constituted the INSAT co-ordination committee (ICC) of Secretaries for the overall coordinated management of the INSAT system. The space segment is assigned to the new Department of Space and ground segments to the user agencies. NASA is selected as the source for the launch and associated services for INSAT-1A and B in September 1977. The Request for Proposals (RFP) for INSAT-1 flight space craft and associated equipment was finalised and released on a global basis in October 1977. Television is separated from Radio and a new organization, Doordarshan is formed (in 1976).

1977–79: ISRO–P&T joint project, Satellite Telecommunications Experiments Project (STEP) is conducted using a Franco-German SYPHONIE satellite. STEP was for telecommunications what SITE was for television. During this period the possibility and potentials of satellites for demestic telecommunications also "gained wider recognition in India." INSAT I system definition was completed and the Government gave the "go ahead" signal for the proposed system **except for the TV ground segment.**

1978: Contract awarded to Ford Aerospace and Communications Corporation (FACC) for INSAT 1A and B. Memorandum signed with NASA for launch services.

1980: The Government constituted a seven member working group to study the various aspects of the introduction of colour television in the country. The group was expected to formulate a strategy for colour TV, to estimate the costs of the transmitter, studio facilities and study the possibilities of a switch over to colour by the TV industry.

1981: APPLE-Ariane Passenger Payload Experiment: APPLE, ISRO's first "three axis stabilised" geostationary satellite is launched. Mrs. Gandhi notes: "That you can see and hear me is a symbol of our growing technological self reliance." Scientists at the SAC, Ahmedabad had a meeting with Mrs.

Gandhi in New Delhi and the event is telecast.

1982: INSAT 1A launched. It is deactivated in a few months. Apparently, the fault occurred because the sail was never tested under zero gravity condtions. During the post-mortem, the fault was traced, and the arrangement has been modified for INSAT 1B and also tested under zero gravity conditions. The services of INTELSAT for telecommunications and Statsionar-6 (USSR) for television networking were sought. Asiad provided strong reasons for introducing colour television[17] and also expanding television. Availability of INSAT 1B for nation wide networking leads to the growth of a number of low powered transmitters. 'A transmitter a day growth is witnessed.'

1983: Growth of television leads to a number of changes in the software aspects. The increasing role of sponsored programmes and the 'critical' demand for more 'educational' programmes continues.

1988: INSAT 1C is launched by the Eurpean Space Agency (ESA) launch vehicle, Ariane. It is a backup satellite for INSAT 1B whose life is 'running out'. Certain snags develop and the satellite cannot be used to its full potential.

1989: The top portion of INSAT ID was damaged during transportation and it has been moved to the manufacturer's plant for repairs. The launch is not likely till early 1990. ISRO is anxious due to these developments and INTELSAT has offered contingency help to maintain the services. Plans for INSAT II continue. Earlier it was claimed that the INSAT II test series would be ready by 1990. Now ISRO has conceded that the series will not materialise before 1992. INSAT II scientists claimed that the delay is due to the non availability of funds that were promised and diversion of available funds to purchase of INSAT ID. Nevertheless ISRO plans continue. As a short run measure the possibility of buying or leasing satellites from abroad is very high and this has raised questions of ISRO's accountability to the tax payer's money.

APPENDIX VI: GLOSSARY AND ACRONYMS

AIR: All India Radio, Indian Broadcasting Agency which controls radio broadcasting in India. It is part of the MIB.

AT&T: American Telephone and Telegraph Company. A Company that has substantial influence in communication related issues in the US and at the international level.

ATS: Applications Technology Satellites. As the name indicates, these satellites developed by NASA were used for demonstration projects in the US and other parts of the world.

CIET: Central Institute of Educational Technology, apex body for policies regarding the use of educational technologies at the primary level.

Color TV standards: Technology of color is not one. There are three technical standards that one can choose from, NTSC, PAL and SECAM.

Common Carriers: Derived from transportation literature. Common carriers (telephone companies) are those who in the business of serving all the customers. Their charges, schedules and routes are regulated and they are bound to serve all without discrimination and are entitled to a fair return on their investment. This term is used more in the US than anywhere else.

COMSAT: In 1962, the US Congress enacted the Communication Satellite Act which established COMSAT as the chosen instrument to establish a commercial communication satellite system as part of an improved global communications network.

Crore: is equal to 100 lakhs or 10 million.

CSIR: Council for Scientific and Industrial Research.

DAE: Department of Atomic Energy, a Government of India agency responsible for India's nuclear programme. Prior to the establishment of the Department of Space, it was responsible for space sector activities. Since 1971, a separate Department of Space has been created.

Doordarshan: Indian "acronym" for television. The Indian Television Organization. It was separted from All India Radio in 1976. There are around 300 transmitters in India under the control of Doordarshan. It is part of the MIB.

DOT: Department of Telecommunications. Established on 1 January 1985 on the bifurcation of erstwhile Indian Posts & Telegraphs. The main functions of the Department are to plan, establish, maintain and operate telecommunication services nationwide. References to these activities, prior to 1985, are described under P&T department.

ESCES: Experimental Satellite Communication Earth Station. Located in Ahmedabad, this was the first earth station set up in India. UNDP financed the project and ITU executed the project.

FCC: Federal Communications Commission, A US regulatory agency.

GE: General Electric Company, a US based transnational corporation.

GHz: Unit of radio frequency equal to 1000 MHz, one billion per (10⁹ cycles per second).

HMT: Hindustan Machine Tools Ltd. A public undertaking in India that has successfully diversified its activities to printing press, lamps, watches, tractors and lathes. HMT has factories in a few places in India.

ICC: INSAT Coordination Committee. An interdepartmental agency that decides and coordinates the uses of the satellite. The secretariat of the ICC is in the Department of Space.

Indian Space Programme: A general term used for describing the various activities of the Department of Space, Government of India. This Department has various institutions that address three major aspects of the space programme, science; technology; and applications.

INSAT: The Indian National Satellite System; a domestic multi-purpose communications satellite serving the communications needs of user agencies in India. INSAT I, the subject of this dissertation, has four satellites launched during 1982-1990 time period. Each one is named in a sequence, A, B, C and D.

INTELSAT: International Telecommunication Satellite Organization and its satellites. The global telecommunications satellite systems. More than 130 nations are members of this organization.

IPR: Industrial Policy Resolution of the Government of India adopted in 1956. It is a broad framework that guides industrial development in India. It also identified the sectors in which the state would enjoy absolute monopoly. Changes to IPR are made as and when neccessary.

IT&T: International Telephone and Telegraph, a transnational communications company.

ITU: International Telecommunications Union.

Krishi Darshan: Agricultural programmes of Indian Television in the Hindi speaking areas. It is also a

pilot project that was initiated by Sarabhai to demonstrate the potential of television for instructional purposes in agriculture.

Lakh: is equal to 100,000 or 0.1 million.

MIB: Ministry of Information and Broadcasting. The Ministry responsible for broadcasting and other communication related activities in India.

NASA: National Aeronautics and Space Administration. US agency that administers the American space programme, including the deployment of commercial satellite via its fleet of space transportation system (STS).

NFDC: National Film Development Corporation. A MIB department.

NTSC: National Technical Standards Committee. Developed in the US and first used in 1954. In this system the color difference modulate in amplitude two subcarriers of the same frequencies but 90 degrees apart.

PAL: Phase Alternating Line. The PAL system was developed in Germany by Telefunken and first used in 1967. The NTSC system was improved by using electronic phase correction devices to solve the problems of color distortion and it was successful in doing this.

Planning Commission: An influential agency of the Government of India that draws up five year plans recommends resource allocation for various sectors.

RABIN: Remote Area Business and Information Network, A DOT project to help industrial development in the remote areas.

SECAM: Sequence de Couleurs avec Memoire (Sequential Colour with Memory). It is based on the principle that luminance information is decisive in producing a color image, whereas color information is of secondary importance. Thus it transmits only one coloring signal at any one moment, and the remaining color information is supplied by a storage device, which means that the subcarrier does not have to be divided into two phase components.

SIET: State Institute of Educational Technology, State level agency for policies regarding educational technology.

SITE: Satellite Instructional Television Experiment. A one year communications experiment (1975–76)

that facilitated direct reception of television programmes to about 2400 villages in six states of India. SITE has been extensively discussed by communication scholars in India and abroad and is often regarded as a successful communications project for developmental purposes.

Sputnik: A satellite launched by the USSR in 1957. This is frequently referred to as the catalyst that spurred the US space programme to its present level of development.

Transnational Corporation (TNC): Corporations/Companies that have operations in many nations. However, their main administrative and planning activities are directed from their head offices in one nation.

UGC: University Grants Commission, policy making agency for university education in India.

UNESCO: United Nations Educational Scientific and Cultural Organization.

UPAU: Uttar Pradesh Agricultural University. Located in Pantnagar in one of the northern states in India. Uttar means north and Pradesh means region

PART C

ENDNOTES

NOTES

Chapter I

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8. Robin Mansell, "Industrial Strategies and The Canadian /Information Sector: An Analysis of Contradications in Canadian Policy and Perfomance." Ph.D dissertation, Simon Fraser University, 1984. pp. 9–14.

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2. Raquel Salinas Bascur, "Technology Choice and the Andean Countries," Alan Hancock ed., Technology Transfer and Communication, (Paris: UNESCO, 1984).

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4. The involvement of US in early broadcasting development in the region has been analysed by various scholars. See, for example, Alan Wells, Picture Tube Imperialism? The Impact of US Television in Latin America, (New York: ORBIS Books, 1972).

5. "In contrast to the dominant paradigm core-periphery analysis focusses attention on the relationships among and the parts of a system, aim being to identify the dominant and dominated elements and thereby to perceive the constraints and pressures which operate to influence the overall development process, particularly at the 'periphery'. This model has its origins in economics but has been found to be highly applicable to the analysis of communication systems." Christopher M. Plant, "PEACESAT and Development in the Pacific Islands," (MA Thesis, Department of Communication, Simon Fraser University, 1979), pp. 12-13.

6. Ibid., p. 13.

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8. Robert S. Anderson and Barrie M. Morrison, "Introduction," Robert S. Anderson and others ed., Science, Politics and The Agricultural Revolution in Asia, (Boulder, Colorado: Westview Press, 1982)

9. Paul R. Brass, "Institutional Transfer of Technology: The Land-Grant Model and the Agricultural University at Pantnagar", in Robert S. Anderson and others ed., ibid., p. 103.

10. Ibid., p. 106.

11. Hari Sharma has noted:" ... rural India has undergone major structural and institutional changes over the past two decades. These changes have brought to the surface a stratum of Indian agriculturists who are much more secure in terms of legal rights and in their vast landholdings, much more articulated-economically and politically vis-a-vis the wider society and much less committed to village based norms of reciprocity and interdependence than were their predecessors twenty years ago ... And it is in the context of these structural and institutional changes that the recent successes of green revolution must be seen. If the Ford Foundation had not exported the new technology to India, the new class of Indian Kulaks would sooner or later have imported from wherever it was available." Hari P. Sharma, "The Green Revolution in India Prelude to a Red One?", Kathleen Gough and Hari P. Sharma ed., Imperialism and Revolution in South Asia, (New York: Monthly Review Press, 1973), pp. 93-94.

