A Strategy Handbook for the Practitioner

Livelihood Augmentation in Rainfed Areas

3

Catching the Virtual Bus: ICT for Augmenting Rural Livelihoods

Astad Pastakia & Sachin Oza

dsc Development Support Centre

AGA KHAN FOUNDATION

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Volume III

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Ahmedabad

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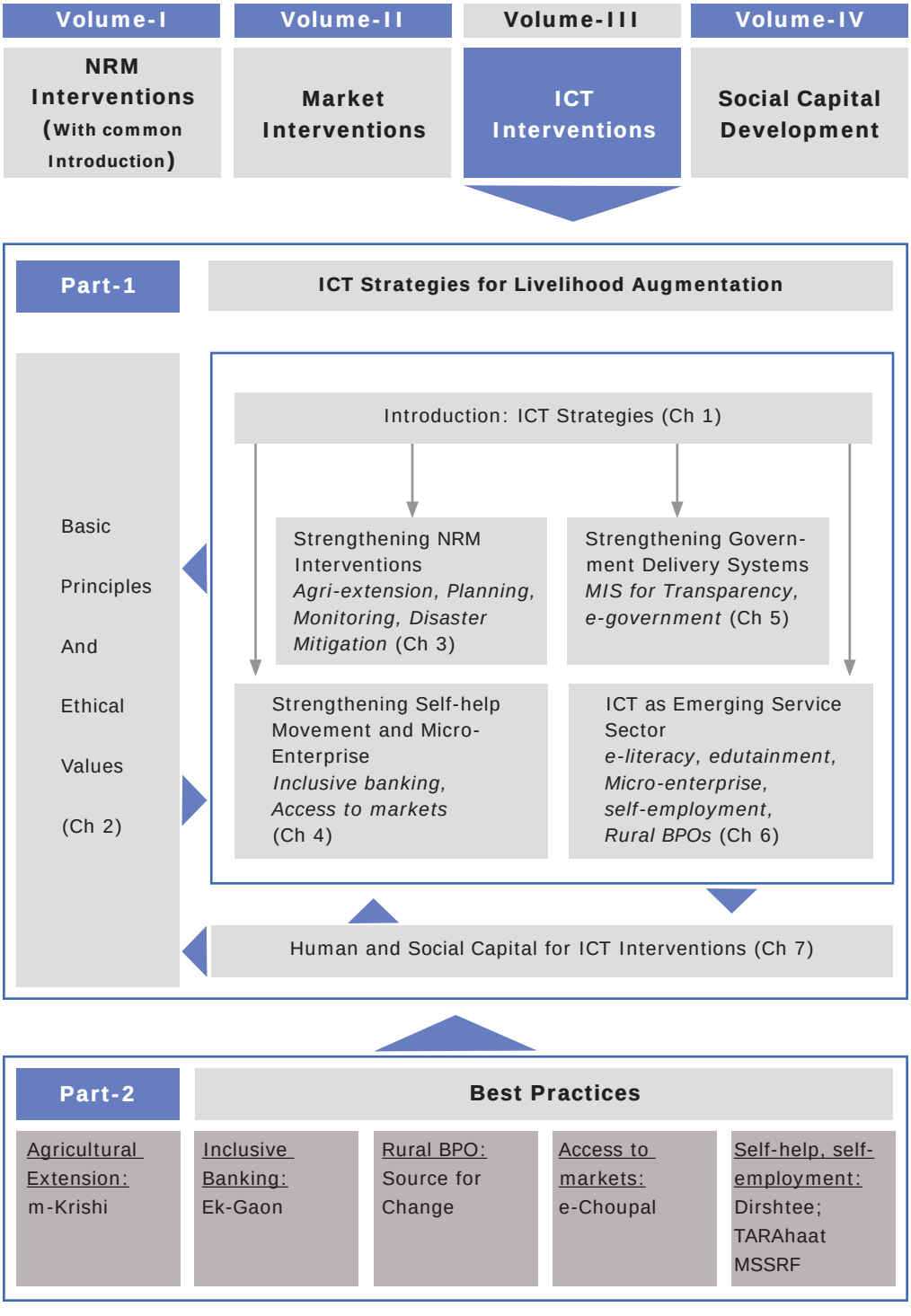
Navigation Chart



Foreword

Removal of poverty and hunger is the first of the eight Millennium Development Goals (MDGs) adopted by the United Nations. About 400 million rural poor reside in about 200 poorest districts of the country that constitute rainfed areas.

If one looks at the overall agricultural pattern across the country, almost 85 million ha, that is, about 60% of the 142 million ha of cultivable land is under rainfed conditions. These make a significant contribution to the production of pulses, oil seeds and cereals in the country. Public investment in irrigation has steadily declined. In addition, even if the entire irrigation potential of the country is developed, 50% of the arable land is likely to remain rainfed. There is, therefore, an urgent need to give attention to improving the agricultural productivity and diversifying the economy of these areas.

The government, research institutes, NGOs and the private sector, each in its own manner, has made efforts to enhance the livelihood opportunities for rural communities in rainfed areas. Prime Minister Dr. Manmohan Singh announced a mega assistance plan of Rs 25,000 crores in 2007 to boost agricultural productivity. A National Rainfed Area Authority has also been set up to specifically look into the issues of enhancing rural livelihoods in rainfed areas. The efforts of luminaries such as Shri P.R. Mishra of Sukhomajri Project in Haryana and Shri Anna Hazare in Ralegaon Siddhi, Maharashtra, are well known.

Development Support Centre (DSC) initiated in 1994 by the late Shri Anil Shah, has made a critical contribution in capacity building, research and influencing policies related to participatory natural resource management. The organization was involved in developing the first watershed guidelines brought out by Mr. B.N. Yugandhar, and continues to look at issues related to the effective implementation of the watershed programme. Some of the studies such as 'Longitudinal Study in Sixteen Drought Prone Watershed and Non-watershed Villages of Gujarat', 'Drinking Water Security in Watershed Villages' and 'Cost-benefit Analysis of Watershed Development: An Exploratory Study in Gujarat' have led to policy changes at the state and national levels and better practices at the ground level.

One of the most important contributions of Anilbhai was the formulation of principles for development and management of natural resources in a sustainable manner or 'Bopal Declarations' as they are popularly known. These have been mentioned in the Planning Commission's 'Approach Paper for Rainfed Areas' and also in the new watershed

guidelines of April 2008, as guiding principles for implementing the programme. The new guidelines give due recognition to the need for improving rural livelihoods through participatory watershed development, with the focus on integrated farming systems for enhancing income, productivity and livelihood security in a sustainable manner.

As an organization involved in capacity building of practitioners, and also working as an implementing agency, DSC realizes that there is no dearth of literature on watershed management. There are many how-to-do manuals such as how to construct a check-dam or how to mobilize people to form Self Help Groups, etc. However, there are few that focus on broadening the horizon of the practitioner, by providing alternative options that could be tried out in different conditions. Whereas plenty of literature is available on the technical aspects of watershed development and other livelihood strategies, not much has been written on the institutional aspects, entrepreneurial strategies or the role of ICT. Besides, there are many rainfed areas such as flat lands or coastal lands where the typical watershed approach cannot be applied and, therefore, intervention strategies for these areas also need to be developed.

A need, therefore, was felt for a strategy handbook that would focus on livelihood augmentation in rainfed areas, which would draw upon the experiences of field implementation, and cull out the principles and strategies to help a practitioner adapt these in his/her context. Given the breadth of the subject, the authors found it practical to present the material in four volumes.

Dr. Astad Pastakia, a doctorate from the Indian Institute of Management, Ahmedabad, and author of *Locked Horns – Conflicts and their Resolution in Community-based Natural Resource Management*, agreed to anchor the project. Mr. Sachin Oza, Executive Director, DSC and a practitioner for 20 years, has co-authored the volumes with Dr. Pastakia. They were ably assisted by Mr. Virendra Vaghani, who has coordinated the entire project.

The development of these handbooks has not been easy and it has taken well over three years to bring them out in the current form. I am grateful to Aga Khan Foundation and the European Commission for having shown great patience and trust and for extending support to DSC in this endeavour. Needless to say, these volumes would not have been possible without the inputs of several organizations that have been toiling night and day to enhance the livelihoods of the poor. I am sure, that these volumes will make a significant contribution and add tremendous value to the existing literature on rural livelihoods.

Vijay Mahajan

Chairman, Development Support Centre

Preface

With the Green Revolution areas showing signs of fatigue, and public investments in rainfed regions not yielding the desired results, Indian agriculture once again finds itself at the crossroads. The crisis of productivity in agriculture is linked to an impending crisis of food security, reminiscent of the PL-480 days, prior to the Green Revolution. Whereas agricultural growth rates have stagnated, the population is growing at exponential rates. The per capita production of food grains dropped from an all-time high of 207 kg/person/yr in 1995 to 186 kg/person/yr in 2007. The per capita availability of agricultural land has declined from 0.48 ha in 1951 to 0.16 ha in 1991 and is likely to decline further to 0.08 ha by 2035. Looking at the magnitude of the problem and heeding the advice of the Planning Commission, the Prime Minister, Dr. Manmohan Singh, announced in 2007 a mega assistance plan of Rs 25,000 crores to state governments to boost agricultural productivity. However, whether these investments will produce the desired results will depend on how and where these resources are deployed.

It is our contention that a vast untapped potential exists in rainfed areas of the country. this has also been corroborated by a recent comprehensive assessment made by a team of international agricultural scientists (Wani, Rockstrom and Oweis, 2009). The keys to unlock this potential are also available, as demonstrated by the efforts of numerous non-governmental and governmental initiatives in the rainfed areas. However, the knowledge of what strategy works in what kind of situations remains diffused and often undocumented. The need of the hour is to consolidate this knowledge and extract principles and strategies that can be applied in similar situations elsewhere. It is precisely this exercise that led to the development of this handbook.

Although the initial idea was to focus on watershed development, the project widened its scope through an iterative process of search and reflection. The advisory committee of the project suggested broadening the scope to include other strategies being followed in rainfed areas, where watershed development cannot be applied, for instance, in flat lands and in regions with problems of saline and alkaline soils, laterite soils, etc. The committee also recommended focusing on livelihood augmentation, which is the ultimate objective of watershed development and other natural resource management (NRM) interventions. Market interventions came as a natural extension of post-watershed development. However, many market interventions, especially in the non-farm sector, were also ‘discovered’. These were initiated from scratch by social entrepreneurs and business houses with a social conscience. The need to consolidate

the knowledge about building human and social capital was evident to the editorial team right from the beginning. Most of the watershed manuals reviewed did not do justice to this theme, given the overriding importance of placing people in the centre of all developmental projects and processes. Another issue that was added at a later stage was the role of Information and Communication Technology (ICT) in augmenting livelihoods in the service sector as well as other livelihood interventions. It was soon realized that the team would not be able to do justice to all these issues within the stipulated pages of the volume. In consultation with the Aga Khan Foundation (India), which is supporting the project, it was, therefore, decided to bring out the handbook in four, stand-alone volumes, each covering a particular theme.

The compiling of information and experiences was pursued through multiple routes such as workshops and personal interviews of practitioners, literature reviews, and the Internet. Wherever cases were readily available, the information was updated and then included. Wherever interesting experiences were found but not documented, the authours took upon themselves to document these. As a result of this process of 'muddling through' and also in view of the expanded scope of the handbook, the project took much longer to complete. Progress was often painfully slow because the team depended on various actors to provide information and updates. Nevertheless, the journey has been an enriching one. The authours comprised a practitioner and an academic; this helped to keep the balance between theory and practice. The readability of the manuscript for the practitioner at the programme/project level, for whom the handbook is primarily designed, was under constant review.

Unlocking the potential of rainfed areas needs a conducive policy environment. There are indications to show that the policy for the development of rainfed areas is gradually moving in the right direction.

The National Commission on Farmers (2005) recommended a paradigm shift in the approach and implementation of watershed programmes in the country, and this has remianed the main plank for developing rainfed areas in an integrated manner. The Commission advocated partnerships among public sector, private sector, NGOs, and farmers, particularly the landless and women, through collective action and institutional mechanisms. It proposed a five-point action plan comprising:

i. Improving soil health to increase productivity.

ii. Promoting water harvesting, water conservation, and sustainable and equitable use of water.

iii. Ensuring access to affordable credit for crop and life insurance.

iv. Developing and disseminating appropriate technologies.

v. Improving opportunities, infrastructure, and regulations for marketing.

Taking cognizance of the above recommendations, the National Rainfed Area Authority (NRAA) was set up in November 2006, to focus on these areas. The main responsibilities of the NRAA have been identified as follows:

- Supporting the process of preparing strategic plans for watershed-based development projects at the state and district levels keeping in view specific agro-climatic and socio-economic conditions.
- Assisting in the preparation of state-specific technical manuals.
- Supporting state-level nodal agencies to identify resource organizations, and establishing capacity building arrangements.
- Facilitating action research relevant to watershed development programmes in different agro-climatic regions.
- Conducting evaluation, impact assessment, and thematic studies for improving the quality of watershed projects.
- Facilitating the convergence of different schemes and projects of the Government of India.
- Accessing additional funds from other sources, including private sector and foreign funding agencies to fill up critical gaps in the programme.
- Scaling up successful experiences through innovative organizations at the field level.

Subsequently, Common Guidelines for Watershed Development Projects (2008) were developed to provide a fresh framework for the next generation watershed programmes. The guidelines sought to bring about a unified perspective across all ministries. Unlike previous watershed guidelines, these gave priority to creating livelihood opportunities, productivity enhancement and conservation measures. The focus was on promoting farming and allied activities to promote local livelihoods while ensuring resource conservation and regeneration. The hope was, the new approach would systematically integrate livestock and fisheries management as a central intervention, and encourage dairy and marketing of dairy products. The project duration has been further enhanced to seven years and the financial allocation has been increased from Rs 6000/ha to Rs 12000/ha. The Guidelines emphasize equity and gender sensitivity, decentralization, need for committed and competent facilitating agencies, centrality of community participation,

capacity building and technology inputs, regular monitoring, evaluation and learning, and above all, establishing appropriate technical and professional support structures at the national, state, district, and project levels.

Having brought out the Common Guidelines, the challenge for policy makers and practitioners alike will be to see how best these can be executed. Considerable experience has been gained since the implementation of the Watershed Guidelines of 1995. Significant work has been carried out in the field of participatory NRM, rural entrepreneurship development, use of ICT, and institution development. These experiences are documented here to broaden the vision of the practitioner and provide him/her with insights into the *principles, strategies* and *best practices*. We hope that this will go a long way in stimulating and strategizing action while providing key insights for practitioners, policy makers, and researchers.

Some of the cases provided are useful for conducting training programmes. With the passage of time, the cases may become dated; however, the principles and strategies gleaned from them are likely to remain valid until such time that new knowledge is generated from new experiences in the field. It is our fond hope that this compilation will stimulate more action in the field, leading to the unlocking of the vast hidden potential of rainfed areas and the generation of new livelihood avenues for millions of poor in the country.

Astad Pastakia
Sachin Oza

Acknowledgement

Development Support Centre (DSC) has been working in the field of participatory natural resource management since 1994. As an organization involved in capacity building and support services, DSC found that there was a need for a comprehensive strategy handbook that looks at various aspects of livelihood augmentation in rainfed areas (LARA), viz., natural resource management, institution building, entrepreneurship, and the use of information and communication technology (ICT). These four volumes of the LARA handbook represent the culmination of two years of continuous efforts, to which many professionals and voluntary agencies from all over the country have contributed.

An advisory committee guided the project from the beginning. We wish to thank this group comprising Mr. Apoorva Oza, Dr. Sudershan Iyengar, Dr. R. Parthasarthy, Mr. Suneel Padale, and Dr. Indira Hirway for their guidance and encouragement throughout the project. Special thanks to Ms Tinni Sawhney, Mr. Somnath Bandopadhyay, Mr. Suneel Padale and Mr. Vivek Singh of Aga Khan Foundation, India, for their continuous encouragement, guidance and support during the entire process of developing and publishing the handbook.

We are grateful to reviewers of each volume for providing valuable feedback and comments. We are also thankful to professionals from various organizations, who have contributed the case studies, and have given their feedback and suggestions to enrich the handbook. We are equally grateful to the practitioners, who participated in various workshops organized during the course of the project, for volunteering their time, and sharing their valuable insights and experiences.

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Contents

Foreword *iv*
Preface *vi*
Acknowledgement *x*
Contents *xi*
List of Tables, Figures, Boxes *xiv*
Abbreviations *xvi*
Conceptual Framework *xxi*
How to Use the Handbook *xxv*

Part-1
Catching the Virtual Bus: ICT for Livelihood Augmentation **01**
1. Introduction **02**
Growth of ICT in India **02**
Extent of Digital Divide **04**
How ICTs can Benefit Rainfed Areas **04**
Grameen Gyan Abhiyan—Pushing for a Knowledge Society **06**
ICT Strategies for Livelihood Augmentation **12**
2. Basic Principles and Ethical Values **14**
3. ICT Strategies to Strengthen NRM Interventions **25**
Planning and Monitoring of NRM Projects **25**
RS and GIS in Micro-planning: Some Experiences **27**
Integrated mission for sustainable development 27
National watershed development programme 27
Irrigation systems 29
Joint forest management 29
Bio-diversity Conservation 29
Eco-profiling as a planning tool 30
Improving Reach and Effectiveness of Agri-advisories **32**
The internet and phone-based services 32
Community and interactive radio 39
On-demand video services 40
Protecting Lives and Livelihoods from Natural Disasters **44**
Early warning systems 44
Weather Insurance 47

4. ICT Strategies to Strengthen Self-help Movement and Micro-enterprise 50
Inclusive Banking and Financial Services 50
ICICI: Promoting women's SHGs 51
Ekgaon Technologies 52
Improving Access to Markets 52
Improving price discovery and price realization for farm produce 53
Promoting rural artisans and artists through virtual marketing 57
Addressing Information Needs of Rural Value Chains 58
Pro-poor agricultural value chains 58
Rural supply chains 61
5. ICT Strategies to Strengthen Government Delivery Systems 63
Improving Accountability and Management of Large Programmes 63
Rural employment guarantee schemes 63
National rural health mission 64
e-government: Improving Efficiency of Government Delivery Systems 66
Gyandoot: The knowledge messenger 68
Bhoomi: Reforming land records through process innovation 69
e-Seva: Bridging the gender divide 73
6. ICT: An Emerging Service Sector in Rural Economy 76
Promoting Literacy and e-Literacy 76
Literacy 76
e-Literacy 77
Edutainment 79
Promoting Self-employment and Nano-entrepreneurship 79
Drishtee: Creating a new vision for rural citizens 83
TARAhaat: Providing education for self-employment 84
Project Jyoti: Realizing Microsoft's 'Unlimited Potential' 85
Promoting Rural BPOs 85
7. Human and Social Capital for ICT Interventions 92
Introduction 92
Creating Human Capital at the Village Level 92
Creating Social Capital for Governance of VKCs 93
Creating Durable Partnerships for Knowledge Value Chains 96
8. Summary and Conclusions 98
Building Durable Partnerships 98
Entrepreneurial model 98
Grant-based model 99
Cooperative model 100
Optimizing Services and Products 100

Knowledge services 100
Information services 101
Planning for Technological Obsolescence 102
References 103

Part-2
Best Practices 107

1. e-Choupal 108
2. mKRISHI 116
3. Village Knowledge Centres—MSSRF 124
4. Source for Change 133
5. TARAhaat 139
6. Drishtee 146
7. Ekgaon 153

Annexures

1. Glossary of Terms 162
2. Resource Guide 167
3. Resource Institutions and Programmes 171
4. About the Contributors 199

Index 204

List of Tables, Figures, Boxes

List of Tables

1.1: Range of Services Available at Information Kiosks 05
1.2: Strategies and Illustrations 13
2.1: Partners in the Fisher Friend Value Chain 17
3.1: Parameters Measured by Indian Remote Sensing Satellites 26
3.2: Three Models of Agri-advisory: A Comparative Analysis 36
6.1: Comparative Analysis of Three BPOs 89

List of Figures

1.1: Global Trends in the Growth of ICTs 03
1.2: Hub-and-Spokes Model Used by MSSRF 07
3.1: Satellite Images of Machhan River before and after Treatment 28
4.1: Categories of Information Flows in Agricultural Value Chains 59
5.1 : E-government Evolution: Four Critical Stages 67
8.1: Pattern of Information/Knowledge Services Provided by VKCs 101

List of Boxes

1.1: GoIs Initiatives 09
1.2: India Inspired ICT Missions 11
2.1: Powering a VKC with Renewable Sources of Energy 18
2.2: Rural Clients Add Value to ICT Products and Services 21
2.3: World's Cheapest Radio Station 22
2.4: The 'Ten C' Criteria 24
3.1: Scientific Eco-profiling as a Planning Tool 31
3.2: eSagu: The Personalized Agro-advisory System in Andhra Pradesh 33
3.3: Kisan Call Centre 34
3.4: DSC's Interactive Radio Programme 41
3.5: Digital Green: Participatory Video for Agricultural Extension 43
3.6: Locust Watch 46
3.7: India's National Tsunami Early Warning System 48
4.1: Gramin Suvidha Kendra: A Partnership for Inclusive Growth of Farmers 54
4.2: AMUL: More value through better use of ICT 60
5.1: Gyandoot: The Knowledge Messenger Gone Astray 68
5.2: Bhoomi: Convergence of Administrative and Political Will 71

6.1: Project Shiksha: Empowering the Future 77
6.2: Akshaya: Making Malappuram the First e-literate District in India 78
6.3: SLS: An Entertaining Way to Literacy! 80
6.4: Harnessing Digital Games for Literacy and e-education 81
6.5: Computerji Makes the Necessary Connections! 86
6.6: Sai Seva BPO 88
7.1: Community Video: Empowering Rural Citizens through Innovative Use of ICT 94

Abbreviations

ACE	Akshaya Centre Entrepreneurs
AIC	The Agriculture Insurance Company of India
AIR	All India Radio
AKRSP	Aga Khan Rural Support Programme
APFAMGS	Andhra Pradesh Farmer Managed Groundwater Systems
APMC Act	Agricultural Produce Marketing Committee Act
APREGS	Andhra Pradesh Rural Employment Guarantee Scheme
B2C	Business-to-Consumer
BOOT	Build-Own-Operate-and-Transfer
BOs	Branch Offices
BPO	Business Process Outsourcing
BREW	Binary Runtime Environment for Wireless
BTN	Bangladesh Telecentre Network
CAGR	Compound Annual Growth Rate
CAPs	Conservation Action Plans
CBFL	Computer Based Functional Literacy
CDMA	Code Division Multiple Access
CEPT	Center for Environmental Planning and Technology
CGIAR	Consultative Group on International Agricultural Research
CFM	Community Firndly Movement
CIC	Central Information Ccommission
CICT	Commission on Information and Communication Technology
CIDA	Canadian International Development Agency
CII	Confederation of Indian Industry
CMC	Community Multimedia Centre
CSC	Common Service Centre
CSR	Corporate Social Responsibility
CSIR	Council of Scientific & Industrial Research
CTLC	Community Technology Learning Centres
CUG	Close user group
DA	Development Alternatives
DCR	Digital Craft Revival
DEM	digital elevation model
DG	Digital Green

DGF	Development Gateway Foundation
DoIT	Department of Information and Technology
DOS	Department of Space
DRDA	District Rural Development Agency
DSC	Development Support Centre
DSS	decision support system
DST	Department of Science and Technology
DTM	digital terrain model
EDP	Entrepreneurship Development Programme
EDSS	Enterprise Development and Support Services
Edu-Sat	The Education Satellite
EMPRES	Emergency Prevention System
FES	Foundation for Ecological Security
FRS	Fertilizer Recommendation System
G2B	Government-to-Business
G2C	Government-to-Citizen/Consumer
G2G	Government-to-Government
GDP	Gross Domestic Product
GGA	Grameen Gyan Abhiyan
GIAN	Grassroots Innovations Augmentation Network
GIS	Geographical Information Systems
GKP	Global Knowledge Partnership
GoI	Government of India
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GSK	Gramin Suvidha Kendra
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT4D	Information and Communication Technology for Development
IDM	International Development Management
IDRC	International Development Research Centre
IFFAD	International Foundation for Fair-trade and Development
IFFCO	Indian Farmers Fertiliser Cooperative Limited
IGNOU	Indira Gandhi National Open University
IIIT	Indian Institute of Information Technology
IIITM-K	Indian Institute of Information Technology and

	Management-Kerala
IKSL	IFFCO Kisan Sanchar Limited
IL&FS	Infrastructure Leasing and Financial Services Ltd.
IMSD	Integrated Mission for Sustainable Development
INCOIS	Indian National Centre for Ocean and Information Services
INTEWS	Indian National Tsunami Early Warning System
IPM	Integrated Pest Management
IRS	Indian Remote Sensing Satellite
ISAP	Indian Society of Agribusiness Professionals
ISRO	Indian Space Research Organisation
IT	Information Technology
ITC	Indian Tobacco Company Ltd.
IVRS	Interactive Voice Response System
JLG	Joint Liability Groups
KCC	Kisan Call Center
KSITM	Kerala State IT Mission
KVK	Krishi Vignan Kendra
KW	Knowledge Worker
MCR	Micro Concrete Roofing
MCX	Multi Commodity Exchange of India Ltd.
MDG	Millennium Development Goals
MF	Micro Finance
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MILLEE	Mobile and Immersive Learning for Literacy in Emerging Economies
MLA	Media Lab Asia
MMP	Mission Mode Projects
MoES	Ministry of Earth Sciences
MoIB	Ministry of Information and Broadcasting
MPEDA	Marine Products Export Development Authority
MSSRF	M.S. Swaminathan Research Foundation
NAFED	National Agricultural Cooperative Marketing Federation
Nasscom	National Association of Software and Services Companies
NDVI	Normalized Differential Vegetation Index
NeGP	National e-Governance Plan
NIC	National Informatics Centre
NIF	National Innovation Foundation
NISG	Networking & Internet Software Group

NRHM	National Rural Health Mission
NRM	Natural Resource management
NRSA	National Remote Sensing Agency
NSEAP	National Spot Exchange for Agriculture Produce
NVA	Jamshetji Tata National Virtual Academy for Rural Prosperity
OWSA	OneWorld South Asia
PDA	Personal Digital Assistant
PI	People's Institution
PIA	Project Implementing Agency
PPP	Public Private Partnership
PRA	Participatory Rural Appraisal
PRI	Panchayati Raj Institution
QCS	Quality Control Specialist
RESCO	Remote Sensing and Communication Centre for Gujarat
RIN	Rural Innovations Network
RKC	Rural Knowledge Centre
ROSCA	Rotating Small Savings and Credit Associations
RRA	Rapid Rural Appraisal
RS	Remote Sensing
RTI	Right to Information
RTC	Right to/for Tenancy and Cultivation
S4C	Source for Change
SAC	Space Application Centre
SADKN	SAARC's disaster knowledge network
SBI	State Bank of India
SDC	State Data Centre
SFC	Source for Change
SHG	Self Help Group
SLS	Same-language Subtitling
SPOs	Sub Post Offices
SRISTI	Society for Research and Initiatives for Sustainable Technologies and Institutions
SWAN	State Wide Area Network
TAC	ToeHold Artisans Collaborative
TARA	Technology and Action for Rural Advancement
TCIL	Telecommunications Consultants India Ltd.
TCS	Tata Consultancy Services
TERI	The Energy Research Institute, India

TEWS	Tsunami Early Warning System
TFTP	Technology for the People
TWINS	Twin Cities Network Services Project
UP	Unlimited Potential
VASAT	Very Small Aperture Terminal
VKC	Village Knowledge Centres
VRC	Village Resource Centres
VSAT	Very Small Aperture Terminal
WAP	Wireless Application Protocol
WLL	Wireless in Local Loop
WV-I	World Vision-India

Conceptual Framework

Our understanding of Livelihood Augmentation (LA) is derived from the overall objectives of development, which have, over the years, come to mean 'growth with social equity and stability'. The notion of 'sustainability' has been included as an equally important goal in the wake of the environmental movement. The idea of equality includes elimination of discrimination on the lines of caste, class, gender, and other social considerations. Hence, LA must lead to the following key outcomes:

i. Increased income of households in target areas / communities

ii. Diversified sources of income for the household

iii. Reduced vulnerability to production and market risks

iv. Increased carrying capacity of the watershed or unit area of land as a result of the above

v. Increased equity and empowerment of the poor and marginalized

vi. Increased participation and empowerment of women

vii. Sustainable use of natural resources

viii. Increased resilience of natural resources and communities to cope with changes in future, including those due to climate change

Figure 1 provides a framework showing how different groups of strategies work towards this common goal of livelihood augmentation in rainfed areas (LARA) viz.:

a) Natural resource management strategies

b) Entrepreneurial strategies

c) Information and communication strategies

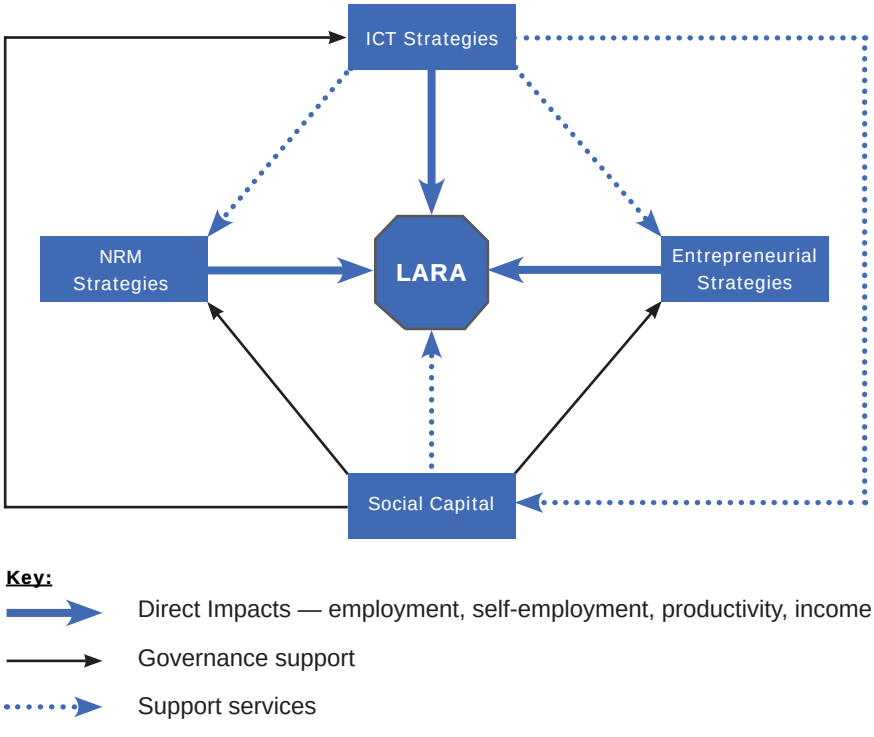
d) Social capital development strategies

Natural Resource Management (NRM) Strategies

Both historically and logically, approaches that make investments in conservation and sustainable use of natural resources are the most prevalent and serve as the starting point. The net effect of NRM interventions is to increase productivity leading to better income as well as enhanced quality of life for rural households. NRM strategies could

be built around conservation of land, water, and biomass. It would lead to increased productivity of agriculture, forests, pasture lands, livestock, and even non-farm activities dependent on these or other natural resources — such as weaving, fabric making, toy making, embroidery, etc.

Figure 1: Framework for Livelihood Augmentation



Entrepreneurial Strategies

Today helping farmers and rural artisans to secure remunerative prices have spawned a number of market interventions. In some cases, accessing distant markets has been facilitated through the process of collectivization and value addition. In other cases, social entrepreneurs themselves have worked backwards from the markets to build value chains that benefit poor artisans and primary producers. Market interventions lead to value addition and enable the primary producer to get his/her rightful share in the terminal price of the value chain.

Information and Communication Technology (ICT) Strategies

Recent developments in the ICT sector has made it possible to open up new vistas in the service sector in rural areas. Examples include the emergence of rural BPOs and information kiosks that provide a host of e-services to farmers and other villagers. However, ICT is not just about the service sector. Its applications are so widespread that ICT has emerged as a cross-cutting force, helping to improve efficiency of all kinds of development interventions through a variety of support services. ICT provides new tools like Remote Sensing and Geographic Information Systems to enable better planning and monitoring of NRM interventions. It has made it possible to provide farmers in remote villages with farm specific agri-advisories of highly qualified agricultural experts. It has stimulated the self-help and self-employment movement through access to information and knowledge via village kiosks. It has also enabled farmers, traders and nano-entrepreneurs to benefit from access to market intelligence and alternative markets. Lastly, ICT applications have the potential to make government delivery systems more transparent and accountable by placing knowledge and information in the hands of the users.

ICT interventions have worked wherever these have effectively addressed the felt needs of the rural population, and helped cut transaction costs for both the service provider as well as the rural customer.

Social Capital

The above interventions can become effective and sustainable only when the local communities are in charge of the development process. Over the past two decades, NGOs have successfully evolved participative tools and techniques for facilitating developmental processes and building social capital. This includes building the capacities of local communities through exposure, training and skill building, and facilitating the emergence of People's Institutions (PIs), also known as community based organisations (CBOs). PIs serve the purpose of self-governance and collective decision-making with egalitarian values such as democracy, unity, equity, gender sensitivity, and ecofriendliness. These institutions also help bring out the collective strength of marginal and scattered producers in negotiating and/or partnering with external agencies, including markets, financial institutions, technology providers, and the government.

In the process, PIs become training grounds for developing community leaders and in empowering marginal producers. Hence, social capital development can be seen both as a means as well as an end of the development process.

Organization of the Handbook

This handbook is organised in four volumes.

i. **Volume I** deals with experiences of improving livelihoods through investments in the natural resource base. This includes both watershed development initiatives as well as specialized NRM interventions for areas where watershed development may not be possible or even relevant.

ii. **Volume II** provides experiences of augmenting livelihoods through market-led interventions, including interventions that address market imperfections and those that seek to tap or create market opportunities. Strategies for value-chain interventions are discussed as a special case of market-led interventions. These seek to augment livelihoods of the poor and marginalized through interventions at different nodes of the value chain by forming strategic alliances with different stakeholders/players in the chain.

iii. **Volume III** puts together the knowledge gleaned from innovative approaches to augment rural livelihoods through the use of ICT. ICT helps to augment livelihoods, especially of the educated youth by creating new opportunities in the service sector. Although ICT applications encompass all aspects of rural life, we have focused more on those that enable creation of human capital and livelihood augmentation.

iv. **Volume IV** dwells upon the difficult task of facilitating the creation of PIs and building the capacity of rural women and men, to implement livelihood projects. PIs help to oversee the maintenance of common assets after the completion of the project.

How to Use the Handbook

*"I used to think I was **poor**. Then they told me I wasn't poor, I was **needy**. Then they said needy was an expression that is self defeating, I was actually **deprived**. Then again they said deprived created a bad image, I was actually **underprivileged**. Now they say underprivileged is inaccurate. I am actually **disadvantaged**. I still don't have a dime, but I sure have a rich vocabulary!"*

– Jules Feitter

Development academics are known for their penchant for creating jargon where there is need for none, points out Pulitzer-Prize and Oscar-winning cartoonist and novelist Jules Feitter in his inimitable style. This may be one of the reasons that puts off the practitioner from reading academic literature, which otherwise may have useful content. The authors were painfully aware of this limitation when attempting to write this handbook. One self-correcting mechanism was to have a team of writers—one a practitioner, the other an academic. Efforts were also made to persuade (or cajole!) practitioners to take a look at the draft volumes and give their reactions. Despite our best efforts to make the volumes reader-friendly, we may have not succeeded completely, especially where we have drawn upon existing theoretical frameworks. To overcome this difficulty, we have provided a glossary of technical terms at the end of each of the four volumes.

Whereas the handbook is largely written to serve as reference material for the practitioner, it may serve other purposes as well. We believe there will be four categories of readers for this handbook.

a. The largest category comprises the practitioners, who may like to use it as a reference book.

b. The academics-oriented practitioners and/or researchers wanting to get a more complete understanding of one or more of the four themes presented in the handbook constitute the second group. Admittedly, this group will be much smaller.

c. A small minority may comprise individuals, who will not be satisfied with just one or two themes but will want to read the entire handbook in order to get a holistic understanding of the problems and opportunities of promoting livelihoods in rainfed areas.

d. We expect that training and support agencies will find this handbook useful from the training perspective. The handbook provides a large number of case studies, some of which have been already tested as training material.

Structure of the Handbook

For all categories of readers, it is necessary to understand how the series and the book are structured.

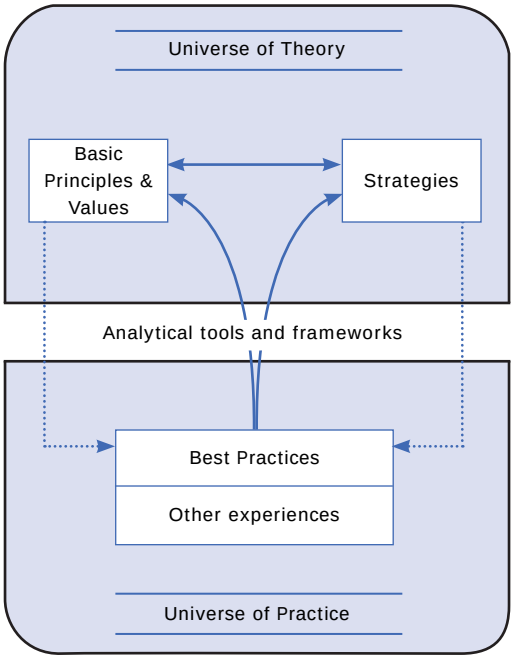
Broad structure

There are four volumes under a common framework. The first part of Volume 1 has a detailed introduction, which is common to all the volumes. Barring this, each volume stands alone.

Each volume comprises a) selected case studies of *best practices*, b) articulation of *basic principles and ethical values* and *c)* description of *strategies*. It also provides an understanding of why particular strategies work better in particular situations. The basic principles and strategies are derived from analyses of the case studies and other experiences and represent the transition from practice to theory (Figure 1). The feedback loop shows that the strategies presented may stimulate more action, leading to new best practices. Depending on one's orientation, the reader can start from practice and end up with theory, or vice versa. Analytical tools and frameworks used to understand strategies are included in the theory section. Human interest stories and checklists of various types are presented as Box items.

Additional information has been provided in the Annexures, keeping in mind the need of the practitioner. The annexures of each volume includes a *glossary of technical terms*, a *resource guide* and a guide to key *resource institutions*. The Resource Guide is in the form of an annotated bibliography of other guide books and references that a practitioner may find useful to pursue a particular strategy. Several of these are in the nature of 'how-to-do' books, covering related sectors and providing technical information, beyond the purview of this handbook. A guide to Key Resource Institutions, with contact details and short descriptions of their important projects/programmes, is also included.

Figure 1: Structure of Each Volume



Volume-specific structure

Each volume can be read as a stand-alone. It is, however, best read in conjunction with the other volumes for a more holistic understanding of the livelihood augmentation processes. The structure of the presentation varies somewhat from volume to volume, depending on the nature of content. A *navigation chart* presented at the beginning brings out the connections between different parts and chapters of the volume. The *index* at the end of each volume will help the reader to locate matter of his/her particular interest with relative ease.

Part-1

Catching the Virtual Bus: ICT for Livelihood Augmentation

Source: khemkafoundation.org

1. Introduction
2. Basic Principles and Ethical Values
3. ICT Strategies to Strengthen NRM Interventions
4. ICT Strategies to Strengthen Self-help Movement and Micro-enterprise
5. ICT Strategies to Strengthen Social Capital and Government Delivery Systems
6. ICT: An Emerging Service Sector in Rural Economy
7. Human and Social Capital for ICT Interventions
8. Summary and Conclusions

1 Introduction

India's growth story in the new millennium has been scripted to a considerable extent by its ability to embrace Information Communication Technology (ICT). Within a short span of time corporate entities like Infosys, TCS, WIPRO, HCL, etc have done India proud and become brand names to reckon with. Owing to its competitive advantage of having a large force of skilled labour, India has also emerged as a major destination for Business Process Outsourcing (BPO).

