CHAPTER 1
Information Technology and Development:
Foundation and Key Issues

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This volume is an attempt to document successful use of information and communication technology (ICT) for rural development in India so that lessons can be drawn on the type of applications that are likely to create a developmental impact and the efforts that will be necessary to implement such applications. To put the case studies and the lessons that have been drawn in a perspective, this chapter traces the history of ICT use for rural development in India. It begins by defining the kinds of activities undertaken by government and nongovernment agencies that are taken up as a part of the developmental process. It examines some of the problems that implementation of rural developmental programs have been afflicted with, and argues that ICT applications could overcome some of the weakness in implementation. It then goes on to assess the early efforts in ICT use. Finally, the paper proposes a scheme by which to classify ICT applications and identifies the key issues in implementing these applications.

Introduction

Rural poverty in India is a complex phenomenon and there obviously cannot be one dominant approach for its alleviation. Many experiments in Asian countries seem to have succeeded in alleviating poverty in smaller pockets (clusters of villages). These experiments were concerned with improvements in micro level planning, effective supply of credit to the poorest of the poor, improved management of government-run poverty alleviation programs, and the work of some nongovernmental organizations (NGOs) in building networks of self-help amongst the rural poor. Most succeeded because of grass root intervention. New policy initiatives taken from time to time have been able to provide greater resources for poverty oriented programs, education, health or family welfare.
However, it is widely acknowledged that there is a great deal of waste in the way these resources have been utilized in the past. Information technology (IT) is often identified as a key to improve the resource allocation process and to more efficiently implement programs. Information and communication technologies (ICT) are indeed generating new possibilities to attack problems of rural poverty, inequality, and environmental degradation. Old ways of doing business in terms of delivering important services to citizens are being challenged and sometimes abolished in both industrialized and developing countries. But the question of the value of IT for rural development is accompanied by this dilemma for decision makers and multilateral funding institutions: should the very limited resources for rural development be applied to developing ICT capacities, or are they best used for other high priorities such as schools, hospitals and dispensaries? Clearly, there is a grave concern about the possibility of wasted, poorly utilized, or otherwise unspent resources in ICT applications for rural development.

**Development Programs and Their Implementation**

Some of the causes of extreme poverty are: inadequate infrastructure such as roads and electricity; inadequate access to government functionaries, health workers, primary school teachers, agricultural extension workers; and poor resource base for productive economic activity. Various programs and activities have been taken up in order to address these causes, including:

- Provision of basic infrastructure in rural areas, e.g., setting up new schools, health facilities, rural roads, drinking water supply, and electrification;
- Schemes aimed at promoting rural industry, increasing agricultural productivity and providing rural employment;
- Providing productive resources to individual families below the poverty line to increase family income; and
- Providing food items at subsidized prices through the public distribution system to shield the poor from price rises.

These programs are implemented through a vast network of government officials at central, state, district, and taluka (a subunit of the district of which there are about 5,000 in India) levels. Legislators, political activists, elected representatives, and the public are the focal points for creating demands on the administrative system. In recent NGOs are also playing a key role in providing social services.

At central and state levels, policies are laid down and resources are allocated. District level officials representing the middle rung of administration are responsible for micro-planning and monitoring. Actual implementation of most programs is done by taluka level officials.
Problems in Management of Rural Development Programs

In spite of substantial expenditures in rural areas in the last 50 years, there are regions which are still backward. A significant proportion of the population continues to live below the poverty line (a minimum subsistence income level used by the government of India). There are some generic problems which plague public administration in every country (Avgerou 1990; Hooja and Mathur 1991; Paterson 1982). These are discussed in the context of the rural development programs in India in the following section.

Centralized Planning

Planning has traditionally been heavily centralized. New programs for rural areas are planned at the state and central ministries, often without access to a detailed status report. A centrally planned scheme may not be appropriate because there are differences in agro-climatic conditions, skill base of the rural population, access to social infrastructure, and literacy levels amongst districts. The Planning Commission (1984) recommended that powers to allocate and use resources should be pushed down to district level agencies which have a much better feel for local conditions. But, such decentralized planning needs to be supported by regional databases and tools for spatial planning.

Multiplicty of Agencies

A large number of agencies are involved in rural development. Very often several programs such as adult literacy, family planning, and loan assistance through the Integrated Rural Development Programme (IRDP) are aimed at the same beneficiary. Ideally, such programs would be coordinated at the grassroots level. Many of the services complement each other and a lack of one service effects acceptance of other services. To illustrate, low female literacy and poor immunization diminish acceptance of family planning methods. In India, these services are provided by three different agencies. One solution is to reorganize all the associated departments into one unit. This may make the department unwieldy—and in any case, vested interests would not let departments be reorganized. Sharing information across departments can improve coordination and planning.