12. P.C. Mascarenhas, Technology Transfer and Development India's Hindustan Machine Tools Company, (Boulder, Colorado: Westview Press, 1982).

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the rich world which initially supplied them with the initial know-how. HMT is one such unit. Set up in collaboration with Oerlikon Machine Tool Works, Burhle and Company, HMT by 1974 had secured an order amounting to 4.5 milliion swiss francs through the swiss partner. Half of this sum was for machine tools and half for technical documentation based on designs supplied by the Swiss company. Mascarenhas, ibid., p. 228

15. Ibid., p. 97.

Chapter III

1. Bella Mody, "Contextual Analysis of the Adoption of Communication Technology: The Case of Satellites in India", Telematics and Informatics Vol. 4. No. 2, p. 151.

2. The creation of NASA has been described as a a reaction to the Soviet Sputnik 1 on October 4, 1957. Ploman described it as follows: " ... a chain of events was triggered by Sputnik. The post of Special Assistant to the President for Science and Technology (later the Office of Science Adviser) was announced. Vast increases followed, in the missile and then the space programs. Both the House and Senate established space and science committees. The National Aeronautics and Space Administration (NASA) was created in mid 1958. Military space programs achieved a degree of respectability within the Pentagon. The State Department established a special office to deal with the international political implications for space. Meanwhile the United States Information Agency had a difficult time attempting to offset the decline of American stature abroad in the face of spectacular Russian successes." Edward W. Ploman, Space, Earth and Communication, (Westport: Quorum Books, 1984), p. 4.

3. According to Smith, satellite communications connects two sets of dreams, science fiction and the dream as to what potential satellites can offer. Fictional ideas are traced to a Boston clergyman, Edward Everett Hale and his "brick moon"' story in which he had conceived the idea of man made bodies revolving around the earth. Seventy-five years after Hale published his "brick moon"' story, Arthur C. Clarke published his views. A world wide communications satellite system, was first proposed by Arthur C. Clarke in 1945. In an article in Wireless World, he proposed a worldwide communications satellite system. Clarke, a British electronics engineer with the Royal Air force published a paper 'Extraterrestrial Relays: Can Rocket Stations Give Worldwide Radio coverage?' outlined the basic technical considerations involved in the concept of a communication satellite. Others had hinted at the possibility—German scientist and rocket expert Hermann Oberth proposed in 1923 that the crews of orbiting rockets could communicate with remote regions in earth. Clarke admits that if he had not proposed it someone else would have done it by 1950 or so. In any case with the exception of a Russian claim that Soviet scientists predated Clarke by theorising in 1937 that TV images could be relayed by bouncing them off space vehicles, Clarke is generally credited with originating the modern concept of satellite communications. Delbert D. Smith, Communication via Satellite A Vision in Retrospect, (Boston, Mass.: A. W. Sijithoff-Leyden, 1976), P. 17. In recognition of Arthur C. Clarke's contribution to the development of Communications satellite, The Department of Space, Government of India presented him a chicken mesh antenna for receiving SITE programmes in his home, Sri Lanka. Romesh Chander and Kiran Karnik, Planning for Satellite Broadcasting The Indian Instructional Television Experiment, (Paris: UNESCO, 1976), p. 55.

4. In 1952, John R. Pierce, research director of Bell laboratories, under the pseudonym of J.J. Coupling, wrote in American Science Fiction that communications with the moon and other planets were within reach. Pierce's initiative in promoting the idea of transoceanic satellite communication within the scientific and technical communities was an important factor. Later he played a major role in NASA's first passive communication satellite experiment, Project Echo.

5. Ploman, ibid., p. 51.

6. By 1958 when NASA was established, there were two recognized genres of communication satellite technology, Passive and Active satellites. Passive satellites, simply act as reflectors. They cannot amplifiy a signal nor can they control that signal's direction. Anyone can make use of this sort of reflector because it allows multiple and random access. Active satellites, the second type receive messages and retransmit them using a delayed or real time electrical repeater and a terrestrial receiver.

7. The Congress allowed for private sector development of space interests by limiting aeronautical and space activities in the NASA charter to a research orientation. Congress restricted operations to the private sector or other government agencies. This distinction reflected a traditional US policy requiring operational or commercial activities to be conducted in the private sector, a policy quite different from other countries. "The careful clarification between research and operations in the space act moreover serves to emphasise the conception of NASA as a highly advanced research organization unique in the world. In addition, the field of communication manifests in particular the traditional trend in American policy which favors private enterprise development of new technology. Over the past hundred years the federal government has assisted the development of telegraph, undersea cable, and radio technology. Although the Charter does not restrict government agencies from operating communication satellites, NASA would eventually transfer satellite communications technology, when more highly developed, to privately owned communications firms." Smith, ibid., p. 44.

8. Ibid., pp. 47–48.

9. Ibid., p. 48.

10. Ibid., p. 67.

11. Ibid., p. 67.

12. In 1961 the executive office furthered policy implementation by appointing Lyndon Johnson as chairman of the National Aeronautics and Space Council. In July the council issued its report. With only minor revisions the council accepted the Council's recommendations and issued his official statement on communication satellite policy on July 24 1961. Ibid., p. 78.

13. Ibid., p. 87.

14. Ibid., p. 89.

15. The OTA regards the creation of COMSAT as a product of public policy considerations and not of the marketplace. Office of Technology Assessment, "Commercialisation of Space Technology," Civilian Space Policy and Applications, (Washington D.C.: OTA, 1982), pp. 231–232. Plant provides a broader interpretation of the creation of COMSAT. The issues of ownership—public versus private—and control were important. Ultimately government created monopoly won out and COMSAT was formed in 1963. Plant, ibid., pp. 21–22.

16. Smith, ibid., p. 94

17. The intent of the 1962 COMSAT act was to promote the development of a global satellite system. It did not define the place of COMSAT or any other entity for domestic satellite systems, but recognized that domestic satellite was a possibility. However, the loose wording of the COMSAT act and the development of markets for domsats sooner than expected, gave rise to a set of new questions. The key to opening the domestic market was the development of the Geo Synchronous Satellites. The cancellation of the Department of Defense's advanced synchronous advent satellite lent strong support to Bell's prediction that GSO satellites were at least ten years away. However, NASA's launch of Syncom series of satellites demonstrated the technical feasibility of geo synchronous satellites. COMSAT quickly adopted the technology and used it for the global system. "The entire structure of the new industry remained uncertain until 1972 when the FCC issued its multiple entry decision enabling any qualified entity, subject to certain conditions, to own and operate a domestic satellite system." Ibid., pp. 156–157.

18. Ibid., p. 94.

19. Ibid.

20. Ibid., pp. 92–97.

21. Ibid., p. 121.

22. Ibid., p. 122.

23. Larry Martinez, Communication Satellites: Power Politics in Space, (Dedham, MA.: ARTECH HOUSE, INC., 1985), p. 8.

24. According to World Satellite Almanac, the INTELSAT ground segment consists of more than 700 earth stations in more than 500 different sites in 159 countries, territories and dependencies. The Intlesat space segment is composed of 15 satellites in geosynchronous equatorial orbits centered over the Atlantic, Pacific and Indian Oceans for transoceanic telecommunications traffic. Combined, the space segements provide more than 1400 international pathways. Mark Long, World Satellite Almanac The Complete Guide to Satellite Transmission & Technology, Second Edition, (Indianapolis: Howard W. Sams & Company, 1987), pp. 57–58.

25. Ibid., p. 5.

26. There were problems in the INTELSAT arrangement. European and other nations which sought the technologies were denied access to technologies through the controls enforced by the US office of Munitions control, an office of the State department. The European aerospace industry felt that the hardware contracts were not being awarded to non-american firms. But the problems, delays, and high costs in doing so became the primary concern of Third World nations which was partially paying for all this education and abetment of already industrialised nations. In addition, the US did not like the idea of regional systems or domestic satellite systems. Policymakers believed that this would undermine the global efforts of INTELSAT. However, nations which wanted to develop their own systems felt: 1. nations large enough to support such a system wanted to have such a system; and, 2. these nations wanted to gain confidence in the development of communication and aerospace technologies. Smith, ibid., p. 142.

27. The question of NASA's involvment in domestic system development was partially resolved in 1972, when the FCC established a policy permitting any commercial entity, subject to certain technical and regulatory provisions to own and operate domestic satellite communication system. For details see Robert S. Magnant, . Domestic Satellite: An FCC Giant Step Towards Competitive Telecommunications Policy, (Boulder, Colorado: Westview Press, 1977).

28. The issue of NASA performing reimbursable research for the private sector had arisen during the NASA authorization hearings, particularly with respect to the Advanced Syncom Programme. Thus in 1965 NASA decided to cancel the Advanced Syncom program and proceed with the ATS series. Delbert D. Smith, Teleservices via Satellite, (Boston, Mass.: Sijthoff & Noordhoff, 1978), p. 11.

29. Ibid.

30. Ibid.

31. Ford Foundation is a key institution involved in television experiments in India. Its role in India will be discussed in relevant chapters/sections.

32. Ralph Engelman, "From Ford to Carnegie: The Private Foundation and the Rise of Public Television," Sari Thomas ed., Culture and Communication, (Norwood, NJ: Ablex Publishing Corporation, 1983).

33. Ibid.

34. Smith, Teleservices via Satellites, ibid., p. 12.

35. Ibid.

36. Engelman, ibid., p. 238.

37. Smith, Teleservices via Satellites, ibid. p. 12

38. Ibid., p. 13.

39. Ibid., pp.13-19.

40. Ibid., p.18.

41. Ibid., p. 21.

42. The first generation satellites were designed to demonstrate technical and economic feasibility for routine telephone and television traffic to facilitate the implementation of the technology for intercontinental communications. For the first five satellites in the series a total of forty-six applications and technology experiments were selected and twenty-three purely scientific experiments were conducted. Christopher M. Plant, Ibid., pp. 25-28.

43. Smith, Teleservices via Satellite, ibid., p. 179.

44. For a full description of these experiments, see Smith, ibid. PEACESAT, a case study discussed in the first chapter was also an ATS demonstration project.

45. "On May 30, 1974, the next satellite in the applications series, ATS-6, was launched into a synchronous orbit ... thereby providing the basis for an expanded set of user experiments. Specifically, NASA designed and developed the ATS-6 spacecraft in order to conduct a series of follow-on ATS-1, 3 and 5 technical experiments and to experiment with using television for social service delivery in the areas of health care and education." Smith, ibid., p. 38. A broad range of education and health related activities was tried out on ATS-6 during its availability in the US. They were undertaken in three main regions, Rocky Mountain area, in the Appalachian States and in Alaska. For a description of these projects and their "political context," (in addition to Smith) see, Bert Cowlan and Dennis Foote, "The ATS-6-American case studies" Tony Bates and John Robinson ed., Evaluating Educational Television and Radio, (Milton Keynes: The Open Universiy, 1977), pp. 230-236.