This success story has been accompanied by a growing unease at the potential consequences of a rapidly increasing 'digital divide' between the urban and the rural sections of society. Determined not to miss the opportunity of the millennium to harness ICT's tremendous potential for development in rural areas, a number of concerned individuals from private and public sectors, and civil society have taken initiatives to bridge this divide through innovative service delivery/business models. These initiatives would enable poor and marginalized farmers, and other villagers to easily access the benefits of new technology and information in their day-to-day lives, especially their livelihoods.

At present rural India is witnessing the emergence of new brand names like e-Choupal, Drishtee, TARAhaat, n-logue, e-Sagu, mKRISHI, Bhoomi, KISAN etc. While pursuing their independent goals, these corporate/social entities are contributing in their own ways to the transformation of rural India into a knowledge society. They have succeeded, where many others have failed, to tap the latent skills of young rural women and men and set up knowledge centres/kiosks that would accelerate the pace of development in a variety of ways. In this volume, we look at the range of strategies deployed, as derived from the analysis of selected case studies.

Growth of ICT in India

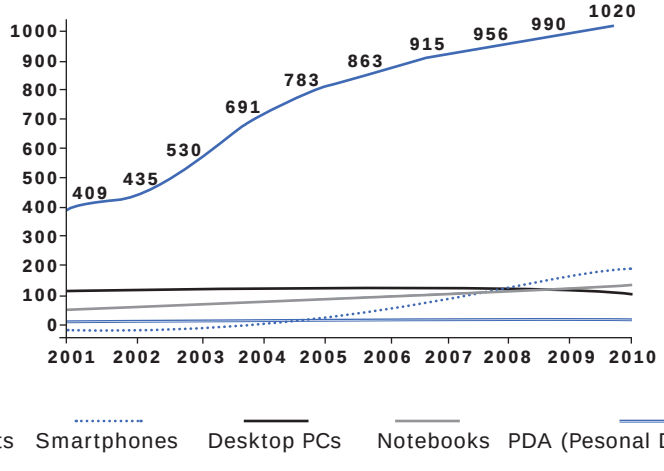
Before commencing the discussion on the growth of ICTs and digital divide, we need to understand the technologies clubbed under ICT. ICT is popularly used interchangeably with the term Information Technology (IT). According to Heek (1999):

> ICT can be defined as electronic means of capturing, processing, storing and communicating information. It may comprise of computer hardware, software

and networks but may also include intermediate technologies like radio and television, literate technologies like books and newspapers and organic technologies based on human body like brain and sound waves.

Although, by definition, the scope of ICT is quite broad, most observers tend to collect and analyze data on technologies commonly associated with computers, the Internet, mobile phones and other related electronic gadgets. The global forecast of ICT given in *Strategy Analytics* (Figure 1.1) is a good example. The figure shows that the trend of using mobile phones and hand-held devices is growing at a much faster rate than the use of computers and the Internet. The increasing penetration of mobile networks and handsets in rural India, therefore, presents an opportunity to deploy information and knowledge services for rural consumers on a wide scale.

Figure 1.1: Global Trends in the Growth of ICTs



Globally Indian telecom service is the fastest growing market. From 65 million subscribers in 2005, it grew to 470 million by August 2009. Since then, 15 million new subscribers are being added every month (Rajendran and Sen, 2009). According to the world's leading IT research and advisory company Gartner Inc. ICT market in India is estimated to grow at a five-year compounded annual growth rate (CAGR) of 20.3 per cent to reach $24.3 billion (about 2 percent of the country's GDP) by 2011. (*The Hindu*, February 7, 2008).

A report (December 2008) by Confederation of Indian Industries (CII) and Ernst and Young estimated that of the 250 million Indian wireless users, approximately 100 million (40 percent) were from rural areas. It estimated that by 2012, rural users will account for over 60 percent of the total telecom subscriber base. This exponential

growth is not just limited to India; other South Asian countries like Nepal, Pakistan, Sri Lanka and Bangladesh are also experiencing growth in mobile penetration. Drawing from the above, it appears that new applications on hand-held devices are poised to revolutionize the rural economy by bringing vital services to rural clients at affordable prices to their doorstep.

Extent of Digital Divide

Although India is emerging as a leader of IT in Asia, one of its main challenges is to mitigate the gap between the information haves and the information have-nots—usually known as the 'digital divide'. The American report *Falling through the Net* (US Department of Commerce, 1995) was one of the first to recognize the digital divide, finding that those least likely to have access to ICTs were "those with low incomes, those living in rural areas, those without a high school education, senior citizens and women." Various government reports in India suggest that an "estimated 20 million people are likely to be excluded from the knowledge economy" unless special measures are taken to bridge the digital divide (Shroff, 2009).

How ICTs Can Benefit Rainfed Areas

ICTs have the potential of transforming rural lives by impacting a wide spectrum of sectors, ranging from education and health to stimulating and diversifying the rural economy. The village knowledge centres (VKCs) or information kiosks provide a variety of information and knowledge services ranging from e-governance to market intelligence and e-health to e-commerce. Table 1.1 provides an idea of the range of services that farmers and other villagers can access from kiosks right at their doorstep. While private players like ITC have already blazed a trail with over 40,000 such kiosks called 'e-Choupals', the Department of Information Technology (DoIT) has been quick to take the cue and is in the process of setting up over 100,000 kiosks called Common Service Centres (CSCs). These centres are located in such a way that each centre can be accessed by six villages, thereby covering all the six lakh villages in the country.

As the table shows, the range is very wide and is constantly increasing because new applications get channelled through information highways that are being created at a great pace. In this chapter, however, we will focus only on those applications that enable poor women and men to augment and/or protect their livelihoods. And before we look at specific applications and strategies, we must first get an overview of the movement of taking ICTs to the rural countryside in India and other developing countries.

Table 1.1: Range of Services Available at Information Kiosks

Category	Services
e-Agriculture	
Farming	Plot-specific agricultural advisories; aggregation of demand for and supply of inputs (like seeds and fertilizers, procurement of equipment and tools from market, and hiring), weather reports, disaster warnings, control of pest-epidemics, best practices
Animal husbandry, poultry, fisheries, etc.	Advisories on animal health and veterinary services, finance and government schemes, information on breeds and livestock husbandry, best practices
Inclusive banking	Accessing micro-finance, crop insurance, life insurance and other financial services at farmers' doorstep
Market intelligence	Market intelligence and better price discovery mechanisms, warehousing facilities, better material handling with minimal wastage, transparency in quality assessment, etc.
e-Governance	
Citizen services	Birth and death certificates, matrimonial, cyber café, contact directory for various services, forms and procedures, etc.
Land/Property	Land records, property transfer and registration, property tax, property rules and regulations, land income certificates
Employment	Job opportunities exchange, registration, self-employment schemes
Social welfare	Schemes and benefits, directory of NGOs, citizens rights
Utility services	Applications, outstanding bill statements, bill collection of various utilities, grievance redressal
Panchayat matters	Birth certificate, death certificate, utility connection, property transfer and registration, tax rules, tax payments, license and concessions, permits
e- Health	Vaccination schedule, maternity care, family planning, medicines, ambulance services and transportation, hospital, primary health-care centre information, blood bank information, life saving drugs, doctors' database, appointment with doctors, e-diagnostics, materials management systems for medicines, etc.
e-Education	
Formal education	School, college and university information, syllabus, education results, education abroad, schemes and scholarships, counselling, FAQs, etc.
	Distance learning, vocational training, computer-aided learning
Consumer welfare	Consumer rights, consumer courts, legal assistance
Literacy	Computer-aided literacy schemes, numeric literacy, non-formal education
Computer literacy	Use of computers, Internet, certified courses, training for BPOs, web-designing, animation, etc.

Continued...

Category	Services
e-Commerce	
Business	Procedures, documentation, forms, schemes (subsidy, loans), compliances with government rules and laws, desktop publishing, data entry work, BPO, etc.
Virtual marketing	Product guides on websites, booking orders on-line
Environment	Pollution control information, forms, environmental compliance, grievance and redressal
Tourism and transport	Room availability and booking, booking of long-distance bus tickets, information on transport routes, sight-seeing places, e-ticketing of railways, airways, etc.
Entertainment	Video and cable TV, screening movies, video games, educational games, etc.

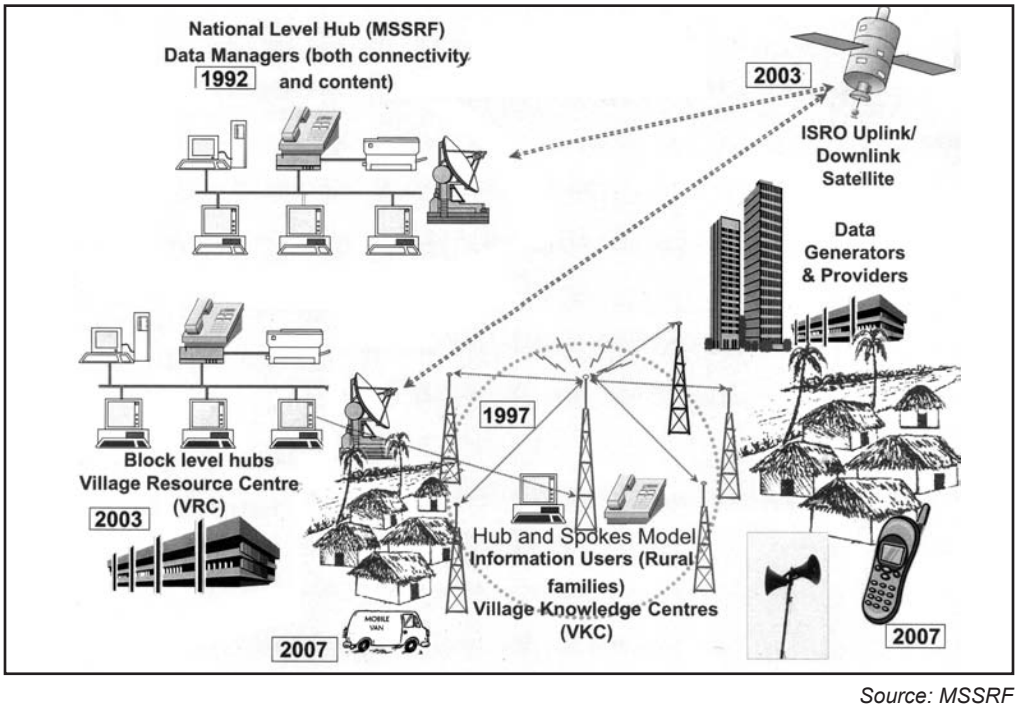
Grameen Gyan Abhiyan (GGA)—Pushing for a Knowledge Society

Foremost among those who pioneered the concept of VKC were eminent scientists Prof M S Swaminathan and his colleagues at the M S Swaminathan Research Foundation (MSSRF), Chennai. By 2004, MSSRF had gathered considerable experience in promoting VKCs, using the 'hub-and-spokes' model (Figure 1.2). It was soon realized that the task of reaching out to more than six hundred thousand villages in the country would be enormous, needing partnerships among a wide range of stakeholders including public and private companies, government, NGOs, village-level entrepreneurs and knowledge workers (KWs), and village communities. New applications would have to be created to meet the specific needs of villagers. An eco-system of strategies and approaches would be needed to cater to the information and knowledge requirements of over 700 million rural citizens living in diverse socio-cultural and ecological settings. The magnitude as well as the urgency of the situation demanded that all these stakeholders be brought together on a common platform. The leadership to make that happen came from none other than Prof Swaminathan, who exhorted various stakeholders to come together for a common purpose. His words, "Seemingly impossible tasks can be achieved by mobilizing the power of partnership!" appear prophetic in the backdrop of the impressive steps taken by India in bridging the digital divide under the aegis of Mission 2007 (now known as Grameen Gyan Abhiyan—Rural Knowledge Movement).

During a national consultation organized by MSSRF in May 2004, participants felt that it was essential to establish a National Alliance (hereafter Alliance) with the mission to "take the tools of ICT for enhancing agrarian and rural prosperity and well-being, on

the principle of social inclusion in access to technology." In June 2004, this Alliance came into existence with an initial membership of 40 institutions. The mission's goal was to "take ICT to every village in the country through a multi-pronged strategy to a substantial extent by the 60th anniversary of Independent India." Since this fell on August 15, 2007, the ICT mission came to be known as Mission '07 (MSSRF, 2004).

Figure 1.2: Hub-and-Spokes Model Used by MSSRF



Source: MSSRF

By the appointed date, Mission '07 found itself falling short of its rather ambitious goals. Nevertheless, it had made considerable progress in the area of influencing public policy and mobilizing public and private investments for its cause. The GoI included ICT as an important strategy in its Bharat Nirman Programme. Mission '07 succeeded in positively influencing the government's broadband policy (2004), which allows at least 2 MB for rural broadband connectivity. The Ministry of Information and Broadcasting, released its Community Radio Policy on November 18, 2006. As per this policy, a non-government organization could get a license to air radio programmes relevant to the needs of the community from their own stations, and would not have to get it from the campus stations run by educational institutions or buy time on All India Radio (AIR). Through its third convention, the Alliance sought to bring about a convergence of various national missions like the literacy and health missions.

The government committed resources through its various institutions. The Indian Space Research Organisation (ISRO) launched Edu-Sat, after which 500 rural knowledge centres (RKCs) were set up at the block level. These centres provide satellite connectivity to VKCs, following the hub-and-spokes model. By the end of the XI Five Year Plan, ISRO plans to set up 4,500 such centres all over the country. IGNOU came forward to lend its infrastructure for distance learning and capacity building. The Department of Information and Technology (DoIT) set aside resources to launch its CSC scheme covering one lakh knowledge centres to be completed by 2008. BSNL provided connectivity to another 60,000 villages. The Mission helped the creation of a framework for government programmes like State Wide Area Network (SWAN), State Data Centres (SDCs), CSCs and National e-Governance Plan (NeGP). (Box 1.1 for details.)

The private sector too became actively involved with the Mission activities, with many of the important technology providers like Microsoft, QUALCOMM, Intel and HCL taking initiatives to promote new applications and products designed to meet the needs of the rural consumer. QUALCOMM developed its hybrid PC, Intel developed a rugged PC to operate in difficult environmental conditions and HCL developed its own version of a rural PC. Besides connectivity and access devices, considerable effort was put in to develop content, relevant to the needs of the rural population in local languages so that they would be able to understand it. The MSSRF launched Jamsetji Tata National Virtual Academy (NVA) with the goal of training rural KWs as change agents, who would be the torchbearers of the knowledge revolution in rural India. The NVA

Box 1.1: Government of India Initiatives

- SWAN: The aim of the SWAN Programme is to provide internet connectivity across the State and to provide IT infrastructure up to the block level. The DoIT provides technical and financial support for creating this infrastructure.
- SDC: SDCs enables the states to consolidate services, applications and infrastructure to provide electronic delivery of Government-to-Government (G2G), Government-to-Citizen/Consumer (G2C), and Government-to-Business (G2B) services.
- CSC: CSCs are designed to empower citizens with information, knowledge and services at their doorstep. In 2005, the DoIT and GoI, appointed Infrastructure Leasing and Financial Services Ltd. (IL& FS) as the national-level service agency for implementing 1,00,000 CSCs, covering 600,000 villages across the country. IL&FS is working on four thematic areas, namely, agriculture, education, health and financial inclusion, to make available content relevant to rural communities.
- NeGP: On May 18, 2006, the GoI approved the National e-Governance Plan. Under the NeGP, various types of services are provided electronically through the ICT platform to citizens at their doorstep through kiosks (CSCs). The central government has approved 27 Mission Mode Projects (MMPs), which fall into three categories as indicated in Table 1. An Apex Committee of NeGP has been constituted to oversee the programme, with the Cabinet Secretary as Chairman. The DoIT is the facilitator and a catalyst for the implementation of the programme.

Table 1: Mission Mode Projects under NeGP

State MMPs	Central MMPs	Integrated MMPs
Agriculture	Banking	CSC
Commercial taxes	Central excise and customs	e-Biz
e-District	Income tax	e-Courts
Employment exchange	Insurance	e-Procurement
Land records	MCA21	e-Trade
Municipalities	National citizen database	NeGP gateway
Panchayat	Passport, immigration and visa	India portal
Police	Pension	
Property registration	e-office	
Road transport		
Treasuries		

Source: TelecomLive. (2007). Digital Inclusion for Rural Transformation.

organizes a fellow programme to recognise the contribution of village level leaders and to provide them access to lifelong education opportunities. By 2008, it had more than 1,000 Fellows, with plans to develop another half a million Fellows and provide them continuous education through distance learning.

In 2007, the partners of the Alliance decided to continue the movement under the name Grameen Gyan Abhiyan. The Alliance developed the following strategy to take the benefits of ICT to all parts of the country (GGA Secretariat, 2008):

- *VRCs to be established with the help of ISRO at the block level*: All VRCs would have satellite connectivity and tele-conferencing facilities in order to provide e-Health, e-Literacy, e-Commerce and other demand-driven dynamic services.
- *VKCs, or Gyan Choupals, to be established at the panchayat or the local body level:* All VKCs would have the Internet connectivity, with training facilities for local school students.
- *Last mile and last person connectivity*: This would be achieved through the integrated use of the Internet and cellular phones or FM radio or public address systems.
- *Showcasing of recent innovations and applications*: This would be organized and demonstrated in the Technology Pavilion of the Annual convention of the GGA.
- *Rural Innovation Fund*: This has been established with the help of telecenter.org, International Development Research Centre (IDRC), Canada, and Microsoft, to promote a spirit of entrepreneurship and inventiveness in the development of technologies for rural areas. The first round of competition in 2007 attracted more than 950 proposals, of which the best 9 were awarded small grants to support innovative application development.

The Mission (now GGA) has been instrumental in catalyzing a number of strategic partnerships, innovations and initiatives, some of which are shared in this volume. Others may be found in the Mission's reports of annual conventions as well as other documents and on its website (Resource Guide, Annexure 2). The Secretariat is housed in MSSRF, Chennai. The GGA website (www.gga.org.in) provides updates and keeps its growing number of members (600 institutions on the last count) informed of the latest developments.

India's success in trying to bridge the digital divide on a scale that is unprecedented in the world has inspired similar initiatives in a number of other countries. Mission

'07 has had a domino effect, prompting ICT stakeholders and players in Bangladesh, Philippines, Nepal and 53 African countries to create public networks of info-kiosks in their own countries (Box 1.2).

Box 1.2: India Inspired ICT Missions

PAN-African e-network

The project, with an investment of Rs 5,430 million, is being funded by Ministry of External Affairs, GoI, and aims to connect all the 53 nations of the African Union by a satellite and fibre-optic network with seven reputed Indian universities and 12 super specialty hospitals. The project, to be implemented by Telecommunications Consultants India Ltd., a public sector enterprise of the Ministry of Communications, will help in the sharing of India's expertise in the fields of health care and education.

Mission Swaabhimaan of Nepal

Mission Swaabhimaan, organized by the Forum for Information Technology with support from 'telecenter.org', was born out of a desire to replicate the Indian experience of Mission '07. A delegation of eight Members of Parliament (MPs) visited India in May 2007 to learn first-hand from India's experience of using ICT for development. By 2008, there were about 200 tele-centres in Nepal. The Mission has plans to create 1500 tele-centres as envisaged in the XII Five Year Plan of Nepal.

Mission 2011 of Bangladesh

The newly created Bangladesh Telecentre Network (BTN) has set a target of about 40,000 tele-centres by 2011 (called Mission 2011), coinciding with the 40th anniversary of Bangladesh's independence. Launched on 13 January 2007, with a membership of 20 institutions, BTN will strive to help villagers have access to livelihood services through ICTs.

Community e-Centres of Philippines

In Philippines, the tele-centre movement has gained ground with support from both the national government and the civil society organizations. By 2008, there were more than 300 tele-centres in operation, a majority of which are supported by the government. Mission '07 served as a model for networking the tele-centres and drawing a roadmap for the future. The Commission on Information and Communication Technology (CICT) was identified as the umbrella organization that will coordinate the activities of the Alliance, which drew up a roadmap for 2007–10.

Source: TelecomLive (2008), Digital Inclusion for Rural Transformation.

ICT Strategies for Livelihood Augmentation

ICTs have touched almost every aspect of modern life, rapidly transforming societies into knowledge societies. ICT represents a cross-cutting theme, with potential to strengthen all three areas of our model of livelihoods augmentation, namely:

a. Natural resources management (NRM),
b. Rural entrepreneurship and self-employment, and
c. Social capital including people's institutions and government delivery systems.

Apart from this, ICT itself can be seen as an emergent service sector of rural areas, with huge potential to augment rural livelihoods.

A wide range of ICT strategies have been identified from the case studies presented in Part II of this volume. The strategies listed are by no means exhaustive and are limited by the examples studied. These are classified into four categories (Table 1.2). The table also shows examples that best help to explain these strategies. These experiences are presented in the volume either as best practices or given in the boxes in the text.

The above groups of strategies are discussed separately in chapters 3, 4, 5 and 6, respectively. However, before moving on to discuss strategies, it would be useful to understand the basic principles and ethical values of ICT interventions that are designed to reach out to the poor and marginalized sections of the society. These principles, extracted from analyses of case studies, are presented in the next chapter.

Table 1.2: Strategies and Illustrations

Group	Strategy	Illustrations
Strengthening NRM	1) Using ICT tools for better planning and monitoring of NRM projects	BAIF, FES
	2) Improving the reach and accuracy of agricultural extension	mKRISHI, e-Sagu, DSC (interactive radio), Digital Green
	3) Protecting lives and livelihoods from natural disasters	MSSRF, Locust watch
Strengthening self-help movement and micro-enterprise	1) Inclusive banking: Improving access to credit and financial services	Ekgaon, ICICI
	2) Improving access to markets	
	a) Improving price discovery and price realization of farm produce	ITC, MCX-India Post
	b) Promoting rural artisans and artists through virtual marketing	Toehold, Drishtee
	3) Addressing Information needs of Pro-poor Value Chains	Amul Dairy Cooperatives, Poultry Cooperatives promoted by PRADAN
Strengthening government delivery systems	1) Improving accountability in large programmes, especially governmental schemes.	NREGA, Health Mission
	2) e-Government as a strategy to improve government delivery systems and empower people	Bhoomi, Gyandoot
ICT as an emergent service sector in the rural economy	1) Promoting literacy and e-literacy	Akshaya, TCS,
	2) Edutainment	PlanetRead, MILLEE
	3) Promoting self-employment and nano-entrepreneurship	Drishtee, TARAhaat
	4) Promoting rural BPOs	Source for Change, Drishtee

2 Basic Principles and Ethical Values

Although efforts at bridging the digital divide are relatively recent, a good number of successful initiatives allow us to analyze the factors that led to their success. Such analyses have helped in uncovering a few principles that are common to most of the initiatives. This knowledge is likely to get further refined and modified as the interventions become more mature, and more experience is gained from taking ICT to the rural countryside, in general, and to the rural poor, in particular.

1. The power of ICT in bridging the digital divide lies in its ability to dramatically reduce transaction costs for the rural client as well as the service provider. The greater the reduction in transaction costs, the greater the chances of economic viability.

2. Strategic action is needed to improve the access of the poor to ICT because markets tend to gravitate toward those who can afford it.

3. Given the vast socio-cultural diversity of the nation, an eco-system of strategies and approaches will be needed to have the benefits of ICT reach the rural population.

4. Successful design and delivery of most ICT applications need good partnerships. A partnership would typically involve technology providers, service providers, application developers, service interface providers (grassroots entrepreneurs or community based VKCs) and non-government support agencies.

5. Whereas proper connectivity through reliable technology is a pre-requisite, attention on 'last mile and last person connectivity' is key to inclusive development.

6. Putting together content that is relevant, culturally compatible and preferably in the local language, is critical for the success of any ICT-based service for rural communities.

7. Selecting an appropriate 'basket of services' helps to make the VKC/kiosk economically viable. Optimal number of services is desirable—cluttering of services leads to inefficiency whereas too few services make the kiosk unviable.

8. The participation of farmers and villagers in the design and delivery of the programme is imperative for success.

9. Substantial investment in developing human and social capital is a pre-requisite for success.

10. Practitioners would do well to steer clear of the 'tool trap', the dangers of which are very real in ICT.

We now take a look at each one of these principles.

1) Reducing transaction costs

The power of ICT in bridging the digital divide lies in its ability to dramatically reduce transaction costs for the rural client as well as the service provider. The greater the reduction in transaction costs, the greater the chances of economic viability.

Given the poor physical infrastructure in a majority of rural areas in India, the cost of accessing critical services like health, education, banking, agricultural extension, etc., are extremely high, making it almost impossible for the poor to access these. Studies have shown that villagers save as much as eight times the amount they pay to a kiosk operator to get the same service at their doorstep.

This is the factor that enables private companies to establish economically viable and therefore sustainable business models of ICT-based services in several parts of the country. These companies follow the logic of tapping the 'fortune at the bottom of the economic pyramid' as espoused by C K Prahalad (2007).

2) Improving access of the poor

Strategic action is needed to improve the access of the poor to ICT because markets tend to gravitate towards those who can afford it.

Whereas ICT represents a potentially powerful tool for inclusive development of rural areas, markets alone cannot be expected to realize this dream. Left to the markets, the phenomenon of digital divide will ensure that the elite among the rural benefit the most and the poor and the marginalized get further alienated and pauperized. Hence, concerted efforts are needed to create access of ICT to the poor, marginalized and women in rural areas. In fact, ICT represents a unique opportunity for inclusive development by placing ICT tools in the hands of the marginalized and empowering them so that they improve not only their own lives and livelihoods but also that of others in the village.

3) Adopting an ecosystem of approaches and strategies

Given the vast socio-cultural diversity of the nation, an eco-system of strategies and approaches will be needed for the benefits of ICT to reach the rural population.

Commercial and entrepreneurial ICT service models are best suited when the clients can afford to pay for the services and the client base is large enough to make the enterprises economically viable and sustainable. However, in highly impoverished regions, knowledge centres may have to be supported by the government and/or donors, at least in the short and medium terms. Here, the knowledge centre may be held as a common property asset, and people's institutions with democratic values should be created/facilitated to provide good governance, leading to inclusive development of the village. Hybrid models that combine features of the entrepreneurial and donor driven models are also possible. ICT services conceived and implemented by cooperatives represent yet another model.

4) Developing durable partnerships

The successful design and delivery of most ICT applications needs good partnerships. A partnership would typically involve technology providers, service providers, application developers, service interface providers (grassroots entrepreneurs or community based VKCs) and non-government support agencies.

A typical ICT initiative needs a number of players to come together:

a. *Technology provider*: Usually large corporations, often multinationals that have developed ICT technologies like CDMA, GSM, etc.

b. *Service provider*: Usually domestic private players, who have invested in infrastructure to provide ICT services in specific geographical regions.

c. *Application developer*: These are small-to-large technical companies and software developers, who come up with new applications, keeping in view the need of specific client groups.

d. *Service interface provider*: Usually, grassroots entrepreneurs or trained KWs at community based VKCs that provide the interface between the technology and illiterate clients.

e. *Support agencies*: Usually, non-government or government agencies that provide capacity building inputs and support for setting up rural kiosks and community based knowledge centres. They also serve as a crucial link between technology partners and rural communities.

A simple illustration will serve to explain how this partnership works. Fisher Friend has been developed as a hand-held device that can provide valuable information to fishermen in coastal areas. The information regarding wave heights and weather helps them decide when to go fishing. The information on the location of stocks helps them decide where to go fishing on a given day without having to return empty handed. In addition, the GPS system of the device makes it possible to locate a fisherman in distress and carry out rescue operations if needed. The service, currently in the final stages of field-testing and product development, has evoked good response from fishermen because it improves productivity and significantly enhances their livelihood. The partners in this value chain and their functions are shown in Table 2.1.

Table 2.1: Partners in the Fisher Friend Value Chain

No.	Value Chain Partners	Functions
1	QUALCOMM	Technology partner—the application uses CDMA technology developed by QUALCOMM
2	Tata Telecom Pvt. Ltd.	Service provider
3	Astute Systems Technology, Indore	Application developer
4	VKCs promoted by MSSRF	Service interface provider
5	MSSRF, Chennai	Support agency

5) Facilitating last-mile, last-person connectivity

Whereas proper connectivity through reliable technology is a pre-requisite, attention on 'last mile and last person connectivity' is key to inclusive development.

This principle cannot be compromised if the overall goal is to achieve inclusive development. Yet, as practitioners have discovered, it is also perhaps the most difficult goal to achieve. A combination of technologies, both modern and traditional, may have to be used, depending on what is relevant and acceptable in the local context. For example, the VKCs promoted by MSSRF, use the public address system, a blackboard placed near the milk collection centre

and the local newspaper to communicate and reach out to the last person. This strategy proved particularly beneficial during the tsunami calamity, when the use of the public address system in two of the villages that had VKCs helped to get people out of the danger zone to safer places before the tsunami struck their villages. The use of community-radio, off-line communication and storage devices like CDs, etc., are also valid methods to bridge the last mile, last person connectivity gap.

A major stumbling block for proper connectivity is the erratic supply of power in rural areas. There is a perpetual shortage of energy because what villages get is an overflow of electricity from urban India. Nearly 12 percent of the villages and 57 percent of village households are yet to gain access to electricity (GGA, 2008). Under the circumstances, the creative use of alternative (renewable) energy sources like solar, wind, bio-diesel, etc., is called for. The choice and capacity will depend upon availability of renewable sources at particular location (Box 2.1). In spite of the optimistic estimates of government sources, given the pace of development of renewal sources of energy, it is unlikely that the situation will improve significantly in the short run. In the meantime, the development of applications using wireless technology may bypass the problem, making hand-held devices and smart phones the most preferred medium to reach out to the rural poor.

Box 2.1: Powering a VKC with Renewable Sources of Energy

Under the Electricity Act, no license is required for generation and distribution of electricity in a notified rural area. Anyone can produce electricity. The government's national rural electrification policy aims to provide minimum lifeline consumption of 1 unit per household per day by 2012. But all this will not be possible unless we have a huge programme for local generation, which includes renewable energy sources even where grid connectivity exists.

A host of options can be combined if several institutions start working together. At present, among the renewable sources of energy, the most important is wind energy. Tamil Nadu has large wind farms. In the area of biomass power too, India is today one of the important countries. Other options include the use of gen-sets, solar photovoltaic cells, micro-turbines and environmentally friendly hydrogen energy, which includes fuel cells and hydrogen generating equipment, where the byproduct of combustion is only water. As shown in Table 1, most of the potential in renewable energy remains to be exploited.

Continued...

Table 1: Renewable Energy: Installed Capacities and Potential

Renewable Energy Source	Potential (MW)	Installed Capacity as on 31. 03. 2007
Wind	45,000	7,092
Small hydro (up to 25 MW)	15,000	1,975
Biomass	22,000	1,140
Urban and industrial wastes	2,700	43
Solar power	20 MW/sq km	3
Total	84,700 MW + Solar	10,253 (7.7% of the total installed capacity)

In terms of economics, as shown in Table 2, the capital cost is the lowest for the PV-wind hybrid whereas the cost of electricity per unit is the cheapest for the biomass gasifier.

Table 2: Economics of Renewable Sources

Energy Source	Capital Cost / kW (Rs)	Cost per kWh (Rs)
Solar PV	2,50,000	25
PV-Wind hybrid	30,000	20
Micro-hydro	40,000	8
Biomass gasifier	50,000	7

Source: S K Chopra, Special Advisor to Ministry of Renewable Energy Resources, as reported in GGA Secretariat (2007).

6) Facilitating relevant content development

Putting together content that is relevant, culturally compatible and preferably in the local language is critical for the success of any ICT-based service in rural areas.

This is easier said than done. Some interventions like e-Choupals have tried to provide a platform for 'farmer-to-farmer' exchange of ideas. In the agricultural extension field, this is referred to as 'land-to–land' linkage (as opposed to 'lab-to–land' or 'land-to-lab' linkages). Others like MSSRF have taken pains to establish a consortium of local institutions, which together interact with local experts and then generate relevant content. Here, a dialogue between clients and service providers, formal science and informal science, lab and land is facilitated, which results in superior content. A lot of thinking and investment goes into the development of such 'value-added' content, which farmers and

villagers will find directly relevant in their day-to-day lives. Another way to overcome the illiteracy barrier is to use alternative technology solutions like graphic interfaces and voice-based interactive systems.

7) Providing a basket of services

Selecting an appropriate 'basket of services' helps to make the VKC/kiosk economically viable. Optimal number of services is desirable—the cluttering of services leads to inefficiency whereas too few services make the kiosk unviable.

Several social entrepreneurs have come to the above conclusion through a process of trial and error. The logic is not far to seek. When serving the poor, the pricing strategy has to take into account what the client can afford to pay. The catchment area of clients for a given kiosk is limited to the population of a village or cluster of villages that it serves; therefore, it is not practical to expect a large number of clients for the same service. Hence, to become economically viable, the kiosk must try to maximize the economics of scope rather than the economics of scale.

From the view point of the client also, the kiosk will be more attractive if it serves as a single window service provider for a basket of essential services. In effect, one can go on adding new services. However, if the back-end support for these services is not in place and if the services are not delivered to the satisfaction of the client, business will suffer in other areas as well. Hence, most service providers have found it practical to cater to a basket of selected services, which provide value to the client and which, at the same time, can be organized in a cost effective way.

8) Facilitating people's participation

Participation of farmers and villagers in the design and delivery of the programme is critical for success.

The principle is true for any technology developed for rural users. Unless the technology/service meets a felt need, the programme will not be demand driven and may die a natural death. Once the farmer, fisherman, artisan, forest dweller, etc., understand what the new technology can do, he/she will come forward with suggestions for a form, content and delivery mechanism that is best suited for the local context.

Clients are also known to redesign products and systems to suit their own

convenience. The work of Eric von Hippel (1988) in instrumentation and other sectors has shown that clients contribute substantially to product development through their own incremental innovations, based on their own needs. Farmers and rural artisans are known to be no less in finding their own solutions and modifications/adaptations to technology introduced by formal science. A body of literature on farmer's innovations bears testimony to this fact (see Chapter 8, Vol I). The innovative use of ICT by farmers and villagers is yet to be documented. Boxes 2.2 and 2.3 provide a glimpse of the creativity of rural clients at the grassroots.

Box 2.2: Rural Clients Add Value to ICT Products and Services

On 23rd January 2007, the *Times of India* carried the news of how Niruttam Kumar Singh and Harvansh Yadav, a student-teacher duo from Gangagarh Village in Bulandshahr, Uttar Pradesh, developed a technique to charge cell phones, light up electric bulbs and work radios in remote areas where electricity was in short supply. Yadav and his student of Class VII had come to showcase their innovation at a workshop on 'Green Grassroots Innovation, Incubation and Enterprises' organized by SRISTI at IIM, Ahmedabad. The system comprised collecting cow dung in a plastic container and putting two discharged batteries in it. The cow dung was treated with a salt-water solution. As a result positive and negative charges were produced that were collected in the batteries and then interconnected in series to produce a current. Each unit produced 1.5 volts of current. The cow dung had to be replaced once in 45 days.

The innovation has changed life in Bulandshahr. Around 250 households in Gangagarh and the neighbouring villages use this device to light bulbs and listen to the radio. The innovators are happy to teach them how to make such batteries free of cost.

Source: Sharma, (2007)

* * *

Another instance of farmer creativity was observed by the first author during a field visit to a lift irrigation society in Dahod, promoted by Sadguru Foundation. The supply of electricity had become extremely erratic. The pump operator devised a unique communication mechanism to inform villagers as soon as the power supply was restored. He borrowed a music system, which was a community asset and hooked it to a public address system, which too was borrowed from an adjacent temple. Whenever the power supply resumed, he would play the music on the PA system. On hearing the music, the farmers would come out of their houses to the fields to take their share of water!

Box 2.3: World's Cheapest Radio Station

In Bihar, where many areas lack power supply, the cheap battery-powered transistor is the most popular source of entertainment, with an operational cost of just Rs 50. In such an environment, a poor, uneducated, rural innovator developed and ran a radio station, broadcasting locally developed programmes from his electronics repair shop in Mansoorpur Village in Vaishali District. This activity continued uninterruptedly for three years before he was 'discovered' by the media. While the media celebrated his genius for inventing the world's cheapest radio station, government officials swooped down on Raghav FM Mansoorpur 1 Radio Station, seized its equipment and lodged an FIR against the creator for violating the Telegraph Act.

Source: downtoearth.org.in

Raghav Mahto, a 23-year old youth of the village created a radio transmitter out of battery-powered tape recorders, wires and a cordless microphone. He hooked the transmitter to an antenna atop a bamboo pole on the roof of the highest building in the Mansoorpur market, which served as his 'dish antenna'. He asked his childhood friend Sambu to do a running commentary on a village-level cricket match less than a kilometre from Raghav's shop. Sambu was the radio jockey for FM Mansoorpur 1. They played Bhojpuri, Bollywood and devotional songs over this FM transmission and delivered messages on HIV/AIDS. The station also broadcast news about missing people, functions and festivals, and read aloud chapters from books recommended by local school teachers and headmasters. All this was done free. The FM station made Mahto a hero in his village where 90 per cent homes have radio and everyone in the village listened to Raghav Radio. Mahto claimed that he was not aware that his station was illegal. It covered a 12 km radius that included parts of the districts of Vaishali, Muzaffarpur and Saran. Many of his radio disciples acquired the 'low-impact kit antenna' from him, for use in their own villages.

The change in government policy, which now aims at popularizing community radio, would have surely brought smiles to the faces of many in Vaishali and adjacent districts.

Source: Abridged from Ritu Tanwar. (n.d.). World's Cheapest Radio Station. Writeshop Infotech Pvt. Ltd. and Plan International.

Tapping into the local and traditional knowledge and wisdom of farmers is extremely important in developing relevant content and ensuring that new technology does not lead to mindless utilization of resources without caring for the sustainability of the resource base. For instance, in the Fisher Friend case, information on the availability fish in certain zones should not lead to exploitation beyond the rate of rejuvenation. Here, the blending of traditional practices and wisdom with modern tools would provide the most satisfactory outcome. As Riya Sinha (2001) has pointed out, easy access to information on the availability of fish catches through satellite technologies without consideration for the critical locations, like spawning areas, can lead to unsustainable outcomes through over-exploitation. Such possibilities highlight the significance of locally evolved religious, spiritual or cultural boundaries and regulations that are defined specifically to protect these critical locations

9) Developing human and social capital

Substantial investment in human and social capital is a pre-requisite for success.

Professionally trained KWs and change agents are critical for the successful operation of VKCs/enterprises because these KWs would become the torchbearers of knowledge revolution. As discussed earlier, an army of trained rural professionals are needed. The MSSRF has established the Jamshetji Tata National Virtual Academy (NVA) for this purpose. The NVA plans to train about half a million fellows in the near future, with a commitment to give them opportunities for life-long learning.

Local institutions to provide good governance for running community based knowledge centres are also needed. This too will require substantial investment in capacity building at the grassroots level. Participation in the knowledge value chain produces multiple benefits for the poor:

- Employment and/or self-employment,
- Better interface with clients and, therefore, better service delivery, and
- Diversification of the local economy.

10) Avoiding the 'tool trap'

Practitioners would do well to steer clear of the 'tool trap', the dangers of which are very real in ICT.

A real danger to guard against is the possibility of a 'tool view' of science overtaking the consciousness of the practitioners, to the detriment of real project goals (Riya Sinha, 2001). Sound technical knowledge, based on satellite imagery and GIS maps, for instance, has been found to be useful in convincing farmers to carry out certain activities to optimize their resources. Collective restraint on use of ground water in Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS) project (Box 2.3, Volume I) is a case in point. However, sometimes officials may be so enamoured by the tools that they may disregard any other source of information, to the detriment of the project. Government projects often flounder due to excessive investment in sophisticated technology and equipment and limited or poor engagement with the rural clients, for whom the service is being created.

Postscript

GGA has developed a 'Ten Cs' framework to promote ICTs in rural areas. These represent a ready checklist of criteria for both planning and monitoring ICT projects. The National Alliance uses these criteria to track the performance of GGA. Many of the principles listed earlier are similar to the criteria under this framework. In fact, some of them have been derived directly from the experience of GGA (Box 2.4).