Bureaucratic and Administrative Problems

Over the years the government agency has not reoriented itself from a regulatory apparatus to a development agency. Because of the sheer physical
distance of field functionaries from their supervisors, there is corruption and slackness in work. The district collector (head of administration at the district level) has become over-burdened and his role politicized. The addition of several new departments and programs has added to the collector’s responsibilities to coordinate amongst departments through committees. A collector may often chair 60 to 70 different committees (Roy 1991). The average tenure of a collector in a district is about a year, which leads to a short-term orientation. Decentralization of power to *taluka* levels with effective monitoring from the collector’s office could help lessen clerical burdens and limit fraud and corruption.

**Problems of Monitoring Large Programs**

Many important programs like health and family planning are based on an “outreach” rather than “clinic” approach. Large armies of field workers are employed by the government to educate and provide health services to an equally large number of rural clients. In India every male/female in the reproductive age group is covered. Clients assigned to one worker may be distributed in several villages, many of which are not easily accessible. The performance of such programs is poor because of the unwillingness of the program worker to spend her/his time in the field. Field level supervision is also weak. Records on individual clients are suspect because these may not be updated through actual contacts with the client. Manual reporting systems which consume nearly 30 percent of the time of field workers (Bhatnagar and Patel 1988) are ineffective because of the inability of the worker to cope with large amounts of data.

**Inadequate Resources**

Although outlays on many rural development programs add up to a sizable sum, the allocated funds always seem inadequate given the enormity of the development tasks. Most of the available funds are earmarked under specific budget categories. In many programs, staff salaries account for a substantial part of the budget. There is no discretionary budget with the field level functionary to do things differently from a standard plan developed at the state and central levels.

**Venturing into Computerization at the Rural Level**

The earliest recognition of the potential of computers in rural development in India came through applied research of some academics during 1975-80 (Patel 1979). A general awareness of the utility of computers was created in the
bureaucracy through seminars and training programs (CSI 1981). This was followed by a few pioneering experiments in the use of computers by district administrators. By 1988, about 15 districts in India had experimented with using personal computers (Bhatnagar 1987; Patel 1986). Some districts were using microcomputers to produce IRDP monthly reports. An interesting application in the health sector was developed at a primary health center training school located in a *taluka*. In this project a PC was used to store data on the couples in the reproductive age in the *taluka*. The system demonstrated how monitoring a program could be more effective once access to detailed data was available. The system also allowed supervisors to develop detailed activity plans for workers outlining which couples should be targeted in a given period (Bhatnagar and Patel 1988). A few districts used a PC for monitoring stocks in their public distribution system. At least one NGO (CAM Centre 1987) installed a PC in its office to map the resources of a district in Rajasthan. Workshops and seminars were conducted around these experiences (Sanwal 1986). Most of these meetings cited potential benefits but implementation difficulties were ignored.

Most early adopters of IT were district administrators from the elite Indian Administrative Service. Many service officers were young (around 30 years old) and could act independently. However, there were hardly any applications in other important departments such as agriculture, health, or public works where the district level heads are older (45-50 years) and are used to executing orders received from their directorates at the state level.

**Government of India Program for District-Level Computerization**

During the period 1978-1985, when most of the work discussed earlier was done, a major problem in spreading the use of computers was the need for significant investment in hardware and software. By 1986-87 prices of computers had begun to decline and the availability of locally produced computers had improved. Left to their own momentum, perhaps 50-100 districts would have initiated computerization during 1985-90. When Rajiv Gandhi came to power in 1985, the government of India decided to force the pace of IT use at the district level. The National Informatics Centre (NIC)—a central government department was—chosen to implement a national program called District Information System of National Informatics Centre (DISNIC) to computerize all district offices for which free hardware and software was offered to states (Planning Commission 1989). NIC quickly built up its manpower capability to 2000 technical staff to undertake the challenge. By 1990, each district computer was connected to a state computer through a local dish antenna and a satellite communication network. The state computer in turn was connected to a computer in New Delhi. This network is called NICNET. The approximate expenditure on the hardware was roughly US$1.5 billion (approximately Rs 6,451.4 crores). Software application development was done centrally for about 15 standardized applications for each
district. It was expected that in these applications databases would be created at the district level from which data could be retrieved for central planning. Memorandum of understanding were signed by NIC with each state government under which state-level cells manned by NIC staff provided support to district level computerization. NIC was also expected to provide two computer professionals to each district to implement the software.