1. Following common usage in both Economics and Political Science, countries are classified in terms of "first", "second" and "third" worlds. First World refers to the industrialized market economies of North America, Western Europe and Japan. The Second World is the non-market industrial economies of the Soviet Union and Eastern Europe. The Third World was coined by French authors, the most famous being Alfred Sanvy, as analogous to the "Third Estate," a pre-French Revolution term that negatively defined all those individuals who did not belong to the privileged estates of the nobility or the clergy. Third world designates all nations that were not privileged to become industrialized and wealthy during the establishment of the present world order, and refers to most countries in Asia, Africa, Latin America, and the Caribbean. Bella Mody, "1 World Technologies in 3 World Countries", ibid., p. 135.

2. The term "context is defined to include the groups, institutions, laws and sets of social relations that constitute the specific environment or surroundings within which a communication technology is introduced, modified, or allowed to die over time." Ibid.

3. Quoted in M. V. Desai. Communication Policies in India, (Paris: UNESCO, 1977), p. 75. This use of communication for development parallels the launching of a nation-wide community development programme in 1952. The programme, based on Gandhi's and Tagore's ideas of rural reconstruction, was heavily influenced by American methods of extension as implemented in a pilot project undertaken by an American Architect, Albert Meyer, in Etawah, Uttar Pradesh, in October 1948. For a contextual explanation of how the Etawah project came about, see George Rosen, Western Economists and Eastern Societies Agents of Change in South Asia, 1950-1970, (Baltimore: The Johns Hopkins University, 1985), pp. 48-50.

4. A small beginning had been made in India in 1948 when about 200 listening clubs were formed. UNESCO decided to find out whether the techniques of the Canadian Farm Radio Forum developed in the rigid winters of the north, might not prove equally effective in the villages of other parts of the world. Based on this decision, the Director General of UNESCO approached the Government of India with an offer to start forums. Accordingly it was started in about 150 villages in Maharastra and later became a "major effort throughout the subcontinent of India." (UNESCO: ?)

5. R.K. Chatterjee, Mass Communication, (New Delhi: National Book Trust, 1973).

6. A. Rahman, "Science and Technology", S.C. Dube, India since Independence Social Report on India, 1947-1972, (New Delhi: Vikas Publishing House Pvt Ltd., 1977), pp. 393-443. See also. Ward Morehouse, Science in India Institution Building and the Organisational system for Research & Development, ASCI Occasional Paper, (Bombay: Popular Prakashan, 1971).

7. For a historical analysis regarding the building of scientific institutions, particularly Atomic Energy, see Robert S. Anderson, Building Scientific Institutions in India: Saha and Bhabha, (Montreal: Centre for Developing-Area Studies, McGill University, 1975).

8. The performance and role of CSIR has been questioned quite often in India. Quite recently, prompted by its adverse track record and consequent criticism, the government appointed a committee to evaluate its functioning. One of the observations which has a bearing on why technology transfer takes place on such a large scale in India is summed up this way: the industrial sector believes that the CSIR laboratories are incapable of useful and timely research while CSIR system believes that manufacturing firms, which have no capacity for technology absorption and development, always prefer the soft option of importing proven technologies. "Pandora's Box", The Illustrated Weekly of India, March 29, 1987, pp. 40-41.

9. For a discussion of India's technological development, see Claude Alvares, Homo Faber Technology and Culture in India, China and the West from 1500 to the present day, (The Hague: Martinus Nijhoff Publisers, 1980), pp. 199–203.

10. Shiv Visvanathan, Organizing for Science The Making of an Industrial Research Laboratory, (Delhi: Oxford University Press, 1985), pp. 236–249. In a different section Vishvanathan has noted how another component, Ferrite rods, production was affected through the powerful intervention of Philips.

11. All India Radio (AIR) is now in charge of radio broadcasting only. Prior to 1976, AIR was also responsible for television and its management and development.

12. Narendra Kumar and Jai Chandiram, Educational Television in India, (New Delhi: Arya Book Depot, 1987).

13. The forum idea, at the time it was suggested and recommended to other developing countries based on Indian experience was supported by: "considerable amount of research including Kurt Lewin's war time experiments in changing social attitudes and behaviours, which demonstrated that an important attitude change is often easier to achieve in a group than in individuals, and that when a decision for behavioural change is taken in such a group it is more likely to be carried out than if it does not originate in a group; moreover, a number of experiments of which some of Carl Hovland's may be cited as examples, on the effectiveness of a prestigious communicator (such as radio can provide for the forum); and finally long tradition in communication research concerning the effectiveness of two way communication (such as occurs when the radio station broadcasts to the forum, and the forum's questions and decisions are reported back to the station)." For a background to Radio rural forums in India, see Wilbur Schramm and others, New Educational Media in Action: Case Studies for Planners–1, (Paris: International Institute for Educational Planning, 1967). Also see B.P. Bhatt and P.V. Krishnamoorthy "Radio Rural Forums Spread Throughout India", UNESCO, Radio Broadcasting Serves Rural Development, (Paris: UNESCO, ?)

14. Vignesh Bhat, ibid., p. 88.

15. G.C. Awasthy, Broadcasting in India, (Bombay: Allied Publishers, 1965), p. 254.

16. Narendra Kumar, ibid., pp. 76–77.

17. "One of the first steps in the transition from a local agency into an international agency was the creation of a committee to examine what the foundation should do and to write a report presenting a program. This committee, headed by Rowan Gaither, a lawyer with past experience in government and a significant actor in creating various post war research and operating organizations, produced the Gaither report in 1949. George Rosen, ibid., pp. 3–7.

18. Ibid.

19. When the foundation decided to enlarge its operations, it decided to enlarge its board of trustees beyond Ford Family members. Accordingly, Paul Hoffman, former president of Studebaker corporation and later administrator of the Marshall plan, was appointed as the first director. Ibid., p. 8.

20. Hoffman gave the example of Marshall plan as the 'most spectacular demonstration of what economic aid can contribute by helping people to help themselves. The twelve billion dollars we spent in Western Europe gave the nineteen countries we helped the chance they needed to get back on their feet,' economically as well as in terms of resisting communist political control. Writing shortly

thereafter to Chester Bowles, a good friend who had been appointed the new ambassador to India, he cited 'the success attendant upon the very limited ECA [Economic Cooperation Administration] Rural Reconstruction Program [in Formosa as convincing him] that if in 1945 we had embarked on such a program and carried it on at a cost of not over two hundred million dollars a year, the end result would have been a China completely immunized against the appeal of the Communists. India, in my opinion, is today what China was in 1945.' Ibid., p. 11.

21. The US Ambassador, Chester Bowles, knowing the Etawah programme, US aid and the Foundation plans met Nehru and offered American financial support for a nationwide plan of village development. Nehru accepted the proposal and an agreement to start a joint programme was signed in January 1952. Few of the village development projects were funded by the Foundation. Indian government requested assistance for more projects than the Foundation was interested. The Foundation responded quickly to this request and this action, according to Douglas Ensminger, the Foundation representative for India and Pakistan (based in Delhi) was crucial for his and Foundation's future relationship with India. It also showed that the Foundation could move very quickly if need be, more quickly than foreign governments or international agencies. The Indian government recognized the Foundation as a useful resource. Ibid., p. 15.

22. "A four year agreement was made with the Ford Foundation of the United States of America for launching a regular television programme for schools in Delhi. This service came into operation on October 23, 1961." In accordance with this agreement 600 television sets were to be installed. The agreement also provided for supply of technical equipment, sending of AIR staff on deputation abroad for training and the availability to AIR of experts on educational television from America. On the eve of the inauguration of the project a special one hour programme was put out for parents and teachers in which apart from the Minister of Information and Broadcasting, the Representative of the Foundation also participated. Awasthy, ibid., pp. 254-255.

23. "To survey the existing state and potential future of ETV in India, a Ford Foundation team of TV experts visited India from January 24 to February 20, 1960. The team was made up of Dr. Lester W. Nelson, Associate Programme Director of the Ford Foundation; Dr. William Brish, Superintendent of Schools, Washington County (Hagerstown), and Dr. Kenneth Christiansen, Director of Television, University of Florida (Gainsvelle), as members. These persons were selected because of their varied background and experience in the development of educational television in the United States." Narendra Kumar, ibid., p. 15.

24. Regarding the use of this grant, the team recommended that the budget could be utilised for the following purposes:
Acquisition of equipment essential to the operation of the programme at a top level of instructional and technical excellance.
The provision of such full time, part-time and/or short term consultants as may be required and agreed upon.
To meet the cost of travel and subsistence for such Indian personnel going to the US for observation, discussion or specialised training activities, as may be necessary and agreed upon.
To meet, in part the costs of such additional personnel in the AIR television unit, and the Department of Public Instruction, as may be necessary and agreed upon.
To meet, in part, the costs of conducting seminars, workshops and conferences for principals, teachers and other personnel directly involved in this programme.
To meet, in part, the costs of assessment.
To meet, in part, the net added costs of required instructional material and supplies. Ibid., p. 17.

25. Ibid., p. 18.

26. Ibid., p. 73.

27. The hardware situation in India at that time was that all equipment was either of Fernseh (German) or of Philips (Holland) and a few Ampex (US). Till 1969, Philips was the selling agent for Fernseh in India. Philips, according to Sehgal and others, tried very hard to secure the right to manufacture TV receivers in India, but the Government of India policy was to reserve this to the small scale sector. Sufficient incentives existed for Philips and the Germans to try and secure a foothold in this area in India. Narender K. Sehgal, Technology Transfer in Communication: Television Broadcasting in India, (Ahmedabad: Space Applications Centre, 1979), p. 58.

28. At that time she submitted an ambitious Rs. 100 crore TV expansion plan, but the planning commission cut the proposal to Rs. 43 crores by allocating a part of the funds for external publicity. In December 1965, she had to admit that inadequate financial resources made it necessary to shelve the plans she had for a 'dynamic publicity policy.' Uma Vasudev, Indira Gandhi Revolution in Restraint, (Delhi: Vikas Publishing House Pvt Ltd., 1974), pp. 335-336.

29. Mrs. Gandhi wrote to an American friend seeking her help to interest US organizations to financially assist her television expansion plans: "With the help of the Government of West Germany, we have expanded our experimenta Television centre...I feel that it is a wonderful opportunity to try out programmes of better farming methods as well as family planning through TV, since the visual impact is much greater than the spoken word...Due to extreme shortage of foreign exchange, it is not possible for Government to import more at the present time. It would naturally expedite matters if we could have help on this from any organization interested in family planning or in increased agricultural production." Quoted in M. Pendakur, "Indian Television Comes of Age: Liberalization and the Rise of Consumer Culture", James W. Carey ed., Communication, Vol. 11. No. 3, 1989, p. 180.

30. The seven companies included German (Fernseh), French (Thompson-CSF), British (Marconi), Japanese (NEC), and American (RCA).

31. Sehgal, ibid., p. 59.

32. Government of India, Radio and Television Report of the Committee on Broadcasting and Information Media, (New Delhi: Ministry of Information and Broadcasting, Government of India, 1966), p. 206.