Box 2.4: The Ten C Criteria

- Connectivity and access devices
- Content, application and services
- Capacity building efforts
- Care and management efforts
- Coordination and linkages
- Conducive policy
- Convergence of resources, themes
- Coalition of the concerned
- Confidence to achieve
- Community at the helm of affairs

Source: GGA Secretariat (2007)

3 ICT Strategies to Strengthen NRM Interventions

ICTs have a great potential for improving NRM at the micro, meso and macro levels. In this chapter, we take a look at the three specific areas in which ICTs have already begun to make a significant impact.

1. Planning and monitoring of NRM projects
   a. Remote sensing (RS) and GIS in NRM
   b. Eco-profiling
2. Improving reach and effectiveness of agri-advisories
   a. Internet and phone-based services
   b. Community and interactive radio
   c. On-demand video services
3. Protecting lives and livelihoods from natural disasters
   a. Early warning systems
   b. Weather insurance

Planning and Monitoring of NRM Projects[1]

The past decade has seen the emergence of two important technologies that have made possible quantum improvements in the management of natural resource projects. These are **Remote Sensing (RS) technology** and **Geographical Information Systems (GIS).** The best results are often achieved when the two are combined and used in an integrated manner. Together, they form a powerful tool in the management and analyses of large volumes of data required to measure, map, plan, and monitor the conservation and augmentation of natural resources.

Remote Sensing

It is the practice of deriving information about the earth's land and water surfaces, using images acquired from an overhead perspective, using electromagnetic radiation, reflected or emitted from the earth's surface (Campbell, 1996).

Geographical Information Systems

This is a computer system, which facilitates the storage and intelligent use of geographic

data, including land and water resources and human activities. It provides the basis for storage, manipulation and display of large amounts of data that have been encoded in digital form (Campbell, 1996).

We share in this section some experiences of developmental organizations joining forces with technology institutions to bring these technologies to bear on rural projects. First, a brief idea of what the technology is capable of doing is presented. NRM programmes like watershed development require up-to-date information like geographical location, aerial extent, spatial distribution, slope, water availability and soil fertility. With the advent of RS and GIS, it is now possible to readily provide a wealth of additional information to the decision makers in such programmes.

India has established a number of RS satellites that provide data in a variety of spatial resolutions and spectral bands for different applications (Table 3.1).

Table 3.1: Parameters Measured by Indian Remote Sensing Satellites

Satellite	Resolution (m)	Parameters
IRS–1A/ 1B IRS – IC/ 1D	75.5, 36.25 23.5, 5.8, 180	Vegetation, land use, crop stress hydrology, geomorphology, crop growth stage, acreage land use/land cover
IRS–P2 IRS–P3 IRS–P4 (Oceansat)	360 x 250	Ocean application, ocean primary productivity, cloud and snow studies, wind speed, total atmospheric water
IRS–P5 (Cartosat) IRS–P6 (Resourcesat)	2.5 <6 70	Terrain visualization, updating topographic map products: digital elevation model (DEM), ortho image, stereo products, agriculture and crop monitoring
Other Missions: Radarsat ERS – ½ SPOT Landsat NOAA	 10 20 10 1100	Soil moisture, snow-water, precipitation, soil hydraulic properties Detailed natural and urban drainage structure Land use, water extent Drainage networks, ice and snow cover, vegetation species, extent, characteristics of vegetation, Biomass, canopy temperature, snow cover, etc.

Source: Pradhan (2001)

The IRS series, launched in March 1988, is considered to be the world's largest constellation of RS satellites. These are used to gather valuable data about earth's atmosphere, land and oceans. This information has been used for a variety of applications, covering environment, agriculture, water resources, wasteland mapping,

urban development, mineral prospecting, forestry, drought monitoring, flood forecasting and ocean/marine resources. The IRS–P6 satellite provides data services on an operational basis for integrated land and water resources management at the micro level. Satellites are now capable of discriminating mixed crops and detecting the moisture content in crops, thus making it suitable for crop-stress studies and crop-growth analysis. The use of IRS–1C/1D data, integrated in a GIS environment along with Global Positioning System (GPS) data allows the generation of detailed digital cartographic data bases. This leads to engineering solutions to complex integrated resource management problems for micro-level development (Pradhan, 2001).

RS and GIS in Micro-planning: Some Experiences

Integrated Mission for Sustainable Development

A key area where IRS data has been used is the Integrated Mission for Sustainable Development (IMSD), launched in 21 drought-prone districts of India in 1992. The project covered 84 Mha spread over 175 districts. Its main objective was to derive locale-specific prescriptions or action plans for sustainable development, using satellite RS data, GIS and collateral socio-economic data. The IMSD generated thematic and action plan maps on a scale of 1:50,000, along with reports. These were made available to the District Rural Development Agencies (DRDAs) for implementation and use in various projects like watershed development projects.

National Watershed Development Programme

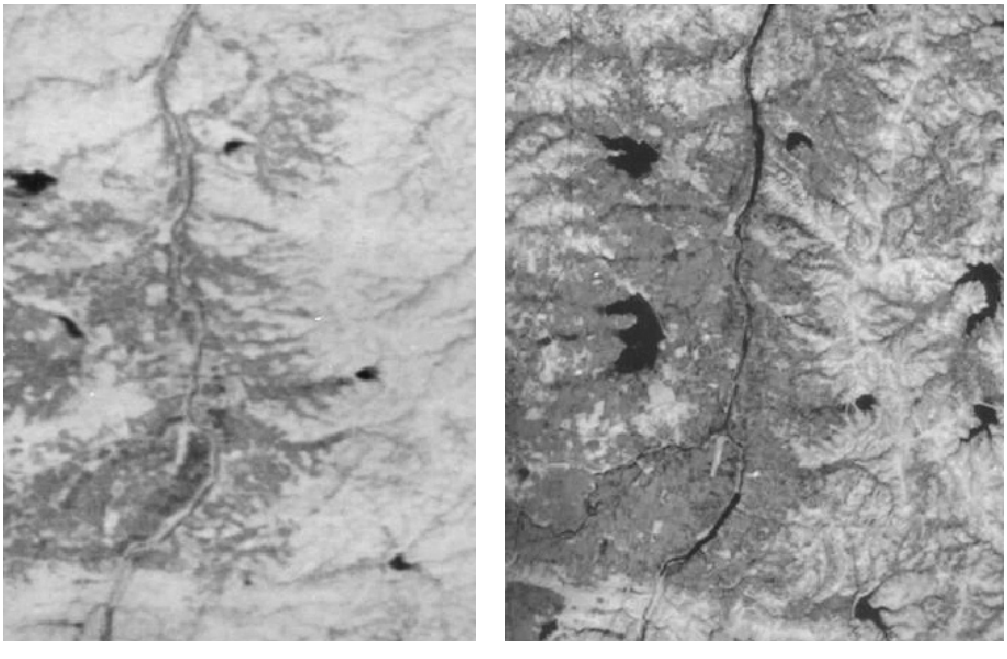
This technology has been applied in the National Watershed Development Programme, with varying results. The project implementing agencies (PIAs) worked closely with technology institutions such as National Remote Sensing Agency (NRSA), Hyderabad, Space Application Centre (SAC), ISRO, Ahmedabad, Remote Sensing and Communication Centre for Gujarat (RESCO), State Remote Sensing Centres, etc. Among the PIAs that benefited the most were BAIF in Maharashtra and Sadguru Foundation in Gujarat. The impact of the action plans implemented was monitored through the following indicators, using satellite RS data:

- Vegetation/plantation/forest area
- Cropped area and intensity
- Vegetation vigour (Normalized Differential Vegetation Index – NDVI)
- Wasteland area and type
- Number and spread of water bodies
- Cropping pattern

The PIAs tried to blend technical information with local knowledge in arriving at solutions. Sound technical knowledge, based on science was found useful in convincing farmers to carry out certain activities to optimize their water and land resources. On the other hand, some PIAs experienced difficulty trying to identify suggested recommendations of scientists using satellite maps alone. The information had to be transferred on to village maps because of scale. A typical micro-watershed has a size of about 500 ha. For this size, maps with a scale of 1:10,000 were found convenient, as opposed to the maps of 1:50,000 that are currently available. Although satellite images have helped to save time and provide accurate data, the information still has to be verified on the ground. Regular field contact and PRA exercises are still needed since satellite maps cannot read social information.

Although the available scale may not be adequate for micro-watershed implementation, it is useful for overall planning, where a macro/meso-perspective is essential. When implementing at the micro-watershed level, the 1:50,000 maps may be transferred to a scale of 1:12500, using optical enlargements. Additionally these enlarged maps should be superimposed on cadastral maps from the villages that show ownership details of the land. Such maps have been found to be successful during implementation (Pradhan, 2001).

Figure 3.1: Satellite Images of Machhan River before and after Treatment



January 1990 January 1999

Note: The black tone indicates water and the red tone (dark grey in this picture) indicates vegetation.

Source: Sadguru Foundation

It is worth noting that the new common guidelines of the GoI for Watershed Development Programmes have strongly advocated the use of ICT tools for planning, monitoring and selection of watersheds. The capacity of the District Review Committee will be so built that it may use these tools to manage the programme in a more professional manner.

Irrigation systems

Satellite-based RS data have been found to be an invaluable tool in improving the performance of irrigation systems. A study of the Mahi Right Bank Canal, using satellite data combined with collateral information in a GIS, has been helpful in identifying and monitoring distributaries with problems of salinity, water logging and urbanization. This served as the basis for sound reclamation measures. The study also developed a methodology for crop water requirement estimation and performance evaluation of the system with regard to adequacy, equity and efficiency. Described as a 'technical PRA', RS data can help PIAs and water user's associations acquire a better understanding of land-use patterns, area covered by crops, irrigated area, conjunctive use of canal and well water, etc., thereby enabling water users to take more informed decisions.

Joint forest management

RS studies in 1997 have been useful in showing the impact of Joint Forest Management in Surat and Sabarkantha Districts. In Vyara Division, the dense forest area increased from 31 ha to 323 ha whereas open forestland and degraded forest areas reduced significantly. Similar results were found for Sabarkantha. These remarkable improvements have been attributed to the efforts of the Forest Protection Committees and the Forest Department. In Maharashtra, RS and GIS have been used to prepare forest working-plans. Additionally, satellite data have been used to detect forest fires and identify the encroachment status in various areas. Integrating high-resolution vegetation mapping with village-level socio-economic data has helped strengthen village-level forest management activities. This is especially evident in the Western Ghats region of Karnataka where a variety of 'subtle' forest cover changes are known to occur.

Bio-diversity Conservation

GIS finds application in planning projects for bio-diversity conservation. FES has been active in this area. A study commissioned by it (Fedman, 2008), focused on participatory GIS mapping and stress assessment of Satsokia Gorge Wildlife Sanctuary, Orissa. Villagers were asked to map different threats areas (like smuggling and poaching routes, fire-prone areas, sites of man-animal conflict, grazing areas

and sites of illegal NTFP collection) to biodiversity in the sanctuary on 3D range-level maps. Perceptions of the current threats versus those existing 25 years ago were also documented. Similar mapping was done with Forest Department officials as well. The data was then compiled into threat maps, using the GIS software programme Arc Info. The software has the capability to link range data, creating maps that highlight the highest risk areas throughout the sanctuary. The layering capabilities of the software also highlighted patterns and relationships between different ecological threat areas. For example, fire areas frequently overlapped with poaching and NTFP extraction areas suggesting a causal relationship between the threat areas. The data was used to suggest trends in resource use over time, livelihood status and illegal activity within the sanctuary. The analysis of causal relationships and spatial trends in the sanctuary was used to propose remedial measures to be incorporated in the future plans of the sanctuary.

Eco-profiling as a planning tool

The Foundation for Ecological Security (FES) is one of the development agencies that use GIS in a systematic manner for planning its various projects. Effective and sustainable management of natural resources requires that one should be clear about different resource uses, able to identify all stakeholders, and know with accuracy the status of resources in different temporal and spatial scales. Since resources like water, soil, nutrients, pollinators and wild biodiversity do not respect administrative boundaries, a realistic assessment of these resources and their impact is often misleading if viewed from a micro-perspective. The use of GIS opens up a way to examine natural resources in an integrated manner.

GIS is developed from the concept of a map. A map allows relationships between a wide variety of quantitative and qualitative data to be organized and presented. The database of a GIS is a structured collection of related spatial and non-spatial information. The integrated data provide a better understanding of the landscape.

Data generated from spatial analysis using visual techniques help communities discuss NRM-related issues and come up with appropriate solutions. Visual representations also allow us to understand and discuss the current use of natural resources and extraction patterns vis-à-vis the pace of resource regeneration. The GIS information base allows communities to assess the status of the resource more realistically and accurately, which leads to better-informed decisions about natural resources. It aids in the analysis of the trends and changes in the landscape over time. The information about the entire landscape helps the community to visualize the impact of its own interventions on the landscape. Box 3.1 describes the process of eco-profiling as practised by FES.

Box 3.1: Scientific Eco-profiling as a Planning Tool

Aided by GIS and the RS technology, the FES has elevated ecological profiling to the status of a planning and decision-making tool. It involves detailing of the ecological status of a given geographical area, providing information about the status of various natural resources, the exploitation patterns and the criticality of the resource. This information can be used for sustainable management of natural resources. It involves the following three major steps.

Baseline Ecological Assessment

1. *Collation of spatial data:* This refers to information on land use, natural resources, biodiversity, etc., from secondary sources as well as the indigenous knowledge of villagers on the historical availability of various natural resources.

2. *Mapping of land use/land cover:* This involves using GIS and RS tools to capture details like the boundary of the landscape under study, watersheds, micro-watersheds and land use along with extent, slope and aspect maps.

3. *Documentation of bio-physical parameters*

    a) Biodiversity: This includes flora and fauna, which play an important role in the farming systems and the local ecology. Using a grid-based approach, inventory and species-specific ecological methods, the role of living organisms performing key ecological functions like pollination, seed dispersal and biological pest control is carefully documented.

    b) Geohydrology: This includes geological formations, aquifers, surface and ground water availability and distribution, water flow in rivers, use of water, surface runoff and the mapping of all these components. It also includes assessment of catchment areas for existing water bodies.

    c) Soil: This includes the assessment of physical, chemical and biological parameters of soil, using soil survey methods. Samples for the soil survey should be collected from all parts of the study landscape, covering all land-use types.

    d) Agriculture and livestock: This includes existing cropping patterns, irrigation sources, livestock and various other components of the farming system. This also includes assessment of productivity.

Developing Conservation Action Plans (CAPs)

The baseline maps developed are used to identify the areas for specific action or intervention. Indigenous knowledge on natural resource use patterns is helpful in identifying specific components for restoration and development. A typical CAP includes measures like recharge and storage of water, soil moisture conservation, restoration of nutrient balance, conservation of various species, etc. It also specifies the necessary institutions concerned with the sustainable management of these resources.

Monitoring and Corrective Action

CAPs also develop appropriate indicators to monitor each parameter and component of the plan. The methods and frequency of monitoring are specified. Such monitoring is expected to lead to the sustainable use of natural resources.

Source: R. Ravindranath, FES

Improving Reach and Effectiveness of Agri-advisories

The internet and phone-based services

The government-sponsored agricultural extension system proved highly effective in promoting chemical-intensive technology in the country in the 70s and 80s. However, the same system failed to diffuse technology from 'lab to land' in rainfed regions. The reasons are many. One of the important reasons is, the rainfed areas are highly heterogeneous and farmers here need 'plot-specific advisories' as opposed to generic advice and standard package of practices (PoP). Farmers usually reject such PoPs because these do not fit the local conditions. Farmers also need timely information and advice that can save unnecessary expenses. A number of interesting experiments are underway to harness ICTs and deliver plot-specific, timely advisories to farmers:

- mKRISHI is an application developed by Tata Consultancy Services, a private sector ICT company that uses the mobile phone as a medium of communicating advisories (see case study in Part 2).
- Medial Lab Asia, a public sector company, on the other hand, has developed e-Sagu, a service with identical objectives but which uses the Internet as a means of communication (Box 3.2).
- Telecommunications Consultants India Ltd., another public sector company, has set up the Kisan Call Centre, using the telephone as the medium of communication (Box 3.3).

Box 3.2: e-Sagu: The Personalized Agro-advisory System in Andhra Pradesh

'Sagu', in Telegu, means cultivation and so e-Sagu aims at improving farm productivity by delivering high-quality personalized (farm-specific), query-less advice, in a timely manner, to each farmer at his/her doorstep. Media Lab Asia (MLA) developed the e-Sagu system, which is being implemented by the Indian Institute of Information Technology (IIIT), Hyderabad. Advice, on all aspects from sowing to harvesting, is provided on a regular basis (typically once a week); this reduces the cost of cultivation and increases farm productivity as well as the quality of agri-commodities. The developments in IT like database, the Internet and digital photography have been extended to improve the performance of agricultural extension services.

A team of agricultural experts with diverse backgrounds (entomology, pathology, agronomy, etc.) works at the e-Sagu main lab (normally in a city), supported by an agricultural information system. An e-Sagu local centre comprises a few computers and a computer operator and covers a group of about ten villages. Educated and experienced farmers work as coordinators. Depending on the crop, each coordinator is assigned a fixed number of farmers. He collects the registration details of the farms under him, including soil data, water resources and capital availability, and sends the information to the main e-Sagu system. Every day, the coordinator visits a fixed number of farms and takes 4–5 photographs for each farm. A CD is prepared with the photographs and other information and transported to the main system by a regular courier service. Agricultural experts at the e-Sagu main lab analyze the crop situation with respect to soil, weather and other agronomic practices and prepare a farm-specific advice. At the local e-Sagu centre, the advice is downloaded electronically through a dial-up Internet connection. The coordinator collects the advice printouts and delivers it to the concerned farmer. In this way, each farm gets proactive advice at regular intervals starting from pre-sowing operations to post-harvest precautions.

The development of e-Sagu was started during kharif 2004 when advisories were provided to 1,051 cotton farms in three villages of Warangal District in Andhra Pradesh. By the end of 2005–06, there were 8 e-Sagu local centres, which had delivered 35,925 advices on 30 crops and fish rearing. About 2.6-lakh crop photographs and 8,918 fish photographs were taken in the process. As of now, the turnaround time for advice delivery is between 24 to 36 hours.

The farmers are happy with the expert advice because it is helping them to improve input efficiency through the use of integrated pest management (IPM), the judicious use of pesticides and fertilizers, etc. At the same time, benefits accrue through higher yield. As per an impact assessment study carried out by social scientists in 2005, farmers

utilizing the service benefited by about Rs 3,874/acre. Fish farmers have also realized significant benefits.

The e-Sagu has received national and international recognition in the form of:

i. Innovative Application Case Study 2006, Institute for Information Industry, Ministry of Economic Affairs, Taiwan.
ii. CSI Nihilent e-Governance Award 2005–06.
iii. Finalist for Stockholm Challenge Award 2008.

Source: Abridged from the case study posted on Solutions Exchange Network, e-group on Poverty and Employment, October 2007.

Box 3.3: Kisan Call Centre

Kisan Call Centre (KCC) is a government-sponsored agri-advisory service that covers the entire country and addresses the queries of farmers in 21 different languages, using a toll-free number. Young agricultural professionals manage the call centres. Since its inception on January 21, 2004, the KCC has spread from initial 40–50 seats to 144 seats in 25 States and union territories. To avail of the KCC, a farmer can dial the toll-free number—1551—from any part of the country on all seven days of the week, from 6 a.m. to 10 p.m. and seek the advice of experts on an issue related to agriculture and animal husbandry. Around 50,000 calls are received every month.

Telecommunications Consultants India Ltd. (TCIL) which implements the project, is a government-owned (under DoIT), profit-making enterprise and does not receive any budgetary support. On the contrary, it pays dividends to the government. However, in this particular project, the objective was not to make any profit but to improve the conditions of farmers in distress, through ICT. The monthly expenses of running the service range between Rs 2.5 to 3.0 million. The Ministry of Agriculture pays this to the call centres and BSNL.

Agricultural graduates, who are in touch with the latest technology, are able to answer 70–80 per cent of the calls. For unresolved queries, they establish a conference call with the Department of Agriculture of the respective state and speak to the designated experts. This is called Level 2 handling of calls. Some of these queries may not be answered immediately; however, the caller is sent a reply through mail within 72 hours, with a copy of the response to the call centre. This is called response at Level 3. The Level 3 queries are generally very specific to a particular field and, therefore, the response is also given after consultations with experts of the specific fields. The agriculture department in each state has designated 2 or 3 officials, who take Level 3 calls and answer the queries.

They have also been given mobile telephones to allow them to take calls even beyond office hours. The agriculture departments in each State randomly make calls to the KCCs pretending to be farmers and ask certain queries to assess the quality of responses provided. In addition, the KCC operator maintains a data bank, which records the question as well as the answers. TCIL is in the process of integrating these state-wise databases so that one data centre at the national level can be created.

The five States with highest number of callers are Rajasthan, UP, MP, Gujarat and Tamil Nadu. The top problem category is found to be pests and pesticides (31.9 percent), diseases (23.9 percent), followed by fertilizer and manure management (12.32 percent). Other issues relate to crop varieties, sowing method and time, market information, animal husbandry, loans and finances, etc.

As per an impact evaluation carried out by Administrative Staff College of India (September 2006), the average value of benefit realized by farmers through the advisory varied from state to state. Among the five States surveyed, it was the highest in Maharashtra at Rs 9,493 and lowest in Andhra Pradesh at Rs 1,500.

Source: Telecomlive, (2007) Digital Inclusion for Rural Transformation.

Whereas all three have demonstrated effectiveness, a comparison of the three cases shows some interesting differences in the approaches and the use of ICT (Table 3.2).

From the above comparison, it appears that the e-Sagu model brings clearer benefits to the participating farmers because it makes a concerted effort of hand-holding throughout the crop cycle and the advices are based on the collective knowledge of the multi-disciplinary team of experts. However, such a model is difficult to scale up and the reach is also likely to be limited. Both mKRISHI and e-Sagu will become financially sustainable when the farmers agree to pay a small fee for the services.

On the other hand, providing free information services is extremely popular with farmers and the model can be scaled up very quickly as seen in the case of KCCs. The limitation of KCCs is that maintaining quality over the long term is difficult because the centres are not made accountable to either the farmers or the shareholders. Besides, the call centres are dependent on the Department of Agriculture for responses to Level 2 and 3 queries. Under the circumstances, the responsiveness of the DoA officers would depend on the importance given to this activity among other responsibility, which is likely to vary from state to state.

All three models have succeeded where traditional agricultural extension has failed because the expert advice provided in these models are: a) plot-specific, b) timely, c)

Table 3.2: Three Models of Agri-advisory: A Comparative Analysis

Parameter	mKRISHI	e-Sagu	Kisan Call Centre
Promoting organization	TCS	Media Lab Asia, GoI, New Delhi	TCIL, DoIT, GoI
Implementing organization	TCS and franchisees	IIIT, Hyderabad	TCIL and State-level call centre operators selected through open tenders
Reach and coverage	Model has just been pilot tested in four villages in Maharashtra for four different crops—grape, cotton, soybean, and potato	35 villages, 4,894 farms, 30 crops, through 35,925 advices (2005 data). Also extended to fish farmers in 2005.	25 states and union territories through 25 call centres with 144 seats, responses in 21 local languages (2007 data)
Type of service	Query based advisories—generic as well as specific responses	Non-query based periodic (weekly) advisories to participating farmers throughout the crop cycle (from pre-sowing to post-harvest).	Query based advisories—generic as well as specific responses
Other add-on services	Market intelligence, yellow pages for local services, railway reservations, bus timings, access to bank loans	None	Market intelligence
Response time	Immediate for generic query; within 24–48 hrs for specific queries	Within 36 to 48 hours of receiving data inputs	Immediate for Levels 1 and 2; 72 hours for Level 3 responses
Data type	Automatic sensors for micro-climate and weather data; plus digital pictures and descriptive information	Digital photographs and observations sent by village-level volunteers	Voice-based communication on toll-free number
Delivery mechanism	Cell phone, text and voice messages	CD through courier service up to local centre, followed by dial-up Internet	Telephone, using the toll-free number
Advisors	Specific experts for specific queries; FAQs to build database for generic queries	Multi-disciplinary team of agricultural scientists located at IIIT	For Level 1: Teams of young agricultural graduates; For Levels 2 and 3: teams of two and three designated officials of the Department of Agriculture in each state, who coordinate with research institutions

Continued...

Parameter	mKRISHI	e-Sagu	Kisan Call Centre
Mode of communicating advisory	Text message on hand-held device; voice SMS for illiterate clients	Printouts delivered by volunteers to farmers	Voice-based communication for Level 1 query, mail for Levels 2 and 3, with copies to call centres.
Interface with farmers	Grass-roots entrepreneurs	Educated farmers trained as coordinators	Call centre operators and/or extension personnel or experts
Perceived benefits	Varies, depending on the nature of query	Very significant increase in income levels due to reduction in cost and increase in productivity: Rs 3,874 per acre saved on an average in 2005.	Ranges from State to State; average benefit valued at Rs 1,500 in AP to Rs 9,493 in Maharashtra
Extension model	Lab to Land	Lab to Land	Lab to land
Business model	Private sector undertaking, franchisee-based model, promoting grass-roots level entrepreneurship	Public sector undertaking, grant-based	Public sector undertaking, grant-based; private operators get paid by DoA, farmers get free services
Scalability	Scalability is greater since many of the queries are disposed of through FAQs, and mobile sets have deeper penetration in rural areas.	Will be limited by the availability of agri-scientists, which are willing to provide such services	Has already been scaled up across the country
Replicability	Replicable	Replicable	Replicable
Financial Sustainability	Will be sustainable if farmers agree to pay a small fee for the services	Will be sustainable if farmers agree to pay a small fee for the services	Totally dependent on government

effective, d) conveyed at the doorstep of the farmer and e) has resulted in substantial economic benefits to the farmer, on account of higher yields, reduced costs and improved quality of produce translating into better price realization. The add-on services in the case of mKRISHI make it more attractive to the farmer.

Among such initiatives, IFFCO Kisan Sanchar Ltd. (IKSL) initiated in April 2007, appears to be the only major initiative in the cooperative sector in India. Through

its Green SIM Card scheme, every subscribing farmer/villager is eligible for five free voice messages per day. Each message is of one minute duration and covers diverse subjects like soil management, crop management, dairy and animal husbandry, horticulture, plant protection, market prices etc. The helpline is offered in local languages. The content provision is supervised by a team of experts. Apart from the general advisories, special communities have been initiated around specific knowledge needs. Examples include the HAFED basmati community, the sheep rearing women of Theni, Tamil Nadu, the fishermen of Pulicat Lake, Tamil Nadu, etc. Focused attention is given through the helpline to meet the specific needs of these communities. As on 2010, IKSL had about a million users, who were utilizing its helpline services.

A number of other tele-centre initiatives like e-Choupal, Drishtee, TARAhaat, Gramin Suvidha Kendra and IKSL have included such advisories in their package of services because these meet a felt need and are being appreciated by farmers. The financial sustainability of the system comes from the willingness of the farmer to pay a small fee for the service. The farmer will be willing to pay this fee only if he/she values the service.

Some common reasons for success include:

- √ Dramatic reduction in transaction costs for both the farmer as well as the extension system.
- √ Deployment of educated farmers as KWs, who interface between the technology system and the farmer (mKRISHI and e-Sagu).
- √ Development of a database to handle generic queries and FAQs (mKRISHI and KCC).
- √ Separate treatment of specialized queries, which are referred to experts (mKRISHI and KCC).
- √ Development of user-friendly, local language interface, including the use of voice mail and graphics interface for the illiterate (mKRISHI, KCC, IKSL).

Whether the system is inclusive in nature will depend on the efforts put in by the service provider to carefully select KWs from the under-privileged class and women, in consultation with the village community. Private sector players often tend to pay more attention to the aspect of economic viability and less to inclusiveness. This may be due to the conditioning of the staff and the emphasis made on meeting the bottom line by the top management. In contrast, private enterprise with social objectives put greater emphasis on social inclusion and positive discrimination when building the capacity of local communities and local institutions. In the cooperative model inclusion is effected through member control over its operating system.

Community and interactive radio

Radio is a major source of news and entertainment for most of India. All India Radio (AIR) is at the top tier in radio coverage as public service broadcaster. Private FM has now become the second tier. Community radio promises to be the third tier, closest to the people. This optimism comes in the wake of the clearance of the new community radio policy on November 16, 2006 by the Union Cabinet. The new policy allows non-profit organizations with a three-year track record of working with local communities to set up and run stations; earlier, only 'reputed educational institutions' were permitted to own radio stations. NGOs are allowed to use campus radios and buy time on AIR but not own transmitters. The new policy permits civil society organizations to have their own transmission.

Community radio

Community radio attempts to cater to the interests of a particular area in need of mass awareness. The broadcasting material of community radio has to be popular to the local audience and is often developed by members of the community itself. The idea of community radio got acceptance in India after the Supreme Court judgment of February 1995 that declared, 'air-waves are public property'. Community radio was initially started with educational (campus) radio stations under somewhat strict control. The new policy of 2006 has completely changed the scenario.

The Ministry of Information and Broadcasting (MoIB) organized a National Consultation in collaboration with UNESCO in March 2007. During the consultation, the Secretary, MoIB made optimistic estimates for the proliferation of community radio in the country. However, although 4,000 community radio licenses had been on offer across the country, by November 2008 only about 110 had been granted license, of which only 38 were operational. The first of these was licensed to Deccan Development Society (DDS), an NGO in Medak District of Andhra Pradesh, which works with women's groups in about 75 villages. Sangham Radio, operated by DDS, was completely separate from the campus-based radio and was launched on October 15, 2008. Its earlier version, started in 1989, was narrowcast with the help of tape-recorders. The programme is run and managed by dalit women under UNESCO's Learning without Frontiers Programme. It focuses on a range of topics of interest, including festivals, issues of dalits and divorced women, and issues of farming like crop damage due to heavy rains, pest attacks, etc. (Kanchan Kumar, n.d.)

The second NGO-led community radio station, Radio Bundelkhand, catering to the needs of Bundelkhand Region of Madhya Pradesh was started by TARAgram in Orchha. Activists and community workers from different parts of the country organized

themselves under the banner of Community Radio Forum in order to organize support for community radio stations as well as to lobby for a more practical public policy. The Community Radio Forum, India, was registered as a society and trust on February 26, 2008.

Interactive radio

The power of community radio as a medium of extension gets considerably enhanced when it is made interactive. In such programmes, listeners get an opportunity to discuss issues related to the radio programme and raise queries or share their own experience with other farmers and experts. UNESCO has tried to combine community radio with multimedia devices in four experimental Community Multimedia Centres (CMCs) in India and found very encouraging results.

Development Support Centre (DSC), based in Ahmedabad, Gujarat, is among those that have used radio as an exclusive medium to reach out to small and medium farmers in an interactive mode . DSC has also been experimenting with hand-held devices that listeners can use to raise queries or listen to archived programmes (Box 3.4).

On-demand video services

Video is a powerful medium of communication. Farmers are attracted to this medium because of the visual impact and the general belief that 'seeing is believing'. The potential of this medium is now being tapped to develop a superior system of agricultural extension. Two examples follow.

Digital Green

Digital Green (DG), promoted by Microsoft, is working patiently and step-by-step to improve the effectiveness of agricultural extension so that small-scale farmers across the developing world can better their livelihoods in a manner that is socially, economically and environmentally sustainable. In the DG system, mediators use locally produced videos to motivate and train small-scale farmers, thereby increasing the adoption of sustainable agricultural practices and technologies, and ultimately raising incomes and mitigating the effects of climate change (Box 3.5).

KISAN Kerala On-line Agri Video Channel

Another such initiative is the KISAN Kerala On-line Agri Video Channel. The project, which claims to be India's first branded on-line video channel in the area of agriculture and allied sectors, was conceived, developed and managed by the Indian Institute of Information Technology and Management, Kerala (IIITM-K) for the Department of

Box 3.4: DSC's Interactive Radio Programme

Sajjata no Sang

DSC and Sajjata Sangh, a network of NGOs in Gujarat involved in promotion of sustainable agricultural livelihoods, initiated Sajjata no Sang in November 2006. The programme is aired every Thursday evening on All India Radio (AIR) in the Kheduth Mandal Programme at 7:20 p.m. It can be heard all over Gujarat, reaching over half a million rural listeners. By December 2009, more than 125 episodes of the programme had been aired.

Each episode lasts for 15 minutes and costs about Rs 15,000 to make (excluding management and human resource costs). The programme is designed around the three seasons of monsoon, winter and summer. Each episode focuses on a specific problem related to a specific crop or livestock or any other component of the farming system. The presentation is made through two imaginary characters, Shankar bhai (male) and Uma ben (female), who play the role of agricultural experts. A typical episode begins with the duo being approached by farmers with a specific problem. The episode then develops around the problem and its possible solutions during which the characters engage in a lively informal discussion.

Shrota Mandals

An innovative aspect of the programme has been the promotion of Shrota Mandals (informal groups of listeners). Seventy such mandals have been initiated in five districts on a pilot scale. The idea behind Shrota Mandals is to stimulate a collective approach to discussing problems related to agriculture so as to have innovative solutions and a free exchange of ideas. It also facilitates the collation of queries from a particular village or hamlet and helps generate ideas for future episodes of the programme.

Each episode is followed by an exclusive 'phone-in' session of two hours. This provides farmers with an opportunity to communicate queries and discuss them with a panel of experts from agricultural universities and other resource institutions. On an average, DSC received over 60 feedback messages per episode. Whereas some farmers call the DSC office on the

phone, others prefer to send their queries and remarks on postcards.

An internal evaluation study confirmed what DSC had already known from the regular feedback of the listener groups. A majority (97 percent) of the listeners had benefited in improved economics either through improved agricultural production and/or reduced cost and risk mitigation. Kanjibhai Nakum from Jamnagar is a typical example of a cotton-growing farmer, who had benefited from the programme. Kanjibhai adopted a new pest management remedy when conventional chemical pesticides proved ineffective in controlling white fly in his crop. As a result, he harvested a normal yield of over three tonnes and benefited from an increase in income of Rs 15,000. More than 50 percent of the respondents stated that they had experimented with new ideas and techniques after listening to the programme.

Avaaj Otalo

Taking advantage of emerging ICT, DSC sought to add value to its interactive programme by introducing Avaaj Otalo, a voice-based interactive system for farmers to access relevant and timely agricultural information over the phone. The system was designed in the summer of 2008 as a collaboration between IBM India Research Laboratory and DSC. By dialing a phone number and navigating through simple audio prompts, farmers can record questions, review and respond to others, or access content published by agricultural experts. In addition to the Q&A forum, Avaaj Otalo includes an announcements board of headline-like snippets, updated regularly by DSC staff, and a radio archive to listen to past episodes of DSC's popular weekly radio programme.

Avaaj Otalo was deployed as a pilot programme with 63 farmers throughout Gujarat in 2009. There were 3,500 hits to the system in the first month. Based on the enthusiastic response, the application was fully launched across the State in 2010.

Source: Based on information provided by Paresh Dave, DSC and Neil Patel (n.d.) "Avaaj Otalo: Voice-based Social Media for Rural India, Stanford HCI Group". http://hci.stanford.edu/research/otalo/

Agriculture, Government of Kerala. The video films produced in the local language (Malayalam) are made available to the farming community through a dedicated on-line video channel, in collaboration with Google India and YouTube. As of 2010, the channel has more than 140 videos on its menu. The project was started to provide on-demand service on best agricultural practices, success stories, technical know-how, etc. with highly informative and authentic content to the farming community. The videos are also localized and showcase the success stories of farmers from each location. Although the project covers the state of Kerala, the contents can be accessed by anyone having access to the Internet.

Box 3.5: Digital Green: Participatory Video for Agricultural Extension

DG is an agricultural training and advising system that seeks to benefit rural farmers by disseminating targeted information through digital videos and phones. Since September 2006, the DG system has been disseminating locally relevant agricultural information to small and marginal farmers in India, using participatory video and mediated instruction. DG was iteratively designed, deployed and evaluated in Karnataka as a project of Microsoft Research India, in collaboration with the NGO, GREEN Foundation, and Karnataka's Joint-Directorate for Livestock Extension. The unique components of DG are 1) a participatory process for content production, 2) a locally generated digital video database, 3) human-mediated instruction for dissemination and training, and 4) regimented sequencing to initiate a learning community. DG found that promoting farmers' participation in both recordings and screenings builds momentum in a community in the process of learning, adopting and innovating better agricultural practices.

Content dissemination

In each farming community local mediators are hired on a part-time basis. These mediators are members and residents of the same community with which they share the DG videos. They conduct a minimum of three screenings per week during suitable evening hours. Mediators transport DG equipment to different segments of their communities, maintain attendance records, and track the interest and adoption of promoted techniques. They are additionally supported by a full-time extension staff (either government or NGO), which provides mechanisms for feedback and audit for a cluster of villages. The mediators are given a performance-based honorarium of up to Rs 1,500, taking into account the local population and agro-ecological conditions of the season.

Whereas video provides a point of focus, it is people and social dynamics that ultimately make DG work. Local social networks are tapped to connect farmers with experts. The thrill of appearing on TV motivates farmers and helps to minimize the distance between the teacher and the learner. Short videos, usually eight minutes in length, provide clear descriptions of practices and help maintain the interest of a fluid audience, which may

come and go during the outdoor screenings in the night. The TV allows a village mediator to provide farmers with comprehensive and accurate knowledge about a particular practice.

Impact

In a one-year trial, involving 20 villages (1,470 households) in Karnataka, DG increased the adoption of certain agricultural practices seven-fold over a classic 'training-and-visit' approach. This system still requires the support of the existing extension system but it magnifies its effectiveness by using relevant content and local presence to connect with farmers on a sustained basis. DG was shown to be ten times more effective for every dollar invested. The table below summarizes the cost-benefit analysis of DG in comparison to the conventional 'training-and-visit' system.

System	Cost (USD) Village / Year	Adoption (%) / Village / Year	Cost / Adoption (USD)
Training & Visit	$840	11%	$38.18
Digital Green	$630	85%	$3.70

Source: Abstracted from Gandhi, Rikin, Rajesh Veeraraghavan, Kentaro Toyama and Vamaja Ramprasad, "Participatory video for agricultural extension", i4d June 2008, pp 22–28, and www.digitalgreen.org (accessed September 2010)

Farmers access the videos through Akshaya Centres[2] and, if required, they can even collect a downloaded version for further reference. These videos can also be accessed via mobile phones. The project runs an interactive portal and tele-advisory service to help farmers with further follow-up and advice. Dedicated teams of agricultural professionals manage these services. Since its inception, the channel has been getting high user access and rating. According to IIITM-K, in the past several months, the channel has received 6, 67,075 views with 484 on-line subscriptions. More than 1, 35,000 direct viewers have been recorded across the country. Almost all videos have a high user rating and appreciative comments (eIndia website, accessed August 2010)

Protecting Lives and Livelihoods from Natural Disasters

ICTs play an important role in the rapid communication of early warning systems as well as in the effective implementation of weather insurance schemes.

Early warning systems

Most of the agri-advisory services have already started providing information on weather

forecasts. This includes impending natural disasters like cyclones and tsunamis. In flood-prone regions, early warning systems include passing of information to coastal villages by the district administration's disaster management cell through mobile phones and other means of communication. Pest-alert services become very critical in case of a major pest or disease attack on crops, cattle and other farm animals.

In the case of earthquakes, even the most sophisticated early warning systems give only a few seconds' warning before a quake strikes. These systems are based on detection of seismic P-waves. Like a flash of lightning that arrives before the clap of thunder, the fast moving P-waves precede slower moving but more destructive waves. In such cases, the use of ICT becomes critical in sending off the warning as quickly as possible to the populations at risk.

Monitoring natural systems for potential disaster threats usually calls for collaboration among nations within a region prone to such disasters. The use of ICT becomes crucial in creating effective communication systems across participating countries. The following are three examples of such collaborative initiatives.

a. Locust watch—a pest alert system of the FAO

b. INTEWS—an early warning system for tsunami developed by India

c. SADKN—SAARC's disaster knowledge network

Pest alerts from FAO

An interesting example of pest alerts is the Emergency Prevention System (EMPRES), for trans-boundary animal and plant pests and diseases, initiated by the FAO in 1994. The desert locust is one of the first priority problems that EMPRES has been covering because of its ability to cause catastrophic plagues (Box 3.6).