In a separate program called Computerized Rural Information Systems Project (CRISP), the rural development ministry and NIC collaborated to develop software for planning and monitoring of IRDP (Department of Rural Development 1987). A PC/AT was provided to each District Rural Development Agency (DRDA) to run the software. State governments were asked to purchase equipment and provide training for their district level officials. Subsequently, the implementation of the DRDA computerization was also handed over to NIC.

What is noteworthy is that the approach taken by NIC for its district computerization program was completely centralized. The conception of the idea, spelling out of objectives, and choice of applications were all done by NIC. The focus was on developing databases, modeling techniques for planning at the district level, and providing relevant information for central planning. The information needs were assessed by a group located in New Delhi and have been treated as standard for all the districts in India. The software design and specification of databases were also standardized and originated in New Delhi. The initial recruitment of personnel and their placement in districts were also done centrally. During the last four years state-level center have been set up to provide implementation support to district NIC functionaries. In the CRISP program, there were a few elements of decentralization. Purchases of hardware and training of district level functionaries were left to state initiative. No personnel were provided to district DRDAs. However, the design of the software which included the assessment of required information specifying the type of databases, and the reporting system, were all centralized.

**Impact of DISNIC and CRISP on Rural Development Programs**

Commissioning nearly 500 computer centers and a country-wide network connecting these computers was a major achievement. Considering that some district headquarters are significantly away from large cities where most computer vendors are located, maintenance and support of the equipment is reported to be satisfactory. There have been no formal attempts to evaluate the DISNIC and CRISP programs, but analysis (Bhatnagar 1991; Madon 1992) indicates that computer utilization has been effective in a limited number of districts. On the basis of field work done in 1989-90, Madon reports that the “manual system still prevails in all the 19 districts of Gujarat and the CRISP system is grossly under-utilized.” In most districts computerization is proceeding at a slower pace than was anticipated. In several districts the DRDA computers are not being used at all. Surprisingly, decision support software supplied by DISNIC and CRISP are
not being used much but several local applications have been developed in many districts suggesting that the objectives and priorities of CRISP and DISNIC were not in tune with perceived needs of local administrators. Overall, the impact of this modest expenditure in computerization has been marginal.

The impact of CRISP and DISNIC on administration has been marginal because the task of changing the administrative culture is enormous. Although IT can be a tool for decentralized planning, integration across departments and reduction in work load, it cannot be the sole instrument of change. Unless district administrators are motivated or held accountable to improve performance of rural development program, they will not try a new tool. In CRISP and DISNIC the effort required to push administrative reforms through the use of IT was grossly underestimated. In a few of the early experiments, computerization in districts did create the intended impact because of the motivation of innovators. However, one could not expect that a similar motivation would exist amongst all district administrators. Very clear pointers from later attempts, such as that in Surendranagar, were ignored. Other organizations which could have shared the tasks were kept away. Finally, the focus of the decision support systems did not quite fit with the past experience of computerization in the state public sector where the primary focus of computerization was on data processing.

In recent years several state governments have become active in promoting the use of IT. Setting up of the national IT task force by the central government has given a new momentum to the development of IT infrastructure and its use in the government sector. In the past, computers were confined to large towns such as district headquarters. Now, at the turn of the century, the growth of telephony, access to VSAT communication and availability of trained personnel in smaller towns, makes it feasible for the government to install computers in small towns and rural areas. The emergence of Internet and web technologies has also given rise to a new paradigm of computing. Many state governments in India are preparing grandiose plans to induct IT in the state administration to provide better service to its citizens.

Types of Information and Communication Technology Applications

Information and communication technology applications can be broadly categorized into the following types:

- Decision support to public administrators;
- Improving services to citizens; and
- Empowering citizens to access information and knowledge.

Each of these types of applications may have different objectives, require different types of technologies to build, and therefore have different sets of critical success factors.
Decision support systems for public administrators focus on improving planning and monitoring development programs. Examples of such systems are the use of the Geographical Information System to plan the location of rural facilities or to identify disaster prone areas. Similarly, provision of PCs in the district rural development agencies was primarily intended to improve the monitoring of the integrated rural developmental program. The case study of health workers in this volume illustrates how ICT could enable field workers to better plan their activities and for their supervisors to more effectively monitor their performance. Such systems are likely to be successful if the request to build them originate from public administrators interested in improving the administration of development programs. However, if such tools are provided in a centrally sponsored scheme to administrators unwilling to change their style of administration, that is, who are unwilling to use information and its analysis for decision making, it is unlikely the decision support system will be used. When development programs are not operationally dependent on such systems, their use becomes purely discretionary.