33. Ibid., p. 207.

34. Vikram Sarabhai, ibid., p. 23.

35. Ibid., p. 24.

36. Daniel Lerner and Lyle M. Nelson ed., Communication Research-A Half Century Appraisal , (Hawaii: East West Centre, 1977), p. 162.

37. Homi J. Bhabha, first chairman of the Atomic Energy Commission initiated and was responsible (until his death in 1966) for the 1963-1966 comprehensive report by the government on electronics. This committee report is often referred to as the Bhabha committee on electronics. For a background to this committee see, Joseph M. Grieco, Between Dependency and Autonomy India's Experience with the International Computer Industry, (Berkeley: University of California Press, 1984), pp. 111-116.

38. "A pilot Agricultural TV project [Krishi Darshan] was initiated by Dr. Vikram Sarabhai. This project- which was inaugurated on January 26, 1967 was aimed primarily at demonstrating the effectiveness of TV as a medium for propagating new agricultural practices. Since, India's only TV station at that time was at Delhi, the project began with 80 community TV sets specially installed in

villages around Delhi ... This was a milestone in establishing the practical benefits that could flow from a wider introduction of TV in the countryside." Romesh Chander and Kiran Karnik, Planning for Satellite Broadcasting The Indian Instructional Television Experiment, (Paris: UNESCO, 1976), p. 9.

39. United Nations, The Application of Space Technology to Development, (New York: United Nations, Department of Economic Affairs, 1973), p. 55

40. B.D. Dhawan, Economics of Television in India, (New Delhi: S. Chand & Co. Pvt. Ltd., 1974), p. 166.

41. Dhawan's reference may be to Sarabhai's address to the United Nations Conference on the Exploration and Peaceful Uses of Outer Space in 1968. As the conference's scientific chariman Sarabhai explained the relevance of peaceful uses of outer space to developing countries and indicated that they could leapfrog certain stages of development.

42. Dhawan, Ibid., p. 167.

43. The various studies projects etc. have been mentioned in the Chronology of INSAT (Appendix V notes).

44. Eugene W. Rostow, Satellite Communications and Educational Television in Less Developed Countries, (Washington, D.C.: President's Task Force on Communication Policy, 1969). President Johnson had also set forth a US proposal to sponsor pilot Instructional Television programs in Latin America based on his task force's recommendation. John K. Mayo and others, Educational Reform with Television The El Salvador Experience, (Stanford, California: Stanford University Press, 1976), p. 27.

45. Rostow, ibid., Appendix A.

46. Ibid.

47. The experience gained during this project was utilised by the ISRO, when it took up the prime responsibility for setting up India's first commercial earth station at Arvi (Poona). The 30 metre antenna as well as some of the electronic equipment was fabricated in the country. This experience in turn has been fully utilised for SITE.

48. Romesh Chander, ibid., p. 9.

49. The question of using satellites as a medium for communication was subsequently examined by a committee. The general consensus of this committee was that India should welcome a pilot project by UNESCO. Ibid.

50. Ibid., p.10.

51. Smith. Teleservices via Satellite Experiments and Future Perspectives, ibid., pp. 124-125.

52. The study team was made up Mr. B.Y. Nerurkar, Deputy Chief Engineer, AIR, Mr. Prasad L. Vepa, representing the INCOSPAR, and Dr. B.S. Rao of Central Electronic Engineering Research Institute (CEERI).

53. Ibid.

54. Ibid.

55. Mr. Edward Ploman, Office of Free Flow of Information and International exchanges, UNESCO; Mr. N.I. Tchistiakov, Professor of Radio Electricity in The Institute of Telecommunications, Moscow; Mr. Robert B. Hudson, Senior vice president, National Educational Television, New York; Mr. Robert Lefranc, Director, Centre Audio Visual de l' Ecole Normale Superieure de St. Cloud (France); Mr. Nagapuram Gadadhar, Senior Counselor, International Radio Consultative Committee, ITU, Geneva. This team cooperated with a counterpart team made up of: Mr. B.Y. Nerurkar, Deputy Chief Engineer, AIR; Mr. V.M. Gogte, Deputy Wireless Adviser to the Government of India, Department of Communications; Mr. Romesh Chander, Director of Staff Training (Programmes), AIR; Dr. B.S. Rao, Assistant Director Central Electronic Engineering Research Institute; Mr. Prasad L. Vepa, INCOSPAR; Dr. S.M. Srinvasachari, Deputy Educational Adviser, Ministry of Education.

56. Bella Mody, "Contextual Analysis of the Adoption of Communication Technology: The Case of Satellites in India", ibid., p. 155.

57. There are a number of documents and publications which deal with one or more aspects of SITE. For a brief description of the experiment and discussion of the numerous research projects, see, UNESCO, The SITE Experience, UNESCO Reports and Papers on Mass Communication No. 91, (Paris: UNESCO, 1983).

58. See, Vikram Sarabhai and others. "INSAT-A National Satellite for Television & Communication." in Sarabhai, ibid., pp. 50-65

59. Among those who were concerned with this question were: radical economists, political parties opposed to the ruling party and producers of radio sets, commercial movies and movie projectors. Dhawan, Ibid., p. 178

60. UNESCO, The SITE Experience, Ibid., pp. 55-58.

61. Ibid, pp. 55-58. The conclusions which the Planning Commission arrived at is attributed to the fact that the researcher who conducted this study was a former ISRO employee and due to serious differences with the higher ups in ISRO, he quit and was later assigned to conduct the evaluation by the Planning Commission. To some extent his findings reflect his personal differences with ISRO. An anonymous SITE researcher provided this background to explain how and why the differences occurred: When Sarabhai visited MIT in the 1960s, Daniel Lerner suggested to him that he should meet Mr. Sondhi, a Chemical Engineer who was doing research there. This meeting resulting in Sondhi being appointed as the Director of the Software Systems Group. This group spent a lot of money on seminars and pilot studies which led to "nowhere." After Sarabhai's death, and a year of no activity, the director of the newly created Space Applications Centre, SAC, created two separate departments with their own staff for programme production and research. This move was intended to get results. Not much happened and in the meantime, Krishan Sondhi managed to create a position for himself in the Planning Commission. The SAC was relieved. Sondhi, however, decided to conduct his own evaluation under the auspices of the Planning Commission. One of the researchers hired by Sondhi for this evaluation was a SAC employee who had resigned due to conceptual and stylistic disagreements with SAC. This may be one of the reasons for the differences in SAC evaluation of SITE and Planning Commission study of SITE.

62. Following the judgement of Allahabad High Court unseating the then Prime Minister, Mrs. Indira Gandhi, the opposition parties demanded her resignation. In a bid to hold on to power, Mrs. Gandhi declared an internal emergency from June 1975-Jan. 1977. The decision to opt for a domestic communications satellite was made in November 1975.

63. Sanjiv Deshmukh noted in a review article: "True to its tradition, when INSAT IA died, the bureaucracy pulled a veil of secrecy over the failure–not only with respect to the general public but also the fraternity of scientists and engineers within the INSAT system. It thus lost a valuable opportunity to at least learn from the costly failure. The same bureaucrats and technocrats who were vying with one another to take credit for successfully sending commands to the crippled INSAT ... now started arguing that the responsibility for the failure rested with Ford Aerospace, who by terms of their contract are legally in control during the first 6 months. Apparently the failure occurred because the sail was never tested under zero gravity conditions. During the post mortem, the fault was traced, and the arrangement has been modified for INSAT 1B and also tested under zero gravity conditions. Sanjiv Deshmukh, "INSAT 1 B: Lucky this time ?", Business India, Aug. 15–28, 1983. p. 55.
The World Satellite Almanac noted the reasons as occuring due to anomolies. "These anamolies occurred in the final stages of a solar outage, just as INSAT 1A was moving out of the Earth's shadow. An incorrectly pointed Earth sensor mistakenly locked on to the moon instead of the Earth causing the satellite to redirect its telecommunications antenna away from India. This resulted in the loss of communication between the controlling ground station and the spacecraft. When INSAT 1A lost its connection with its ground command, it automatically burned its remaining stationkeeping fuel in an unsuccessful attempt to reorient itself." See Mark Long, World Satellite Almanac The Complete Guide to Satellite Transmission & Technology, (Indianapolis: Howard W. Sams & Company, 1987), p. 510.

64. Department of Space, Annual Report 1988–89, (Bangalore: Department of Space, 1989), p. 15.

65. Ploman noted: "In Indonesia, the name chosen for its satellite system, Palapa, is a symbol of national unity and integration. The government's determination to follow the capitalistic road for rapid economic development required an extensive and effective communication system for security, development administration and for growing business corporations and extractive industries. These factors were so critical that the question of cost and technology dependence on the West were considered problems of secondary importance to be tackled later." Edward W. Ploman, Space, Earth and Communication, (Westport, Connecticut: Quorum Books, 1984), pp. 132–133. Ploman was a UNESCO team member to India to prepare plans for the pilot project.

1. Mel Gorman, "Sir William O'Shaughnessy, Lord Dalhousie, and the Establishment of the Telegraph System in India", Technology and Culture, Vol. 12, No. 4, Oct. 1971.

2. See "The Impact of Western Civilisation", in L.S.S. O'Malley ed., Modern India and the West, (London: Oxford University Press, 1941), pp. 80–81.

3. Daniel Headrick, The Tentacles of Progress Technology Transfer in the Age of Imperialism, 1850–1940, (New York: Oxford University Press, 1988), pp. 119–122.

4. The members of the National Planning Committee were as follows: Jawaharlal Nehru, Chairman; Sir M. Visveswaraya (resigned); Sir Puroshottamdas Thakurdas; Dr. Megh Nand Saha; A.D. Shroff; A.K. Shaha; Dr. Nazir Ahmad; Dr. V.S. Dubey; Ambalal Sarabhai; N.M. Joshi; J.C. Kumarappa (resigned); Walchand Hirachand; Dr. Radha Kamal Mukerjee; Prof J.C. Ghosh; Hon'ble Mr. Shuaib Quereshi; Rani Laximbai Rajwade; Abdur Rahman Siddiqui; Gulzarilal Nanda; Mrs. Vijayalakshmi Pandit; K.T. Shah. In addition there were members representing the various state governments and departments.

5. Sir Rahimtulla Chinoy, National Planning Committee Series Report of Sub Committee Communications, (Bombay: Vora and Co., Publishers LTD., 1948), p. 21.

6. Ibid.

7. The telephone system was concentrated in the bigger cities of Bombay, Delhi etc., and was operated by private companies. Only 659 places in the country had telephone services. In addition, no facilities for production of telephone equipment existed.

8. Claes Brundenius and Bo Goransson, The Quest for Technological Self Reliance The Case of Telecommunications in India, (Lund: Reprocentralen LU, 1985), pp. 15–16.

9. D.K. Sangal, "Role of Telecommunication Infrastructure in Socio-Economic System of the Country", DakTar, Nov-Dec, 1983.