Indian National Tsunami Early Warning System (INTEWS)

Tsunami is a system of ocean gravity waves formed as a result of large-scale disturbance on the sea floor that occurs in a relatively short duration of time. Recognizing the imperative to put in place an early warning system for mitigation of oceanogenic disasters that could cause severe threat to the lives and properties of nearly 400 million Indians living in the coastal belt, and further driven by the national calamity due to Indian Ocean tsunami of December 26, 2004, the Ministry of Earth Sciences (MoES) took up in late 2006 the responsibility of establishing INTEWS. The system has been established by MoES in collaboration with the Department of Science and Technology (DST), Department of Space (DOS) and the Council of Scientific and Industrial Research (CSIR) (Box 3.7).

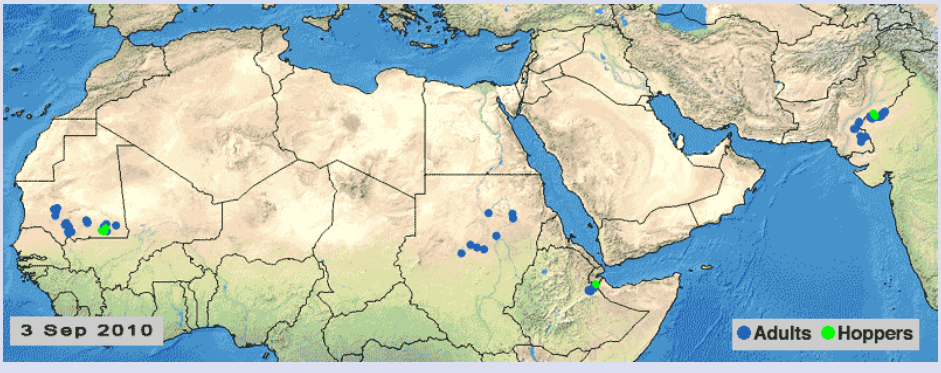
Box 3.6: Locust Watch!

The EMPRES programme, organized by the FAO in 1994, aims at reducing the risk of trans-boundary animal and plant pests and diseases. The desert locust is one of the first priority problems that EMPRES has covered because of its ability to cause catastrophic plagues. Locusts and other migratory pests can fly over great distances and threaten crops hundreds or thousands of kilometres away from their places of origin. The desert locust plague of 1986–89 was an example of how agricultural pests and diseases can easily spread across borders and cause emergencies.

EMPRES is a coordinated effort between FAO and its partners—locust-affected countries, donors, regional organizations and other institutes—aimed at developing a sustainable preventive strategy against the desert locust. The programme was initially concentrated in nine countries that border the Red Sea and Gulf of Aden, which have historically been a source of many locust outbreaks and plagues: Djibouti, Egypt, Eritrea, Ethiopia, Oman, Saudi Arabia, Somalia, Sudan and Yemen. It has now also been extended to West Africa.

EMPRES attempts a new approach to an old problem by emphasizing early warning, early reaction and research. It provides periodic updates and forecasts on locust activity on its website under 'Locust Watch'. These are based on information collected by survey teams of partner countries as well as FAO.

On September 2, 2010, for example, Locust Watch reported small-scale breeding in southern Mauritania and in Pakistan near the Indian border, in parts of northern Mali and Niger, southern Algeria, eastern Chad, northern Sudan, western Eritrea, and Rajasthan in India. During the forecast period, small-scale breeding would continue in the above



areas and locust numbers could increase rapidly. By mid-October, there was a low risk that locusts could concentrate in vegetation that remains green and form small groups, especially in northwest Mauritania. It cautioned that although the current situation was calm, careful monitoring should continue during the next few months.

Source: FAO's website on Locust Watch, www.fao.org/WAICENT/FAOINFO/AGRICULT/AGP/AGPP/EMPPRES/Default.htm (accessed September 2010)

SAARC Disaster Knowledge Network

This virtual network of networks known as South Asian Disaster Knowledge Network (SADKN) has been envisaged to provide a common platform to create, learn, organize, share and reuse knowledge related to disaster management. The network was launched by the honorable UN Secretary on November 4, 2009 at the 2nd International Congress on Disaster Management held in New Delhi.

SADKN web portal (http://121.243.155.109:81/sadkn) is the common platform for knowledge sharing among the SAARC countries. The portal has become the gateway of information on major natural and man-made hazards in South Asia. The SADKN portal is designed to provide SAARC countries with ready access to clear, understandable, user-friendly information about emergency management. It also provides information on various government organizations, and other services like weather forecasts, which are integral to managing disaster among SAARC nations.

Weather Insurance

As is well known, agriculture is a risky livelihood, especially in rainfed regions where crop productivity is often directly related to monsoon patterns. Earlier experiences of promoting crop insurance schemes for farmers were not very successful because of various limitations including high premiums, delays in clearing claims, etc. Of late, weather insurance schemes that overcome many of these difficulties have emerged as a viable alternative to crop insurance. This has been made possible by breaking up the risk into different parcels, and the application of ICT for reliable and expedient clearance of claims.

The IFFCO Tokio General Insurance Co Ltd, in collaboration with the District Central Cooperative Bank (DCCB) has field tested in Ambikapur, Chattisgadh a weather insurance model that uses satellite imagery to assess crop damage and settle claims quickly. The scheme entitled Barish Bima Yojna aims to secure the livelihood of Indian farmers by reducing the risk and uncertainties faced by them from dependence on weather. Normally, investigation for insurance takes a long time in the case of poor

Box 3.7: India's National Tsunami Early Warning System

The Indian Ocean tsunami occurred on December 26, 2004, causing devastation of life and property in coastal regions of India, Sri Lanka, Indonesia and Thailand. Due to non-availability of an early warning system, the event was not detected in time and caused extensive damage. India decided to take the lead in establishing a state-of-the-art tsunami early warning system (TEWS) in the region.

On October 15, 2006, the National Tsunami Early Warning Centre was set up at INCOIS, Hyderabad, with the technical expertise of TCS. The centre runs a fully automated warning system that operates 365 days in the year, continuously monitoring seismic activity in the tsunamigenic source regions and sea levels through a network of national and international seismic stations as well as tide gauges and bottom pressure recorders (BPRs). The monitoring of water levels enables confirmation or cancellation of a tsunami. Tsunami bulletins are then generated, based on pre-set decision support rules and disseminated to the concerned authorities for action following a standard operating procedure. The solution provides facilities for dissemination of alerts through the web, e-mails and SMS. The centre can predict the exact location and wave height of tsunamis with the actual time of impact. The application identifies the exact inundation of areas thus reducing the evacuation costs incurred by various state and central governments, to minimize devastation of life and property.

Source: barco.com

The system successfully validated the earthquake off southern Sumatra that took place on September 12, 2007, within 12 minutes. The tsunami warning centre swung into action and issued a tsunami alert for Andaman and a tsunami watch for the mainland within 13 minutes. The centre claims 100 per cent accuracy for earthquake parameters like location, depth and magnitude. The time taken to evaluate and detect a tsunami from the moment an earthquake is identified is less than 8 minutes.

INCOIS has received wide recognition in the form of number of awards from various international and national organizations:

- Geospatial Excellence Award (2009) for implementation of geospatial technologies for disaster management during Map World Forum 2009
- Special Achievement in GIS (SAG) Award (2009) for application of geospatial solutions from Environmental Systems Research Institute, California.
- The Special Jury Award of CSI-Nihilent e-Governance Awards (2009) under the Project Category 'Disaster Mitigation Award 2009' during the Second India Disaster Management Congress in New Delhi.
- Platinum Icon under the Innovative Use of Technology category of Web Ratna Awards (2009) by Ministry of IT, New Delhi.
- Best Geospatial Solution of the Year Award (2008) from Geospatial Today

Source:http://www.eindia.net.in/2010/awards/details/eGov-G2C-Details.asp?PNo=27 (Accessed September 2010).

harvesting causing financial havoc on farmers, sometimes even resulting in farmers' committing suicide. With the help of satellite technology, the process gets completed even before the harvest. The satellite images are used to measure the normalized difference vegetative index (NDVI) that is used to determine the loss in crop yield. Not only does the new method speed up the process, it also reduces errors because there is no human inference (IFFCO Tokio, 20101).

End-notes

1. This section is based on a study called Application of Remote Sensing and Geographic Information Systems in Participatory Natural Resource Management by Asif Pradhan, International Development Management (IDM) Fellow, 2000–01, for DSC.

2. Refers to the e-literacy and e-services centres established in Kerala under Akshaya Programme of the Department of Information Technology.

4 ICT Strategies to Strengthen the Self Help Movement and Micro-enterprise

ICTs have proved useful to the self help movement by creating greater access to financial services and markets. It has also opened up the prospects of a new service sector in rural areas, which can provide services not only to rural clients but also to urban clients through Business Process Outsourcing (BPO). In this chapter, the early experiences in the first two areas are described:

a. ICTs for inclusive banking and financial services, and

b. ICTs for accessing markets by:
   - Improving price discovery and price realization for farm produce, and
   - Virtual marketing of rural artifacts.

c. Addressing information needs of pro-poor value chains & rural supply chains

The prospects of ICT as an emerging service sector are discussed separately in Chapter 6.

Inclusive Banking and Financial Services

The chairman of the State Bank of India (SBI), Mr O P Bhatt, is of the view:

> *With inclusive banking, we are on the threshold of a new era. When we talk of financial inclusion, we are talking about providing an identity, dignity, self-respect and empowerment to these people (marginalized rural clients) and affordable cost to the institution which does that.*
>
> (GGA Secretariat, August 2007).

The financial logic of inclusive banking is compelling enough for banks to sit up and take notice. In the very poor households, the bread-earners, particularly women, try to save part of their earnings at home. They are reluctant to open an account in a bank because a visit to the bank could cost them Rs 25 to 40 and the opportunity loss of a full day's wages. There are tens of crores of such bread-earners, who would not mind investing and saving for their future if they could access banking services at an affordable cost. The Grameen Bank experience of Bangladesh, BASIX and SEWA Bank experiences in India among others and the phenomenal

growth of women's SHGs for savings and credit have demonstrated this beyond doubt.

In India, there are about 6.5 lakh villages, which are serviced by only 20,000 rural commercial banks. The current model does not allow commercial banks to reach these people and it is not economically viable. In addition, the staff refuses to go to remote villages. ICT has helped to provide new models for inclusive banking with new technologies like:

- Smart cards and hand-held devices.
- Remote banking accounts.
- Cards with biometric identification (fingerprints of owners who cannot sign)
- Business correspondence outlets located in villages where farmers can operate their cards.

Being the largest bank in the country, SBI felt obliged to take the lead. It has invested considerable resources into the venture, in terms of manpower, technology and partnerships (GGA Secretariat, August 2007.).

ICICI: Promoting women's SHGs

ICICI, the second largest bank of India, was among the first to take up the promotion and financing of women's self help groups to minimize the costs associated with expanding rapidly and to gain qualified rural staff, ICICI decided to partner with the NGOs and micro-finance institutions (MFIs) currently in the field. By 'piggybacking' on the established network of these rural-oriented players, ICICI gained knowledge about the market it intended to serve and eventually increased its banking presence. ICICI has developed two routes for inclusive banking:

a) *Direct access route:* This route was stimulated by its merger in 2001 with the Rural Banking Institution, Bank of Madura. At the time of the merger, there were 1,200 SHGs. ICICI subsequently accelerated the pace of growth and by March 2003 there were more than 8,000 SHGs. ICICI identified leaders from mature SHGs as 'social service consultants', who were entrusted the task of promoting new SHGs in collaboration with the bank staff.

b) *Partnership route:* Through this route, ICICI hopes to play a catalytic role in micro-finance by partnering with MFIs, making equity investments with partners, creating technologies that will help penetrate the rural areas and utilizing their corporate network to funnel resources. Initial partnerships included those with DHAN Foundation in Karnataka, PRADAN in Jharkhand and CASHPOR in Uttar Pradesh. It has also partnered with EID Parry, n-Louge, ITC e-Choupal

and BASIX to take advantage of the rural kiosk network they have established (Markson and Hokenson, 2003).

Ekgaon Technologies

A combination of hardware innovations and software applications has made it possible to develop new systems of inclusive banking, using hand-held devices. Delhi-based Ekgaon Technologies Pvt Ltd developed OneMIS, a mobile enabled monitoring and transacting system for micro-finance. The system takes advantage of the 'Business Correspondent' initiative[1] of commercial banks and intends to train these institutions as agents of change. They will act as the interface between the marginalized rural client and the technology system that makes it possible for the client to carry out financial transactions and access credit right from the comfort of his/her village. As clients gain confidence in the system, a larger portfolio of financial services, including health and crop insurance schemes, savings schemes, etc., will be channelled through the same system.

Interestingly, OneMIS and similar systems simultaneously address the issue of generating reliable and instantaneous data, which financial institutions (FIs) including banks and SHGs/Joint Liability Groups, and their federations can use to monitor the flow and use of funds. Better on-line information systems are likely to enable these institutions to manage their portfolios more efficiently. The system has been field tested in the Palani hill areas of Tamil Nadu in Dindigul District, with World Vision-India (WV-I) and its micro-finance programme for the poor. Realizing the benefits of the system, WV-I intends to scale up the system in 24 States across the entire country in 12 languages (for more details, see case study in part 2 of this volume).

Improving Access to Markets

The initiatives aimed at providing access to markets for farm produce as well as for artifacts produced by rural artisans have shown remarkable improvement in price discovery and price realization in various pilot projects.

The small-holder farmers are facing increasing challenges of competition in the global marketplace. Partly in response to this situation, a handful of initiatives in India have succeeded in creating 'pro-poor value chains' that are controlled by farmers' institutions (Volume II). The information needs of such value chains can only be addressed efficiently through the judicious use of ICT. Parikh, Patel and Schwartzman (2007) have provided a useful framework for developing such information and communication systems. The framework is discussed in brief at the end of this section.

Improving price discovery and price realization for farm produce

By now it is well know that one of the many reasons for farmers falling into the debt trap and committing suicide is their inability to get a fair deal in the market. Realizing this, many NGOs have made forays into the market in the hope of securing better prices for their target communities. These 'market-led initiatives', described in considerable detail in Volume II of this Handbook, range from direct participation in the local mandi and acting as a persistent bull to raise prices in favour of the farmers (as done by Jannarth), to complex interventions that build value chains in ways that empower the poor communities. Here, however, we will discuss in brief only two interventions that aim at creating market access to farmers and other villagers through spot and futures markets, using ICT tools for communication.

Multi Commodity Exchange of India Ltd (MCX)

MCX, promoted by Financial Technologies India Ltd., is a company that believes in the slogan, 'think big, start small, and scale fast'. Started in 2003, it achieved an average turnover of Rs 6,740 crores per day in two-and-a-half years. By 2007, it had over 21,000 trading stations in 600 cities, trading in 72 commodities of which 28 were agricultural. MCX pioneered the spot and futures trading in the country by setting up a National Spot Exchange for Agriculture Produce (NSEAP) in collaboration with NAFED. The concept of NSEAP is to provide a national-level electronic institutionalized spot market to farmers. It provides a place where farmers can sell at the best possible rate and the end users can buy at the most competitive rate. Farmers communicate market information through VSAT, mobile, the Internet, etc. A delivery contract has to be signed. The farmer has to deliver the produce at the nearest warehouse of the company and get his payment right there. In this system, the farmer stands to gain because the best price is offered directly by the end users. In India, farmers get only 25–30 percent of the price paid by the end users. NSEAP strives to change this situation in favour of the farmers. As a result of this initiative, MCX believes that the income of farmers can be doubled without increasing the consumer paid price.

However, a number of support facilities need to be in place. A crucial link is the absence of warehousing facilities in rural areas. MCX, therefore, started a sister concern called National Bulk Housing Corporation to meet the needs of farmers. Banks have been linked to provide loans for farmers. Information kiosks are being set up with the help of TERI. A unique partnership with India Post has led to the formation of Gramin Suvidha Kendra (GSK), through which MCX will cater to the marketing, warehousing and advisory needs of the farmers (Box 4.1).

MCX's success can be attributed to the following strategic measures:

- Identifying a suitable partner with high credibility and reach.
- Starting with the felt need of the farmer (market intelligence) and adding on other support services quickly.
- Adopting a participative process to identify farmers' needs and modifying programmes accordingly. Close to 400 farmers interacted with MCX and India Post officials through group meetings, focus group and one-on-one sessions. The feedback is being used to broad base the services offered through GSK.

Box 4.1 GSK: A Partnership for Inclusive Growth of Farmers

GSK is a joint initiative of India Post and MCX. This unique partnership aims to demonstrate how the widespread network of over 1,55,000 India Post branches across the country can be synergized with MCX to cater to the farmer's need for information, warehousing, advisory and agriculture inputs. The model was first pilot tested in Jalgaon in Maharashtra and then replicated in other states like UP, MP and Gujarat. By mid-2009, more than 4,000 farmers had registered on the GSK platform across 768 villages through 160 branch post offices.

Source: smeworld.org

GSK operates on a hub-and-spokes model and its structure parallels the existing multi-tiered structure of India Post. The village-level branch offices (BOs) exchange postal bags on a daily basis with the taluka-level sub-post offices (SPOs). The significance of the network is evident here. The SPO is the hub, and MCX provides the ICT set-up and a centre-coordinator to manage it. MCX has installed a computer facility complete with the Internet connection, scanner and fax machine at the SPO to provide information on the price of various commodities. BOs reporting to SPOs, function as the spokes of the hub. To display GSK information and content, BOs are provided with blackboards along with the necessary stationery. GSK provides opportunities for rural youth to get employed and work for its people. MCX pays the rural coordinator a basic salary plus a performance-

related incentive. It also provides domain knowledge and training to all India Post staff associated with the project.

Services through BOs include:

- *Futures and spot prices of commodities:* This helps the farmer to decide whether to hold his produce for a better price in the future or to sell it immediately. It also helps him select the most remunerative crop to cultivate, looking at the futures price information.
- *Agriculture-related query redressal system:* GSK has tied up with Krishi Vigyan Kendra (KVK) and other research institutions to provide a query based agri-advisory service to farmers. The farmer can take a query form for Rs 10 and send it through the BO. The average response time is four days.
- *Integrated warehousing:* GSK provides the farmer with warehousing facilities where he can store his produce after harvest and sell it when he thinks the price is most remunerative. Members of GSK can also avail of a bank loan, based on the warehouse receipt.
- *Supply of agri-inputs at the farmer's doorstep:* GSK offers a supply of quality seeds and other agri-inputs like fertilizers and pesticides at the nearest post office, thereby saving on the farmer's transaction costs and assuring quality inputs.

The impact made so far can be gauged from the findings of an internal survey:

- In 57 per cent of the cases, MCX futures prices helped farmers decide which crop to sow in the coming season.
- Sixty-six per cent said that they hold on to part of their produce on the basis of MCX future price signals and sell at a later date to benefit in price realization.
- Twenty-seven per cent changed their cropping pattern due to the expertise received through GSK query system.
- Sixty-six per cent claimed increase in farm productivity due to the timely availability of quality inputs.

Source: Sarita Bahl (2009) and the company website http://www.mcxindia.com/csr/GSK/GSK.htm (accessed September 2010).

ITC's e-Choupal

GSK is an example of a private enterprise pursuing a social goal. An equally celebrated case is that of ITC's[2] e-Choupal. Although the primary objective in this project was to bring efficiency to ITC's procurement process for its agri-export division, it has today led to a significantly increased empowerment of rural farmers where such information

kiosks have been established. In Hindi, a *choupal* is a village gathering place. An e-Choupal seeks to web-enable a village community. A basket of information and knowledge services can be accessed by farmers through this rural digital infrastructure including weather updates, ruling international and local prices, best practices in farming, crop conditions, soil-testing and input supply. Here too, a *sanchalak* (who is a literate farmer) acts as the interface between the illiterate farmers and the digital technology. As on 2008, there were about 40,000 e-Choupals. ITC plans to scale up the model to cover 1, 00, 000 villages. Over 70 companies utilize the two-way channel created by e-choupal network for one of the most efficient distribution and procurement systems in rural India.

The farmers' preference to sell their produce through this alternative infrastructure can be attributed to the following:

- *Efficiency and transparency:* Efficient material handling systems at the ITC collection centre ensure precise weighing, transparency and minimal wastage.
- *Lower transaction costs for farmer:* In the mandi system, transaction costs like bagging, transportation, loading and unloading had to be incurred by farmers. In the e-Choupal system, transportation costs are reimbursed to the farmer and other costs are absorbed by the material handling system.
- *Instant payment:* Farmers get payment within a couple of hours of offering the produce at the collection centre.
- *Convenience:* In the mandi system, farmers had to wait for hours, or even days, before the produce was sold. In the e-Choupal system, transactions are done close to home.
- *Savings in cost:* Although prices offered by ITC are not always higher than those at the mandi, farmers end up saving about Rs 400–500 per tonne of soybean, on account of the above.
- *Exercising choice:* The final decision to sell their crops to the mandi or to ITC rests with the farmers themselves.

ITC gains in terms of assured supply and savings of more than Rs 200/tonne by avoiding the cost of transportation of the crop from the mandi to the collection centre and other intermediary costs in the supply chain. The intermediaries are not removed from the value chain. Their roles are redefined to samayojaks (coordinators), who assist ITC in setting up new e-Choupals by conducting village surveys and identifying the best

sanchalaks. They get paid a commission of 0.5 percent on the product processed (Case study in Part 2, this volume, for details).

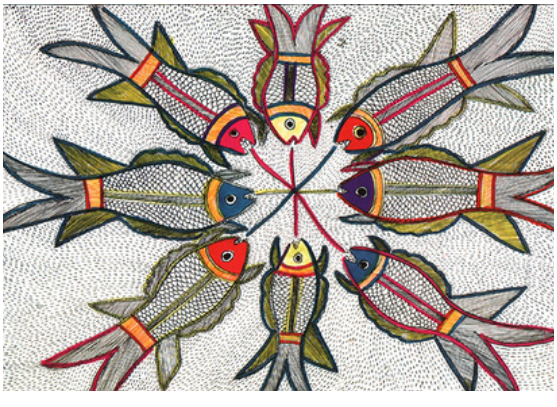
e-Choupal's success can be attributed to, among other things:

- Participatory approach to identify farmers' needs and expand the basket of services according to their needs.
- Creation of a two-way channel for communication as well as distribution and procurement.
- Creation of an alternative market infrastructure that is efficient, reduces wastage and transaction costs for both parties, increases convenience for the farmer and saves opportunity costs.
- Facilitation of farmer-to-farmer exchange of ideas and technology.
- Partnerships with other service providers, academics and NGOs for developing useful content and maximizing traffic on the digital highway created.

Promoting rural artisans and artists through virtual marketing

As virtual marketing becomes increasingly an effective tool for private companies to reach distant markets, social entrepreneurs too have begun to tap this resource effectively.

Drishtee, a social enterprise involved in promoting rural entrepreneurship through the use of ICT, has effectively promoted the Mithila paintings of Madhubani through virtual marketing. Kiosk owners procure photographs of the paintings directly from the artists and put them on sale on the Drishtee e-commerce portal dirshteehaat.com. The sale of these paintings results in a 400 per cent increase in direct revenues to the artists due to elimination of middlemen. This direct-sales model has also helped to improve the



Source: flickr.com

artists' understanding of the dynamics of the market and has led to the development of new products (case study in Part 2 of this volume).

Volume II of this handbook provides a number of other examples of the use of virtual marketing. Sahaj has set up a catalogue of tribal artifacts made in Dahod, Gujarat. ASCENT, a support organization based in Bangalore, helped 200 artisan families to revive their art and start exporting their produce through Fairtrade channels under the brand name of ToeHold. The ToeHold Artisans Collaborative (TAC) is an organization marketing new products made by artisans of traditional Kolhapuri footwear. TAC has been successful in using virtual marketing as a tool to reach customers in industrialized countries. TAC began exporting its product as 'ethnic footwear' to clients in Italy, Japan and Australia. A B2B web-driven model was established. Its web-based catalogue showcases over 450 designs, a testimony to the design and quality capabilities of the artisans. By 2007, its export turnover was expected to cross US$ 100, 000. TAC's website www.toeholdindia.com won the National Manthan Award for e-content in business category in 2005.

The Community Friendly Movement (CFM) is another social enterprise that uses virtual marketing for promoting the products of rural artisans from all over the country. The management of CFM believes that product tags with the company website on it have been helpful in stimulating repeat purchases especially as gifts. Once the consumer is assured of the quality of the produce, he/she does not mind purchasing on the Internet.

Addressing Information Needs of Rural Value Chains

Pro-poor agricultural value chains

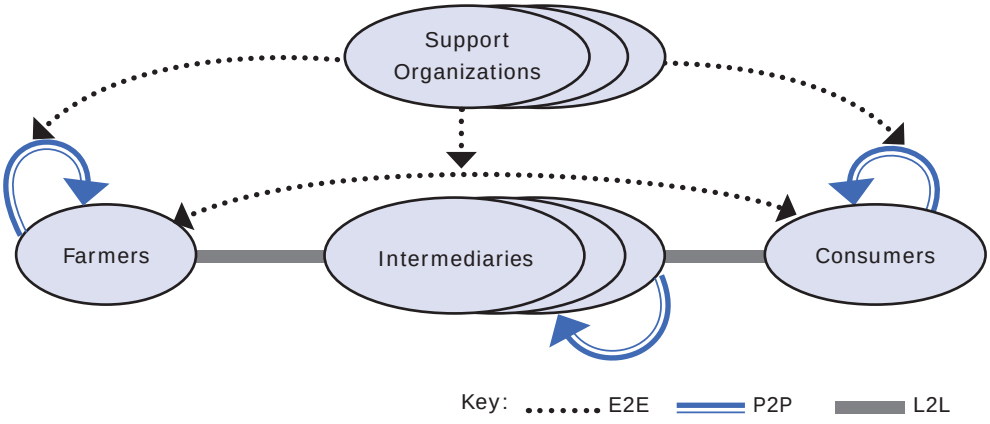
Small-holder farmers face many challenges competing in the global marketplace. A major constraint is the lack of access to information and communications, which could be used to make decisions and reach new markets. Parkih, Patel and Schwartzman (2007) provided a framework for understanding inter-stakeholder communications within agricultural value chains, focusing on the needs of small producers (Figure 4.1).

Broadly there are three categories of information flows within agricultural value chains:

i. *Link-to-link (L2L):* The information flows required to coordinate the sale, movement and distribution of produce along the value chain.

ii. *Peer-to-peer (P2P):* The communication required to share knowledge and experiences between members of the same stakeholder group, and the expert community serving that stakeholder group.

Figure 4.1: Categories of Information Flows in Agricultural Value Chains



iii. *End-to-end (E2E):* The communication between producers and consumers, for example, to facilitate exchange of non-economic values to be used as external inputs to market pricing (for example, certification).

In a pro-poor value chain, a transparent recording of all transactions is an essential requirement of building member trust in the system. In the poultry cooperatives promoted by PRADAN, for instance, transactions arise between the supervisor and producers, between supervisor and cooperative and between the producer and the cooperative. The transactions cover the supply of chicks and inputs, lifting of birds and payment o producers. For al these, a well-defined system of receipts, challans and vouchers is required. PRADAN has developed an operations manual that spells out the formats for recording transactions at each level. The flow of information is facilitated through computerized systems. The data is collected at three different levels as shown below (Anish Kumar, Deka, Das and Ojha, 2007):

- *Individual level:* The key financial indicators capturing business performance are batch profits, capacity utilization or batch intensity. Similarly, the stock transactions with the cooperative and the batch margins, the financial transactions such as payments received and the repayment to banks in case the cooperative is a guarantor are also recorded.
- *Service provider level ll*: the stock transactions and the financial transactions of the enterprise are recorded.
- *Cooperative level:* The MIS data helps to review the progress and paves the way for solving problems and facilitates planned action both on the marketing and production fronts. The MIS report to the Board of the cooperative covers the highlights of batch performance, productivity parameters data on market

interface, performance of the cooperative in terms of various financial parameters and indicators of performance efficiency.

Hence the L2L communication in the poultry cooperative system is quite well developed and computerized. P2P communication within farmers is facilitated by the service providers and cooperative leaders through periodic meetings. P2P communication between poultry cooperatives, is facilitated by PRADAN and the apex cooperative body of a given State, through periodic meetings. E2E communication happens mostly when the cooperative officers deal with the traders directly. The market related information is then passed back to the small producers through the cooperative via the team of service providers.

The AMUL dairy system of cooperatives represents another instance of the use of ICT tools to facilitate information flows and improve efficiency within a pro-poor value chain. AMUL has been instrumental in bringing the white revolution to India. The introduction of an Automatic Milk Collection System (AMCS) in 1996 by the Anand District Milk Cooperative Society, brought about dramatic improvements in efficiency (see Box 4.2). By 2006, AMCS had a comprehensive database of 290,000 members in Anand-Kheda districts in 691 dairy cooperative societies out of a total of 1003 societies under

Box 4.2

AMUL: More value through better use of ICT

An Automatic Milk Collection System (AMCS) was introduced by the Anand District Milk Cooperative Society in 1996. The cooperative has staff strength of 1200 and collects 700,000-800,000 liters of milk every day from 1003 milk societies.

Each AMCS consists of a computer for billing, a milk-testing machine and an automatic milk tester. Each AMCS costs Rs 70,000-90,000/-. The cost of the milk-testing machine was brought down from Rs 180,000/- to Rs 22,500/- through product and process innovation. Simple rugged plastic cards with holes are used as personal identifiers rather than smart cards. The idea was to keep the cost to affordable levels without sacrificing any essential requirements.

The e-governance Center of the Indian Institute of Management – Ahmedabad, worked to extend the benefits of this application by developing the Dairy Information System Kiosk (DISK) software, which replaced the existing application a the milk collection centers. It has tow major components: a) an application with enhanced database and reporting running at the society level and b) connectivity to a dairy portal serving transactional and information needs of all members and staff at various levels in the district cooperative structure. The DISK database includes a complete history of all milch cattle owned by

the farmers. The basic details of breed and a history of diseases, inoculations, artificiaal insemination and pregnancy are maintained in the system. Longitudinal data on milk production by individual farmers is also available in the collection center, which can provide feedback to the farmers.

AMCS provides automatic weighting of procured milk, measurement of fat content of the milk and automatically calculates the amount to be paid. It maintains a database on the computer for member details like membership number, date and time of the milk collection, weight of the milk, fat content of the milk and amount payable. The payment is made on the spot on per kilo fat basis.

The system also meets the needs of marketing staff within the cooperative system. All 50,000 AMIL product distributors have been connected to 50 marketing offices of AMIL across the country through dial-up connectivity and in turn this is connected through VSAT with 12 District Milk Unions in the state of Gujarat.

In most village level dairy cooperatives one or two staff has been removed after introduction of AMCS, thereby reducing operational costs. The system has been found to be economically viable and sustainable with costs being recovered within a period of two years on account of the improved efficiency at different levels of the value chain.

Source: Roger Harris and Rajesh Rajora (2006) Empowering the Poor: Information and communications Technology for Governance and Poverty Reduction. UNDP-APDIP

the cooperative. This has brought down the waiting time for the members of the Milk collection centers from 20 minutes to 50 seconds. It has reduced payment delays from 13-14 days to same-day payments. The system is gradually being adopted across the country by other dairy cooperatives under the AMUL pattern, although replication is hampered by the poor financial position of most dairy cooperatives in other states (Harris and Rajora, 2006).

Rural supply chains

ICTs can play an equally important role in improving the efficiencies of rural supply chains that provide goods and services to the rural consumer. The lack of information

and communication infrastructure has left companies with manual paper-based information methods as the only means of analyzing and aggregating data. This primitive approach to rural supply chain management creates a barrier to efficiency and a barrier to entry for many companies. Due to the number of stakeholders involved in delivering and selling goods to consumers in rural areas, and the large geographic distances between them, collecting and aggregating information manually is inefficient and time-consuming. Javid and Parikh (2006) demonstrated how a mobile-based information system could help optimize distribution routes and reduce inefficiency. By knowing the location and details of transaction, the company can better direct rural marketing strategies and manage human and material resources.

Upstream flow of information from the customer is essential for a company to properly understand customer demand, manufacture the required amount of products and distribute them in a time-effective manner at the right locations. This requires generation of three types of information:

- What amounts of products are needed?
- Where should they be delivered?
- When are they desired?

This information is generated at the customer level and becomes useful only when it flows up the supply chain to where the products are produced.

Periodically, the company managers need to re-assess business processes and strategies. Such iterative business processes require repositioning of sales and distribution routes, marketing strategies and organizational structures and hierarchies. ICT can automate a number of labour-intensive information processes required for providing decision makers with timely and complete information in order to take these strategic decisions.

The ICT e-Choupal case (Best Practices, Part II) has shown that once an information highway has been created to procure farm produce in a cost-effective manner, which reduces transaction costs for both the company as well as the farmer, the same could be utilized to aggregate demand for consumer products, and supply the same to the rural consumers.

End-notes

1. As per an RBI circular of 25 January 2006, NGOs/MFIs set up under Societies/Trust Acts, Societies registered under Mutually Aided Cooperative Societies Acts or the Cooperative Societies Acts of States, Section 25 companies, registered NBFCs not accepting public deposits and Post Offices may act as Business Correspondents. The Business Correspondent plays the role of an intermediary between the bank and the rural client, who is outside the reach of the formal banking system, thereby facilitating inclusive banking.

2. The ITC group of companies has a yearly turnover of Rs 7.5 billion (US$162 million), and its activities span tobacco and cigarettes, paper and packaging, paperboard, hotels and tourism, IT and agricultural exports.

5 ICT Strategies to Strengthen Government Delivery Systems

ICT can play a significant role in streamlining data management and MIS of large programmes, including those of the government. The government, on its own, is also keen on improving its delivery systems through the use of ICT. These efforts are popularly known as e-government initiatives. This chapter takes a look at both kinds of initiatives:

a) Improving accountability and transparency of large programmes, and

b) Improving efficiency of government delivery systems through e-government

Improving Accountability and Management of Large Programmes

Rural employment guarantee schemes

Software applications for large programmes, especially those of the government, can help improve transparency and accountability, as demonstrated by TCS. In April 2006, Andhra Pradesh was the first State to implement an automated solution for the Andhra Pradesh Rural Employment Guarantee Scheme (APREGS) in which every rural household is guaranteed a minimum of 100 days of wage employment each year. The software developed by TCS has simplified a number of processes in the implementation of the programme like:

- Issue of job cards,
- Identification of work to be undertaken, and
- Generation of work estimates, which has got reduced from 15–20 days to a few minutes.

This has brought in transparency in the wage payment structures through agencies like banks and post offices, fostered accountability, and minimized the possibilities of misuse of funds. Villagers can now get information about their villages, work status and wage payments online.

By 2007, 657 mandals across 13 districts in the State had already used the package with impressive results. Transactions worth Rs 635 crores, covering 42-lakh job cards, were available on the portal operated by APREGS. By making data available for public

scrutiny, the portal facilitates the Right to Information (RTI). The central government has decided to implement the software in other States as well (GGA Secretariat,2008).

The National Informatics Centre (NIC) has also developed software for monitoring NREGA. The NREGA portal (www.nrega.nic.in) has been prepared and deployed in consultation with the Ministry of Rural Development (MoRD). Each stakeholder can input and access information through this portal. The software is Unicode-enabled and supports all Indian languages. It allows a citizen to access all relevant information about a scheme, like the NREGA, and its implementation, operational guidelines, contact details of key officials, monthly progress report, employment status, work status, financial details, available funds at each level, job card, employment register, muster roll, issue register, etc. Workers can check their records, lodge complaints and check on the action taken on their complaints (GGA Secretariat, 2007).

National Rural Health Mission

Among other governmental programmes, the National Rural Health Mission (NRHM) is actively pursuing a strategy to improve performance and accountability of health services with the help of ICT. The NRHM strategy emphasizes decentralized planning and governance, adopts a rights based approach for care and primary health care systems, has a pro-poor focus and is result oriented. Above all it focuses on empowerment through information. The NRHM has identified a number of ways in which ICTs could benefit the Mission and usher in the era of e-health:

- *Health informatics*: Information on coverage, usage, sustainability, scale, costing, quality, etc., of various health initiatives need to be brought together and disseminated.
- *Providing information on health*: This should be locale-specific and include traditional knowledge. The advices should be culturally and socially relevant.
- *Connecting health workers to specialists*: ASHAs (primary health workers) are now being digitally connected to hospitals and specialists. Within 7 years, it is estimated that there will be about one million ASHAs. This will make it possible to:
  - Issue warnings about epidemics,
  - Provide a list of facilities available for specific health problems, and
  - Send digital images to experts for their advice online and organize virtual OPDs.
- *De-mystifying ailments:* countering myths and harmful beliefs.

- *Providing e-support groups:* for patients suffering from terminal illness such as cancer, HIV, etc.
- *Tracking the use of money and the performance of functionaries*: The department is spending about Rs 9,500 crores annually at the sub-district level. It needs to track these funds with speed and precision.

(GGA Secretariat, 2007 and 2008)

Such information systems strengthen the hands of activists, who fight for the rights of the poor and unemployed using the RTI Act. (For a more detailed discussion on the use of RTI for empowerment of the poor, see Chapter 9 Volume IV)

Implementing Forest Rights Act in Maharashtra: Use of Geo-informatics

The Government of India (GoI) enacted the Forest Rights Act (2006), to formalize the relationship between forest rights holders and forest resources. The Act implies recognition of forest dwellers' rights on forest land. The Tribal Research and Training Institute (TRTI), Pune, is the nodal agency for implementing the Act in Maharashtra. The number of claimants of forest rights in Maharashtra is approximately 0.33 million. The process of regularization involves measuring each plot of forest land under claim. TRTI has effectively harnessed geo-informatics to facilitate speedy and effective processing of applications.

A 13-digit alpha-numeric unique ID has been assigned to each claimant. GPS machines are used for measurement of the land. GPS data is uploaded and processed in the computer at the office of the sub-divisional officer in charge of tribal areas. The XML file (GPX file) created gets transmitted on-line to the TRTI website along with the claimant's details. It generates a measurement report containing the area polygon with information on the latitude/longitude and the claimant's basic data. Simultaneously, updated reports get generated automatically at the village, block, district, and state levels, showing the number of claimants, area under claim for various categories of claimants, etc. This data is used by the concerned committees at different levels for processing a case.

The land-use positions of the claimed forest land in December 2005 and December 2007 being critical parameters, a temporal trend analysis has been introduced at the district level. Cartosat-I satellite imageries of two years (2005–06 and 2007–08) are used for superimposing simultaneously on them the polygon generated by GPS machine by using an in-house developed application named 'TRTI-VGIS'. This comparison makes it easy to distinguish the genuine cases from those that are ineligible to get title of the land. The web-based SMS services on the TRTI server

developed by NIC, Pune, are used to contact implementers and monitor progress. The system is user friendly and very simple to operate. Once the staff at the field level gets trained, troubleshooting is taken care of by dedicated teams at TRTI and NIC. The use of ICT has saved substantial amount of time and money by empowering decision makers, on the one hand, and reducing conflicts and containing illegal claims in the field, on the other.

The system is designed to cover the entire 14,000 forest villages of Maharashtra. It is, however, easily replicable in other areas and different states. The GoI is actively supporting the utilization of the system for expedient implementation of the Act. TRTI is also engaged in the process of sharing the knowledge and application with other states (like Karnataka) interested in using the same. It plans ultimately to develop a common GIS-based tribal development framework for the country (eIndia, 2010).

E-government: Improving Efficiency of Government Delivery Systems

Electronic government, or 'e-government', was a term coined after the term 'e-commerce', to represent any kind of use of ICT within the public sector. Most definitions use the word e-governance and e-government interchangeably. However, as pointed out by Bhatnagar (2009) the two terms bear different meanings.