The second type of applications focus on automating the process of delivering services to citizens, and in the process, bring in transparency. Examples of such systems are the use of ICT for collecting a variety of payments that citizens need to make to government agencies. The use of ICT can shorten queue and waiting times at collection counters, improve accuracy in billing and accounts receivable, and provide immediate proof of payments to citizens. The case study of collecting stamp duty for registration of property deeds included in this volume exemplifies the kind of benefits that can accrue to citizens as well as the department delivering the service. Computerization of land records which has been undertaken in many districts is another example. Similarly, issuance of important documents to citizens can also be done through computerized systems.

The last type of applications is concerned with empowering citizens through access to information and knowledge. Access to information about markets is crucial for rural producers of all varieties of goods and services because these must be exported to other regions. Often middlemen, who bring consumers and producers together, are able to seek disproportionate rent because they have access to ruling prices in different markets. Use of ICT can provide up-to-date information on markets to producers, thus increasing their bargaining power. In spite of a plethora of developmental programs, citizens are often unaware of free and priced services that institutions are expected to offer them. They are also not aware of the expenditure that different agencies are expected to incur in their village/region and therefore have no way of auditing the performance of development departments. Recently, in a backward region, illiterate villagers demanded information from senior government functionaries in the district regarding allocation of resources for local schemes. They agitated to receive photocopies of such allocations and forced the administration to share this information with the public. ICT can be used to deliver such information through kiosks located in rural areas, some experiments of which are described in this book.
Rural communities can also be helped through access to knowledge that will improve productivity in their work, health practices, and enable them to learn about their environment. A large number of innovations in farm practices, tool design, and use of indigenous medication do not diffuse beyond local boundaries because of the isolation of rural communities. Much indigenous knowledge passed down from generations is also becoming extinct because of a lack of presentation efforts. ICT and Web technologies could make such information/knowledge visible to large cross sections of rural communities. An organized effort at diffusing such knowledge through ICT—the Honey Bee network—is described in this volume.

Training programs to build skills that are in short supply can generate rural employment opportunities. Basic training in ICT can provide employment in electronic repair centers and information handling services. ICT can also be used to train field workers located in rural areas through innovative designs of distance learning programs. ICT needs to be further deployed to train physically and socially disadvantaged groups.

Key Issues in Planning and Implementing ICT Applications

Project Justification

Some IT applications implemented in the past were meant to provide decision support without a clear identification of their benefits in terms of efficiency of the decision making process or better quality of decisions. Several of the successful ICT applications included in this volume were implemented after pilots had clearly indicated benefits to all the stakeholders. Even though it may not be possible to specify monetary benefits it helps to be able to quantify benefits. In selecting applications, costs, benefits and risks have to be balanced. Risks may arise from the quantum of change involved, use of new technologies which have not had extended field use, complexity of the application software, and resistance to the application from vested interests. Often times simple indigenous technology may be the most appropriate, but there is a tendency to ride the technology bandwagon. Most state governments do not have adequate funds to build ICT applications. They need to raise resources by involving the private sector and/or develop project proposals that are bankable. This requires a clear assessment of costs, benefits, and risks. Applications that touch the lives of a large number of citizens are more likely to be able to find benefits outweighing costs.

Multiple Service Centers

There are a number of areas where citizens must interface with government departments to make payments and receive services. Careful analysis must be
done to identify the number of citizens that would be benefited by developing ICT applications because they are expensive and the services need to be located as close to the customer as possible. It is therefore important to select centers that handle multiple services so that benefits accrue to a larger section of the society. Otherwise the benefits may not seen to be commensurate with the costs and investments particularly in a country like India where there is a perpetual resource crunch and several possible alternative use of funds. Government offices that collect revenues can increase collection provided the process is made convenient. Often community centers (subscriber trunk dialing booth, TV viewing center, and computer centers for neighboring schools) can reduce capital investment costs. If such centers serve multiple functions the gap between revenues and costs can be reduced. Convenient access to such facilities is important but it must be remembered that in most of rural India the population has to walk miles even to obtain drinking water. The key issues in designing these systems are the generation of content that would be useful for rural citizens and the trade-off between cost versus convenience in providing access to this content. The content would have to be built in local languages. Tools are now becoming available to view content in Indian languages.