10. B.G. Talloo, "Resource Mobilisation for Telecom Development", Dak Tar, Nov-Dec. 1983, pp. 47–55.

11. Ibid.

12. In 1982, the Plenipotentiary Conference of the ITU decided to set up an Independent Commission for World-Wide Telecommunications development. The mandate of the commission was to examine ways in which the expansion of telecommunications across the world could be stimulated. The importance of this commission at least for India was that one of its members, Prof. Sukhamoy Chakravarty was also the Chairman of the Advisory council to the Prime Minister and the Planning commission. So the basic philosophy of the Commission and its recommendations has had an impact over the development of telecommunications since then. See Donald Maitland, The Missing Link Report of the Independent Commission for World-Wide Telecommunications Development, (Geneva: International Telecommunications Union, 1984), pp. 10–11.

13. "Bigger Thrust to Science for Common Good", The Hindu, April 11, 1986.

14. Ibid.

15. Schwartz Schilling met Mrs. Gandhi, the finance minister, Pranab Kumar Mukerjee and the Minister of state for communications, V.N. Gadgil. He held out an offer that would virtually pay for the foreign exchange cost at an annual interest rate of only 2.5%. "Telecommunications Crossed Wires", India Today, July 31, 1983.

16. This deal was a major decision which was widely discussed in India. A detailed analysis is available in Clea Brundenius and Bo Goransson, ibid., pp. 48-64.

17. "Do not Expect Miracles: Pitroda", The Hindu, May 23, 1989. For a complete description of the conflict among national institutions and import lobbies, see Rajendra Prabhu, "Telecom Mission in 'Jeopardy' " and "Bickering over Import Lobby", The Hindustan Times, May 25 and 26, 1988.

18. Vikram Sarabhai, ibid., pp. 54-55.

19. Sanjiv Deshmukh, ibid., p. 55.

20. Sarabhai, ibid., p. 57. Sarabhai noted that the P&T had presented its demand based on its requirements of 12,000 circuits for use in these four centres.

21. Sanjiv Deshmukh, ibid.

22. Ibid.

23. In the case of the meteorology department, the failure of INSAT 1A was a blessing in disguise as it had not made any preparations for using the satellite. It spent the year in planning for later use of the satellite. Ibid.

24. Heather Hudson, "Magic from the Sky: The Political Economy of Communication Satellites", paper presented at the Annual Conference of the International Assciation for Mass Communication Research Scientific Conference and Thirteenth General Assembly, Paris, September 6-10, 1982.

25. Department of Space, Ibid., p. 27.

26. G.K. Gupta, "INSAT system." Paper presented at the AIBD/ICC seminar on Satellite Communications and Development, Kuala Lumpur, June 1986.

27. Department of Space, The INSAT System, ibid., p. 29.

28. The thrust in this process has been to integrate satellite and terrestrial capability. The goal of loading of circuits etc., is similar to the US model. This goal, she points out, is a reflection of the US carrier's original interest in ensuring that satellites could never challenge their huge space capacity for backup channels. INTELSAT is trying to depart from this thinking in order to compete. This may not reflect any versatality but reflects the US influence of how the technology should be used. Robin Mansell, personal communication, June 1987.

29. G.K. Gupta, ibid., p.12. This was confirmed during an interview with Mr. Gupta in November 1986. The problems associated with C band configuration exists because microwave systems also use this system and it has been exploited intensively in India. A technical solution lies in having a higher band configuration for the space segment such as the Ku or the Ka band, which in turn means struggle for a "parking spot" in the scarce Geo Synchronoous Orbit (GSO). It may be recalled here that India had to struggle to get the spots it now has for INSAT. At least 8-10 satellites are parked in the vicinity. Getting a parking spot involved intense planning and negotiations with many interested actors and nations.

30. Sukumar Muralidharan, "Muddling Towards the Information Millennium", Economic and Political Weekly, July 4, 1987. p. 1063.

31. Ibid.

32. Interview with B.S. Govindarao, Additional General Manager (terrestrial systems), and B.S. Subramaiah, Engineer, Satellite Group, Transmission R&D, Indian Telephone Industries,Bangalore, December 1986.

33. Confederation of Indian Engineering Industry (CIE) survey. Interview with Piyush Bahl, Executive Officer, Confederation of Engineering Industry (CIEI), Southern Region, Bangalore, December 1986.

34. R. Krishnan, "Business Network for Users in Remote Areas", The Hindu, April 27, 1989.

35. At a seminar organised by the Association of Indian Engineering Industry (previously AIEI, now CEI), Mr. D.K. Sanghal, Secretary, Department of Telecommunications, stated:
"An inter-departmental committee consisting of representatives from telecommunications, space, electronics and economic affairs has been constituted to work out a feasibility of a Telecommunication Overlay Network to meet the special needs of the business and industry with proper linkages with the existing network. ... (that) investment constraints had compelled the Planning Commission to allocate only Rs 4010 crores ... In view of the bigger role assigned to the private sector for making subscriber terminal equipment, the Government looked forward to the engineering industry participation."

In response to Sanghal's offer, the chairman of the Association expressed some concern over "excessive outgo of foreign exchange during the seventh plan period amounting to an estimated Rs 830 crores out of the Rs 1,000 crores worth of equipment and a significant distortion of end production in India." He wanted the government to extend a number of "incentives" to the Indian investor: "On an investment aimed at achieving an indigenous content beyond 25 percent there should be a concessional rate of interest of eight percent. This would mean a parity in the total cost of capital goods imported into India, provided of course we keep the duty element on capital goods at a low level." See "Bigger Role for Private Sector in Telecom industry", The Hindu April 27, 1986.

36. Interview with Vijayaditya, Department of Electronics, November 1986. See, "Networks in India Forging Data Links" special report in Computers Today March 1986.

37. Ibid.

38. The clearance of the proposal involving satellite links have to be approved by the DOT and the Overseas Communications Service (OCS). The control will be by the OCS and all earth station terminals will be subjected to inspection with regard to all messages transmitted and received. "The Policy Menu", Special Report Computers Today, November 1985, p.21.

39. Interview with G.P. Sekher, a software engineer in Madras, October, 1986.

40. For example: Texas Instruments (TI), one of the leading telematic firms in the world with its base in the US, has used INTELSAT links for a 100% software export institution in Bangalore, India. Marc Beauchamp, "Planet Computer", Forbes, January 24, 1986. This service is part of the Overseas Communications Service's (Videsh Sanchar Nigam) plans to introduce INTELSAT's new service offerings. "INTELSAT's International Business Service (IBS) allows earth stations to be located on customer premises for dedicated voice and data networks, eliminating the need to haul the traffic over congested and often unreliable terrestrial links to a national uplink ... Texas Instruments was the first customer for this service." Heather Hudson, "Communication Policies and Practices: India", A Report to the Office of Technology Assessment, July 1987, p. 15. To get further details I met Mr.

Ramachandran, Administrative and Personnel Manager, Texas Instruments (India) in Bangalore in December 1986. He declined to discuss details and implications and informed me that he has to get clearance from their Corporate Headoffice in Dallas, USA.

41. Arun Kumar, "Software Policy: Where are we headed?", Economic and Political Weekly, February 14, 1987.

42. Interview with Kapil Chandra, Vice President, Constellate Consultants, (P) Ltd., New Delhi, November 1989.

43. Raquel Salinas Bascur, "Information in the Third World: Adjusting Technologies or Strategies", William H. Melody, ed., Media Culture and Society, Vol. 7 Number 3 July 1985.

44. L.J. Haravu and K. Nagaraja Rao, "Telex Access to Dialog: Some Experiences", IASLIC Bulletin, 27 (4) 1982, pp. 181-190.

45. Bob Packwood, Excerpts from Long Range Goals in International Telecommunications and Information An outline for United States Policy, (New Delhi: US Information Service, American Centre). Strategies for promoting such sectors include working out international arrangements which include: " ... careful consideration should be given to the tradeoff between (a) positive effects (eg. reducing uncertainity and risk, improving the business climate) and (b) negative effects (e.g., imposing too rigid a structure on a technologically dynamic area, stifling innovation, and reducing entrepreneurial opportunities)". As a nation, US recognizes the importance suggests, "It is especially important for the United States to avoid the development of omnibus, rigidity."

46. See for example, Ithiel de Sola Pool, "Direct Broadcast Satellites and the Integrity of National Cultures", H.I. Schiller, National Sovereignity and International Communication, (Norwood, NJ: Ablex Publishing Corporation, 1979), pp. 120-153.

47. In April 1973 the Swedish Parliament passed a Data Act governing the relationship between computer techniques and privacy. It is the first law of its kind in the world to go so far in the protection of personal integrity against possible challenges from computerised information systems. See "Sweden's Unique Data Law", Intermedia, Vol. 2 No. 6, May 1975, p. 5.

48. Karl P. Sauvant, "Transborder Data Flows and the Developing Countries", International Organization, Spring 1983, p. 368.

1. Joseph M. Grieco, Between Dependency and Autonomy India's Experience with the International Computer Industry, (Berkeley: University of California Press, 1984) pp. 110–111.

2. Ibid., pp. 113–115.

3. Grieco, ibid., p.116.

4. Ibid., p. 117.

5. The Department of Space, set up in 1971, grew out of a small group within the Department of Atomic Energy, the INCOSPAR. DAE as already discussed in Chapter III was a key institution in the transfer of satellite technology to India.

6. A Working group on Electronics industry was constituted by the Planning Commission for the formulation of the VII plan 1985–90. A number of specialist study teams were set up to help this group. The study team no. 1 concentrated on consumer electronics which among many other issues has focused on television. Details are available in the "Report of the Study Team on Consumer Electronics Industry." Electronics Information & Planning, Vol 11 No. 12 September 1984.

7. The study team has also indicated that if the price levels of B&W and CTV sets are beyond Rs 1000 and 5000 respectively, the projected would not be as high as it has been estimated. However, even a cursory look at the prevalent prices for TV sets in India indicate that prices are much higher than the figures indicated. For example, prior to the recent budgetary changes, the price of a B&W set averaged around Rs 6000 and a CTV, Rs 12000.

8. See. "CTV components seminar at Bangalore." ITMA newsletter, No. 9/86 September, 1986.

9. Large Japanese manufacturers in consumer goods advertise in the Indian media, especially print, even though there is no actual sale taking place in India. The strategy is used to persuade the Indian public to select their wares and request their friends and relatives to bring home some of the products. See. R.V. Venkataraman. "The Electronics Dilemma." in Electronics Information & Planning. Vol. 11, No. 19 , September 1984, p. 821. This problem has also been raised by the ITMA which regarded the concessions offered by the Centre at that time as a big hurdle to the industry. According to industry estimates, in 1985 50 percent of the market demand was being met through import of TV sets through baggage. See "Govt. urged not to permit import of colour TV sets." The Hindu. Feb.26, 1985.

10. Indranil Banerji and others, "The High Gloss Wars Welcome to the Battlefield that is Indian Advertising", Sunday, July 10–16, 1988.

11. Interview with Y.N. Chandrasekharan, Lunar Radios, Hyderabad, December 1986. Lunar Radios manufacture ET&T kit based TV sets.

12. Quotation from the Budget speech of the Finance Minister, The Hindu March 1, 1989.

13. Ibid.

14. "Excise revision 'will hit' TV Manufacturers." The Hindu. March 10, 1989. This suggests that Doordarshan's emphasis is exclusively on such programming, this is not the case as there has been considerable shift towards entertainment programming during prime time.