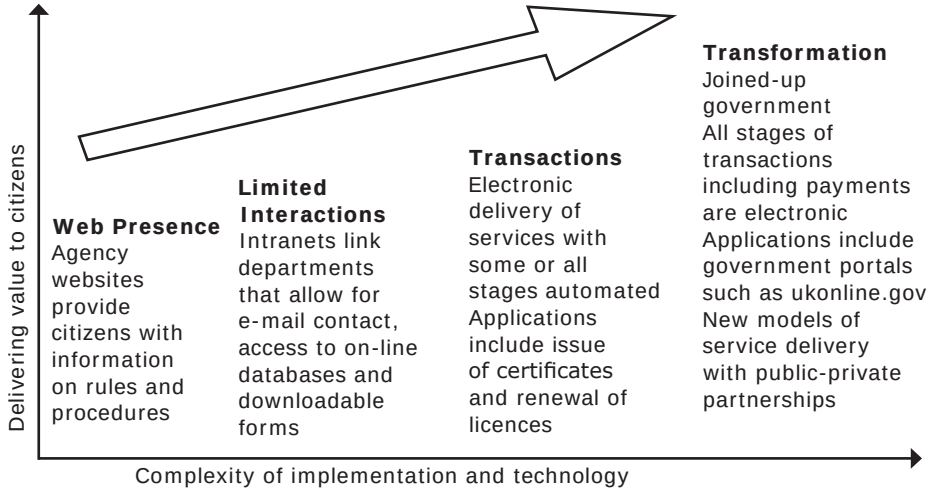
E-governance refers to the use of ICT in making democracy function better. For example, the Internet is seen by many as a tool of empowerment of disadvantaged groups and rural communities. Several experiments within the local governments and political parties to strengthen and deepen democracy are included within the scope of e-governance (Bhatnagar 2009).

E-government is about a process of reform in the way governments work, share information with and deliver services to the external and internal clients. Specifically, e-government harnesses ITs like wide area networks (WAN), the Internet and mobile computing to transform relations with citizens, business and other agencies of the government. These technologies can serve a variety of ends like:

- Better delivery of government services to citizens.
- Improved interaction with business and industry.
- Citizen empowerment through access to information.
- More efficient government management.

E-government applications normally evolve through four stages (Figure 5.1). The first stage includes the publication of information about procedures governing the delivery

Figure 5.1: E-government Evolution: Four Critical Stages



Source: Gartner Dataquest 2000, in Bhatnagar (2009)

of different services on the website. The second stage allows on-line interaction. Clients can download applications for receiving services. The third stage involves the electronic delivery of documents. The fourth stage offers integrated electronic delivery of services in which more than one department may be involved in processing a request or service.

The GoI and various state governments have taken initiatives to improve the delivery of their services, making them more efficient and accountable while reducing hardships of the common citizen. Several success stories, at least at the pilot scale, have demonstrated the potential of ICT applications in e-government. The examples of Gyandoot in MP, Bhoomi in Karnataka, CARD, e-Seva in Andhra Pradesh, FRIENDS in Kerala and many others have stimulated more initiatives by other state governments as well. However, not all successful projects have been able to sustain the interest of the clients over time. Further, many of the 'me too' projects implemented by various state governments turned out to be watered down versions of the original. This is because such projects were implemented in a hurry, with total disregard to participatory processes that are so important for making them successful.

The following section looks at some of the initiatives, to understand what made them work and what factors led to loss of interest over time.

Gyandoot: The knowledge messenger

Among the early examples of e-government was *Gyandoot* in Dhar District in Madhya Pradesh. Gyandoot made the headlines in 2001 by bagging the Stockholm Challenge Award. Under this unique government intervention, an intranet community network was installed in five blocks of Dhar, considered one of the most poverty stricken districts of Madhya Pradesh.

Within a few months of its installation, the network was offering 22 services, including e-governance services like land records, grievance redressal, information on government programmes and applications for caste/residence/income certificates. Later, commercial services like market intelligence, rural e-market, Hindi e-mail and other educational and health-related services were added.

The project developed a business model that included participation of grassroots knowledge entrepreneurs. The model was replicated in 33 districts of Madhya Pradesh and 12 districts of other states. Although the project had a number of innovative features, it failed to sustain itself because of weak infrastructure and lack of back-end computerization. (Bhatnagar, 2009) (Box 5.1).

Not withstanding the above, Gyandoot Project successfully demonstrated the following:

- √ Participatory rural appraisal provided the necessary inputs for effective design and implementation of the community networking project.
- √ Profit sharing between community institutions like the village council and private entrepreneurs provides a means for establishing a symbiotic relationship between the two.
- √ Financial viability of kiosks is ensured by the fact that people are willing to pay user-fees for the services that they value.

Box 5.1 Gyandoot: The Knowledge Messenger Gone Astray

The Gyandoot Project was launched on January 1, 2000 with the establishment of a low-cost intranet connecting a server at the district headquarters with 20 government-owned information kiosks in five blocks of the district. Subsequently, 17 privately owned kiosks were added. The information kiosks, comprising a computer, a modem, a printer, a UPS and furniture, were located in government buildings or in a market along the main road. Each kiosk provided services to 20–30 villages with a population of about 30,000. The owners of the kiosks, mostly young and educated, were jointly elected by the village committees and the local community.

The villagers could apply for different government services (copy of land records, old-age pension, birth certificates, etc.), file complaints on-line and access market prices through these kiosks. At the back-end, because the district was not computerized, hard copies of e-mails received by the officials at the district headquarters (complaints and applications) were forwarded manually to the concerned departments. To ensure financial sustainability of the project, a fee of Rs 15 was charged for the services provided at the kiosks. Kiosks had to pay 10 percent of the income from government services to the district council. A license fee of Rs 5,000 per annum was also paid by a kiosk. Privately owned kiosks added services like STD, PCO, photocopy, horoscope and computer training. To popularize the concept, cash awards (Rs 2000–5000) were offered to the three best performing kiosks.

Moderate activity levels (more than 6,000 e-mail complaints) were reported in the very first year of the project operation. Villagers, who used the Gyandoot kiosks, saved time and cost of one trip to the district headquarters. Over time, infrastructure bottlenecks like slow and unreliable dial-up connectivity and irregular power supply (a 6-hour power cut was a regular occurrence) forced additional investments in power back-ups and made the kiosks economically unviable. Often, the availability of power supply determined when the kiosks could be opened. The number of users diminished significantly by the third year of the project. The initial team of the district officers, who had conceived the idea and implemented it enthusiastically, was transferred. Various departments in the district headquarters slowly reverted to the earlier unresponsive attitude to citizen's requests for services and complaints.

An evaluation study by IIMA, in 2002, reported that the grievance redressal system, which was very popular initially, left 90 percent of the users dissatisfied in terms of response time as well as corrective action. Similarly, the process of obtaining land records had become more tedious and prone to corruption. Prior to Gyandoot, land records could be obtained directly from the *patwari* (though 'speed money' had to be paid). But now, even though the request can be filed electronically, speed money has to be paid to the *tehsildar* (authorized signatory of the land record) and, sometimes, to the kiosk owner, who prints the land record certificate.

Source: Subhash Bhatnagar (2009) Unlocking E-Government Potential.

Bhoomi: Reforming land records through process innovation

Let us take a look at another important government initiative—that of computerizing land records and providing land records services on similar lines—for a small fee that is easily affordable by the rural client. Karnataka was the first to successfully computerize

its land records through its project, Bhoomi.

The Record of Right Tenancy and Cultivation (RTC) is the main document pertaining to land holding. In the manual system, village revenue officials maintained these records. Since RTC is required for various purposes, including land transactions, opting for crop loans and other government schemes, the revenue officials tended to extract rent from farmers and other landowners.

The Bhoomi Project in Karnataka was launched in 2000 and within two years the entire land holding records of 6.7 million farmers in 27,000 villages were computerized. The process by which this mammoth task was accomplished is in itself an interesting story (Box 5.2). The benefits and the business model are described in some detail here.

The system has been designed to facilitate on-line updating of records. Farmers can visit the taluka-level kiosk and collect copies of their land holding just by providing the name of the owner or plot number. They can also file requests to make changes in ownership through sale or inheritance for a small fee. The Revenue Inspector passes the 'mutation order' after going through the mandatory process of serving notices to interested parties and waiting for their response for a period of 30 days. The system has led to tremendous savings in transaction costs and time for the farmers and other villagers.

Against a total investment of Rs 244 million, by the end of 2005 the government had recovered Rs 625 million through 203 kiosks through user fees for the distribution of RTCs and mutations. Thus, the model is a financially sustainable one. Clearly, the rural communities are willing to pay for a service if it means efficiency, reliability, reduction in transaction costs and freedom from bribery.

Some of the factors that led to the success of the Bhoomi Project in Karnataka can be summarized as follows:

- √ Presence of a champion, who worked 15 hours a day for over a year.
- √ Minimizing of resistance from staff by harnessing political support.
- √ Extensive training coupled with a participatory style of management.
- √ Phasing of implementation in terms of scope: first RTC, then mutation, state data centre and expansion to rural areas and finally integration across agencies.
- √ Phasing of geographical coverage.
- √ Strategy of declaring manually written TRCs as illegal from the day the computerized system became operational in a given taluka. This forced the farmers and the department to completely rely on the new system. The strategy worked because the application design was robust and did not falter (Bhatnagar, 2009).

Box 5.2 Bhoomi: Convergence of Administrative and Political Will

Bhoomi Centres are operational in all 177 taluka headquarters of the state, providing a primary access point to all citizens. Many constraints and challenges were faced during implementation. However, each one of these was overcome with patience and determination. The then Chief Minister S M Krishna's personal interest in the project may have helped to bring about a convergence of political and administrative will, resulting in demonstrable outcomes.

Some of the constraints the project administration had to face were:

- *Magnitude of the task as opposed to trained personnel:* There were 20 million land records of a dynamic nature, which had to be updated at least once a year.
- *Question of data integrity:* The manual copies of land records had a number of inaccuracies and inconsistencies, which came to light once the data was placed in public domain rather than under the monopoly of the village revenue officers.
- *Deploying multiple agencies:* Data-entry operations by multiple agencies had to be closely monitored because there was an urgent need to create a robust process to facilitate data validation by the owners.
- *Resistance to change:* There was huge resistance to change from an exploitative system of land records, which had operated for over 300 years. It was necessary to change the mindset of 10,000 revenue officials and 1,500 officials from other departments.
- *On-line updating of the system:* This feature had to be built in, to obliterate the manual updating of records. The system of issuing manual records had to be discarded, which was a major procedural shift. The mutation system had to be robust and quick once it was decided that it would go on-line.
- *Spatial distribution:* The geographic expanse of the project cutting across 27 districts provided a challenge in terms of coordination and monitoring.

These challenges were met through substantial investment in the capacity building of government officials and the outsourcing of certain tasks. Rs 12.8 million were spent on capacity building to provide both technical skills as well as to bring about attitudinal changes amongst departmental staff. Capacity building activities included:

- Seven-day training of 1,200 village-level revenue officers on the basics of computing and the Bhoomi software.
- Two-month intensive training of 108 revenue officers on hardware and networking
- Seven-day training of 500 tehsildars and 900 shirastedars on computer operations and the Bhoomi system.
- Twelve state-level seminars for 1,200 senior- and middle-level officers.

- Four division-level workshops to train 800 officials.

In addition to the above, over 150 technical circulars were issued and compiled into seven compendia, in order to clarify technical and administrative issues. A Bhoomi Help Manual was also compiled and distributed at the sub-district level. A computer-training lab was set up to facilitate training of the officials.

NIC, Bangalore, the government agency that developed the software for the project, was requested to provide data-entry software support in the field but was unable to do so, on account of other commitments. The government then provided 27 consultants—one for each district—to advise and help the district administration on the implementation of the project. These were young engineers, fresh out of college, with a zeal for doing something novel. Their dedication helped to overcome teething problems.

That the efforts of the Government of Karnataka were not in vain can be seen from the results. As of May 2006, 42 million people had availed of the service. The generation time of the RTC has been reduced from 1 to 30 days to less than 15 minutes. The mutation process cycle time has been brought down from between 90–180 days to 30–45 days. The monthly user charges collected amount to Rs 10 million. The experience shows that land records can become a core e-governance service for any tele-centre or kiosk.

Source: Harris and Rajora (2006), Telecom Live (2007)

Soon after the initial success, elected representatives, farmers and others demanded that Bhoomi be extended to the sub-taluka level. However, this expansion would have increased the costs without necessarily increasing the number of RTCs. The department resisted the temptation to do so. Instead, it explored other possibilities that could make RTCs available at the sub-taluka level. Plans to allow private rural kiosks to issue unsigned copies emerged as an alternative system. If such copies are accepted by banks and verified by accessing the departmental database, the need for signed copies will be reduced.

The Bhoomi project too has had its share of criticism. The system has been criticized for being biased towards large farmers and landowners (who were eligible to apply for credit) over small and landless farmers. The second charge against the project was that by eliminating the role of the village accountant who was a crucial intermediary for small farmers and landless labourers in accessing various facilities like state-sponsored development programmes and bank loans, the Bhoomi Project appeared to worsen rather than improve the living conditions of the poor (Thomas, 2009, as quoted in Madon 2009).

Despite such criticisms, the project has been successfully replicated in ten other states where land records have been computerized. Mutation, which is a more complex process, has been computerized in five states. The percentage of users paying bribes declined from an average of 38 to 25 per cent in the 10 states. In two states, corruption has been impacted significantly. Bhoomi empowers the small farmer in many ways. Armed with genuine certificates, farmers can raise loans for a variety of purposes and cannot be easily harassed by bank staff. Earlier, in case of disputes, landowners simply bribed the officials to get records changed in their favour. Now, the records are in the public domain and can be verified easily by anyone (Bhatnagar, 2009).

e-Seva: Bridging the gender divide

One e-government project that has achieved spectacular results owes its success (at least in the rural areas) to its strategy of harnessing the creative energies of women's SHGs. This project, implemented in West Godavari District of Andhra Pradesh, is transforming the lives of 3.8 million people. By May 2005, 200 kiosks run by women's SHGs had carried out more than 1.2 million transactions. The e-Seva district portal (www.westgodavari.org) offers a number of citizen services, ranging from the issuance of certificates to getting information about government programmes and support for community-based transactions between the residents of different villages. The computers in the kiosks are on a district-wide network (a hybrid of dial up, 802.11 and WLL) helping kiosks interact with the district server hosting the local portal. To save on the networking cost, the project has developed a unique synchronization tool that allows the kiosks to work offline and allows the databases to be periodically synchronized in minimal time.

Each kiosk does good business generating between Rs 10-25,000 per month. The kiosks are exclusively run and managed by women's groups that allow them to be positioned as information brokers in their communities, thereby helping to bridge the gender divide. The project has provided information leadership to these SHGs and has empowered them to act as change agents. (NIC, West Godavari District, n.d.)

The e-Seva project was initially initiated in urban areas to offer integrated Government-to-Consumer (G2C) services in ways that reduced transaction costs of the citizens. Launched in 2001, it was one of the earliest e-government projects of its kind in India, offering multiple services under one roof. Many other states and cities have followed the example of e-Seva. The precursor to this project was a pilot project located in Hyderabad called Twin Cities Network Services Project (TWINS), to provide the on-line delivery of eight services under one roof. The e-Seva centres have now evolved into

a one-stop shop for more than 130 G2C and business-to-consumer (B2C) services, including payment of utility bills, reservation of train tickets, obtaining birth and death certificates, vehicle permits, driving licenses, transport department services, sale and receipt of passport applications, telephone connections, ATM (cash withdrawal and deposits), mutual funds and cell phone bill payments. Before the launch of e-Seva, citizens had to visit different offices to avail these services.

After the success of e-Seva in the twin cities of Hyderabad and Secunderabad, the AP government extended the facility to all the 117 municipalities in the State. For expansion of e-Seva, nearly 230 centres were opened in the state, covering 85 percent of AP's population of around 75 million. These centres are connected to a district-level data centre where the necessary databases of utility companies are maintained. A public-private partnership model was adopted for scaling up the project on the basis of build-own-operate-transfer (BOOT) model. The technology partners provided the necessary hardware, software, connectivity and maintenance for the centres. This will be transferred to the government after the completion of the contract period of five years. As on 2006, nearly 1.8 million transactions were being processed at the 230 centres. The aggregate monthly collection from all the centres was around Rs 4–5 billion.[1]

Some of the key success factors identified for e-Seva were:

- √ Strong and visible political support from the chief minister: The very idea of e-Seva was sparked by a visit of the chief minister to Singapore where he became familiar with the role of the city state's portal in delivering services on-line.
- √ E-Seva directorate was allowed to operate with flexibility because of political support.
- √ Informal relationships with private partners and use of PPP model led to better coordination.
- √ Effective coordination by the directorate across government departments, which is often a stumbling block in such initiatives.
- √ The error rate as a result of wrong postings is also very low, indicating that the system design is robust.

A review of the not-so-successful e-governance projects reveals that the projects faltered on account of one or more of the following reasons.

- People were not involved right from the design stage.
- Government support was lacking in terms of routing additional services through the kiosk, which could have made it economically viable.

- Government servants, lacking in motivation to serve the community, ran the kiosks.
- Excessive capital investment by the government and neglect of investment in soft skills of the people made it a non-viable and non-replicable model.
- Back-end computerization was not done and inter-department coordination proved to be a major bottleneck.

It is as important to guard against these pitfalls as it is to learn from the practices of successful interventions.

End-notes

1. For more details on the initiative, see case study in Bhatnagar (2009). Unlocking E-Government Potential—Concepts, Cases and Practical Insights. New Delhi: Sage Publications India Pvt. Ltd.

6 ICT: An Emerging Service Sector in Rural Economy

The promotion of employment, self-employment and entrepreneurship in the ICT service sector can be seen as a major way of augmenting livelihoods in rural areas, particularly rainfed areas, where the natural resource base is no longer able to support the burgeoning population. Some of the important strategies in this area include promoting:

1. Literacy and e-literacy,
2. 'Edutainment',
3. Self-employment and nano-entrepreneurship, and
4. Rural BPOs.

Promoting Literacy and e-Literacy

Literacy

ICT has become a useful tool to accelerate the pace and reach of literacy programmes. TCS has developed a multimedia-based software to impart functional literacy to adults in eight different languages. Material based on the National Literacy Mission has been adopted for the computer-based functional literacy (CBFL) curriculum. By 2007, 96,000 people had been trained at 1,400 centres across the country. The programme is successful in making adults literate within 40–50 hours of inputs over a period of three months. The process calls for minimum skills from the teacher. Each teacher can handle a batch of 10–15 students. This innovative software comes at a time when performance under the National Literacy Mission has levelled off over the past few years.

TARAhaat has developed a similar literacy programme called TARA Akshar. The programme claims to teach illiterate Hindi-speaking women to read and write in just 30 days. The pedagogy used comprises using memory associations embedded in animated movies for the first step of learning letters. This is reinforced with other memory techniques together with video gaming techniques. In the first year of implementation, over 43,000 women were made literate through 291 centres spread over five states. The average success rate was 98 per cent (TARAhaat Prospectus, 2008).

e-Literacy

Creating computer literacy in rural areas particularly among the youth is seen as a prerequisite for bridging the digital divide. These e-literate youth can be counted upon to take up entrepreneurship at the local level and serve as the torchbearers of a digital and knowledge revolution. As discussed in most of the earlier strategies, an army of KWs will be needed to deliver services to rural people and act as the interface between technology and illiterate farmers, artisans and other villagers.

Among the e-literacy programmes being implemented in India, Project Shiksha under Microsoft's Unlimited Potential (UP) Programme and the Government of Kerala's Akshaya Programme are the best known (Boxes 6.1 and 6.2, respectively).

Box 6.1 Project Shiksha: Empowering the Future

Launched in India in December 2003 by Bill Gates, Chairman, Microsoft Corporation, the project is an integral part of Microsoft's UP Programme. Whereas the project had set itself the goal of training 80,000 teachers within five years, it has actually surpassed all expectations and impacted over 3, 82,000 government school teachers within that time period. In the process, it transformed the lives of more than 10 million students across the country. Under this programme, Microsoft India has partnered with 12 state governments (including Maharashtra, Uttaranchal, Andhra Pradesh, Karnataka, Gujarat, Bihar, Mizoram, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh) to set up 14 Shiksha academies. With the objective of 'empowering the future', this initiative is focused on delivering affordable software solutions, and comprehensive training and curriculum leadership for students and teachers in government schools, thereby making them adapt to the changing education environment in India. (For several other related initiatives under UP and similar programmes of private sector companies like Intel, Azim Premji Foundation, Nasscom Foundation, IDRC, etc., see Resource Guide, Appendix 2.)

Source: Company website, www.microsoft.com/india/.../msindia_up_partnerslearning.aspx (accessed Dec 2009)

Box 6.2 Akshaya: Making Malappuram the First E-literate District in India

Akshaya (which means perpetuating prosperity) was started as an e-literacy project in 2002 in Malappuram District of Kerala by the Kerala State IT Mission (KSITM). It started promoting micro-entrepreneurs called Akshaya Centre Entrepreneurs (ACE) in each village panchayat. Thanks to Akshaya, Kerala now boasts of the first e-literate district in the country. Over time, Akshaya took up the responsibility of becoming a citizen service centre. At present, it has over 2,200 ACEs spread over 14 districts.

Akshaya was established with the objectives of:

- Bridging the digital divide by bringing e-literacy to the masses.
- Bringing citizen services to the doorstep of public.
- Providing a one-stop shop for all citizen services (G2C and B2C).
- Giving a citizen friendly face to the government.

Its vision is to make at least one member in each of the 6,400,000 families in the state e-literate. During the first phase of its operation, Akshaya claims to have achieved 100 per cent e-literacy in eight districts. In 2006, the project moved into phase two, covering the balance six districts and also starting new G2C and B2C services.

Source: akshaya.kerala.gov.in

On an average, each panchayat has two centres. Each centre caters to the needs of about 1,500 families within a reach of 2 km. The entrepreneur makes an investment of about Rs 3.0 lakhs for setting up an Akshaya centre with 5–10 computers, printers, scanners, webcams, other peripherals and the necessary software. Recurring expenses are also borne by the entrepreneur. Each centre becomes self-sustainable from the income earned through transactions. By May 2010, 3,247,149 e-transactions through Akshaya centres worth Rs 1,148.0 million were recorded.

At the district level, the District Collector and the District Planning Officer monitor, evaluate and control the implementation of the project, as per the guidelines laid down by the government. Local Self Government Institutions (LSGIs) play an important role in implementing the project at the grass roots level. These are responsible for the selection of locations for Akshaya e-centres, selection of entrepreneurs, sourcing of e-literacy

fund, monitoring of e-literacy activities, campaign activities, engaging social animators and implementation of post e-literacy and e-governance activities.

Some of the spin-offs of the project include widespread demand for advanced training packages, creation of direct employment opportunities and triggering economic growth in general. Each centre employs 3–4 people, thereby creating direct employment of 2,400. Over the years, Akshaya Centres have become vehicles for providing a host of services, including e-governance; information kiosk; digitalization and data management services; hardware sales and maintenance; financial kiosks including sale of insurance policies, loan packages etc; travel and tourism; multimedia, animation and designing centre; health care; and product selling especially for products like solar lighting systems that are normally not available in the market.

Source: Profile of Akshaya Project on e-India's website http://www.eindia.net.in/2010/awards/details/eGov-G2C-Details.asp?PNo=37 accessed September 2010.

Edutainment

It has long been known that entertainment is a good medium for education. Two social entrepreneurs have demonstrated the innovative use of ICT tools to promote literacy and education among the illiterate and neo-literate populations, including children, through the medium of entertainment. They are Prof Brij Kothari, founder of PlanetRead, which promotes the idea of same-language subtitling (SLS) and Prof Matthew Kam founder of Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE), which works on the development of mobile-based educational games that promote literacy, computer literacy and education. These are briefly described in Boxes 6.3 and 6.4, respectively.

Promoting Self-employment and Nano-entrepreneurship

Social entrepreneurs were quick to realize the potential of ICTs in promoting a new breed of grassroots entrepreneurs who would provide knowledge and information services to farmers and other villagers. Many of these services in turn would help other farmers and villagers in augmenting income levels and saving costs.

Box 6.3 SLS:An Entertaining Way to Literacy!

PlanetRead

More than 500 million people in India are poor and 40 per cent of these viewers have low literacy skills. However, all of them have access to TV. Using the simple tool of SLS on popular song-based television programmes, PlanetRead is sharpening the literacy skills of an estimated 200 million 'literates' or 'neo-literates', who have weak reading and comprehension skills, despite having attended at least primary school. By superimposing subtitles on visuals in the 'same' language as the audio, PlanetRead ensures that reading becomes a byproduct of entertainment, already consumed by the audience.

Source: khemkafoundation.org

SLS is the brainchild of Brij Kothari, who serves as an Adjunct Professor at IIM Ahmedabad and is the Founder of PlanetRead. In 1996, while watching a Spanish film with his friends, Brij hit upon the SLS idea. As a student of Spanish, Brij wished that there could be subtitles in Spanish so that he could read along. He thought of the 560 million celebrated 'literates' and wondered, "How many of the so-called literates can read a newspaper, write a letter and fill out applications?" These, he felt were important questions in a country where an ability to sign one's name often gets equated with literacy.

For SLS to reach the millions of early literates in India, PlanetRead brought the government, especially the Department of School Education and Literacy, and the Ministry of Information and Broadcasting, on board as strategic partners. SLS went on national TV throughout India in 2002 when Doordarshan agreed to subtitle popular song-based programmes. Today, superimposed on Rangoli and Chitrahaar, SLS leverages four-and-a-half hours of prime-time viewing per week on Doordarshan—this does not include the repeat telecasts. In addition, regional stations of Doordarshan in West Bengal, Andhra Pradesh, Karnataka, Maharashtra, Gujarat and Tamil Nadu include SLS on local language film songs.

Impact

Nielsen' ORG Center for Social Research carried out two impact studies (2003 and 2007), drawing a sample of 3,179 households from five villages each from five States of India. The percentage of schoolchildren, who could read a simple paragraph in Hindi

after five years of schooling, went up from 25 to 56 after exposure to 30 minutes of SLS per week on the Rangoli programme. Exposure to SLS led to higher rates of ability to write one's name (82 percent vs 55 percent), home address (56 percent vs 34 percent) and familiarization with any five words (72 percent vs 45 percent). Research carried out by PlanetRead shows that SLS is doubling the number of children, who will become good readers after five years of primary schooling. Brij is now pushing for SLS to be accepted as national policy.

But how cost effective is the SLS programme? In India, because of the large number of viewers in most major languages, every Rs 50 spent on SLS, can deliver, on an average, 30 minutes reading practice to approximately 1,00,00 people, for one whole year.

Recognition

SLS won the World Bank's Development Market Place Award in 2002 and the Tech Museum Award in Education in 2003. In 2005, the Google Foundation awarded PlanetRead a grant to increase the number of SLS programmes. Google is also supporting PlanetRead with free advertising and content hosting on Google Video. In 2009, PlanetRead and IIMA received the India Social Entrepreneurs Award from Schwab Foundation for Social Entrepreneurship and from the United Nations Development Programme.

BookBox

Brij is also the Founder of BookBox, a social enterprise that produces animated books with same language subtitling on compact discs and VCDs. Based on the response to SLS, BookBox aims at providing reading practice to children aged 6 to 14 and familiarizing a child aged 4 to 5 with basic print concepts.

Source: http://googleblog.blogspot.com/2005/12/same-language-subtitling.htm and http://www.planetread.org Accessed September 2010.

Box 6.4: Harnessing Digital Games for Literacy and e-education

Much has been written about the potential of mobile phones to aid in the delivery of 'anytime, anywhere' education, given their low cost and increasing ubiquity, even in very poor communities. But how does such an educational practice look like in practice? The MILLEE project has been examining this issue for the last six years, beginning with low-income communities in the urban slums and villages in India.

Matthew Kam, Professor at Carnegie Mellon University and the founder of MILLEE, has

conducted ten rounds of iterative small pilot field studies in developing and testing mobile phone gaming applications that help children acquire language literacy in immersive, game-like environments. One goal of this work is to investigate how to make localized English language learning resources more accessible to underprivileged children, at times and places that are more convenient than schools. Building on its initial work, MILLEE is now beginning a controlled experiment with 800 rural children in 40 villages in India, with early replication underway in Kenya and China.

Under the project the researchers have developed games that target computer literacy, language literacy and e-education for STEM (science, technology, engineering and math). In one of the studies with three communities in North and South India, Mathew and his colleagues found some problems with digital games that fail to match rural children's understanding of games. To design culturally meaningful digital games, the team studied 28 Indian village games and analyzed the mechanics of these games vis-à-vis existing video games. This led to the design of a new video game that rural children found to be more intuitive and engaging.

Another study found that the use of educational games on mobile phones facilitated new ties between participants across gender, caste and village boundaries, and the new social relationships that developed transferred to real-world, non-gaming settings.

MILLEE is not the only project investigating the use of mobile phones to aid language acquisition in developing countries. Others include mobile phones as a Literacy Platform in Niger, the m4Lit project in South Africa, Jokko in Senegal and, in slightly different ways, Nokia Life Tools in India and the BBC's Janala project in Bangladesh.

Source: Matthew Kam, Mobile Phones and Literacy in Rural Communities on EduTech—A World Bank Blog on ICT use in Education, at http://blogs.worldbank.org/edutech/node/552 accessed September 2010; Mathew Kam, Akhil Mathur, Anuj Kumar, John Canny (2009); MILLEE website (http://www.millee.org/); Playpower website (http://playpower.org/)

Satyan Mishra, Founder and Managing Director, Drishtee Development and Communication Ltd. enunciated the economic and social rationale for such initiatives as given below:

> "Two-thirds of the Indian population comprises rural consumers. However, despite an open market, 68% of the rural economy still lies untapped due to a lack of perceived opportunities by the investors. Villagers are desperate for appropriate services such as education, market access, telecom, health care, financial intermediation and entertainment but at an affordable cost. Locations and distances of the existing network prove a constraint for the villagers seeking cost-effective services. They have to travel 20–30 km for redressal of their problems and to avail of education, banking and health services. The cost incurred comes to around Rs 600 per service, which includes transportation cost and opportunity cost of the time spent in availing of the service. Compared to this, an urban counterpart spends around Rs 400 for the same service. This lack of access to a much-needed set of services thwarts progress in rural India".
>
> (TelecomLive, 2007)

Drishtee: Creating a new vision for rural citizens

Drishtee is committed to reform the socio-political scenario of the Indian village. It seeks to make a paradigm shift by creating a direct delivery network of services to rural India through the empowerment and enterprise of local entrepreneurs. Drishtee, incorporated in October 2000 as a private company, provides e-government services directly rather than through distant civil servants. Drishtee offers three types of services to its rural clients:

- E-government services through contractual arrangements with the district administration,
- Commercial services through partnerships with corporate institutions, and
- Services conceived by Drishtee itself.

The total number of services offered on Drishtee network has grown from three to twelve and include computer education, insurance, digital photography, agri-services and e-commerce. Drishtee is currently serving over 1.5 million villagers of India through these services.

Drishtee generates employment opportunities for rural entrepreneurs, especially women. Over 1,600 new entrepreneurs have been created, of which about a third are women. Starting from Haryana and Uttar Pradesh, then Assam, Drishtee has a

reach in over 10,000 villages across 14 states. As kiosks are owned and operated by local villagers, the model supports wealth creation by developing entrepreneurs within the village community. For a fully equipped computer-based kiosk centre, the investment is in the range of Rs 25,000 to Rs 40,000 (for earlier batches, the cost was around Rs 80,000). Entrepreneurs can avail of institutional finance provided by banks and even through Drishtee itself. Entrepreneur incomes have increased on an average from Rs 40 to Rs 200 per day by sales of products and services through the kiosk. Kiosk owners generated additional income from project-based work. For example, data entry projects for the Madhya Pradesh and Haryana governments increased the kiosk owners' income by Rs 8,000 to Rs 20,000 (Best Practices, Part II, for more details).

TARAhaat: Providing education for self-employment

TARAhaat has much in common with Drishtee. It is a private organization promoted by well-known NGO, Development Alternatives, and its rural marketing arm, Technology and Action for Rural Advancement (TARA). As in the earlier case, TARAhaat delivers its services through a network of franchised community and business centres owned by individual entrepreneurs. The set-up comprises TARAhaat.com, a mother portal along with a network of business centres or TARAkendras. It delivers education, information services and market opportunities to rural consumers via the Internet and its kendra outposts. Its overarching social objective is the creation of sustainable rural livelihoods and the enrichment of the rural India's economy through improved and affordable information flow, education and direct job creation. TARAhaat was launched in 2000 in Bundelkhand, Madhya Pradesh, and later expanded to UP and Punjab. Within six years of its establishment, TARAhaat had rolled out 47,350 kendras servicing 53.56 million users.

A unique feature of TARAhaat's franchise model is that it minimizes the front-end cash burden on the franchisee, reducing the need to raise working capital. The annual fee and deposit payments start at a low level and increase modestly each year, thereby allowing the franchise to pay the fees out of the increasing earnings, allowing talented individuals to open a TARAkendra even if their access to financial resources is limited. A unique enterprise, the development programme supports the entrepreneurs through their business life cycle and includes technical training, financial and market linkages, consultancy advice and an 'ask-the-expert' Web-based support service. (Best Practices, Part III, for more details)

Project Jyoti: Realizing Microsoft's 'Unlimited Potential'

With its UP Programme, Microsoft aims to help all people to benefit from ICT that is accessible, affordable and relevant to their needs. With particular emphasis on the youth, UP focuses its efforts on three interrelated key areas, namely, *education, local innovation* and *employment generation*.

Project Jyoti was conceptualized to help create sustainable livelihood opportunities in rural India. This entails setting up Community Technology Learning Centres (CTLC) in partnership with NGOs. Till date, Microsoft has given grants to 14 NGOs in India aggregating to Rs 47 crores (USD 10.5 million) and has set up a network of around 1,148 CTLCs. The CTLCs are making impact not only in terms of employment creation but also in terms of empowerment that local communities perceive after getting easy access to vital information.

Aga Khan Rural Support Programme (AKRSP) is one of the NGOs that has partnered with Microsoft under Project Jyoti. Microsoft and AKRSP have set up 13 CTLCs in Bharuch and Surendranagar Districts in Gujarat. Each centre has around six or seven computers, a technical trainer and a community worker. The CTLCs rely on user fees to cover costs and become financially viable. Despite targeting the poorest, the CTLCs still netted a revenue of Rs 7 lakhs in seven months, surprising even AKRSP's project coordinator, Sheeji Abraham. Box 6.5 provides examples of how the project has touched the lives of the marginalized and the poor.

Promoting Rural BPOs

The emergence of rural BPO companies is another indication of the potential of ICT-based service sector in rural areas. As of June 2009, there were about a dozen rural BPO players in India, including RuralShores, HOV Services, Sai BPO, DesiCrew, Firstsource Solutions, GramIT, Source for Change, Drishtee, etc. GramIT is perhaps among the older ones but several others such as RuralShores and Source for Change are just beginning to learn the ropes. In terms of size, they vary from the 20-people BPO of Source for Change at Bagar Village in Rajasthan to the 160-people BPO of RuralShores at Bagepali Village, close to Bangalore.

Box 6.5: Computerji Makes the Necessary Connections!

For many years Vasava tribals in Ghanikut, a village in south Gujarat's Netrang District, waited patiently for electricity. Poles were erected and promises made. Officials came and went. Stuck on a rocky hill, the Vasavas waited in vain. Then, in May 2007, AKRSP and Microsoft set up CTLC, a computer hub, close by in Thava Village. Salim Bhai, the technical trainer, told Mohan and Ishwar Vasava that they could use the computer to find out why they were not getting electricity. Salim also told them about the RTI Act. A form was acquired and signed by 60 Vasavas. This was sent to the Gujarat Electricity Board with a copy to the District Collector. Almost immediately, a nervous District Executive Engineer appeared saying he would fix the problem. For the Vasavas, it was a rare moment of victory.

The CTLCs provide computer training courses at subsidized rates. A two-month basic computer course is just Rs 200 and a three-month Microsoft UP Programme costs only Rs 450. At the end of the course, Microsoft gives a much-valued certificate. The centres also take up job works, which help needy students gain experience and meet the cost of the course. Till now 1,046 people have been trained. Employers now go to the CTLCs to recruit staff for their IT-related work. When the bank manager of the Baroda Gujarat Grameen Bank at Netrang was looking for a data entry operator, he inquired at the kiosk. Coincidentally, Deepmala, an unemployed graduate, was doing a course there. Her technical trainer recommended her. She now works at the bank and earns Rs 2,700; the bank manager wants to hire more youths from the centre.

The walls of each CTLC are decorated with job notices. The technical trainer gathers all these for display. Information is accessed from the Internet and job applications are downloaded. At the Sagbara CTLC, Shankar, a 22-year-old tribal, who used to travel 17 km to attend the computer course, now has a job at Pune Telephone Exchange. The CTLCs live up to their slogan: *'Computerji jode duniya se* (Computer Sir will link you to the world)'. Computers are certainly connecting people with the government. The CTLC workers tell people about all government schemes -- how to get a BPL certificate, about the rural employment guarantee scheme, the tribal sub-plan for which Rs 13 crores has been allocated, the Manav Kalyan Yojana (for micro-enterprises), micro-finance schemes, etc.

For farmers, there is information on agriculture. The CTLCs are linked to agricultural universities and KVKs. Farmers get to know about farm practices, pest control, seeds, crop care and medium range weather forecast. The correct prices of crops can also be accessed. The CTLCs have tied up with the MCX, to help farmers sell at a good price. Suresh Bhai, a physically disabled farmer, lives in Vakhtar Village, in Sayla Taluka of Surendranagar. When his sesame, groundnut and cotton were ready for sale, he desperately wanted to know the correct prices for these yields so that he could negotiate with wily traders, who were sure to turn up at his door. It struck him then that he had seen a banner in Sayla with a slogan about a computer giving such information. He hurried to the CTLC in Sayla and asked for help. They quickly downloaded the market rates in Chotila and Rajkot. Suresh got 20 per cent more for his crops this year. He is now doing a computer course at the CTLC!

Villagers are not only asking for more kiosks but also for software on agriculture, livelihoods, animal husbandry, Tally, Photoshop and a training programme on computer maintenance.

The Sagbara CTLC is housed in a room provided by the *Navjeevan Adivasi Mahila Vikas Manch,* a federation of SHGs of 41 villages with 81 SHGs. They have even donated a computer to it. A farmer's federation manages the Thava CTLC.

The Jagruti Mahila Manch, another SHG Federation, looks after the Dediapara CTLC. The local panchayat contributed a computer. To meet the rising demand, AKRSP is planning a 'hub-and-spokes' model. The CTLCs on main roads will continue and smaller sub-centres will be set up in interior villages with a trainer and a community organizer so that each village, especially the women in it, finds a friend—the liberating Computerji.

Source: Abridged from 'When Villages Discover Computerji.' Civil Society News (February 2008)

Drishtee's model of the rural BPO varies from other BPOs in as much as the kiosks promoted by Drishtee also get data entry and processing jobs, which they forward to their regional office for consolidation and quality control. Hence, Drishtee has a decentralized BPO model with centres having one to 10 people. Table 6.1 shows a comparison of three BPOs on certain common parameters. For details of these initiatives, see case studies on Drishtee and Source for Change in Part 2, and Box 6.6 for Sai BPO

The key challenges identified by the BPO operators are:

- Investing in a good source of power back-up, which does not come cheap.
- Changing the mindset of clients, because they doubt the quality of work that can be provided by the BPOs located in rural settings.

Box 6.6: Sai Seva BPO

Sai Seva Business Solutions was set up in 2006 by management students of the Sri Sathya Sai University, with a mission to 'serve and inspire simple employment for rural advancement'. Housed in a fully air-conditioned building, with state-of-the-art infrastructure, the BPO aims at helping rural youth live a life of dignity without destroying their cultural fabric. The idea is also to prevent rural migration to cities by providing young people employment at the local level.