**Involve Stakeholders**

In the past, national programs like DISNIC and CRISP were formulated without adequate consultation with key stakeholders. The key stakeholders were: district-level clerical workers (who entered data and generated reports); heads of user departments (users of the output of the system); state level departments coordinating computing services; and the NIC staff at district, state and central levels. For the 440 districts about 5,000 officers were affected by computerization. Less than a small fraction of these stakeholders were involved in the process of conceptualizing the program and defining the scope of different applications.

Now state-level agencies are driving the analysis, design and roll out of new ICT applications. This allows greater involvement of field unit personnel. However, the expediency of rushing implementation may still inhibit a participatory design process. A centralized “technology push” approach offers the possibility of quick execution but in the end effectiveness could be compromised. A largely technical orientation of executing agency staff can be a handicap in project implementation that requires predominantly managerial skills. Some central agencies executing similar projects have recruited “hybrids” and managers to successfully oversee the implementation of such projects (El Sherif 1990).

**Organizational Mechanisms and Adequate Project Management**

It is important to proceed slowly in computerizing at the field level. The most difficult proposition in large scale computerization is the scaling up from
successful pilot sites at a few field sites to a large number of sites spread over a wide geographic area. In the case of DISNIC, during scaling up the objectives were enhanced further to include networking of all districts. This converted the focus of the project from what should have been a managerial task of diffusing computer applications at the districts to a predominantly technological task of building an inexpensive computer network.

Most of the ICT applications being implemented now present the same dilemma. Wide area networking and communication infrastructure needs to be built before decision support systems or improvement in services to citizens can be implemented. Various organizational models are being tried out to manage these tasks. In Andhra Pradesh the two tasks are performed by separate organizations with a state level coordination mechanism.

Often the effort involved in managing a large project that is to be rolled out to several field units is underestimated. The skills available to manage such projects are in short supply. A variety of competencies have to be built in the teams handling implementation. These include: technology assessment, administrative process redesign, systems analysis and design, project management, and management of change. Frequent transfers of the senior officers in government also disrupt the execution of large projects.

**Sustained Training**

Information technology cannot be forced down the throats of unwilling administrators. These public officers need to be motivated to improve the effectiveness of rural development programs. Once they are so motivated they will find the technology to be an invaluable tool. IT can support the planning and monitoring effort by making detailed analysis possible. It can create an openness in the administrative system by providing access to information to stakeholders. However, administrators need to be convinced about such benefits through first hand experience, demonstrations and training. Since the purpose of field level computerization is to improve management, it requires sustained training efforts and technical inputs. Training needs to be oriented towards use of information by workers, supervisors, and managers for strengthening, planning and monitoring activities. Field-level officers generally lack training in the use of information. In fact, most field-level managers are seldom trained in management/administration. They have usually had technical jobs before becoming middle level supervisors.

**Conclusions**

Increasing the effectiveness of rural development programs is a complex task. The administration has to be energized to face up to the challenge and implement development programs with honesty and vigor. The rural poor need to be educated and organized to make demands on the administrative system. In all
these areas information technology can play only a supportive role. In design and implementation of applications, field officials must get a sense of involvement and a sense of ownership.

In discussing the likely impact of ICT on development, a caveat is in order. Some significant successes in transformation rural communities have had nothing to do with ICT. For instance, a movement called *Swadhyay* has enlisted urban professional volunteers to give one or two days of their time to work amongst rural people (Sheth 1992). The movement focused on slow change through repeated contact with rural population focusing on self-help and awakening. Volunteers reach out to rural people asking them to join the movement. Participants are to follow a few basic practices that are essentially focused on self-help, cooperation amongst communities and contribution of a part of one’s time to communities. It is not possible to sketch this in detail but literature is now available on recording the transformation of whole communities through this movement over a period of 5 to 10 years. Men have been weaned away from alcoholism. Cleanliness has been brought in villages and productivity increases in agriculture has resulted. A significant increase in the level of well being has been felt in the basic transformation attitude that it is indeed possible to transform one’s life.

Clearly improved literacy, particularly of females, can have a lasting impact on rural poverty. However, another kind of education which focuses on self-help, understanding one’s own political rights, and more open access to information, can lead to transparencies in resource allocation and reduced corruption. This kind of education does not necessarily come from the traditional schooling system. It cannot be provided by an inefficient and corrupt bureaucracy. (NGOs movement such as *Swadhyay* can play a significant role.) A major stumbling block is the poor quality of governance and lack of participation by the poor in governance. The only way this can be improved is through a greater sharing of information and better communication amongst the concerned stakeholders.

**References**