15. Ashok Mitra, "For a new kind of Software", NAMEDIA, A Vision for Indian Television, (New Delhi: Media foundation of the Non Aligned, 1986), p. 96

16. G.G. Mirchandani ed., Indian Backgrounders-Television in India, (New Delhi: Vikrant Press, 1976), p. 35

17. Interview with Arbind Sinha, November 1986. The commercialisation of Indian television is not regarded as being useful in terms of realising the objectives originally intended for television. The only way to curb the intrusion of commercial interests into the medium would be by banning advertisements, the way Indonesia did after it realised the harmful effects of advertising. India still waits for such a policy. See Arbind K. Sinha, "Communication and Rural Development: The Indian Scene", Gazette, 38: 1986, pp. 59-70.

18. Bal B. Mundkur, "Television, Advertising and The Sponsored Programmes", NAMEDIA, ibid.,

19. Lynn de Souza, Media supervisor, Ogilvy Benson and Mather defended the expansion of TV as an advertising medium and argued that the consumption base existed in India. Interview, Bombay, October 1986.

20. Arun Ghosh, "Doordarshan: Prime Time Perspectives" Economic and Political Weekly, November 1-8, 1986.

21. Ibid.

22. Ibid.

23. Harish Khanna, a former director of Doordarshan was asked to comment on the fact that 95 % of the population could not afford a television set. His reply was: " ... more people with low incomes are purchasing sets than those with high incomes. Most sets are being offered on hire-purchase. Deposit Rs 500 and you can take the set home. Go to Sonepet or Rohtak, Guragaon or the Karamacharis [workers] flats in Delhi. You will be astonished by the number of television sets you see. The reason for this is that they have three or four earning members in a family, whereas the higher income families usually have only one. So buying a TV set is not at all difficult for them." Shailaja Bajpai, "Doordarshan has been a Success", TV & Video World, January, 1985, p. 59.

24. Pendakur, ibid., pp. 185-186.

25. Gopal Saksena, "The Forward March of Soap Operas", Navhind Times, November 1, 1987.

26. Arvind Singhal and Everett M. Rogers, "Television soap operas for development in India", Gazette, 41: 1988.

27. Ibid. See. "Dividing Accounts" India Today July 31, 1989.

28. Khalid Mohamed, "Serial Time, Scandal Time", in the Sunday Review of the Times of India, April 13, 1986.

29. Ibid.

30. Ministry of Information and Broadcasting, Annual Report, 1984-85, p.31.

31. "What Experts Say" interview with A.S. Tatari, published in a supplement on Television industry in The Economic Times, April 23, 1986.

32. Some aspects of the economics of importing foreign serials have been discussed earlier. Taruna Tanwar, ibid.

33. Interview with Jayantha Sen Gupta, Manager-Sponsored Programmes, Redifusion Advertising Pvt., ltd., Bombay, October 1986.

34. Interview with Amol Palekar, one of the producers/directors of a sponsored show. October, 1986.

35. When serials were introduced, the price per episode was in the range of Cdn $8000-10,000. Recently, however, one episode in a new serial has been sold for Cdn $ 45,000.

36. Mundkur, ibid.

37. Ministry of Information & Broadcasting, Annual Report 1984-85, (New Delhi: Government of India, 1986), p. 39

38. The movement of the film industry talent into TV industry cannot be simply taken as an extension of the film industry into TV industry. The scale of operation of the Indian film industry is much higher than the TV industry given that India produces the "largest" number of feature films in the world. Ibid., p. 37.

39. TVPPGI, Memorandum submitted to the Working group for Autonomy to the Broadcasting Media. Madras: (?) The Delhi representative, Surinder Kapoor confirmed TVPPGI views in an interview, November 1986.

40. Surinder Kapoor is convinced that this is bound to happen.

41. Jagananth Dubashi, "TV commercials Viewing the Viewers", India Today, May 15, 1985.

42. "INTAM: The last word in television audience measurement", Crossroads. Bombay: Apr-June '86. Interview with Praveen Tripathi October 1986.

43. Ibid.

44. Ibid.

45. Interview with Surinder Kapoor, November, 1986.

46. The relevant section reads: "Nothing in this section shall be construed as restricting the powers conferred on the Governor General by this act for the prevention of any grave menace to the peace and tranquility of India, or as prohibiting the imposition on Governments or Rulers of such conditions regulating matter Broadcast as appear to be necessary to enable the Governor-General to discharge his functions in so far as he is by or under this Act required in the exercise thereof to act in his discretion or to exercise his individual judgment. Vignesh N. Bhat, ibid., p. 103.

47. P.C. Chatterji, Broadcasting in India, (New Delhi: Sage Publications, 1987), p. 183. See Chapter 6 on the future of Broadcasting system in which the issues of government control are discussed. p. 183.

48. "Reach of Electronic Media a factor in Cong-I sweep", The Hindustan Times, Feb. 12, 1985.

49. Som Bengel, "The Media Scene", Indian & Foreign Review, Vol. 21 No. 16 June 15, 1984. p.4

50. Bal. B. Mundkur, ibid., p.122.

51. The question of restructuring the mass media, especially radio and television, through greater autonomy has been raised quite often. However, the government maintains that at this stage, it is not prepared to grant autonomy to the media. For an overview of some of the issues, Ministry of Information and Broadcasting, Report of the Committee on Broadcasting & Information Media. New Delhi: Government of India, 1966. and Akash Bharati National Broadcast Trust, (New Delhi: Government of India, February, 1978).

52. Mundkur, ibid., p. 123

1. Committee on Information & Broadcasting. Ibid. p.18.

2. In July 1983, a "TV special plan" was approved. The plan which has since been implemented at the rate of one transmitter a day, included a direct satellite TV broadcasting service to clusters of three contiguous districts in the States of Andhra Pradesh, Bihar, Gujarat, Maharastra, Orissa and Uttar Pradesh using 8000 DRS. At least in AP, where the study was conducted, not much progress had been made. For details. See Department of Space, The INSAT System ibid., p. 7.

3. See Ministry of Information and Broadcasting. annual report 1984-85. New Delhi: Director of Publications, Ministry of Information and Broadcasting, Government of India, 1986. Chapter V on Doordarshan, p 29.

4. This decision was taken at the 18th conference of State Information ministers in June 1985. At that time, the Karnataka Information Minister, Dr. Jeevaraj Alva had appealed to the Centre to restructure the television programmes so that a major portion of the broadcast time on television went for regional language programmes. The Andhra Pradesh Information Minister, Mrs. Pratibha Reddy wanted the State Governments to be allowed to set up their own radio and television facilities. She was quoting the views of the Chief Minister, AP who had suggested to the Sarkaria Commission on Centre-State relations that laws should be made or amended to enable the State governments to set up radio stations. See "National Communication Policy Suggested", The Hindu, International Edition, Week ending June 29, 1985. In pursuance of the decisions taken at this conference, the AP government had sanctioned Rs 2.25 lakhs for providing 25 colour television sets in the primary service area for the benefit of Scheduled Castes and Tribes. See The Hindu. International Edition, Week ending November 2, 1985.

5. N.L. Chawla, "TV as catalyst of Social change", Times of India, November 10, 1985.

6. "State demands separate TV channel", The Indian Express, August 4, 1986.

7. The system study for INSAT makes a reference to this issue. The SITE system turned out to be a fairly efficient one by design and a degree of luck. Though we can base the INSAT system on SITE we have to exercise a degree of caution. Firstly SITE, being an experiment, the dedication of the personnel was high, this is not likely on an ongoing basis in an operational set up. Secondly SITE being an experiment, many corners could be cut. Thirdly, certain arrangements, e.g. FEC (Front End Convertor) were more oriented towards meeting shortterm requirements of an experiment and will fail if used on an operational basis. See, Space Applications Centre, INSAT Utilisation for Education and Development a System study, (Ahmedabad: Space Applications Centre, 1979), pp. 25-26.

8. This scheme (1982-87) approved in July 1981 provides to clusters of selected contiguous three districts in Andhra Pradesh, Bihar, Gujarat, Orissa, Maharastra, and Uttar Pradesh. The criteria for selecting the areas were their remoteness and lack of communication facilities, concentration of backward segments of the population, developmental activities requiring media support, infrastructure already available for TV programme production. See Department of Space, ibid., p. 37. In the actual village selection for INSAT there were problems such as supply of electricity and related problems. These problems were noticed in the pilot project and SITE and they continue to affect village selection for INSAT.

9. Interview with Bhaskara Ram Mohan Reddy, Deputy Engineer (Radio & TV), Government of Andhra Pradesh, Hyderabad, December 1986.

10. Doordarshan researcher, Sanjeev Thomas involved in the village selection process for INSAT endorsed ECIL's view. Interview with Sanjeev Thomas, December 1986.

11. Interview with S. John, Senior Manager, ECIL, Hyderabad, December, 1986.

12. To carry out the deployment work as as well as testing, a special instrument called 'Satellite Signal Stimulator' is used. From a cost consideration point of view it is not possible to have this equipment in many centres. Therefore, during SITE this facility was provided at two centres only, ECIL and Delhi. The ISRO paid Rs 108000 plus the actual cost of the spares to ECIL for maintaining the FECs.

13. R.S. Mathur, "Indian Television: The Uttar Pradesh View", NAMEDIA, ibid., p. 157.

14. Ramakrishna Hegde, "Indian Television: Case for Diversification", NAMEDIA, ibid., pp. 149–153. Hegde has further elaborated his views in two articles on Freedom of the Media in Janata December 22 and 29, 1985.

15. P.C. Joshi, An Indian Personality for Television, ibid., p. 29.

16. Abid Hussain, "Television as a Vehicle of Development" in NAMEDIA, ibid., pp. 109–111. This is a quote from the seventh plan document.

17. Accordingly, "The Government of India, have, therefore, strongly supported the concept of community viewing and have impressed upon the State Governments to make allocation for the purchase of sets and to create the necessary infrastructure of their maintenance ... Within the limited resources available with the Planning commission for the installation of community viewing sets by earmarking funds in the States Plan outlays." Though the funds for the states in this sector have been increased, the plan document does not specify how much is actually intended for this purpose. Ibid.

18. Pramod Kale, "SITE Hardware", Space Applications Centre, Satellite Instructional Television Experiment SITE Winter School, (Ahmedabad: Space Applications Centre, 1976), p. 78.

19. SAC has issued a termination of contract notice to the Shyam systems. Shyam does not identify SAC as the supplier of this technology. It has collaboration with KATHREIN of Germany, CATEI of USA and NEC of Japan.

20. The TVRO/DRS costs Rs 19,500 and at this cost, only communities such as industrial townships and housing societies can afford the system. Interview with N.K. Mohapatra, senior excutive of Shyam Antennna Systems, New Delhi.

21. Jai P. Singh and K. Narayanan, "Broadcasting Satellite Service in India", IEEE Journal on Selected Areas in Communications, Vol. SAC–3, No. 1, January 1985. pp. 233–245.