Sai Seva BPO has been set up in a tiny hamlet called Puttaparthi, 140 km from Bangalore city in Andhra Pradesh. The BPO employs 50 young citizens, who stay within a 10–15 km radius of the centre. Unlike other BPOs, there are no night shifts; this makes it convenient for women to work here. Around 80 percent of them are graduates, the remaining have passed class XII. Sai BPO provides free computer training to potential employees and also sponsors them for higher education. As a result of the encouragement provided by the BPO even people who were unable to study beyond Class XII are now enrolled for the degree of Bachelor of Computer Application in colleges and Open University. There is no attrition at the Sai Seva BPO.

The BPO provides a host of services to domestic and overseas customers that include form/image-based data entry, data/format conversion from PDF, back-office transaction processing, application processing, e-mail marketing, data mining, data imaging and formatting document archival and retrieval. Sai BPO's customer list includes HDFC, MATRIX, Royal Sundaram, and Rea Source, a US-based mortgage firm. The centre received a major boost when the HDFC bank decided to outsource part of its work on data capture and profiling of new account details to it. Today, customers opening new accounts at HDFC are likely to have their personal profiles and details indexed at the Sai Seva BPO. The BPO offers a cost advantage of around 30-40 per cent as compared to similar facilities in urban complexes.

Source: Nasscom Foundation's website: 'Making Rural BPOs a Reality', www.nasscom.in/Nasscom/templates/NormalPage.aspx?id=53089 (accessed March 2010)

The present scenario of rural BPOs, however, is likely to undergo drastic changes as Indian IT majors like Infosys and Wipro finalize their plans for entering rural areas and small towns to maintain their competitive edge and cater to the growing domestic market. Infosys BPO, the $316 million back-office service arm of Infosys, plans to tie up with service providers and shops in rural areas and small towns for its domestic operations. The $395 million Wipro BPO, which already provides technology to a few rural service providers, is likely to explore service delivery tie-ups with them.

Table 6.1: Comparative Analysis of Three BPOs

Parameter	Source for Change	Sai BPO	Drishtee BPO
Promoters/ Founders	Founded by Indicorps Fellows, in collaboration with the NGO, Piramal Foundation.	Four management graduates of Sri Sathya Sai University	Satyan Mishra, Social entrepreneur
Type of organization	An initiative of Grass Roots Development Laboratory, established jointly by Indicorps and the Piramal Foundation	Sai Seva Business Solutions	Drishtee Development and Communication Ltd.
Year of establishment	2007	2006	2007
Vision	To revolutionize the rural landscape by leveraging the talent of women to deliver world-class BPO services.	To help rural youth live a life of dignity without destroying the cultural fabric and to check the trend of migration to cities by providing employment locally.	To retain educated youth and to foster reverse migration from cities to villages, so that both rural and urban economies prosper at an equal ratio.
Location	Bagar Village, Jhunjhunu, Rajasthan	Puttaparthi, 140 km north of Bangalore	Jind in Panipat District of Haryana, Golaghat in Assam, and Saurath in Madhubani, Bihar
Size (No. of workers)	20	50	Two one-seater and one 10-seater kiosks; additional 30 kiosks can provide BPO services when needed.
Gender composition	All women BPO	NA	NA
Age profile	18 to 35	Youth	Youth
Education profile	X pass	80 percent are graduates, remaining XII pass	Fresh graduates
Services offered	Form- and image-based data entry; data and format conversion from PDF; application processing; data imaging and formatting; document archival and retrieval	Form-/image-based data entry; data/format conversion from PDF; back-office transaction processing; application processing; E-mail marketing; data mining; data imaging and formatting; document archival and retrieval	Digitalization of services: Converting documents to PDF format, book digitization, typing, scanning, and data entry. Voice-based services—inbound and outbound calling operations for tele-sales, tele-marketing, customer-care centres, feedback collection centres, etc. Local language solutions

Continued...

Parameter	Source for Change	Sai BPO	Drishtee BPO
Type of clients	Hindi-based data entry project for Rajasthan Government, form data-entry for Pratham India and for Ekal Vidyalaya	HDFC: Data capturing and indexing of customer details through applications; Rea Source: a US-based mortgage firm; BASIX: Processing insurance claims for the micro-finance company; MATRIX, Royal Sundaram, etc.	In-house clients such as Drishtee's Call centres for micro-finance Government of Bihar: Call centre for sugar cane farmers; data processing for education loan in Assam and Haryana Governments
Quality control	Quality control specialists (QCSs) check all data for accuracy. Management team makes spot checks for errors from completed box.	NA	The processed data moves from the local centre to the regional centre, where the first-level quality check occurs and finally to the centralized location quality centre, which assimilates all the work and dispatches to client.
Security considerations	Non-disclosure of data agreement binding on all employees. Restricted work area. Separate, secure areas for data storage. Strict time-bound access to work area.	As in case of Source for Change.	Less secure due to decentralized management.
Client satisfaction	Rated as highest quality data entry amongst 20 BPOs, by Pratham India.	Clients get a cost advantage of 30–40 percent.	NA
Increase in income for rural participants	Monthly stipend of Rs 3,500 with increment of Rs 500 after every six months.	Monthly stipend of Rs 3,500.	Rs 10-15,000 per month.
Scalability	Dependent on donors for investments but this can change in the future.	As in the case of Source for Change.	Relatively easier to scale up because Drishtee has a network of over 1,600 kiosks in 12 States.
Replicability	Replicability limited by human resource, in terms of social entrepreneurs in the ICT sector.	As in the case of Source for Change.	Replicable by similar interventions like TARAhaat.
Financial sustainability	Likely to be financially viable after reaching a particular scale.	As in the case of Source for change.	Financial viability does not depend only on BPO work, hence more likely to become viable.

But what are the drivers for this change? And how lasting are these changes going to be? With the global demand for outsourcing falling in the wake of meltdown in the economies of industrialized countries, the attention is increasingly focusing on domestic markets. The global growth rate has come down from 25 percent to about 16 per cent a year, according to an estimate by Nasscom. On the other hand, the domestic market, estimated at $ 1.6 billion and growing at an annual compounded rate of 38 per cent has gained momentum. The shift to rural areas is similar to moving jobs from the US to India—to cash in on cheaper talent and office space. The move to rural areas for these companies will help cut costs by 60 per cent while retaining gross margins from domestic business at rates similar to those from international business (about 22–24 percent) (Shelley Singh, June 2009).

Tie-ups with IT majors are likely to benefit small start-ups that will get both technical support as well as access to large orders from, say, the mobile phone or banking industries that are making major inroads into rural markets. Rural BPOs can offer everything from native language capabilities to data entry type services. The growth of rural BPOs will no doubt be linked to the supply of KWs in rural areas.

7 Human and Social Capital for ICT Interventions

Introduction

Catalyzed by Mission 2007, India is attempting to bridge the digital divide on a scale that is unprecedented in the world. However, bringing about such a revolution will call for generating widespread awareness about what ICT can do for the poor and the rural communities. It will also need to create an army of KWs in the countryside. Hence, investment in human capital to eradicate illiteracy and increase e-literacy must precede or go hand-in-hand with ICT interventions.

The creation of people's institutions at the hamlet/village level is equally important. Village governance should promote equitable and inclusive growth. Investment in social and human capital, therefore, would have to match the investment made in hardware and in the creation of information highways. These information highways will prove to be of little use if there is no traffic on it and if there are no potential users.

At the level of the value chain, strategic partnerships will have to be created not only for creating the delivery system but also for generating relevant content. The stakeholders in these partnerships will be drawn from public, private and civil society organizations as well as from local communities and people's institutions. The power equations and relationships between strategic partners, therefore, should be such that the interests of the end-users (rural poor) are not compromised. Creating such partnerships on the principle of mutual benefit and trust represents another dimension of the social capital that is needed to make ICT interventions work.

In this chapter, we take a closer look at each one of these issues:

a. Creating human capital at the village level.

b. Creating social capital for governance of VKCs.

c. Creating durable partnerships for knowledge value chains that reach the rural poor.

Creating Human Capital at the Village Level

A number of ICT interventions were started by simply providing courses on computer literacy. Many of these have taken advantage of the structured syllabus offered

under Microsoft's UP Programme. In the field of e-literacy, the achievement of Akshaya Programme of the DoIT in Kerala stands out. Akshaya claims to have made *Malappuram District of Kerala the first e-literate district in the country***.** Over 0.6 million people have completed the e-literacy programme at a cost of Rs 300 million. This has already led to direct employment for 2,400 local people, who run the e-kendras (centres) of the programme in the district. The government of Kerala has replicated the programme in seven other districts of the State through a total of over 1500 e-kendras (TelecomLive, 2007).

In 2003, MSSRF established the NVA, which organises a Fellow Programme to recognize the contribution of village-level leaders and to provide them access to lifelong education opportunities. By 2008, the NVA had organized four convocations in which more than 1,000 rural KWs were awarded the NVA Fellowship. It has plans to scale up its capacity building operations in the near future and prepare half a million Fellows.

Apart from these structured efforts, many private training institutions have opened shop in small townships and are providing short- and medium-term courses on computer learning and allied subjects. Whereas some of the e-literate rural youth become nano-entrepreneurs providing knowledge services in the village, many others get employed in private and public enterprises.

A somewhat radical way of building human capital and empowering the poor has been adopted by Drishtee, an NGO based in Ahmedabad. It has demonstrated the use of community video as a medium for empowering rural communities through the innovative use of this ICT (Box 7.1)

Creating Social Capital for Governance of VKCs

A number of development agencies are promoting community based VKCs, similar to the ones pioneered by the MSSRF. Proper governance of VKCs becomes critical to ensure inclusive growth and development. These agencies need to build the capacity of village institutions in managing knowledge centres well and ensuring that the benefits flow to the weaker sections on a priority basis. For NGOs that have already been working with rural communities in a participatory mode, the social capital already exists and only needs a re-orientation, keeping in view the specific requirements of the ICT that is adopted, and the services that are being offered. For the others, however, investment in developing suitable social capital at the VKC level will have to be planned.

Box 7.1 Community Video: Empowering Rural Citizens through Innovative Use of ICT

Drishtee[1], an NGO founded in 1992 by two young development communication experts Shabnam Virmani and Stalin K., uses media and the arts to build empowered communities that value self-expression and uphold human rights. Drishtee believes that community media has the power to revolutionize grass roots struggle and to promote sustainable change. Therefore, it is actively working to build a media of the people, for the people and by the people, in partnership with NGOs around India.

Drishtee's Community Video Unit (CVU) is a unique space for local communities to voice their stories of joy, strife or tribulations. Here communities create, control and disseminate their stories through the medium of videos. It comprises 6–8 community members, who are trained as full-time Community Video Producers. They produce a video film on different social issues every two months. These films are screened in around 25 *bastis (*hamlet*)*, or villages, on wide screen projectors and viewed by about up to 10,000 people. Every film sparks debates, discussions and ultimately leads to actions towards positive change.

Drishtee collaborates with different non-profit organizations in India to set up CVUs within the communities in which they work. In this way, it contributes a fresh approach to their work. A Drishtee trainer works with the emerging CVU for 18 months, helping them understand film-making, journalism and community development. Simultaneously, a Community Editorial Board, comprising people who live and work within the community, is convened to discuss issues to be covered by the CVU and how the community can use these films to bring about change. It generally takes between 6–8 months to set up a CVU.

Over 100 community members in five different States have created more than 100 films that are being screened to audiences in India and around the world. The topics covered include education, health, government services, democracy, peace, gender, environment, livelihoods and daily life among others.

Screenings are a core responsibility of the Community Producers (CPs) and often the

hardest part of the process. There are screenings every day; only the location changes. Each CVU holds screenings unique to their community, often inviting poets, vocal artistes, dancers, theatre troupes and others to perform prior to the screening. After the film, the CPs conduct a lively discussion and sound a *call to action.* Great emphasis is placed on listening and responding thoughtfully to concerns raised by the community members.

Recently, Drishtee along with Udaan have launched an exciting new community video programme called Videoshala in Gujarat. The programme produces stimulating, curriculum-based educational videos for local children. Perhaps this is the first initiative in the country that uses community-produced video content to improve the quality of education, a valuable and innovative approach for all those interested in the role of the community in local education. Soon the videos will be shown to 8,400 children in Gujarat in over 200 schools in interactive sessions, also conducted by local people. The videos will be on subjects that students find hard to learn and teachers find difficult to teach. The project focuses on citizenship and diversity in an attempt to break the continued polarization of youth in Gujarat after the 2002 riots, and also because the organizers strongly believe that education must prepare students to be active citizens.

This Project is supported by the USAID-created Quest Alliance, a partnership of public, private and non-governmental organizations, including Microsoft, Wipro and the International Youth Foundation, which work together to promote technology in education.

Source: Websites of Drishti (www.drishtimedia.org),Udaan (www.udaanedu.net), and Videoshala (www.mydrishtimedia.org/videoshala.html)

Some of the important functions of a village institution managing a VKC will include:

- Identification of suitable products and services that meet the needs of the local communities.
- Selection of KWs to run the knowledge centre. Giving priority to marginalized sections of society and women will go a long way in promoting inclusive growth.
- Sending KWs/nano-entrepreneurs for suitable training.
- Supervision of KWs and monitoring of VKCs.
- Identification of local experts in different fields—veterinary experts, herbalists, geologists, pathologists, etc., who will interact with scientists and research institutions in order to develop content relevant to the needs of the local community.
- Mobilization of community and providing good governance for inclusive growth and development.

- Fixing suitable rates for various services provided in a manner that the poorest can afford to avail these.
- Looking to the financial and social sustainability of the VKC.
- Negotiating with external partners in the knowledge value chain to ensure that the needs of the village are not compromised.
- Dissemination of relevant technology through knowledge centres.

Creating Durable Partnerships for Knowledge Value Chains

Knowledge value chains are characterized by strategic partnerships between various players drawn from different sectors of society—private, public, government, civil society and local communities. A typical value chain for a knowledge service will comprise players who are willing to play one or more of the following roles:

a. Technology provider
b. Connectivity service provider
c. Application developer
d. Content providers
e. Service interface provider
f. Development support agency

These roles can be taken up by any of the following players: private companies, public sector organizations, government departments, civil society organizations and people's institutions/local entrepreneurs. Sometimes, the initiative comes from the technology-provider or the application developer and, on other occasions, it could come from a civil society organization in search of technology partners. The agency that takes the initiative to forge partnerships becomes the lead agency in developing the value chain. The fact that ICT applications are supply driven makes it very important for the *lead agency* to facilitate participative processes for need assessment, product design and testing. Active participation of the target population during the pilot phase of the project will ensure relevance to the local needs.

Providing institutional space to people to participate in the design as well as the delivery of the information and knowledge services is critical for the success of the value chain. These spaces will serve as forums for the people to negotiate with service providers so that they get the right kind of services at prices that they can afford. These will also serve as platforms for developing relevant content by facilitating dialogue between formal research institutions and local experts. Maintaining the *network of content providers* so that it provides relevant content on an ongoing basis is another challenge

that social entrepreneurs involved in ICT interventions must be prepared to meet.

Civil society needs to build the capacity of local institutions in order to negotiate and plan for, among other things:

- Supply of relevant knowledge services and content at an affordable price.
- Periodic up-gradation of facilities in order to plan for technological obsolescence.
- Proper management of centres by locally trained KWs.
- Inclusive, gender sensitive growth through a policy of positive discrimination for the poor and the marginalized.

The design of institutional arrangements in a knowledge value chain will depend on the nature of the lead agency, the nature of services being planned and the target audience. This is discussed in greater detail in Volume IV.

Endnotes:

1. Not to be confused with Drishtee Development and Communication Ltd, which operates in the States of Haryana, Uttar Pradesh and Assam. This NGO is based in Ahmedabad Gujarat.

8 Summary and Conclusions

ICTs offer tremendous potential for strengthening rural livelihoods and diversifying the rural economy. India has taken the lead in trying to bridge the digital divide. Several other Afro-Asian countries have followed suit, drawing inspiration from the Indian experience. A suitable policy environment has been created, thanks to the initiatives of the DoIT, the private sector and others who have come together under Mission 2007 (now GGA). Efforts are being made to scale up the successful pilots and experiments, many of which have been discussed in this volume. The challenge is to build durable partnerships, which is extremely important for these initiatives to continue to deliver ICT services to the rural communities. Other challenges include maintaining content and services that are relevant for the poor, optimizing services and planning for technological obsolescence.

Building Durable Partnerships

An important aspect of ICT services is that it needs several partners to deliver the service on the ground. Here is a sector that compels different stakeholders from private, public, civil society, government and local communities to come together to work for the common good. If the partnerships are fragile, the sustainability of the services will be in doubt. On the other hand, if the partnerships are based on domain, ideological consensus and mutual appreciation of each other's skills, expertise and roles, the partnerships are likely to last, leading to win-win situations for all.

A perusal of the case studies in this volume shows that broadly three categories of delivery models exist:

a. Entrepreneurial (including commercial and social business),

b. Grant-based (including free service and pay-to-use), and

c. Cooperative.

Entrepreneurial model

Proponents of the model believe that ICT services can best be delivered by grass roots entrepreneurs chosen for their ability to work as KWs and having acceptance within the community. The investments should be low enough for the entrepreneurs to be able to make profits from the fees paid by rural customers. The fees, in turn, should be low

enough to be affordable and the services should be valued enough by the customers for the model to remain sustainable over an extended period of time.

In the *commercial model*, investments are made by the private company with expectations of returns from the enterprise. However, most of these companies have realized that they need the participation of local entrepreneurs and/or local institutions in order to create a value chain that can serve the rural masses. ITC's e-Choupal is the best known example.

The *social business model* has been adopted by social entrepreneurs for whom the enterprise is a means to achieve a social end, which in this case, is to provide ICT based services to the poor. In order to meet this social goal it becomes necessary to remain profitable as an enterprise. Examples of social business include TARAhaat promoted by Development Alternative and Drishtee promoted by Satyan Mishra.

Grant-based model

Grant-based services can be of two types:

a. Free services, and
b. Pay-to-use.

Free services

In many regions of rural India, people are so impoverished that it is beyond their means to pay for information services. The government owes it to the people residing in such areas to provide them free knowledge services. Besides, the whole idea of bridging the digital divide would be lost if the poorest of the poor remain excluded.

Typical examples of this model include government and/or public sector organizations providing the technology as well as services. Partnerships between public sector/ government and NGOs are also to be seen. The best known example is that of the satellite connectivity provided by ISRO to set up VRCs at the block level, in partnership with NGOs to facilitate the setting up of VKCs. As per the model established by MSSRF, these centres are governed by village institutions and managed by especially trained KWs. It is hoped that the community will pay back in the long run for the free knowledge services it would receive in the short run, thereby making the knowledge centre viable over a longer time frame. However, this essentially remains a grant-based programme implemented by developmental agencies, with a thrust on positive discrimination of access to ICT by the poor, marginalized and women in rural areas.

Free agricultural extension services offered by the Department of Agriculture through its Kisan Call Centres (KCCs) is another example.

Pay-to-use services

For many e-government services, it is felt that the users must pay at least part of the cost so that they value the service. In this way, the operating costs of the project can also be covered, making it financially self-supporting. Examples include land records services offered by Bhoomi, e-government services by Gyandoot and e-Sewa, etc. DoITs ambitious CSC programme falls in the same category. The government has made investments in creating the information highway. However, the CSCs to be set up with the support of private and civil society organizations will function on the principle of pay-to-use.

Cooperative model

Cooperatives fall in a different category because they represent collective enterprise. When a large cooperative like IFFCO creates call centres to offer free agricultural extension services to its members, it cannot be classified as grant-based because the very purpose of the cooperative venture is to serve its members while remaining profitable. The extension service will, in turn, help members to make proper use of agricultural inputs. Even when this service is extended to non-members, it may be seen as an investment in potential clients because they are more likely to purchase the fertilizer produced by the company.

Newer models may emerge as we gain experience in the design and delivery of ICT-based services for the rural client, especially the poor.

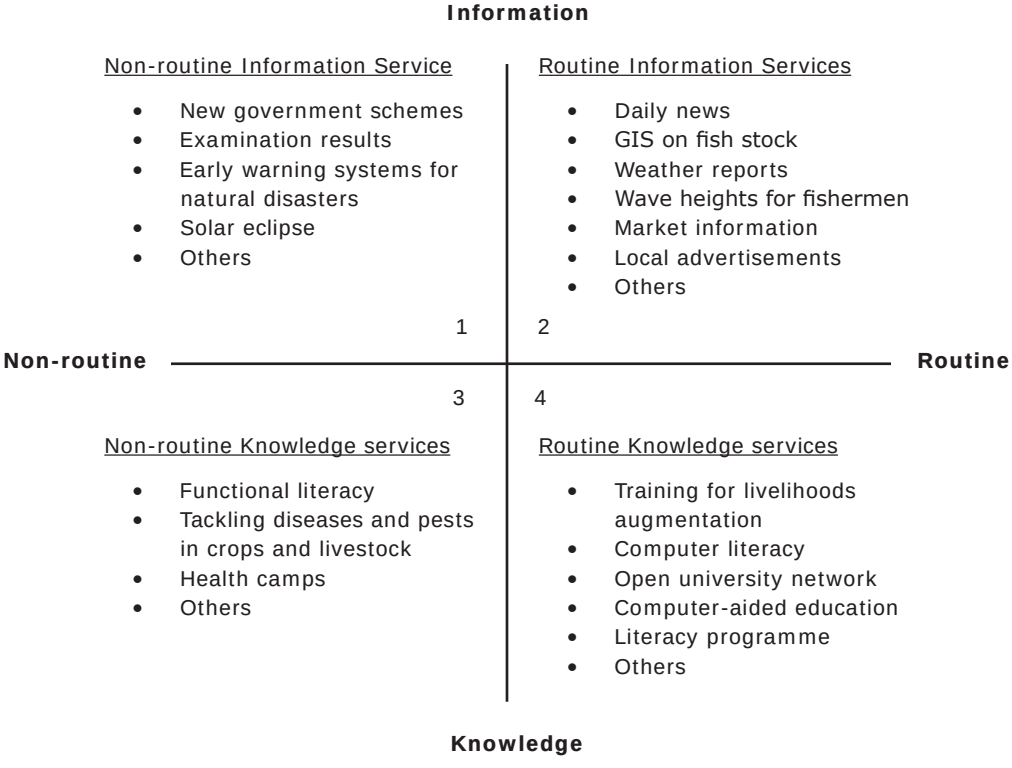
Optimizing Services and Products

An information kiosk, knowledge centre or tele-centre provides both information and knowledge. Some of these are of a routine nature while others are non-routine. The Matrix in Figure 8.1 provides examples of all four types of services.

Knowledge services

Non-routine knowledge tends to be of the trouble-shooting kind: What should the farmer do if there is a severe attack of a particular pest in his cotton crop? Can he fix the water pump with the help of the functional literacy package when a mechanic is not available? Routine knowledge, on the other hand, provides knowledge through training programmes that build capacities that can help the participant in the long run. He/she can either get employed or self-employed or start a micro-enterprise. Even simple literacy (including numeral literacy) can augment the survival skills of the individual and protect him/her from being cheated by unscrupulous elements.

Figure 8.1: Pattern of Information/Knowledge Services Provided by VKCs



Information services

Routine information services include information on a daily or regular basis, for instance, weather reports, market information, daily news and wave heights for fishermen. On the other hand, non-routine information is provided as and when the situation demands. Among these, alerts for pest and disease attacks, epidemics, natural disasters like cyclones and floods are the most important because these can save precious lives, crops and livelihoods. Other non-routine services could include announcement of new schemes by government and examination results.

The experiences shared in this volume show that many of the successful programmes started with a very narrow and focused agenda; for instance, ITC started with market intelligence (routine, information service) and Akshaya started with e-literacy (routine, knowledge service). However, when these became successful, farmers and villagers started demanding more services through the same channel. Ultimately each programme has ended up with a basket of services that best meets the requirement of the local population. The move to expand the product range has been justified because it brings economic viability to the kiosk operator and, at the same time, meets the requirements of the local community through a single window.

This basket of services varies from region to region even within the same programme, reflecting the importance of designing programmes in consultation with the local people in a participative mode. Practitioners have noted, however, that cluttering of the information channel with many services is avoidable because it leads to inefficiency and lack of focus. The selection of services, therefore, should be done after careful consideration and in consultation with all stakeholders. New services that the customers value can be progressively added to the basket until a point when the VKC is unable to do justice to all or some of the services. At that point, the management would need to see if adding staff to the centre can help in accommodating new services. If not, it may be better to restrict the number of services to the level of competence of the centre. An additional centre for other services could be thought of to meet the additional needs of the villagers.

Planning for Technological Obsolescence

ICT has been growing at an unprecedented rate. The emergence of new technologies stimulates the emergence of new applications thereby enhancing the prospects of serving the vast millions, especially in the rural areas. However, the high rate of innovation also implies high rate of obsolescence, a factor that has to be built into programmes when creating knowledge centres in rural areas. Sample, for instance, the following news item:

> Researchers at General Electric claim to have made a key breakthrough in optical data storage that could lead to commercial discs holding the equivalent of 100 DVDs, within three years. The new technology is based on the physics of holograms, which enable information to be packed far more densely than with established recording formats. A new device will be needed to play these discs but this will be compatible with established formats such as CDs, DVDs and Blu-ray discs, say the US-based team (Dacey, in *physicsworld.com,* 24 June 2009).

Whereas the new DVDs promise great new possibilities for data storage and retrieval, it also implies additional capital expenditure in purchasing the new device that will be needed to play the new discs. Not upgrading would mean falling behind times and de-evaluating one's service. Hence, the project promoters should evolve financial mechanisms that budget for such frequent capital expenses.

Among the emerging technologies, smart phones, Internet phones, interactive community radio, interactive TV, community video among others hold promise for reaching out farther to the rural poor. Practitioners would do well to keep track of the latest developments in these and other emerging technologies.

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Part-2

Best Practices

1. **e-Choupal**
2. **mKRISHI**
3. **VKCs of MSSRF**
4. **Source for Change**
5. **TARAhaat**
6. **Drishtee**
7. **Ekgaon**

The views expressed in these case studies are those of the authors and do not reflect the official opinion of the institutions studied.

1 e-Choupal: ITC's Rural Networking Project[1]

Introduction

In Hindi, a *choupal* is a village gathering place. The ITC Limited, a large agri-business company undertook e-Choupal initiative to web-enable village communities, so that the farmers are able to face the challenges posed by certain characteristics of Indian agriculture that often lead them into a vicious cycle of poverty.

Fragmented farm sizes, which constrain economic scales of production, and low productivity keep farmers poor and disadvantaged. Inadequate and sometimes non-existent infrastructure aggravates the already poor levels of connectivity. The significantly low bargaining power of a farmer (in that he sells his produce at wholesale prices at the beginning of a long chain, and buys his farm inputs or consumption needs at high retail prices at the end of another long chain); the wide geographic dispersion that makes it difficult to access information (for example, market prices, news that impact prices, weather forecasts) on real-time basis; and the level of heterogeneity in the conditions of different farmers (for example, agro-climatic conditions, financial resources, competence, risk-taking ability) necessitate customized solutions, and increase cost and complexity.

Although the primary objective of the project was to bring efficiency to ITC's procurement process, it has today led to a significantly increased empowerment of rural farmers in villages where e-Choupals have been established.

The e-Choupal initiative directly links the rural farmers with the company for the procurement of agricultural products. Traditionally, the companies like ITC used to procure these commodities from mandis (major agricultural marketing centres in rural India). A long chain of intermediaries was involved in buying the produce from farmers and moving it to the mandis. But now the farmers use the e-Choupal technology to access on-line information from ITC's farmer-friendly website—www.echoupal.com. Data accessed by the farmers relate to weather, crop conditions, best practices in farming, ruling international prices and a host of other relevant information. The e-Choupal is among the world's largest rural digital infrastructure systems. This access to information helps farmers in improving the quality of their produce and obtaining better prices.

Background

ITC Limited has a yearly turnover of Rs 22,000 crores (US$ 5.1 billion), and its businesses comprise agri-business, packaged foods and confectionery, cigarettes, hotels, paperboards and specialty papers, packaging, IT, branded apparel, personal care, stationery, safety matches and other FMCG products. Typically, a farmer sells his produce to a small trader called a *kaccha adat*, who sells the produce to a larger trader called the *pakka adat*, who, in turn, takes the produce to a local mandi, where a larger trader buys the produce. The mandi traders then operate through brokers to negotiate sales to companies like ITC. This long supply chain resulted in high procurement costs for ITC and in lost profit opportunities for the farmers. Because this long supply chain is a very time-consuming system, it also results in deterioration in the quality of the products.

Intervention

The e-Choupal system was introduced by ITC in June 2000, whereby Internet kiosks were set up along with its dedicated website in villages. An investment of Rs 40,000 is needed to establish an e-Choupal with dial-up connectivity and Rs 100,000[2] if a very small aperture terminal (VSAT) has to be mounted. An e-Choupal is operated by a *sanchalak*, who is usually a literate person, elected from among the farmers of the village. He acts as an interface between the computer and the illiterate farmers, and retrieves information on their behalf.

Whereas ITC covers the cost of equipment, the sanchalak pays for day-to-day operational costs, like electricity and Internet charges. These costs vary from Rs 3,000 to Rs 8,000 (US$ 60 to US$ 160) per year. Training is given to the sanchalak, who also doubles as an ITC salesman. He is paid a commission of 0.5 per cent per tonne of processed product. ITC spends an average of Rs 5,000 annually on the support and maintenance of each e-Choupal—training, maintaining a help-desk, addressing equipment and software complaints, and repairing and replacing broken equipment.

Information that can be accessed from an e-Choupal includes crop prices, disaggregated weather information, scientific farming practices, farmer peer groups, help-desks and soil-testing. This on-line information is made available in the local languages. For the farmer, the selling process works as follows: a farmer carries a sample of his produce to a local kiosk and receives a spot quote from the sanchalak. If the farmer accepts the quote, he can then transport the produce directly to an ITC collection centre and get payment within two hours.

The material handling systems at the ITC collection centre ensure that tractors, trolleys or trucks can directly unload their produce without spilling any grain, and a modern weighbridge ensures precise weighing. The transportation cost is reimbursed to the farmer. If the farmer is located in a remote area, he has the option of selling his produce to the sanchalak or to a nearby collection centre. The farmers prefer this system to the mandi system, where they had to wait for hours, or even days, before the produce was sold. In addition, transaction costs like bagging, transportation, loading and unloading had to be incurred by the farmers. Commission agents at the mandi used a small weighing scale that was inaccurate and resulted in less revenue in proportion to the produce. Moreover, the wastage level was higher because the agents threw away some grain when evaluating its quality.

The intermediaries are not removed from the value chain. Their roles are redefined to *samayojaks* (coordinators), who assist ITC in setting up new e-Choupals by conducting village surveys and by identifying the best sanchalaks. They manage the physical transportation of sales made at the e-Choupal, collect price data from local auctions and maintain records. These coordinators earn a 0.5 per cent commission on the product processed. Initial resistance to joining, because of low commissions was overcome once the increased volume of transactions became apparent.

ITC coordinates its activities with institutions like the national meteorological department and several universities to build useful Internet content, and with companies supplying agricultural inputs (fertilizers and seeds) to enable e-commerce. Such companies take orders and market their products on the e-Choupal website. ITC has also collaborated with an insurance company, on a pilot basis, to provide insurance services specially designed for landless or marginal farmers.[3]

Another initiative—the *Choupal Pradarshan Khet*—brings the benefits of agricultural best practices to small and marginal farmers. Backed by intensive research and knowledge, this initiative provides agri-extension services, which are qualitatively superior and involve pro-active hand-holding of farmers to ensure productivity gains. The services are customized to meet local conditions and ensure timely availability of farm inputs, including insurance and credit. A cluster of farmer schools has also been established to capture indigenous technical knowledge and facilitate horizontal diffusion of the same. This initiative, which currently covers 60,000 ha, has a multiplier impact and reaches out to 1.4 million farmers.

Outcomes and Impact

ITC's e-Choupal has become the largest Internet-based rural intervention by a private enterprise anywhere in the world. Its services today reach out to over 4 million farmers

Source: indiaprwire.com

growing a range of crops—soybean, coffee, wheat, spices, pulses, shrimp—in over 40,000 villages through nearly 6,500 kiosks across ten States (Madhya Pradesh, Haryana, Uttarakhand, Karnataka, Andhra Pradesh, Uttar Pradesh, Maharashtra, Rajasthan, Kerala and Tamil Nadu).

Web-enabled, real-time data on crop prices give farmers an accurate picture of the prices they can expect from ITC and from different mandis. This helps them to become informed decision makers and thereby sell their produce at a price that gives them a higher profit margin. With the participation of agri-input companies in e-commerce, the farmers now can conveniently order agricultural inputs too.

Although the prices offered by ITC are not always higher than those at the mandi, farmers choose ITC because the transactions are done closer to home and the practices of weighing and quality assessment are more efficient and transparent. Farmers save on travel time and costs, and incur less wastage. Their savings have been estimated at Rs 400 to Rs 500 (US$8 to US$10) per tonne of soybean. The final decision to sell their crops to the mandi or to ITC rests with the farmers themselves.

The farmers can transact with the company directly and exchange information through the Internet. In the process, farmers save about Rs 250–Rs 500 per tonne, depending on their location relative to the collection centre. ITC gains in terms of assured supply and savings of more than Rs 200 per tonne by avoiding the transportation of the crop from the mandi to the collection centre and other intermediary costs in the supply chain.

Altogether, more than Rs 4000 crores in transactions have occurred so far, and the company plans to extend the initiative to several other states across the country over the next few years.

Key Elements of Empowerment

Information

Access to information through e-Choupal has reduced the dependence of farmers on the traditional agricultural intermediaries. It has also enabled them to align their agricultural output with market demand. The e-Choupals carry a transparent listing of various mandi prices, giving farmers a fair chance to choose where to sell their produce to gain a better price, thereby increasing their bargaining power. Historical data and figures on supply, expert opinion on future price movements, information on farming practices and techniques, soil testing, virus testing, and weather information also contribute to the empowerment of the farmer.

Inclusion/Participation

Source: business.rediff.com

The e-Choupal model involved farmers in the design phase of the project. In some cases, farmers have also contributed to the content on the web, to ensure user-friendliness. The sanchalak, who operates the computer, is a farmer selected from the village itself. Farmers actively access information for crop prices in the mandis, and get inputs on soil testing, best farming practices and expert advice from the system.

Accountability

The e-Choupal system considerably reduces transaction costs for farmers. The weighing techniques under the system are accurate and transparent, and farmers are paid in proportion to the quantity of their produce, unlike the mandi system. In addition, quality measurement is more open because the results are immediately available to farmers.

Local organizational capacity

This initiative has created an organization at the local level that is transparent and accountable in its operations. The sanchalaks and the samayojaks play redefined roles as intermediaries, who add value—the sanchalak as an interface between ITC and the farmer via the Internet and the samyojak as a brick and mortar interface between the farming community and the company.

Issues and Lessons

Challenges

The problems encountered when setting up and managing these e-Choupals are primarily related to inadequacy of infrastructure, including power supply, telecom connectivity and bandwidth besides the challenge of imparting skills to the first-time Internet users in remote and inaccessible areas of rural India. Several alternative and innovative solutions—some of them expensive—are being deployed to overcome these challenges, for example, power back-up through batteries charged by solar panels, upgrading BSNL exchanges with RNS kits, installation of VSAT equipment, mobile choupals, the local caching of static content on website to stream in the dynamic content more efficiently and 24 x 7 help desks.

Familiarizing first-time users in remote areas of rural India with the Internet presented a challenge. When the e-Choupal concept was first proposed, the farmers were hesitant but offered no direct resistance. They learned quickly; the basic training for the very first batch of sanchalaks was planned for two days and was accomplished in just four hours! A video showing farmers using the kiosks has helped hasten acceptance and adoption of the technology among other farmers.

ITC also had to surmount regulatory barriers. The Agricultural Produce Marketing Committee Act (APMC Act) prohibits purchase of specified commodities (including several that ITC deals in) from any source other than the government-designated mandis. ITC has overcome this challenge by convincing the political and bureaucratic leadership of various state governments that the 'spirit' of the Act (to benefit the farmers) is better served through e-Choupals. As a result, some States (like Uttar Pradesh) have amended the Act whereas others have allowed specific exemptions for new business models.

Another challenge is to build personalized content, catering to individuals with a wide range of income levels and information needs.

Key factors for success

Unlike many other experiments in which the Internet kiosks had been established to provide information to rural communities, this experiment is completely funded by a private sector company. ITC's e-Choupals face no significant competition from a business perspective. Whereas other industry players have attempted to replicate the e-Choupal business model, ITC retains a strong competitive advantage as a result of its first-mover status, broad multi-sector experience, extensive partnerships and adequate financial commitment.

In implementing the project, the interests of a chain of small and medium traders were hurt because of the process of disintermediation. However, ITC recognized the resistance that would build up if the role of intermediaries were completely eliminated. In introducing e-Choupals, ITC has redefined the role of the local intermediaries from that of procurement agents to that of the facilitators and information gatherers. In the process, ITC has ensured that at least a part of the income derived by intermediaries through trading commissions is replaced by commissions or service charges paid by ITC to these traders. This has helped ITC in overcoming any resistance from these traders.

Instead of creating an entirely new mechanism of direct procurement, ITC has chosen to strengthen an existing institution in rural areas, the village meeting place (choupal), which serves as the focal point for exchange of ideas and information by word of mouth in rural communities. By web-enabling the rural communities, ITC has enlarged the scope and quality of information exchange.

Factors contributing to the success of e-Choupal are the partnerships built with academia and NGOs to create and document relevant knowledge about agricultural practices that are useful for farming communities. Another success factor was the participatory method in which ITC tried to understand the information needs of the rural communities.

Outlook

ITC plans to scale up the model to cover 1,00,000 villages in the near future. A plan to market and distribute other services related to micro-credit, insurance, health and education through the same e-Choupal 'channel' is also underway. Such a scale-up will require very large investments, to the order of US$ 200 million. Currently, over 70 companies utilize the two-way channel created by the e-Choupal, making it one of the most efficient distribution and procurement systems in rural India. This innovative model has raised farmer incomes, transformed rural areas and is today acknowledged as one of the most effective partnerships in agricultural development.

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End-notes

1. This case study, originally prepared by a team comprising Prof Subhash Bhatnagar and Ankita Dewan of the Indian Institute of Management (Ahmedabad), and Magüi Moreno Torres and Parameeta Kanungo of the World Bank (Washington DC), has been updated with information from ITC's website. The case is reproduced here with permission from ITC.

2. VSAT is a small terminal that can be used for one-way or interactive communications via satellite.

3. Insurance services are currently provided by ICICI Prudential, a private sector life insurance company. The Life Insurance Corporation of India, which has a 10.43 per cent share in ITC, plans to offer group insurance policies that will provide comprehensive benefits in terms of life insurance, pension and disability income, as well as lump-sum survivor benefits to landless agriculture workers.

2 mKRISHI: A Mobile-based Agro Advisory System[1]

Introduction

TCS's mobile-based agro advisory system mKRISHI[2] is an innovation that allows the farmer to send queries to agricultural experts in their local languages through a mobile phone and receive personalized advice or relevant information in the local language. It also helps literacy challenged farmers by allowing them to send queries and receive advice and information through 'voice SMS'.

The application has received international recognition. It won the prestigious Golden Peacock Innovation Award (2008) and also the Wall Street Journal Technology Award under the wireless category (2008).

The case focuses on the problem of declining agricultural viability especially in dry land conditions of India and how advisories can reach a large number of farmers with the use of ICT. Initial results from the pilot project show the kind of response elicited from farmers and the nature of benefits realized by them.

The Problem of Agricultural Viability

India has been witnessing excellent growth. Its growth rate of 8 to 9 per cent is certainly impressive. However, an analysis of the growth reveals that it is lopsided. Whereas urban India is growing fast, rural India is struggling to reach even a growth rate of 3 per cent.

We have already started seeing the evidence of lopsided growth in terms of social problems. On an average, every 30 minutes a farmer in India commits suicide.[3] Agricultural productivity seems to be at an all-time low. Farmers are not getting their due, on produce.