22. Under the INSAT scheme a cluster of three districts in each state (Andhra Pradesh, Bihar, Gujarat, Orissa, Maharastra and Uttar Pradesh) are provided by rotation, area specific programmes (ASPs) of 40 minutes in the evening and educational programmes of 45 minutes during the forenoon.

23. See "Indian National Satellite (INSAT) Utilisation." in Annual Report 1984–85 New Delhi: Ministry of Information & Broadcasting, 1985.

24. He has quit Doordarshan and is an independent producer in the private sector.

25. Interview with P.V. Sateesh, a senior producer at Doordarshan Kendra, Hyderabad, December 1986. During SITE, Sateesh was in charge of producing children's programmes as part of the ETV programme. With the transfer of the children's programmes to the State Institutes of Educational Technologies—SIET—he or any of his colleagues are no longer associated with this area.

26. Kheda Communication Project (KCP) has its origins in SITE, and has been continued on the basis of the Memorandum of Understanding between ISRO (Indian Space Research Organisation)/Department of Space and the Ministry of Information and Broadcasting. Under this unique arrangements, DECU/ISRO has the responsibility for producing the developmental and educational programmes for transmission from Pij, while Doordarshan (the national television organisation, a part of the Ministry of Information & Broadcasting) produces the news, current affairs and other programmes using the DECU studios. Production costs for the KCP/DECU programmes are shared by ISRO and the Ministry of I&B. B.S. Bhatia and K.S. Karnik, The Kheda Communications Project, (Ahmedabad: Development and Communication Unit, ISRO, 1985).

27. Interview with H.S. Rawat, Controller, INSAT Programmes Doordarshan, New Delhi, November 1986.

28. Shib K. Mitra. "NCERT-A Retrospect", Silver Jubilee Supplement, Indian Express, September 11, 1986.

29. Krisha Kumar, "NCERT's Silver Jubilee" Economic and Political Weekly, September 20-27, 1986.

30. Ibid.

31. M.M. Chaudhri, "Development of Science Programmes for Rural Children Under the Project Satellite for Instructional Television." Mimeo (?)

32. M.M. Chaudhri, "Reaching the Rural Children of India with Educational Technology-From SITE to INSAT", Media and Development, September 1986. Chaudhri was also interviewed in New Delhi for this study in November 1986.

33. M.M. Chaudhri, "Challenges in Educational Technology", Silver Jubilee Suppliment, ibid.

34. ETV programmes are telecast for about 3 hours and 45 minutes from Monday to Saturday in five different languages. In addition to the six states originally covered under the project, the programmes are relayed by all the HPTs and LPTs in some other states.

35. Parvati Menon, "Education Technology-Claims and Reality in a Promising Programme", The Hindu, July 7, 1989.

36. A major drawback of the educational programme is its timing. "Between 9 and 9.45 a.m. (which is when the programmes are beamed on six days of the week) a child is in school. Now school children are bound by their time tables, and it is not always convenient to interrupt regular classes for 45 minutes every day to watch the TV programmes. The answer would lie in the schools getting the programmes taped and shown later, but how many schools would have such facilities? As for television in village community centres which are supposed to cater to non-school going children, even by the admission of some of the producers, things do not work out this way. The home of the village sarpanch invariably becomes the 'community centres.' Eventually the viewers of the programmes are non working adults." Ibid.

37. Ibid.

38. Krishna Kumar, "Mystique of non-formal education", Indian Express September 24, 1986.

39. According to one analysis: " ... we know on the basis of experience with the satellite programmes that over 40 percent of school TV sets remain out of order and that of the remaining 60 percent of cases, no electricity is available at the time of the broadcast-the net result being that only about 20 percent of schools actually receive the programmes. Is this what we mean by universally available." See Vijaya Shankar Sharma, "The Technological fix to outfix all fixes", The Indian Express, August 3, 1986.

40. Since the early seventies, experts like Philip Coombs and Manzoor Ahmad, backed by powerful institutions like the Ford Foundation and the World Bank have been selling non-formal education as a panacea for illiteracy ... and other similar problems of Third World societies.

41. Vijaya Shankar Sharma, ibid.

42. Ibid.

43. India built its own experimental satellite APPLE (Ariane Passenger Payload Experiment) which was launched in June 1981. "One of the important among application's experiments was a 'television course' conducted with the help of APPLE. This television course was the first of its kind in India for an advance level teaching using distance learning method ... The aim of the experiment was to provide advance learning in satellite communications to final year under-graduate and graduate students of electronics and professionals working in satellite operation system." B.C. Agrawal, "Satellite Communication Beyond SITE: Some Observations from India", paper for the 35 annual Conference of International Communication Association, Honolulu, Hawaii, May 1985.

44. Interview with Prof. E.V. Chitnis, Ahmedabad, November 1986.

45. Association of Indian Universities, Utilisation of INSAT 1B for Higher Education Report of the Task Force, (New Delhi: AIU, 1984), p. 15.

46. See Usha Vyasulu Reddi, "Television in Higher Education: the Indian experience", Media in Education and Development, December, 1987, pp. 128-133.

47. UGC has therefore proposed that during INSAT II, they should have a separate channel for education.

48. Prof. Rais Ahmed, vice chairman quoted in Skumar Mahajan, "TV Channel for Education", The Statesman, April 23, 1985.

49. Interview with Nargis Abraham, April 1989. See also Ranjani, "UGC Countrywide classroom-Need & Response: Feedback from Andhra Pradesh", Hyderabad: EMRC, Central Institute for English and Foreign Languages, EMRC, Hyderabad, 1988. Usha Vyasulu Reddi and Chiruvolu Padmaja, "Periodic Feedback Study on UGC's Countrywide Classroom Programmes Phase I", Audio Visual Research Centre, Osmania University, 1988.

50. At the initial stage, four Educational Media Research Centres (EMRCs) were developed in four institutions of higher learning, those being Jamia Milia Islamia (New Delhi), Gujarat University (Ahmedabad) Poona University (Pune), and Central Institute of English and Foreign Languages (CIEFL, Hyderabad). Two smaller centres the Audio Visual Research Centres (AVRCs) were set up at Osmania university and University of Roorke. Subsequently five more AVRCs were established. There are at present four EMRCs and seven AVRCs. The proposals for the use of the INSAT for educational purposes were prepared much earlier, the structures and institutions for the project were

set up in 1983. As in other developmental projects in India, the higher education project has been funded until 1990 by the University Grants Commission. The future of the financial aspect of the project remains uncertain, but the normal course responsibility for the annual recurring expenditure would become that of the state government, with the UGC retaining an interest in further developmental costs. See Usha Vyasulu Reddi, ibid.

51. The Education Department in the University of Madras has a small studio for producing TV programmes and the Department of Communication is located next door. The students in this Department need exposure to the medium and therefore are sent to AIR and Doordarshan through a long drawn out process. An arrangement can be worked out to use this facility. So far for various reasons, such a thought has not even been explored. A detailed research has not been done in many universities but the general feeling is that faculty-wide coordination is difficult. The problem is more acute when it comes to institutions having different administrative jurisdictions. In Madras, for example, there is a UGC funded AVRC. The film institute, the Indian Institute of Technology and a few other centres that have comparable facilities.

52. The UGC INSAT cell located in Delhi at Jamia Milia Islamia. Jamia Milia Islamia topped the production of programmes for the UGC telecasts. Jamia is being assisted by Canadian International Development Agency (CIDA). CIDA had put York University on to Jamia. York University in turn assigned Prof. James Beveridge, Mrs. Beveridge and production engineer, Mr. Ken Maccay to assist in the Jamia effort. Equipment worth over $ 1 million which includes cameras and editing machines have been installed at Jamia. See, Skumar Mahajan, ibid.

53. Usha Vyasulu Reddi, ibid.

54. "Better planning of educational TV", The Hindu, March 28, 1985.

55. Interviews with Mrs. Dharmamba, Poornima Vyas, Mrs. Vinod Mishra and Mr. Rajendra Mitra, UGC INSAT TV Project, Mass Communication Research Centre, Jamia Millia Islamia, New Delhi, November 1986.

56. D. Swaminathan quoted in Ann Johnston and Albert Sasson ed., New technologies and development, (Paris: UNESCO, 1986), p. 270.

57. Interview with Nargis Abraham. See also Binod C. Agrawal and others, "Message System Analysis of UGCs Countrywide Classroom", Development and Educational Communication Unit, Ahmedabad, 1988.

58. Ann Johnston, ibid., p. 270.

59. Association of Indian Universities, ibid., Foreword.

60. Ibid., p. 13.

61. U.V. Nayak, "Satellite Communication For Rural Development", Daktar World Communications Day Number, Nov-Dec, 1983. Daktar is the montly house journal of the P&T department.

62. Ibid.

63. S.K. Hajela, "Rural Telecommunication", Daktar, ibid., p. 57.

64. Ibid. In India, the definition of a rural area has been derived from the definition of an urban area with minimum population, employment pattern, and population density as the criteria. Areas not

falling under the definition of urban areas are termed as villages and constitute the rural areas.

65. Ibid.

66. Heather Hudson, When Telephones Reach the Village The Role of Telecommunications in Rural Development, (Norwood, NJ: Ablex Publising Corporation, 1984), p. 123.

67. Hudson, ibid., p. 125. A global criteria has been formulated that no one should be more than 5 km or one hour's walk away from telephone. A global plan has been proposed to penetrate the rural areas. Known as a "GlODOM" concept, this is based on the criteria formulated in India.

68. S.N. Kaul, "Problems in Forecasting Demand for Rural Telecommunications in Developing Countries", Telecommunications, August, 1986. pp. 35–41.

69. According to the task force, the traffic generated in rural areas is generally short distance with 60–80 per cent calls terminating within the district or the administrative unit.

1. Harold A. Rosen, "Satellite System for Educational Television", United Nations, Space Exploration and Applications, Volume I. (New York: United Nations, November 1969), p. 117.

2. Ibid.

3. Wilbur Schramm, "Satellites for Education: Lessons from a Decade of Experience with Educational Television", United Nations, ibid. Also see, Godwin C. Chu and Wilbur Schramm, Learning From Television What the Research Says, (Washington, D.C.: NAEB, 1967)

4. Ibid.

5. Ralph Engelman, "From Ford to Carnegie: The Private Foundation and the Rise of Public Television", Sari Thomas ed., Culture and Communication, (Norwood, NJ: Ablex Publishing Corporation, 1983), p. 241.

6. To make certain that the cost implications of various alternatives towards realization of the system were fully explored and understood by India, NASA proposed a joint study with an Indian team and a memorandum of understanding was signed on October 2, 1967. This agreement with the Department of Atomic Energy had to have the concurrence of the US Department of State. For a description of the study and the various alternatives explored, see B.S. Rao and others, "Satellite Proposal: A System Proposal for India", United Nations, ibid., pp. 95-100. Arnold W. Frutkin, A.M. Greg Andrus and Leonard Jaffe represented NASA. Arnold Frutkin and Leonard Jaffe were keen advocates of technology transfer, "international cooperation."

7. Prasad L. Vepa, "Opportunities Available to Developing Nations Through the Use of Communication Satellites-the Delhi School Project", in United Nations, ibid., pp. 903-907.

8. United Nations, The Application of Space Technology to Development, (New York: United Nations, Department of Economic Affairs, 1973), p. 55. Sarabhai's influence on the space programme in India has been noted in earlier chapters. McAnany provides a broader perspective to this issue of influencing factors regarding the use of satellites. Making a specific reference to the period (mid 1960s), he has noted that there were two important lines of thought that influenced development and education. "On one side, there was an enormous faith in the potential contribution of technology to the solution of social problems. On the other, the values and priorities attached to schooling and the improvement of educational opportunities favoured enormous efforts throughout the world." There was also promotion of universal primary education by authoritative agencies like UNESCO and "at the same time, sophisticated technologies were presented as an alternative way for underdeveloped countries to skip steps in their efforts towards development (and development was mainly conceived as industrialization). Associated with these trends was the fact that the mere act of acquiring or developing some technologies, like satellite, were conceived as a matter of prestige." It was in this context that the Advanced System of Communications and Education in National Development (ASCEND) report was prepared in 1967 as a product of a multidisciplinary class held in Stanford Engineering School. Sarabhai participated in this class. This report influenced the founder of the Brazilian space programme, Fernando de Mendonca, and Vikram Sarabhai: " ... [They] used the study to strengthen their cases for the planning of a domestic satellite. What ASCEND did was to provide estimates of educational need and estimated cost figures, as well as design configuration to what had been, up to that time, only a very general hope in the minds of different educators and development planners." See Emile G. McAnany and Joao Batista A. Oliveira, The SACI/EXERN Project in Brazil: An Analytical Case Study, (Paris: UNESCO, 1980), p. 3.

9. ISRO had to carry out a number of experiments and demonstration programmes to convince the leadership and the public of the benefits that satellite systems could offer. "Overcoming the initial reluctance of the user agencies that had delayed the decision on implementation of an operational satellite system was difficult." K. Narayanan, "INSAT System and SAC Contributions to the Programme", SAC Courier , Vol. 11, No. 2, August 1986. p. 2.

10. Robert T. Filep, "The ATS-6 Experiments in Health and Education: An overview", Journal of Communication, Autumn 1977, Vol. 27 No. 4.

11. For a brief description of this "AIR-VOA" deal and the opposition generated in India leading to the resignation of Mr. Gopal Reddy, Minister for Information and Broadcasting in 1963, see. G.C. Awasthy, Broadcasting in India, (Bombay: Allied Publishers, 1965), pp. 244-247.

12. This has been described in Chapter III.

13. K.E. Eapen, "The Cultural Component of SITE", Journal of Communication, Autumn 1979, Vol. 29, No. 4, p. 106.

14. Ibid. For details of this evaluation, see Department of Communication, Report on Evaluation of Karnataka SITE-Experience, (Bangalore: Banglore University, 1977).

15. Narayanan is a member of the Technical Advisory Group (TAG) of ISRO which decides on technical matters related to space. Interview with Narayanan, November 1986. Also see K. Narayanan, ibid.

16. T.V. Srirangan, "Orbital Planning: Views of a Third World Country", Heather Hudson ed., New Directions in Satellite Communications: Challenges for North and South, (Dedham, MA: Artech House, 1985).

17. M.S. Gore, The SITE Experience, (Paris: UNESCO, 1983).

18. P.C. Chatterji, Broadcasting in India, (New Delhi: Sage Publications, 1987), pp. 131-132.

19. K.E. Eapen, ibid, p. 107.

20. "After many years of study and consideration, Government finally approved in 1977 the proposal for an operational system with telecommunications, TV and meteorological capabilities ... The Government has approved the ground segment required for telecommunications and for meteorology ... Government has not yet sanctioned any funds for TV ground segment for INSAT. The Ministry of I & B too has proposed provision for ground segment of INSAT; however, none have been formally accepted so far ... This report attempts to provide an outline of the possible utilisation of INSAT for developmental communication and education." See Chapter I in Space Applications Centre, INSAT Utilisation for Education and Development A System Study, (Ahmedabad: Indian Space Research Organisation, 1979), p. 1.

21. Emile G. McAnany, "Understanding 'Success' in Communication Technology: a Review of Third World Projects", UNESCO, The Economics of New Educational Media Vol. 2. Cost and Effectiveness, (Paris: UNESCO, 1980), pp. 48-67.

22. Ibid.

23. Heather Hudson, "The Role of Telecommunications in Development: A Synthesis of Current Research" Oscar Gandy Jr. and others ed., Proceedings from the Tenth Annual Telecommunications Policy Research Conference, (Norwood, NJ: Ablex Publishing Corporation, 1983), p. 306.

24. Paranjoy Guha Thakurta and others, "Indo-US Trade Eyeball to Eyeball US Accuses India of Using Unfair Means", India Today June 30, 1989, pp. 56-58. The other contentious issues are: removal of 40 percent limit on foreign investments; removal of export comitments; strengthening of trademark, copyright and patent laws in line with the Paris Convention; and, improve the access of US films to India and non exclusion of US videos to the Indian home video market.

25. Prabhu Chawla, "Doordarshan Hijacking the Medium", India Today, July 15, 1989, pp. 26-33.

26. Indranil Banerjee and others, "The High Gloss Wars Welcome to the Battlefield that is Indian Advertising", Sunday, July 10-16, 1988, pp. 49-57.

27. Prof. Rais Ahmed, Vice Chairman of UGC has stated that UGC hopes to have a separate TV channel devoted solely to education. The reasons have been discussed in Chapter VII.

28. "The key men-UGC Chairman, Professor Yashpal, and adviser, Professor E.V. Chitnis, Bordia, Professor M.M.Chaudhri, head of the Central Institute of Educational Technology (CIET), ... and Kiran Karnik, director of the Development and Educational Communication Unit (DECU) ... are competent but can best take good decisions. Implementation is another matter." David Devadas, "Children's TV A Muddled Picture", India Today, February 15, 1988. p. 139. Prof. E.V. Chitnis, M.M. Chaudhri and Kiran Karnik were interviewed for the study and their views have been used for analysing institutional relationships in the development and education sector in the earlier chapters.

29. Ibid., p. 134.

30. This problem is not unique to India. Godwin Chu based on his study of the Palapa system (Asia's first domestic satellite system) in Indonesia has noted institutional constraints in programming for development in Indonesia. See Godwin C. Chu and Alfian, "Programming for Development in Indonesia," in Journal of Communication, Autumn 1980, Vol. 30 No. 4.

31. Pendakur, ibid., pp. 177-197.

32. Ibid.

33. Texas Instruments operates one of the world's largest private, on-line data communications networks. "The diversified microprocessor and electronics company has 50 major plant sites in 19 countries employing about 80,000 people. TI's system embraces 8,000 inquiry terminals and 140 distributed computers connected to the Corporate Information Center in Dallas. It is used for engineering, manufacturing, ... " Dan Schiller, Telematics and Government, (Norwood, NJ: Ablex Publishing Corporation, 1982). See "The US Offensive in International Telematics." p. 100.

34. Total electronics production in India for 1989 is projected at US$ 6.14 billion with an import bill of US$1.33 billion. Statistics presented by Mr. Wadhwa, Adviser, Department of Electronics, Government of India, at a Dataquest seminar in Santa Clara, CA, USA, June 28, 1989.

35. Bruno Wambi describes technology as genetic material which is encoded with the characteristics of the society which developed it and it tries to reproduce that society. Bruno Wambi, "Domination by Cooperation A Third World Perspective on Technology Transfer and Information", IDRC Reports, January 1988, pp. 24-25.

36. The INSAT II project is crucial for ISRO because the purchased variety of satellites would be 'dead' by 1996. "Since India does not intend buying any more satellites this would mean that the first of the indigenous satellites should be ready by 1990 and the other two in the series before 1995 ... What would be under test would be ISRO's ability to successfully scale up its technological capability to the

INSAT class of satellites. And after a two year interaction with user agencies like the Post and Telegraphs, Doordarshan, All India Radio and Meteorology Department it was only in January [1986] that ISRO scientists finally worked out the kind of satellite they would have to build. Taking into account the rapidly growing demand for satellite facilities, they have now decided that INSAT II would be, both in size and capacity, one and a half times that of INSAT I." Raj Chengappa, "Space Programme Going Indian" in India Today, August 31, 1986. pp. 76-77.

Appendix I

1. Source: Department of Space, INDIAN NATIONAL SYSTEM (INSAT), (Bangalore: The INSAT Programme Office, August 1983), and Department of Space, Annual Report 1988-89 (Bangalore: Publications and Public Relations Office, 1989).

Appendix II

1. Discussions with Profs. Majid Tehranian, Heather Hudson and Bella Mody provided a better perspective on the nature of the problem based on their interaction and observations during the SITE period.

Appendix III

1. Ramesh Menon and T.N. Ninan, "Classy Clan", India Today, April 15, 1987. This description is part of an investigation into the manner in which the Sarabhais have created Trusts to avoid taxes.

2. M.G.K. Menon, "Vikram Sarabhai My Friend & Colleague", Science Today, January 1972, pp. 39–43.

3. Ramanathan recalls: It was as early as 1942, when Dr. Sarabhai and his newly married wife, Sreemati Mrinalini, were staying for some time in Poona, that he had conceived the idea of starting the PRL. Soon after he returned to UK in 1947, Sarabhai started looking for a place. He talked to many people. Shri Kasturbhai Lalbhai, and Shri M.G. Malvankar and other members of the Ahmedabad Education Society agreed to let him have a few rooms at M.G. Science Insitute to start the laboratory. I had agreed to join him early in 1948 as soon as I retired from the India Meteorological Department. We started work with three or four research scholars, a glass blower, an office assistant and a carpenter cum mechanic. The funds came from the Karmakshetra Educational Foundation (a trust of the Sarabhai's) and later grants from CSIR and the DAE. PRL owes its existence and status to Sarabhai and his intiative, personal contacts, persuasiveness, and supreme confidence that financial assistance would be forthcoming for a good cause and good work. See, K.R. Ramanathan, "PRL– A Home For Work", Science Today , January 1972, pp. 39–43.

4. Joshi and Ganesh are of the opinion that Sarabhai was a prolific institution builder. He set up an institution every year beginning from 1947 until his death in 1971. S.R. Ganesh and Padamanabh Joshi, "Institution Building: Lessons from Vikram Sarabhai's Leadership", Vikalpa, Vol. 10, No. 4, October–December 1985, pp. 399–413.

5. Kamala Chowdhry ed., Science Policy and National Development, (New Delhi: Macmillan Company, 1974). See the Introduction. This book is a collection of speeches and papers of Vikram Sarabhai and provides considerable insights regarding the situation in India between 1960–70.

6. "Dr. Vikram A. Sarabhai Dead: Led India's Atomic Energy Body" New York Times, December 31, 1971, p. 22.

Appendix IV

1. Source: "India–US SITE Agreement", Romesh Chander and Kiran Karnik, Planning for Satellite Broadcasting The Indian Instructional Television Experiment, (Paris: UNESCO, 1976), pp. 51–52.

PART D

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