Currently, farmers have to depend on their traditional knowledge of farming and crops. They are unsure of the best farming practices, especially in the changing agricultural scenario. They do not have information on the latest seed variety or a reliable source for purchase of seeds. According to the Director, Central Institute for Cotton Research, Nagpur, there are almost 60 companies selling hybrid-cotton seeds. On scrutiny, it was found that only five or six companies were selling seeds of good quality.

The government also tries to educate and train farmers through television, newspapers and by sending extension workers to the farms. This helps in increasing the awareness but fails to address specific queries of farmers related to crop, soil and environment. Also workshops for farmers and the efforts of extension workers prove woefully inadequate in disseminating information to large number of farmers.

The mKRISHI designers met farmers in different parts of India. The TCS team also met NGOs, university professors, agriculture experts and progressive farmers. The questions that the farmers asked were often specific to their problems. The following are some of the questions that they ask:

- What is the composition/quality of soil on my farm?
- Which crop should I grow?
- What is a good time for sowing?
- Will it rain enough in my village in the coming week?
- Can I divide my land into cotton and soybean crop in equal proportion?
- This year, I got good rates for soybean; will I get the same rates next year?
- Which fertilizer should I use? Last year, I did not get a good produce despite spending a significant amount on fertilizer.
- How do I know that seeds supplied in the market are of good quality? There are almost 60 companies selling hybrid seeds. Which one should I choose?
- My colleague spotted a disease on cotton crop in his farm. Will my crop catch the same disease? Which pesticide should I spray, in what concentration and when?

These questions are quite specific to a farmer's immediate environment and context. Hence, to achieve the best benefits, the information or advice given to farmers should be personalized according to their needs. Unfortunately, farmers are frequently given generic advice. The source of advice is usually television, newspapers or farmers' gatherings. It appears that there is a last mile gap between the farmers and the stakeholders like agriculture experts, markets, government officers, fertilizer experts, and pesticide and seed companies. In the absence of correct information and specific advice, farmers rely on what other farmers do, or rely on their traditional wisdom.

The problems and/or challenges that need to be addressed are:

1. How can the last-mile gap between the farmer and the expert be removed?
2. How can personalized information and advice be given to farmers?
3. How can the operation be scaled up while ensuring that the system remains sustainable?

How mKRISHI Addresses the Problem

The mKRISHI addresses the above problems and challenges in the following manner:

1. Farmers can send their queries to a remote expert through their mobile handsets. Along with their queries, they can also send a photograph of the crop taken with their mobile phone camera. The information related to crop, soil and micro-environment, gathered by sensors is sent to experts through automatic weather station, using the cellular network. Farmers receive responses to their queries through the same channel. Thus, interaction between farmers and experts is established and the gap is bridged.

2. Farmers submit soil nutrient and farming pattern data. Also, they furnish details regarding their family and cattle during registration. The information on application of fertilizer and pesticide can be sent through the handset application. Thus, the expert has access to farmer-specific information like as soil, crop, farming practice and so on. He is able to advise on one-on-one basis and *hence the advice becomes personalized.*

End-to-end mKRISHI solution has been developed through the integration of the following technologies:

- *Sensors*—to sense soil and weather parameters.
- *Solar power*—for supplying the power to the weather station installed in villages.
- *CDMA modem, CDMA network*—to send data from a field to a server.
- *GPS*—for location of the weather station and sensors.
- *Handset with camera*—for the farmers to interact with the system.
- *Binary Runtime Environment for Wireless (BREW)*—to develop multiple applications on the handset.
- *Client Software (on mobile phone)*—to allow farmers to send a query and see a response.
- *Expert console software*—to send advice to the farmers.
- *Indian languages rendering engine*—to assist in displaying mobile screens in Indian languages.

Appendix 1 provides an illustration of how grape farmers in Borgaon Village (in Maharashtra, about 7 hours from Mumbai) use mKRISHI to raise such queries. With ongoing interactions with farmers, there are continuous changes in the screen layout. Most of the challenges faced are because the mobile phone keyboard is not suitable to enter an Indian script. This requires the product designers to present menus, which enable farmers to make a specialized query.

From Concept to Implementation: The Pilot Project

The concept originated in July 2005 after an informal interaction between TCS and the farmers of Vidarbha, a hotspot for farmers' suicides in Maharashtra. TCS staff met several farmers, including the progressive farmers, government officials, faculty of an agriculture university, NGOs and agriculture scientists from different research labs. There was no system in place that addressed the farmers' locale-specific queries. Everybody expressed their inability to reach the marginal, small and medium farmers. The idea of using the mobile phone and the cellular network to give personalized advice was conceived in October 2006.

The idea was presented internally and a project was initiated. The team felt this innovation had the potential to create new markets and services at low cost, a 'disruptive innovation'. The idea was given credence when international experts chose this innovation for a Grand Prize under the Wireless Reach Programme of Qualcomm Corporation in March 2007.

The next step was to demonstrate the idea in the lab by integrating several technologies and proving the concept. This was achieved in September 2007. It was tested in the field; a farmer made a query, to which an expert responded from a remote location. Automatic weather stations and sensors were procured for installation in four Maharashtra villages—Borgaon, Waifad, Ganori and Bichaula—for grape, cotton, soybean and potato farmers. An informal agreement was reached with the experts from the agrochemical manufacturer Rallis India, Panjabrao Krishi Vidyapeeth and Tata Chemicals for providing advice. Also, a relationship was established with MSSRF, an NGO created by Professor M S Swaminathan, renowned for his path-breaking research in Indian agriculture, for help in terms of advice. Thus an end-to-end system installed at four places was demonstrated to a section of farmers. Already the system was operational and being used by grape farmers in Borgaon. In 2008, mKRISHI was launched in several villages in Punjab and Uttar Pradesh on a commercial basis. Camps were held to understand farmers' reactions and feedback.

TCS is testing the village entrepreneur model in the field. It believes that a village entrepreneur can make good money by providing mKRISHI-based services to farmers. In the meantime, private organizations like fruits and vegetable companies, agro-processing industries and tea gardens have approached it to deploy the system on a paid pilot basis.

Demonstration of Benefits during Pilot Stage

In Mansa, TCS staff found that some farmers were bold enough to tell the pesticide

retailer that he was wrong in suggesting a particular pesticide, based on the advice received from the mKRISHI expert. A small farmer in Bichaula Village found out that the cracks developed in potatoes were due to deficiency of Boron, a micro-nutrient in the soil. Many farmers used the picture gallery available on the handset to distinguish 'good' bugs from harmful ones. Moreover, mKRISHI has been effective also in disseminating integrated pest management technology to farmers. As a result, pesticide consumption has reduced by 40 per cent, leading to savings in cost.

Urea fertilizer is subsidized and affordable; therefore, many farmers tend to use it very frequently. With expert advice, farmers have realized that excess urea application is not good for the crop and is detrimental to the soil and groundwater. The yield has increased because farmers are able to identify the right mix of fertilizer (for example, NPK of 13-0-45 in place of 19-19-19). The approximate increase in yield has been 1.5 quintal per acre, worth about Rs 4,000.

The system has given farmers a certain level of emotional security because they know that they can get in touch with an expert any time, anywhere, whenever they face a problem. Some farmers send their query at 10 p.m. at night, with the confidence that it would be answered the next day. The reduction in transaction cost is estimated at Rs 300 not counting the opportunity cost of one full day needed to travel to the nearest agricultural expert/input retailer.

Thus mKRISHI has improved the bargaining power of the marginal, small and medium grape farmers by providing them market prices from various markets.

Future Plans and Opportunities

The successful launch of mKRISHI in Borgaon village has resulted in the following commercial queries:

1. A discussion has begun with Grape Grower Association to extend the services to 40,000 grape farmers in Maharashtra and, later, to an additional 75,000 grape farmers all over India.
2. A private company engaged in fruit and vegetables has shown interest, in deploying the system in banana plantations.
3. An agro-processing company, engaged in a castor oil-based product export, has expressed interest in increasing the yield of castor seed production, using mKRISHI system.
4. A well known trust is working with the University of Punjab, to develop a

decision support system (DSS) for alerting farmers about cotton pest attack. Discussions are being held as to how their DSS can be integrated with mKRISHI, and can offer services to 100,000 farmers there.

5. A tea estate has also shown interest in deploying mKRISHI to increase yield and quality of tea.

6. Pesticide and fertilizer organizations would like to target individual farmers to address specific needs through mKRISHI.

TCS plans to scale this model through local franchisee operations. There are many rural youths trained in agriculture, who are forced to migrate to cities in search of jobs. The mKRISHI franchisee operation will provide them an opportunity to generate income in their hometown. A franchisee for a cluster of villages will help scale up the operations. Also it will become sustainable by ensuring that the partners in the system (franchisee, wireless operator and experts) make adequate money through the commercial operation of mKRISHI.

TCS also plans to leverage the KVK infrastructure for agricultural extension. Currently, KVKs are not in a position to provide personalized advisories to farmers. With the help of mKRISHI, they will be able to do so, covering about 1 to 1.5 lakh farmers in a district.

On the technical side, the architecture of the mKRISHI platform is scalable. One can add racks with additional servers, routers, voice cards as the number of farmers increase. Also, the bandwidth can be increased in steps if the number of transactions increases.

Appendix 1

How the mKRISHI System Works

The following screens depict how grape farmers in Borgaon village use mKRISHI to raise a query.[4] In the case of general queries, the answers are provided immediately. However, if the query is specific, it is routed to an expert. The expert takes into account the location-specific information before sending advice to the farmer.

Figure 1

The figures depict various handset screens, which the farmer can view. These represent a small section of the entire mKRISHI suite of agro-advisory applications.

Figure 2

The screen in Figure 2 shows the options for the type of service. Currently, four services are available—namely fertilizer advice, pesticide advice, local weather information and local market prices. A graphic user interface with icons indicating each service will be introduced. This will assist even barely literate farmers to use the service.

Figure 3

Figure 3 shows the services for a crop selected by the farmer. In this case, it is grapes. Unlike grape farmers, who do not require information on grape prices in various national markets, cotton, soybean and potato farmers need market information, which is provided through a mandi price service.

Figure 4

Figure 4 shows the interface providing general information. If the farmer gets the information he is looking for from the table on the screen, he need not send a query to the expert. Experience shows that there is a need to provide general information or recommendations even though the information is provided in the form of a booklet or a CD. There is also a Quick Reference to the recommendation table, which is very useful. Thus, the application provides both generic information that is readily available as well as on-demand expert advice.

Figure 5 depicts how the farmer is required to provide information on the current growth stage of the grape crop, before sending a query to the expert. Farmers are intimately

aware of each growth stage of the crop, and need no help in identifying this.

Figure 6 illustrates the four choices given to farmers to make a query:

1. The first choice is a Frequently Asked Questions (FAQ) facility. By allowing farmers to choose an FAQ from the list of questions, they can find answers instantly.

2. The second choice allows farmers to select a question from a list of possible questions. This list has been created with inputs from several farmers. A selected question is then routed to an appropriate expert.

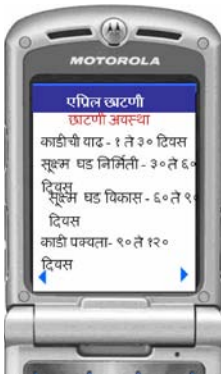


Figure 5

Figure 6

3. The third choice allows farmers to record a question using their mobile's recording facility. The recorded voice message is transported to the expert's PC through a server. The expert can retrieve this query and play it on his multimedia PC.

4. The fourth choice allows farmers to send high-resolution images of the crop, select a query, or call an expert.

End-notes

1. This write-up was provided to the editorial team by TCS in late 2009.

2. mKrishi is the product of collaborative effort of Dr Arun Pande and other colleagues at TCS Innovation Labs, Mumbai. The lab works in areas like speech and natural language, wireless technology and application development in BREW developed by Qualcomm. It has a number of successful cases of commercialization of technology.

3. P. Sainath, The Hindu, April 17, 2008.

4. These are sample screens (not to scale), only of the handset application; the web interface and other aspects of the solution are not visually depicted here, due to want of space.

3 Livelihoods Promotion through MSSRF's Community Based ICT4D Intervention[1]

Introduction

MSSRF was established in 1989 adopting a pro-nature, pro-poor, pro-women and pro-sustainable livelihoods paradigm of technology development and dissemination. The bottom line of its research, education and outreach programmes is social inclusion through access to resources, including information, and relevant technologies. Since 1997, the Foundation has been promoting a model of community based knowledge centres for sustainable rural development, using ICT-enabled development.

MSSRF's work in the sector has received national and international recognition. MSSRF has also triggered a national movement for bridging the digital divide under the charismatic leadership of its founder chairperson, Prof M S Swaminathan. This case describes the efforts that have gone into making Village Knowledge Centres (VKCs) what they are today. It also provides a brief account of its impact on rural clients as well as on the practice of ICT4D.

MSSRF's Community Based Model

Genesis

Although the concept of a VKC was formed in the course of a dialogue in 1992 (Swaminathan, 1993) it took the form of a programme in January 1997 in the Union Territory of Pondicherry with financial support from International Development Research Centre (IDRC) and Canadian International Development Agency (CIDA). The programme aims at empowering the largely unskilled, resource-poor rural farming and fishing families to make better choices and achieve better control of their own development by building skills and capacities that would enhance their livelihood opportunities. The VKCs provide value-added information to the communities they work with and facilitate two-way communication between formal and informal sciences, between scientists and farmers, and professional service providers and the community. It also provides a platform for farmer-to-farmer exchange of problems and solutions, ideas and innovations.

On August 23, 2003, MSSRF launched an umbrella institution, the Jamsetji Tata

National Virtual Academy (NVA) for Rural Prosperity, to carry out all its ICT-enabled developmental activities. The NVA is supported through grants from Sir Dorabji Tata Trust and Tata Education Trust and its activities are supported by many other organizations. NVA has been involved in creating an information system that seeks to facilitate three kinds of knowledge flows, namely,

a. *Lab-to-land:* Symbiotic linkages between the providers of information and the users on the ground.

b. *Land-to-lab:* Linking traditional knowledge and wisdom of farmers and other villagers with professionally trained technical experts and policy makers.

c. *Land-to-land:* Facilitating lateral learning among rural families and grassroots communities.

Bruce Alberts, the former President of the National Academy of Sciences, USA, observed that the land-to-lab link is very important because it enables scientists and policy makers to listen to the concerns of the poor and the marginalized, and reorient their research and policy to address those concerns.

Creation of knowledge networks

All the VRCs are connected through the ISRO uplink and downlink satellite communication facility under the ISRO's VRC programme, which incidentally was established in collaboration with MSSRF. This programme aims at providing digital connectivity to remote villages and providing multiple services like tele-medicine, tele-education, interactive farm and fisheries advisories, government schemes and entitlements, weather services and remote sensing applications through a single window. Most of these services used to be provided by MSSRF much before the ICT intervention. The partnership with ISRO helped to expand the scale and scope of these services with the help of ICT.

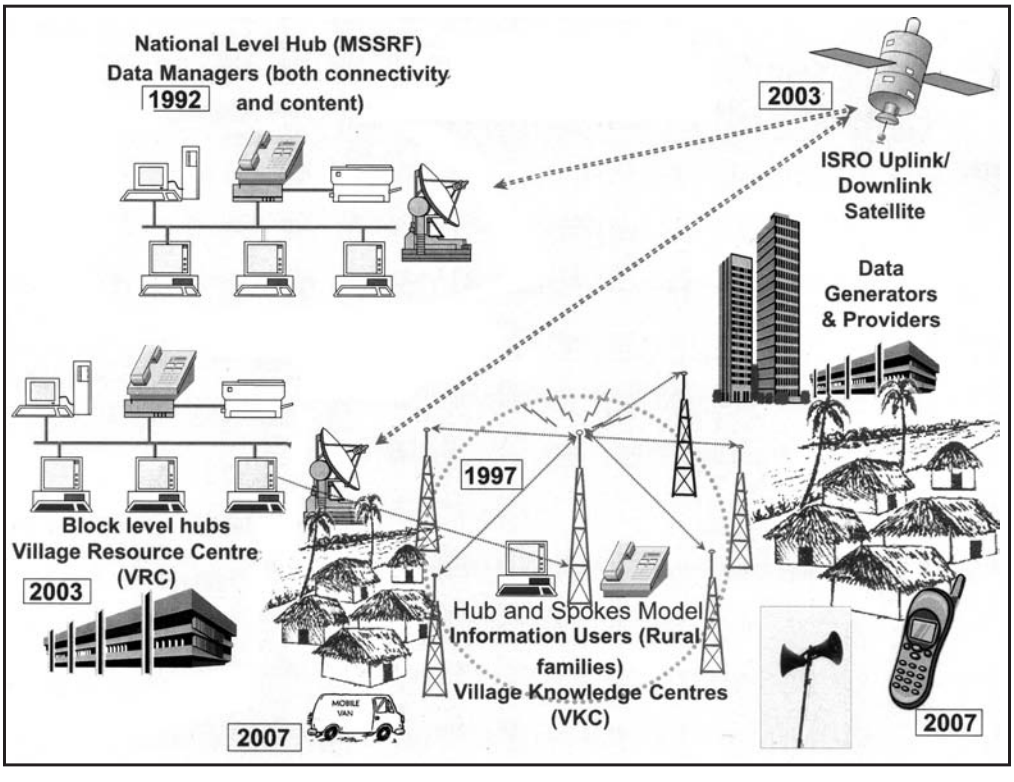
The state-level hub located at MSSRF is a key knowledge coordination source and creates and maintains websites and databases for the local hubs, in close collaboration with national and international

agencies. The local hubs serve as primary data providing centres tied up with research institutions, field stations and government extension departments. The state-level hub links with the block level or equivalent hubs (VRCs). The VRCs are linked to VKCs through a hub-and-spokes model (Figure 1). The VKC serves a cluster of villages. Last-mile and last-person connectivity takes place through the integrated application of a variety of communication channels or tools like the Internet, cell-phone, community radio, public address system, community newspaper, cable TV, wireless and telephone. The key is to use a blend of modern and traditional technologies—the choice being determined by the actual need and the ground realities.

Institutional arrangements

The VKCs are generally located in public buildings, like the panchayat office, community hall, school or the office of the fishermen's associations. A separate committee, representing all social groups, is formed to oversee the working of the centre at the village level. Sometimes, existing institutions, like temple committees, or other CBOs may take up the running of the centre. These institutions are referred to as *boundary institutions*.

Figure 1: MSSRF's Hub and Spokes Model



VRCs are established at the block level by MSSRF through grants. Apart from serving as the hub for a cluster of villages, a VRC also serves as a training centre for farmers, who need specialized inputs for livelihoods. The VRC actively networks with the knowledge and research institutions within and outside the block and arranges dialogue with the advisory committee, which comprises local farmers. This dialogue helps to develop content relevant to the local needs.

MSSRF has established partnership with more than 90 institutions from all over the country. The partner institutions comprise those that help provide connectivity (like ISRO, private sector companies), those that provide content (IMD, IGNOU, AIR, Doordarshan, private and public companies, etc.) and those that help MSSRF in other states to play the facilitator's role (civil society institutions and social entrepreneurs).

At the state level, the NVA serves as an umbrella institution. However, the NVA also doubles up as the Secretariat for Gramin Gyan Abhiyan (GGA) and has, therefore, acquired a national status. A separate organization called Jamsetji Tata Training School for Leadership in Rural Knowledge Connectivity (JTS) visualized as a national training institution has also been established. The JTS organizes need-based capacity building programmes and ensures life-long education for the NVA Fellows through periodic interaction, monitoring and evaluation of their performance. Apart from meeting the capacity building needs within the country, it also caters to the training needs of other developing countries.

Achievements

By 2007, the NVA had established 80 VKCs and 15 VRCs in five States and in one Union Territory. The most recent inclusion is the distress spot of Vidarbha region of Maharashtra.

The NVA aims to create an army of KWs by selecting local leaders with appropriate orientation and value system. These leaders are selected through an open process of nomination and awarded the Fellowship of the NVA. The NVA Fellows are expected to become torchbearers of the rural knowledge revolution and agents of change. So far, 1,010 Fellows from 20 states possessing local expertise in about 25 categories have become NVA Fellows through five convocation ceremonies. In addition, there are 25 Fellows from foreign countries, namely, Sri Lanka, Afghanistan, Nepal, Philippines, Kenya and Nigeria, who were inducted in the Fifth Convocation held in New Delhi in August 2007. The NVA has given itself an ambitious target of creating half-a-million knowledge workers by the end of the decade. These workers will also participate in other ICT initiatives in the country as part of GGA.

MSSRF's ICT initiative has received the following international recognition:

- Motorola Dispatch Solution Gold Award (1999).
- Stockholm Challenge Award (2001).
- *Scientific American* selected the project for special mention when it chose Prof M S Swaminathan as one among 50 scientific leaders of the world, who are making a difference (2004).

Impacts

Several impact studies have demonstrated the transforming power of VKCs. The benefits range from convenience and cost-saving through services delivered at the doorstep, to savings of life and property during disasters (early warning systems) and crops (treatment during epidemics). Several SHGs have benefited from the new technology and the hand-holding by MSSRF staff. Moreover, it has been able to make impacts on women and other marginalized groups. They have been brought to the forefront of the ICT movement through training and empowerment. Among schoolchildren, it is fostering creativity and self-learning capacities apart from education and computer literacy. MSSRF has documented many 'caselets' (over 500), showing the impact on individual households.

An internal evaluation in 2006 brought out the range of impacts that were taking place:

Access to opportunities/entitlements

The knowledge centre has been a boon for the educated unemployed. Earlier, they did not know where to get application forms and how to fill them up. By the time they finished the process, the last date for submission would have elapsed. The VKCs have made the process accessible and easy, leading to a number of youth getting jobs in various governmental departments, and public and private companies. The precise number of such beneficiaries is hard to estimate. However, it is known that about 60 of the participants trained under the Microsoft UP programme have obtained jobs for themselves.

The VKC also helps farmers to apply for government schemes and subsidies. In Embalam Village, three groups of farmers obtained power tillers costing over Rs 1,00,000 with 50 per cent subsidy from the government. They expect to recover the investments within two years.

Convenience and cost saving services

The installation of a siren in some of the villages helps to remind the villagers,

students, etc., of their daily routine so that work gets done on time. In Embalam Village, a discussion ensued on the over utilization of this facility because multiple groups started making demands for it! The public address system installed in some villages is a great convenience for making announcements. This is supplemented by billboards on which important local news on weather, wave heights, etc., is made available. People are happy to avail of typing and computer services for a nominal fee.

Troubleshooting technologies

An example of troubleshooting is as follows. The incidence of fowl pox disease in turkeys became a major threat to the livelihoods of turkey raisers because it is a viral disease that spreads very quickly. The Thangachimadam VRC responded with a solution within half-an-hour by contacting a resource person at Tamil Nadu Agriculture University (TNAU). The villagers were advised to administer tetracycline, which they procured from the block headquarters. The disease was checked within three days. The quick response and the success of the solution created a major impact on the farming community and raised the credibility of the VRC. Similar responses for pest attacks in crop plants and animal husbandry problems have been highly appreciated. The functional literacy programme being planned by MSSRF can further create an impact in fixing all kinds of problems.

Awareness raising

Specific campaigns range from topics like 'how to avail crop insurance' to 'dealing with snake bites'. Recently, a campaign to conserve endangered marine species like the sea-cow and the sea-turtle was carried out. The use of the sea-turtle excluder was demonstrated. With this appliance, the fishermen could exclude the turtle from a fish catch and put it back into the sea. The turtles would, otherwise, have been sold in the local market as seafood.

Protection of life and property

During the tsunami, two coastal villages that had their own public address system were able to alert the entire community in time, thus saving majority of the population.

Subsequently, the VKCs also became the nodal points for relief and rehabilitation work for these and neighbouring villages.

Information on wave heights that provide 12 hour predictions on a routine basis are accessed from a US Navy website and passed on to the villages through Indian National Centre for Ocean and Information Services (INCOIS). This helps fishermen to make appropriate decisions before venturing into the sea. The use of a flashlight on top of the tower also serves as a beacon for fishermen, who have lost their way in bad weather. In Embalam, during a recent fire, the people were able to get the timely help of the fire brigade by contacting it through the VKC.

Computer education

The centre is frequented the most by enthusiastic schoolchildren, who are eager to learn. They become proficient in Microsoft Office packages and use of Internet very quickly. They also make use of educational CDs, which help them to grasp subjects very quickly. The Azim Premji Foundation provides the CDs.

Health and longevity

Specific campaigns like eye and TB eradication camps have been launched successfully. For eye camps, KWs have been trained to diagnose cataract, long sight and short-sight problems. Based on the preliminary screening, records of potential cases are sent to the referral hospital. The doctors visit the village on an appointed day and treat all the patients. A referral system had also been established by which the centre refers patients to selected hospitals.

Livelihoods augmentation

Livelihoods augmentation occurs in two ways: a) strengthening the existing livelihoods, and b) creating new livelihood options.

a) *Existing livelihoods*:

In Veerampattinam, INCOIS provides regular information on potential fishing zones, which the fishermen have found useful. More recently, four boats have procured GPRS and Echo-sounder machines for about Rs 1,00,000 each, with 50 per cent subsidy from MPEDA. This represents the state-of-art technology for locating a potential catch and has helped to raise the productivity significantly. There are 50 boats in the village and now all the fishermen are interested in procuring the equipment. In addition, plans are afoot to switch to larger boats (from 30 to 47 feet), with the in-built facility of an icebox. This is estimated to cost Rs 15 lakhs per boat.

b) *New livelihood options*:

There are 7 SHGs in Veerampattinam that have launched micro-enterprises. The products include seashell handicrafts, incense sticks, phenyl, garments and mushrooms. The mushroom producing SHG has 10 members, who earn Rs 600 per month per member. Veerampattinam being a coastal village, only 'bracket mushrooms' are produced; these have a very poor shelf life. The villagers have, therefore, learnt to convert this product into delicacies like pakodas and soups, which are sold locally.

At Embalam, there were 15 SHGs producing soap oil, washing powder, vermi-compost, mushrooms and seashell handicrafts. One SHG was involved in trading sarees. In addition, one woman made a successful business of pickle-making. She used the MSSRF newsletter to advertise her products locally and her business grew in a short span of time.

Gender balance and empowerment of women

MSSRF tries to maintain a balance between women and men KWs. When the centre is managed mainly or only by either sex, it prevents the opposite sex from coming to the centre and freely participating in its activities. Women's empowerment is taking place mainly through the women volunteers, Fellows and SHGs.

Triggering a national movement

MSSRF has triggered a national movement by initiating a National Alliance for working towards 'every village a knowledge centre'. The Alliance was an outcome of a Policy Makers' Workshop, organized on October 8 and 9, 2003 by MSSRF. Starting from an initial membership of 60 organizations from private sector, public sector, academia and civil society, the membership of Mission 2007 grew to more than 400. On August 3, 2007, the Mission took the form of a movement, with the launching of GGA by Sri Raghuvansh Prasad Singh, Union Minister for Rural Development, GoI.

GGA has succeeded in creating a more favourable policy environment to take ICT to the rural poor. ICT4D finds pride of place in the government's Bharat Nirman plan, which promises a new deal for rural India. The DoIT has initiated a programme for establishing 100,000 common service centres (CSCs) to cater to the needs of rural India. The Mission is also triggering innovations in applications, technology, delivery systems and content creation. It is fostering partnerships across stakeholder groups.

Impact on other developing countries

The Mission has triggered similar initiatives in neighbouring countries like Mission 2011 of Bangladesh, Mission Swaabhimaan in Nepal and Community eCenters programme in the Philippines. Pan-African e-Network is a project funded by the Ministry of External Affairs, GoI, to connect all 53 nations of the African Union by a satellite and fibre optic network with seven reputed Indian universities and 12 super specialty hospitals.

Conclusion

MSSRF's community based model draws its strength from the following simple principles: empowering people through sharing knowledge, building partnerships and collective action through community participation and ownership. Also, the programme is technology neutral; both old and new technologies are used in tandem. The MSSRF programme goes far beyond the average tele-centres, which just provide information and access to technology; it aims at holistic development.

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End-notes

1. Based on information provided by S Senthilkumaran, Programme Director, NVA, and Secretary, GGA Secretariat.

4 Source for Change: Makings of an All-woman Rural BPO[1]

Introduction

The Source for Change (SFC) was founded by three young social entrepreneurs under the aegis of Ajay G Piramal Foundation, (more specifically Grassroots Development Laboratory[2]) at Bagar Village in Rajasthan, in 2007. This rural, all-woman BPO aims to change the rural landscape by leveraging the talent of women, to deliver world-class BPO services. It hopes to address the chronic problem of unemployment and under-employment in 'India-within-India' by transferring technology skills to the rural poor and integrating social progress with economic development. At present, the BPO start-up is being incubated by the Piramal Foundation. A management team, comprising three young professionals, runs the BPO. Two of them are non-resident Indians from the USA.

SFC employs women from Bagar and surrounding villages. Most of them are first-time paid employees, with a minimum educational qualification of Class X. Their ages range from 18 to 35. A majority of the women are married, thus minimizing the risk of their leaving the BPO after marriage.

SFC began with a group of 10 women in a region plagued by a tradition of discrimination against women, as evidenced by prevalent female infanticide cases and the purdah system. In a place where it was a rare sight to see women go to work in an office, SFC offered women a platform to be financially empowered and achieve a greater social standing. By 2010, the BPO had expanded to include 45 women. This case focuses on the anatomy of a rural BPO start-up—one with a mission to empower rural women through ICT.

Why a women-only BPO?

The management team provided two main arguments for making it an all-woman BPO.

a. Economic considerations: The team believed that women provide high quality and cost-competitive BPO services due to their keen attention to detail and long-term commitment to an enterprise.

b. Social considerations: Rural women would gain technology skills and

Source: flickr.com

employment through this initiative in an industry that would otherwise overlook them. Women, thus empowered, were more likely to invest their incomes in their families and to pass their new IT skills on to their communities.

A recent survey of BPO clients conducted by oDesk[3] has shown that clients rate deliverables created by women to be 3.5 per cent more satisfactory than those created by men. This has vindicated the stand taken by the founders of SFC. Their own experience has also shown what they had always believed to be true. In the first major project implemented by SFC, for Pratham India, a national level NGO in the educational sector, the client rated SFC as providing the highest quality data entry services among 20 other BPOs.

Operations

Bagar, a town with a population of 8,000, is located 18 km from Jhunjhunu, the district capital, which has a population of about one lakh. The choice of location was guided by the fact that Piramal Foundation had been working in the area and also because there was already a prior relationship with the local communities. Bagar also had easy access to Broadband connectivity. Power supply was relatively good and power cuts took place for only 2 hours a day, during which a diesel generator was used. To keep costs to a minimum, the founders chose to set up the facility on rented premises and use open access software like Linux and Open Office.

The BPO does not believe in night shifts because many women commute to the centre in Bagar from neighbouring villages. Also, the type of data-entry work the BPO takes up does not necessitate night shifts.

The women employed are referred to as Business Process Associates. When the BPO comes out of its incubation phase and gets registered as a private company, the Associates will have a stake in it.

The operational details are discussed under the following heads:

a. Design of the BPO centre
b. Human resource development and policies
c. Quality control and security systems

Design of the BPO centre

SFC's management believes that the optimum size of a BPO unit should be in the range of 80 to 100. A minimum size is needed when processing certain orders, in order to

exploit economies of scale and to facilitate teamwork. On the other hand, beyond 100 seats, the BPO would become difficult to manage. In order to become economically viable, the BPO would need to grow into a cluster of say five such centres, with one of the centres serving as the hub.

Human resources development and policies

The prospective associates apply to the centre after paying a deposit of Rs 1,000 towards a two-month training programme. The Associates undergo rigorous training in English and Hindi typing, data-entry skills and Microsoft applications. On successful completion of the training, they are given a monthly stipend of Rs 3,500. They get an increment of Rs 500 per month after every six months. The training deposit is returned to them in two installments, the first after three months and the second after 6 months of employment.

Good performers are rewarded through non-pecuniary benefits. They get first priority for new and interesting assignments. There is also scope of getting promoted as Team Leader and later as Local Manager. As of now, two women have entered the management cadre. Mrs Sunita Choudhary and Ms Shweta Kashimpuria are Local Managers.

BPO work can at times get tedious; therefore, efforts are made by the HR department to break the monotony through various enriching activities like outings, lectures and seminars, and team-based events. Much attention is given to ergonomics at the workstation so as to minimize occupational health-related problems.

Quality control and security system

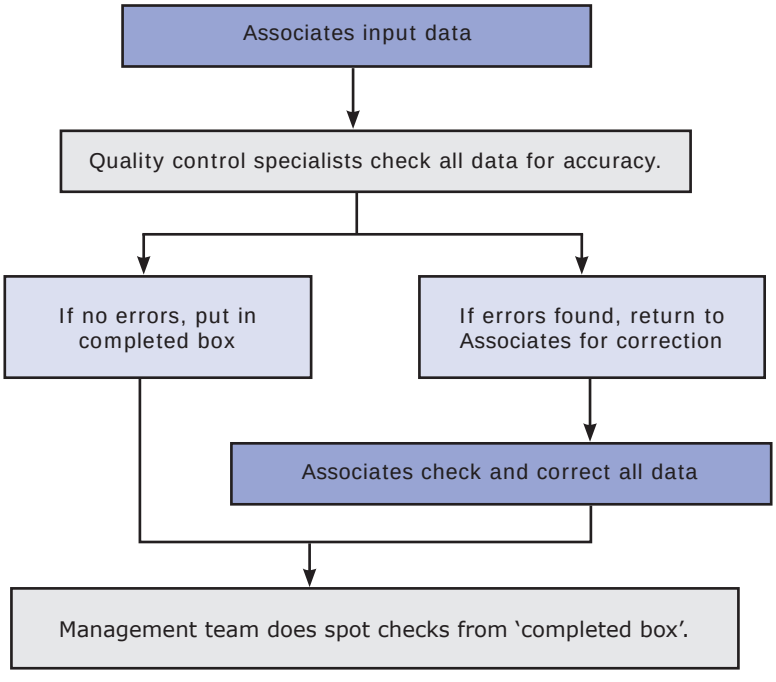
The quality control function is carried out largely by the Associates themselves. Depending on the intensity of quality control, two types of checks are organized:

i. Level 1: Here 50 per cent of the forms are picked up through a random process and checked for errors by teams of Associates, who specialize in the task.

ii. Level 2: Here 100 per cent of the forms need to be checked. The data in these forms are entered twice and compared. The errors thus identified are eliminated.

After the Associates have corrected the data, the management team makes spot checks for errors from the ‘completed box’. Figure 1 shows how quality control is carried out when processing a job.

Figure 1: Quality Control System



To ensure information security, all Associates undertake an agreement of non-disclosure of data used or generated in the BPO. Nothing can be taken in or out of the work area. Separate, secure areas are maintained for data storage. Access to the work areas is also time-bound and monitored strictly. Associates understand that maintaining the security system is critical in the type of business they have joined.

ICT Services and Marketing

So far, SFC has focused on the following services:

- Form- and image-based data entry
- Data and format conversion from PDF
- Application processing
- Data imaging and formatting
- Document archival and retrieval

SFC has serviced offshore as well as domestic clients. Among domestic clients, it has worked with urban clients and rural clients. It sees a unique advantage in serving clients that need the local language as a medium of communication. The following is a list of completed and ongoing assignments:

i. Pratham India: Completed 19,200 forms data entry project, in a turnaround

time of 21 days. It contributed to the Annual Report on Status of Education in Rajasthan, December 2007.

ii. Ekal Vidyalaya: Completed a detailed data-entry project of over 3,000 forms.

iii. University of Maryland: Data entry of a rural survey in South India carried out by the university scholars.

iv. Confederation of Indian Industry (CII): Pilot project that used Hindi based voice services, to verify contact information from their database in northern India.

v. InTouch Solutions: Prepared a searchable database for HR documents.

vi. ARAVALI: Data entry of rural surveys carried out in Rajasthan

vii. Empowering India: PDF conversion and data-entry from the website. The NGO works on governance issues.

According to the management team, one of the biggest challenges in dealing with urban clients is the urban bias against rural people—regarding their ability to provide quality output. Whereas the women have proved their worth in their very first assignment with Pratham India, getting assignments from urban clients is not easy, especially during recession. The difficulties in tackling assignments from overseas are two: the level of English required and the need to do night shifts. Some emerging opportunities have been identified as follows.

a. Rural clients: The management team is negotiating a deal with an MFI for filling up loan application forms of individuals and groups, which is currently done on paper, leading to much loss of time of loan officers. Other potential rural clients may include rural hospitals, educational institutions and service organizations.

b. Urban clients requiring local language capabilities to service rural markets like telecom companies and farm advisories.

c. Jobs requiring image editing and Tally (an accounting software), where knowledge of English is not a limiting factor.

d. Collaborative partnerships with large BPOs like Infosys and WIPRO: This will ensure a steady supply of clients and provide technical training and support. Rural start-ups, on the other hand, will organize the women and ensure timely delivery of outputs. A profit sharing mechanism will have to be worked out.

Organization

At present, the BPO has a flat organizational structure, with a management team comprising three professionals looking after the Human Resources, Operations and Business Development functions. A local manager and a co-manager assist this team and supervise the work of the Associates.

The structure will evolve depending on how the project is scaled up through the addition of more centres. It is possible to envisage individual centres being run by local managers with technical and managerial support from a central team. Scaling up could also require a centralized training facility and an office in a two or three-tier city. The office will deal with clients, coordinate with the centres and provide add-on services like conducting surveys so as to give a complete package to clients.

Economics and Financial Viability

The capital expenditure for 30 employees is about Rs 5 lakh, covering the cost of computers, UPS, furniture, peripherals and a generator. The training cost is Rs 6000, which is the salary of the trainer for two months.

At the present capacity, the operating costs work out to about Rs 1.2 lakh per month. These are only partially covered by the income from assignments, which range from Rs 50,000–Rs 80,000 per month. The salaries of the management team are paid by the parent organization and this arrangement will continue till the project is scaled up to about 500 seats. The income generated at that stage is expected to meet the cost of management team as well.

Conclusion

The project being a start-up has yet to scale up and become economically viable. It is estimated that this will happen within a couple of years. The experience gained so far has proved beyond doubt that rural women are well suited for BPO work and can deliver world-class quality output, provided they are given adequate training and the systems of quality control are in place.

End-notes

1. Based on information provided by Shrot Katewa, Alim Haji and Karthik Raman who are Heads of HR, Operations and Business Development, respectively, at Source for Change. Shrot and Alim co-founded the start-up along with Gagan Rana, an Indicorps Fellow.

2. See www.piramal.com/social-initiatives/grassroots-developmental-laboratory, html.

3. See http://www.odesk.com/blog/2009/01/women-are-better-than-men-at-remote-work/

5 TARAhaat: Fostering Self-help, Self-employment and Micro-enterprise in Rural India through ICT[1]

Introduction

TARAhaat Information and Marketing Services Ltd. is a social enterprise promoted by Development Alternatives[2] (DA), a Delhi-based NGO. It is an e-business that seeks to bring the benefits of the Internet and other ICTs to the rural poor, with special focus on women, unemployed youth and illiterates. TARAhaat's mission, as a social enterprise, is to create and deploy an enterprise model for the creation of sustainable enterprises on a large scale. TARAhaat delivers its services through a mother portal, TARAhaat.com, and a network of franchised business centres called TARAkendras owned by individual entrepreneurs. It primarily offers educational and vocational training programmes that range from those that equip individuals to acquire skills necessary to succeed in the job market to those that develop necessary skills to compete in the global market place.

TARAhaat was founded in 2000 as a partnership between DA and its rural marketing arm—Technology and Action for Rural Advancement (TARA), which together account for 400 employees and 25 years of experience in working for the rural poor. DA and TARA created TARAhaat as a means of harnessing the power to ICT, to help the entire DA group to bring sustainable jobs, useful information and economic opportunities more effectively to the rural Indian population. By mid-2008, TARAhaat had established more than 300 TARAkendras across the eight northern States of Uttar Pradesh, Punjab, Haryana, Himachal Pradesh, Madhya Pradesh, Bihar, Jharkhand and Chhattisgarh. Having grown by over 100 per cent in 2007–08, the network is poised for rapid expansion.

TARAhaat pursues a mix of business and social objectives. Welfare and developmental services are cross-subsidized with funds generated by its commercial services. Its business goals are to become a leader in the supply of information, knowledge services and market opportunities as well as computer-enabled education

to rural Indian market. Its overarching social objective is to create sustainable rural livelihoods and enrichment of the rural economy through improved and affordable information flows, education and direct job creation. In addition, TARAhaat addresses a number of social issues, including women's health and education, governance and resource conservation.

This case study examines the unique business model adopted by TARAhaat, its growth trajectory, its short- and medium-term impact, and future plans with specific focus on its self-employment and enterprise development activities.

Business Model

The key elements of TARAhaat's business model are:

i. A decentralized network of commercially run franchised tele-centres (TARAkendras) is the cornerstone of TARAhaat's business model. This ensures that the profits generated through ICT services largely remain within the community. The franchisees are typically young entrepreneurs, who manage their tele-centres, with active support from TARAhaat's field offices. Each TARAkendra, in turn, provides direct employment to three to six youth.

   Unlike any other franchise fee model, TARAhaat minimizes the front-end cash burden on the franchisee, reducing the need to raise the working capital. The annual fee and deposit payments start at a low level and increase modestly each year, thereby allowing the franchisee to pay the fees out of the increasing earnings. Hence, it allows talented individuals to open a TARAkendra even if their access to financial resources is limited.

ii. A rich menu of services and products to create robust revenue streams (see following section for details).

iii. Strong support systems in the form of training and capacity building, technical, marketing and management guidance.

iv. A market-driven approach to product and service development, focused on identifying areas of value.

v. Strong public-private partnerships forged with the government, business entities and civil society. Its partnerships with organizations like Microsoft, ICICI, Philips, the Shell Foundation, USHA International, ISRO, UNDP, NISG, Samsung, OWSA and a large number of civil society organizations provide a strong vehicle for the development of additional products and services.

Portfolio of Products and Services

The portfolio of products and services delivers both social and commercial goods through various projects and programmes.

- *Enterprise Development and Support Services (EDSS):* A programme to equip individuals to start and manage their own businesses.
- *TARA Akshar:* A computer-based literacy programme to teach individuals to read and write in 30 days.
- *Lifelines India:* A project that provides expert advisory services to farmers and entrepreneurs.
- *TARAgyan:* Runs educational and vocational courses, meeting the demands of the present-day job market.
- *E-governance services:* Provide rural access to government machinery.
- *TARAdak:* An e-mail service in 11 local languages.
- *Other services:* Relevant local information through the Internet portal www.tarahaat.com like access to yellow pages, job search, astrology and weather. The portal content is both static and dynamic and is in Punjabi, Hindi and English.

The first three of these services are discussed in some detail below.

Enterprise Development and Support Services

Fostering local entrepreneurship is seen as the key to address the challenge of creating 15 million new jobs every year outside the agriculture and government sectors in India. TARAhaat conceived of EDSS to address one of the most critical needs of the rural community, namely, to secure jobs closer to home. EDSS is a comprehensive ICT-based programme that supports aspiring and established entrepreneurs through every element of a business. The main components of the service are described below:

Enterprise package

Enterprise packages have been developed to provide rural unemployed persons with options of acquiring technical training in a variety of micro-enterprise options. The activity was initiated with two packages, selected on the basis of scalability, sustainability and replicability. These were broiler-based poultry farming and micro-concrete roofing (MCR) tiles manufacturing. MCR is a technology developed by DA

and has been specifically selected because it is a waste recycling-based enterprise. Apart from these, EDSS has helped entrepreneurs with a variety of farm- and non-farm based enterprises like dairy, kirana (grocery) shops, computer centres, pickle manufacturing, candle-making units, beauty parlours, roadside hotels and dhabas, cycle repairing shops and shamiyana business.

Entrepreneurship development programme

The objective of the EDP is to motivate the rural youth towards entrepreneurship, develop their business understanding and skills, and empower them to independently establish and manage successful enterprises. It covers the basics of identification, setting up and managing the business to meet the needs of budding as well as existing entrepreneurs. A week-long training is delivered through multimedia and audio-visual tools.

Recognizing that several factors make SHGs different from other client groups, especially the youth, EDSS has evolved a separate EDP for SHGs.

Web-based business support system

The web-based business support system provides entrepreneurs with ongoing support even after the training period is complete. This computer-based system does not rely on live Internet connectivity and has a very user-friendly, multi-lingual interface. The system integrates an exhaustive database of questions categorized by enterprise, domain and region, which form the basis of FAQs. A second service, 'Ask the Expert', allows the entrepreneur to submit queries to which he/she has not found answers in the FAQ database.

Local consultants (TARAgurus)

Local consultants, known as TARAgurus, represent the virtual TARAguru or teacher in physical form and assist the entrepreneurs with on-site problems. They also provide standard services such as project proposal corrections and creating linkages.

TARA Akshar

India is home to about 400 million illiterate people, which is also a cause of its poverty and under-development. Literacy forms the cornerstone for making the provision of equality and opportunity a reality.

Currently, it takes about six months to two years to teach people to read and write. The poor and marginalized, who constitute a majority of the illiterates, either fail to muster courage to enroll into a literacy programme or lose steam mid-way and drop out

because of the staggering amount of time and effort it takes to become literate, using conventional methods.

To address the issue, TARAhaat developed a literacy tool—TARA Akshar, which is one of the fastest literacy programmes in the world. It teaches completely illiterate Hindi-speaking women to read and write in just 30 days. The only requirement is a computer and a willing instructor, who has undergone a week's training.

Pedagogy

TARA Akshar trains students to instantly recognize the sound of the letter, then trains them in syllables and finally lets them work on words and sentences. The conventional wisdom is that the hard part of learning is to recognize the various letter combinations. However, if the student has an intuitive recognition of all the letters, the subsequent stages of learning to read become very easy. Hence, TARA Akshar uses a method of teaching the letters through the use of memory associations embedded in animated movies. Later, other memory techniques are used to reinforce the learning. Victor Lyons, chief designer of the programme, spent 18 months perfecting the programme by trying it out in villages around Delhi. Students watch animated cartoon movies, featuring the letters of the alphabet, who turn into characters and have adventures with each other. Students also play card games with special cards featuring letters of the alphabet. A hundred minutes like this constitutes one day's lesson.

Instructors, who go through an intensive training, are also monitored by 'Master Trainers', who serve as technical mentors and also serve to check the quality of training through spot checks.

The project is focused on five Hindi-speaking States, namely, Bihar, Jharkhand, UP, MP and Haryana. The success of the programme has led to a long waiting list of learners in most centres. The panchayats extend their support, by providing space for conducting the programme and providing reading material for reading clubs that have been organized voluntarily by them.

Lifelines India

Many agriculture universities and a vast network of over 550 KVKs have been set up by the government to provide agriculture extension services to the farmers. However, in spite of this vast network, farmers continue to struggle to find timely solutions for their crop-related problems.

To address this problem, TARAhaat established an agri-advisory service for farmers, using ICTs in collaboration with One World South Asia in 2006. The project, now

commonly known as *Soochna se Samadhan* (using information to solve problems), has its origins in the Digital Inclusion Initiative, which is a part of the corporate social responsibility (CSR) initiative of British Telecom.

The project provides voice-based question-and-answer services to farmers. The farmer dials a designated number from a landline/mobile telephone and gets a reference number for his query. The call first reaches the Interactive Voice Response System (IVRS), where the farmer registers the query with the help of the voice menu. The query from the farmer is stored as a voice clip in the database server. The KW logs on to the application through the web interface and views all the calls that are waiting for attention. The KW searches the FAQ database for an answer. If the answer is in the database, the KW stores the same for the query in the IVR. If not, the KW sends the query to subject matter experts. When the answer is received from the expert, the application alerts the KW. The KW then retrieves the text answer and stores it in the audio database. Finally, the answer in voice mode is played when the farmer calls for the answer to his query. The farmer can also retrieve the answer in text format from the information centre near his village and even send pictures related to his query for some expert opinion.

TARAhaat has currently implemented the programme in the Bundelkhand Region. A team of 12 volunteers and one agri-coordinator work at the field level. This field team visits farmers to generate agriculture-related queries. The success can be judged from the fact that within nine months of the implementation of the project (April 2007), more than 23,000 queries from 351 villages have been answered.

Short- and Medium-term Impact

EDSS

As on mid-2008, more than 500 people, including SHG members, had been trained and more than 50 of them had successfully set up their enterprises. A fifth of these were women. EDSS, in this way, is playing a vital role in diversifying the local economy and raising the standard of living of the rural poor.

TARA Akshar

The programme achieved unprecedented success in a short span of time. Within 10 months since its inception, nearly 25,000 women had been made literate through 291 centres in five States. The average success rate was 97 per cent.

Anecdotal evidence shows a dramatic increase in self-esteem and consequent

improvement in intra-family dynamics. The programme has drawn extensive media coverage in India and abroad.

Lifelines India

A survey to assess the satisfaction level of farmers with the service was carried out in 2007. A majority of the 1,400 farmers that were contacted knew about the service and had used it. About a third had used it three times or more. The questions asked related to vegetables (55 per cent), food-grain crops (20 per cent), livestock (20 per cent) and others (5 per cent). Seventy per cent of the respondents expressed satisfaction with the information provided and had implemented the advice provided. Eighty per cent of these reported improvement in the farm on account of the advisory.

Future Plans

TARAhaat has drawn up plans to scale up successful pilots like EDSS and Lifelines India. TARA Akshar is already into its second phase. It is also exploring various options to bring the Indian BPO success story to its tele-centres. TARAhaat is poised to enter an age where millions of people will be affected daily through its services, either directly or indirectly.

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End-notes

1. Compiled from various published documents and information provided by DA, in particular Mr. Rakesh Khanna, Director, TARAhaat Information and Marketing Services.

2. DA was established in 1983 as an international research, development and consultancy organization in the non-government sector. DA has had a substantial impact on the creation of sustainable livelihoods and employment for rural people in India. Its efforts have been recognized through numerous national and international awards, including the prestigious United Nations Sasakawa Environment Prize, Stockholm Challenge Award, KlausSchwab Award for Outstanding Social Enterprise, Jawaharlal Nehru Prize of the Indian Science Academy and the UN Global 500 Roll of Honour. Mr. Ashok Khosla, a former director in the GoI and the UN, is currently President of DA and its marketing wing TARA.

6 Drishtee: Development of the Rural Economy through Local Knowledge Entrepreneurs[1]

Introduction

Drishtee Development and Communication Ltd was founded by the social entrepreneur Shri Satyan Mishra to create a sustainable, scalable platform for entrepreneurs to help inclusive development of rural economy and society through the use of ICT. Incorporated in October 2000, the company sought to make a paradigm shift in the delivery of government services in rural India. It sought to serve villagers directly rather than through distant civil servants. Contractual arrangements with state governments provided the bedrock on which Drishtee was able to build a network of sustainable franchises. Over time, the local entrepreneurs learnt to provide additional services like ICT training, regional job postings and even matrimonial services to surrounding villages. The network began increasingly to be utilized as an outlet for commercial services like farm insurance, loan processing and equipment sales. More recently, Drishtee knowledge centres have also doubled up as rural BPOs.

As on 2007, Drishtee was serving 1.5 million people through 1,640 kiosks in over 10,000 villages across 14 States. Focused on creating employment opportunities, education, empowerment and improved livelihoods, Drishtee's vision is to replicate the self-sustainable model in 590 districts of India. This case study focuses on the nuances of setting up a decentralized network of KWs, which is expanding at a rapid pace. It describes the vision, key elements of the business model, the portfolio of services and products, the short- and medium-term achievements and future plans of this unique organization.

Vision

Shri Satyan Mishra, the Founder and Managing Director, articulated the following economic and social rationale for the initiative:

Two-third of the Indian population comprises rural consumers. However, despite an open market, 68 per cent of the rural economy still lies untapped due to lack of perceived opportunities by the investors. Villagers are desperate for appropriate services like education, market access, telecom, healthcare, financial intermediation and entertainment but at an affordable cost. Locations and distances of the existing

network prove a constraint for the villagers seeking cost-effective services. They have to travel 20–30 km for a redressal of their problems and to avail education, banking and health services. The cost incurred is around Rs 600 per service, which includes transportation costs and opportunity costs of the time spent in availing the service. Compared to this, an urban counterpart spends around Rs 400 for the same service. This lack of access to a much-needed set of services thwarts progress in rural India. Drishtee is committed to reform the socio-political scenario of the Indian village. It seeks to mark a paradigm shift by creating a direct delivery network of services to rural India through the empowerment and enterprise of local entrepreneurs.

Key Features of the Business Model

Technology

Drishtee has three hardware nodes:

a. *Web server:* It acts as the main administrator of the complete system. It coordinates communication among districts, and monitors the performance of the districts and kiosks. It also acts as the national-level content provider.

b. *District server:* It acts as the local content provider by providing data like auction centre prices, and acts as a sub-administrator processing the requests of the local kiosks, facilitates communication, monitors kiosks and administers the district database.

c. *Kiosk:* It has user-friendly applications, with dial-up connectivity through local exchanges on optical fibre or UHF links. The hardware has been procured by the kiosk owner paying full price.

The kiosk can either connect to the web server through an ISP or connect directly to the district server because the latter acts as a Remote Access Server. Drishtee has been experimenting with other mediums of connections like optic fibres initiated for a kiosk in Jaipur, Rajasthan. Access to various services is facilitated through Drishtee's intranet. Drishtee Portal, a state-of-the-art software platform, allows the kiosk operator to access a wide range of on-line services.

Organizational structure

Drishtee has a three-tier structure, comprising the Head Office, regional offices and district offices, and a call centre (Sampark).

- The Head Office, located at NOIDA, National Capital Region, controls all operations and acts as the central link to all other nodes. It is responsible for strategic functions like service development, partnerships, sales and service delivery, setting up of kiosks and expansion strategy, finance and facility, technical, call centre, and HR and training.
- The regional offices are the operational activity hub. Their main function is to monitor the operations of the state offices, research, and undertake need assessment and market survey, training and development, technical support and liaison with the government.
- The district offices are the kiosk relationship hub. They comprise a team for providing technical and marketing support.
- The call centres (Sampark) offer a centralized medium of communication, ensuring direct communication of the kiosk owners with the Head Office.

Setting up a kiosk

The kiosk owner is a local entrepreneur, who in partnership with Drishtee serves a population of around 5,000. He/she earns by delivering a package of customized services to the villagers. The cost of setting up a kiosk, a Drishtee Centre, is usually in the range of Rs 25, 000–Rs 40,000. The current cost is almost half of what it used to cost earlier. Efforts have been made for institutional financial support through banks and even through Drishtee itself. The essential components of a kiosk include a computer, a printer, a UPS and sometimes a digital camera. Drishtee also introduced some low-end technology models based on access through WAP application-driven mobile phones or call centre–supported, telephone-based service models for increasing the base of service delivery points as well as to engage more number of users in the network.

Revenue model

There are three main revenue sources for Drishtee:

i. A one-time license fee that a kiosk owner pays initially.

ii. A monthly franchisee fee paid by the kiosk owner.

iii. The transaction revenue from service providers of different sectors like

insurance, education, health and e-commerce, for every transaction on the network.

The kiosks become viable through a nominal fee that the entrepreneurs charge the community for the services provided through the centres. The services promoted by Drishtee generate revenue for the kiosk owner, making the centres viable. It also strengthens the rural economy by generating livelihood opportunities, reversing the tide of rural migration and improving access to information and knowledge. The use of IT as a tool for basic education increases the viability of the kiosk because the rural populace wants to get trained for gainful employment.

Portfolio of Services and Products

The services can broadly be classified into three heads:

a. *E-governance:* These are framed in partnership with the district administration. The aim is to provide rural citizens doorstep access to several services for which they initially had to spend a lot of time and money. Examples of services provided include on-line certificate and application forms, government on-line grievance registration and learner's driving license.

b. *Commercial services:* These are implemented in partnership with corporate entities. Drishtee has, so far, ventured into rural employment, computer education, life and non-life insurance, digital photography, agri-services, virtual marketing, e-commerce, on-line heart consultation and appointments (Heart Health Solution), private on-line vegetable market (Drishtee Mandi), on-line market place (Drishtee Haat), e-mail service (Drishtee Daak), on-line astrology, BPO, among others.

c. *Private services:* These have been conceived by Drishtee itself and often meet its own requirements of providing customer care, collecting feedback, etc., for its various projects.

Business Process Outsourcing

Genesis of the BPO initiative

In 2007, Drishtee did an impact assessment study, which revealed that creating employment opportunities in the village itself was the key to retaining educated youth and fostering reverse migration from cities to villages. This prompted it to start the BPO services at selected kiosks.

Coverage

As on 2008, there were three centres that took up BPO work on a regular basis. These included Jind in Panipat District of Haryana, Golaghat in Assam and Saurath in Madhubani District of Bihar. The first two were single seater BPOs whereas Madhubani had ten seats. In addition, there were 30 kiosks, which could provide BPO services when called upon to do so.

Services

Two types of services are being offered:

a. Digitization service, which includes converting documents to PDF format, book digitization, typing, scanning and data entry.

b. Voice-based service, that is, inbound and outbound calling operations, which include tele-sales, tele-marketing, customer-care centres and feedback-collection centres.

Clients

These include both external clients as well as in-house clients (Drishtee Projects). Examples of external clients include:

- Government of Bihar: call centre for sugar cane farmers.
- Governments of Haryana and Assam: Call centres for micro-finance, education loans, etc.
- Various state governments: For on-line data entry, data entry of affidavits, etc., during elections.

Being a rural BPO, Drishtee has an edge over others when it comes to providing local language solutions. At a time when companies like Airtel are tapping into the rural market, there is a growing need for customer-care associates, who can provide services in the local language.

Capacity building

Drishtee provides two types of training programmes:

For rural BPO associates: This covers soft skills, computer skills, data management skills and specialized training skills, as required, for example, by the BPO associates in the sugar cane call centre.

- *Grooming of kiosk operators:* This helps prepare potential kiosk operators

in managing the kiosk and taking critical decisions with regard to data management and data security. The ability to take timely and informed decisions is the key to success in this enterprise.

Quality control

The work done at the kiosks goes through the Regional Assimilation Quality Centre, which is the first level of quality check. Thereafter, the completed assignment comes to the Main Quality Centre, which assimilates all the work and converts it into the format required and dispatches it to the client. A third layer of control will be needed as the organization scales up. The three layers will be referred to as a) local centre, b) regional centre and c) centralized location quality centre.

All the business development and client partnership operations are managed by the head office.

Challenges and potential

From the technical perspective, there is a need for electricity and power back-up, which is not very expensive. However, this represents a major challenge because in rural areas electricity supply is not very reliable. Whereas telephone connectivity is quite strong, Internet connectivity is not good in some rural areas and this is plagued by either inadequate speed or frequent breakdowns. Periodic upgradation of the system, machines and data security is also a challenge.

On the operational front, the supply of skilled rural BPO associates and the flow of work from the client-end are other constraints. There is a need to change the mindset of clients, who doubt the quality of work provided by these BPOs because of their rural setting.

These challenges are not insurmountable and the BPO sector does offer immense potential of change in the rural economy.

Short- and Medium-term Impact

The following immediate impact can be seen in terms of employment generation and income generation:

i. Drishtee has created more than 1,500 new jobs, of which 560 are for women. Entrepreneur income has increased on an average by Rs 40–Rs 200 per day via the sales of products and services through kiosks.

ii. About 3,000 rural individuals have been trained through Drishtee's

computer education programme and English language programmes. About 35 per cent of them have gained employment.

iii. Kiosk owners of Madhubani procure photographs of Mithila paintings directly from the artisans and sell them through Drishtee e-commerce portal (Drishteehaat.com). The direct sale of these paintings has resulted in a 400 per cent increase in income to the artisans. Apart from that, it has also helped them to understand the market demands and dynamics, leading to the development of new products.

iv. So far over 1.5 lakh rural clients have benefitted from the services. According to one estimate, on an average, a villager saves eight times the money that he spends on the kiosk. The total number of services offered on the network has grown from 3 to 12; these include education, insurance, medical, entertainment, information and communication.

v. Realizing the depth of the market, certified companies in the field of health, insurance and agriculture have been actively campaigning through Drishtee kiosks in the villages.

The long-term impact is likely to be seen in the strengthening of the rural economy and the reversal of rural migration.

Future Plans

Drishtee has a vision to replicate the self-sustainable model in all 590 districts of the country.

It plans on becoming a major player in the rural BPO market. In the next five years, it plans to have 30 centres, employing 150–200 people working in BPOs.

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End-notes

1. Compiled from information provided in various published documents and company website.

7 Enabling Financial Inclusion: Doorstep Financial Services in Rural Areas by Ekgaon Technologies[1]

Introduction

The developments in IT and the growth of telecom infrastructure allow the possibility of using mobile technology for the delivery of doorstep financial services in remote rural areas. An integrated decentralized infrastructure services support is required to enable access of rural clients to MFIs. This case study describes the efforts of Ekgaon Technologies[2] in developing one such system. OneMIS (One Management Information System) technology framework has created a platform for banking inclusion of the rural population of the world.

Ekgaon's mobile phone-based financial-inclusion platform for enabling micro-finance access has received wide acceptance as well as international recognition. Ekgaon's project 'Enabling financial inclusion and increasing efficiency of Self Help Group Microcredit Federations' won the first Stockholm Challenge—GKP Award 2007 in the Economic Development category.[3]

OneMIS: A Mobile-enabled Monitoring and Transacting System for Microfinance

Ekgaon developed a mobile-based integrated open-framework, 'OneMIS', a field-based monitoring, transacting and real-time interaction system to address the service gap for SHGs and other forms of grassroots FIs.

OneMIS framework evolved around a shared-services infrastructure model, designed to help MFIs, banks and NGOs with microfinance programmes, SHGs, Joint Liability Groups (JLGs), Rotating Small Savings and Credit Associations (ROSCAs), etc. Its main objective is to reduce operating costs, streamline lending processes, broaden the product and service portfolios, scale rapidly, and integrate with other resources like credit bureaus, investors, banks, FIs and national and international payment networks. OneMIS also allows access to value-added services for optimizing investment, portfolio spread and operational costs besides support in audit, financial reporting, due diligence support and real-time access of status through personalized interfaces and business correspondents.[4]

The system facilitates the collection of financial information for rural SHGs/JLGs/groups

and portrays it on an on-line server, to enable stakeholders to obtain the required financial information at any time and anywhere. This allows the rural women to utilize various services such as financial and banking services at their doorstep.

A major problem in rural financial services is the non-availability of accurate and timely information for decision-making at higher levels. In the microfinance sector, due to the lack of information, SHG members could not ascertain the financial position (profitability) of their group or the documents/reports required for submission to obtain loans, to portray their strengths as a FI. Because the data is captured on a mobile phone and sent to the on-line server, the field staff monitoring the SHGs can supply the computer printed reports to the SHGs, which help them to overcome their difficulties in terms of reports, bookkeeping and portfolio management. This also allows other stakeholders such as SHG federations, banks, NGOs and MFIs to track their loan repayment on-line and arrive at decisions on time.

System architecture

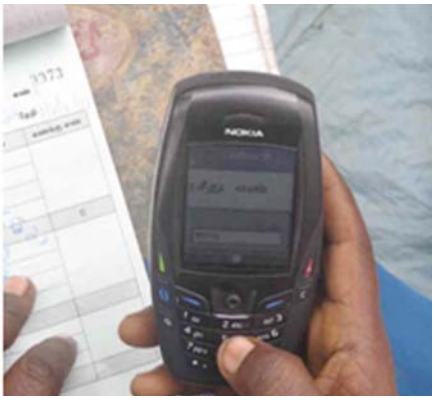
A camera-enabled mobile linked with the OneMIS service framework for micro-finance has a three-tier, document-based architecture for providing remote rural information services for SHGs.

i. The end-user level tier (usually field officers of NGOs and MFIs) comprises a set of paper forms that people use to record information, perform queries and conduct transactions.

ii. The server is a standard web application server, residing with the bank/ MFI/service provider linked with Internet.

iii. The middleware application that processes data resides in the mobile phone, which plays the role of scanner, user interface, network, cache and pre-processor in the system.

OneMIS can be linked to various interfaces like mobile phones, smart phones, Simputer, Personal Digital Assistants (PDAs), using Ekgaon's mobile application with MFIs as well as for doorstep banking services through field officers and/or Business Correspondents. It allows integration with 'point-of-sale' (POS) transactions for doorstep banking, using biometric, magnetic and smart card authentication systems through GPRS



(General Packet Radio Service)-enabled POS terminals. In the near future, it will also facilitate money transfers via mobile phones and/or other devices, as well as on-line, by linking to other mainstream banking money transfer channels.

Functional Framework of OneMIS

There are three levels in the service infrastructure of OneMIS.

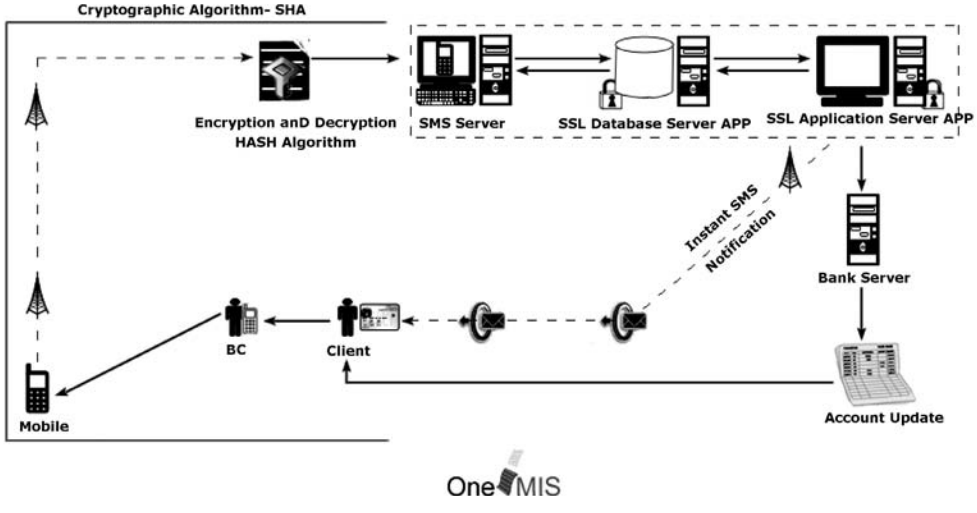
Level 1: OneForms are paper applications containing embedded data and processing instructions. The receipts and vouchers for customers have codes showing how mobile phones can process them.

Level 2: OneBrowser is a mobile-phone application used to capture and transmit OneForms as OneCode (which works like a bar code), scanned with the mobile phone camera. It can be used both for 'push', that is, sending information like new savings collection or withdrawal, and 'pull', that is, getting information such as mini-statement, balance in account and loan installment payment date from the server.

Level 3: OneMIS is a network application that communicates with OneBrowser to collect and process incoming information from mobile/POS devices.

Figure 1 provides a schematic diagram of the way the system works. The mobile application interfaces with OneMIS framework, using the OneCard issued to the client. The mobile acts as a POS terminal for Business Correspondents. All transactions can be secured, using the optical recognition of unique security code (OneCode) by the mobile camera. All transactions are recorded, encrypted and transferred to central

Figure 1: Functional Framework for OneMIS



servers. The client gets a transaction receipt generated over the Bluetooth-connected portable thermal printer. In this way, OneMIS framework makes possible secure transactions in real-time, with the server providing services like savings collections, loan repayment, remittances, mini statements and bill payments.

Box 1: How OneMIS Works

- A Business Correspondent with a mobile-based application that allows the mobile to function as a POS device reaches a client/SHG doorstep to provide financial services.
- Before any transactions, the Business Correspondent authenticates the account using mPIN as password.
- For any withdrawal from the account by a client, the client has to enter his/her mPIN in the mobile to authenticate transaction.
- Balance inquiry on client accounts on the Business Correspondent's mobile, client's mobile and as mini-statement can also be obtained in a similar way.
- All receipts of transactions are generated on a portable printer that has a wireless (Bluetooth) connection with the mobile phone. A 'Customer Copy' of the receipt is given to client and the 'Business Correspondent Copy' is kept by the Business Correspondent, who later submits his/her copy to the bank along with balance cash to complete the transaction cycle.

- The data are sent from the mobile to the on-line server of the Bank/NGO and get integrated with the on-line OneMIS server application. If the user is not in the network coverage area, the information is stored in the mobile and is automatically sent to the server when the BC approaches a network coverage area.

OneMIS Benefits

The OneMIS system enables access by community owned FIs to formal FIs such as banks, venture capital funds and other FIs. It creates a decentralized management information system, increases efficiency of fund management and reduces credit cycle.

The system does not require any additional software to be implemented at the client side to access the information from the server. Just a web-browser (Internet Explorer and/or Firefox) and the Internet connection are good enough to access the system by anyone, any time and anywhere using the login and security codes. It is simple to operate; human involvement is needed only at the entry point and at the point of generating and printing reports. Once the data is sent to the server, the transaction is completed by the technology and the member records get updated within a couple of minutes.

The computations, ledger postings and the generation of financial statements and reports are completely automated. Hence, the rate of accuracy is high. Human mistakes are completely eroded by automating the system. The cost is much less when compared to the manual entry of data, using stand-alone software.

The on-line system can be accessed anywhere and any time simply by logging on to the website. When the mobile user is not within the network coverage, the data are stored in the phone compact without any damage and transferred when s/he reaches the coverage area.

The OneMIS system also helps the management of banks, NGOs, etc., to keep in touch with the field staff and monitor their movements.

Adoption of OneMIS by World Vision India

World Vision[5]-India (WV-I) operates across 24 states in India and has more then 50 years of experience, working to improve the living conditions of the poor, with primary focus on children. Through its many development programmes, WV-I is trying to help communities have better livelihood opportunities.

WV-I adopted micro-finance in its own way and has been trying to encourage SHGs to have better savings behaviour. Rotating loans are provided, both in cash and kind, like goat, sheep, cattle and poultry, by WV-I to SHGs and their federations. With over 40,000 SHGs (more then 800,000 clients) across the country and centralized management of programme, WV-I wanted a decentralized system for enabling management of financial operations while retaining some level of centralized reporting to help its management

team understand the overall impact of the programme. Other objectives are to reduce error in reporting, use of multiple languages for reporting, error in data compilation and inability to give value and evaluate gains of 'in-kind' support.

Ekgaon provided WV-I with a mobile-based system for decentralized reporting of financial transactions by its field workers. OneMIS helped WV-I consolidate all accounts client-wise, SHG-wise as well as federation-wise as per the accounting standards followed by it. OneMIS also had a unique module for valuation of 'in-kind' support and measuring the 'capital gains' on such assets over years. The system was implemented in Palani Hill areas in Dindigul District, Tamil Nadu. After its implementation, WV-I was able to better organize its micro-finance programme, and the agency is now going to scale up the system across the entire country in 12 languages.

Diffusion of OneMIS

Ekgaon's products for enabling financial inclusions have been implemented in India and Sri Lanka, reaching more than 25,000 clients across six banks and MFIs. Business expansion is being taken up in India, Sri Lanka, Nepal, Bangladesh and Pakistan. By December 2009, Ekgaon aimed to have 7, 50,000 clients, using OneMIS systems for accessing their financial service providers.

Future Plans

Of the next 250 million Indian wireless users, approximately 100 million (40 percent) are likely to be from rural areas, and by 2012, rural users will account for over 60per cent of the total telecom subscriber base, according to a report jointly released by the Confederation of Indian Industries (CII) and Ernst & Young in December 2008. This exponential growth is not just limited to India; other South Asian countries like Nepal, Pakistan, Sri Lanka and Bangladesh are also seeing growth in mobile penetration.

Considering the current and expected growth of the micro-finance market in India (and South Asia) and the spread of telecom, the OneMIS system will target to reach a large number of existing SHG networks, JLGs and other ROSCAs, being promoted by large numbers of NGOs/MFIs/banks.

OneMIS Free 'Account'

Ekgaon is proposing to offer a free on-line 'account' for SHGs and JLGs, accessible over a secure web or mobile phone connection, allowing them to monitor their transaction records and maintain account balances. Ekgaon will provide training support to the field agents, using a free, online distance learning application, and training of trainers

(TOT) sessions in major urban hubs across the region. Training will cover both basic SHG/JLG operations (forming groups, meeting protocols, loan terms, interest calculations, cash controls, etc.), as well as the use of the online services. After the training, each field agent will receive a user account in the system.

Conclusion

OneMIS has found wide acceptance because all stakeholders benefit from the system, albeit in different ways, as indicated below:

- √ *SHGs:* Better-managed financial transactions, and better and faster response to credit requirement.
- √ *Bank Staff (and Banking Correspondents):* Better operational efficiency and ability to serve larger number of clients.
- √ *Federations/NGOs:* Efficient and better-managed FIs.
- √ *Banks:* Better-managed portfolio, following the Reserve Bank of India (RBI) norms and greater financial inclusion.
- √ *FIs and Government:* Better monitoring of development and livelihood finance programmes.

End-notes

1. Authored by Vijay Pratap Singh Aditya CEO, Ekgaon Technologies Pvt. Ltd.

2. Ekgaon Technologies, established as a Private Limited company on October 1, 2002, provides technology and management support for knowledge management, strategic decision-making and business development. It works towards increasing the efficiency of the value chain process, enabling access to financial services, technology and information services for primary producer communities across South Asia.

3. The Stockholm Challenge–GKP Award recognizes initiatives that leverage ICT to improve living conditions and increase economic growth in all parts of the world. The award is a new ICT prize, promoted by Global Knowledge Partnership (GKP), Malaysia and the Stockholm Challenge, Sweden. It focuses on social inclusion, champions ICT projects that show clear benefits to people and their communities, and aims at wide impact and sustainable business models. Of 119 entries in the award from across the globe, nine finalists were chosen by the jury; three in the Education category and two each in Culture, Economic Development and Public Administration.

4. As per an RBI circular of 25 January 2006, under the 'Business Correspondent' model, NGOs/MFIs set up under Societies/Trust Acts, Societies registered under Mutually Aided Cooperative Societies Acts or the Cooperative Societies Acts of States, section 25 companies, registered NBFCs not accepting public deposits and Post Offices may act as Business Correspondents. The Business Correspondent will play the role of the intermediary between the bank and the rural client, who is outside the reach of the formal banking system, thereby facilitating inclusive banking.

5. World Vision is an international development organization that serves close to 100 million people in 100 countries across the world.

Annexures

1. Glossary of Terms
2. Resource Guide
3. Resource Institutions and Programmes
4. About the Contributors

1. Glossary of Terms

3G Technology

The 3G, or 3rd Generation, is a family of standards for mobile telecommunications defined by the International Telecommunication Union, which includes GSM, EDGE, UMTS, and CDMA 2000 as well as DECT and WiMAX. Services include wide-area wireless voice telephone, video calls and wireless data, all in a mobile environment. Compared to 2G and 2.5G services, 3G allows the simultaneous use of speech and data services and higher data rates up to 14.0 MB/s.
(http://en.wikipedia.org/wiki/3G accessed in January 2010)

BREW

BREW (Binary Runtime Environment for Wireless) is an application development platform created by QUALCOMM. Originally for CDMA mobile phones, GSM is also supported now.
(en.wikipedia.org/.../Binary_Runtime_Environment_for_Wireless accessed in January 2010)

CDMA

Code division multiple access (CDMA) is a channel-access method utilized by various radio communication technologies.
(http://en.wikipedia.org/wiki/CDMA accessed in January 2010)

Digital Divide

Digital Divide refers to the problem of the growing technology and/or knowledge gaps between and within countries, placing certain groups of people farther in the shadow regions of the global information flow. These gaps persist, both at the level of access to ICT infrastructure and in terms of the form of information conveyed and who is able to use, understand and produce the information and knowledge (Wilson Merridy, 2000).

Digital Elevation Model

Digital elevation model (DEM) is a digital representation of ground surface topography or terrain. It is also widely known as a digital terrain model (DTM). A DEM can be represented as a raster (a grid of squares) or as a triangular irregular network.
(http://en.wikipedia.org/wiki/Digital_elevation_model accessed in January 2010)

E-governance

The model for e-governance is a one-stop portal, where citizens have access to a

variety of information and services.
(http://en.wikipedia.org/wiki/E-Governance accessed in January 2010)

GPRS

General packet radio service (GPRS) is a packet-oriented mobile data service, available to users of the 2G cellular communication systems, global system for mobile communications (GSM) as well as the 3G systems.
(en.wikipedia.org/wiki/General_Packet_Radio_Service accessed in January 2010)

GPS

GPS is a system that allows a mobile receiver to determine its precise location, based on signals received from a constellation of US military satellites.
(en.wikipedia.org/wiki/Global_Positioning_System accessed in January 2010)

GSM

Global System for Mobile communications (GSM) reigns as the world's most widely used cell phone technology. The origins of GSM can be traced back to 1982 when the Group Special Mobile was created by the European Conference of Postal and Telecommunications Administrations (CEPT) for the purpose of designing a pan-European mobile technology. Now it is being upgraded to 3G, provided the government makes available the spectrum.
(http://en.wikipedia.org/wiki/GSM accessed in January 2010)

Gyandoot

Gyandoot is an e-government application, implemented since January 2000, in the poor and drought-prone Dhar district of Madhya Pradesh.
(http://www.gyandoot.nic.in.)

Hybrid PC

Hybrid computers exhibit features of analog and digital computers. The digital component normally serves as the controller and provides logical operations whereas the analog component normally serves as a solver of differential equations.
(http://en.wikipedia.org/wiki/Hybrid_computer accessed in January 2010)

ICT

Information Communication Technologies can be defined as the "electronic means of capturing processing, storing and communicating information. ICT may be computer Hardware, Software and Networks. They also include intermediate technologies like radio and television, literate technologies like books and newspapers and organic

technologies based on human body like brain and sound waves" (Heeks, 1999). The term 'ICT' is popularly interchanged with the term 'IT'.
(www.csi-sigegov.org/3/26_380_3.pdf accessed in January 2010)

IVRS

Interactive Voice Response Service uses interactive technology that allows a computer to detect voice and keypad inputs. IVR technology is used extensively in telecommunications, but is also being introduced into automobile systems for hands-free operation.
(en.wikipedia.org/wiki/Interactive_voice_response accessed in January 2010)

Kiosks

In IT, a kiosk is a small physical structure (often including a computer and a display screen) that displays information for people passing by.
(www.bitpipe.com Hardware › Computer Hardware accessed in January 2010)

Knowledge Economy

Knowledge economy refers to the use of knowledge technologies (such as knowledge engineering and knowledge management) to produce economic benefits as well as jobs.
(http://en.wikipedia.org/wiki/Knowledge_economy accessed in January 2010)

Knowledge Worker

KWs in today's workforce are individuals, who are valued for their ability to interpret information within a specific subject area.
(en.wikipedia.org/wiki/Knowledge_worker accessed in January 2010)

Micro-concrete Roofing

Micro-concrete Roofing (MCR) Roofing are tiles that are a cost effective, aesthetic and durable alternative sloping roof technology.
(www.devalt.org/da/tsb/mcr.pdf accessed in January 2010)

Ortho Image

Ortho Image shows ground objects in the orthographic projection.
(www.isprs.org/education/PDF/GOA_BGK_Orthoimage_Section5.pdf)

PDA Technology

A personal digital assistant (PDA) is a mobile device, also known as a palmtop computer. PDAs are used to organize a person's life by taking notes, holding contacts

and connecting to the Internet.
(wapedia.mobi/en/Personal_digital_assistant accessed in January 2010)

Piggybacking

Piggybacking (data transmission) refers to a bi-directional data transmission technique in the network layer.
(en.wikipedia.org/wiki/Piggybacking accessed in Jan 2010)

Protocol Stack

A protocol stack (sometimes communications stack) is a particular software implementation of a computer networking protocol suite. The terms are often used interchangeably. Strictly speaking, the suite is the definition of the protocols, and the stack is the software implementation of them.
(en.wikipedia.org/wiki/Protocol_stack accessed in January 2010)

Rugged PC

A rugged computer is specifically designed to reliably operate in harsh usage environments and conditions like strong vibrations, extreme temperatures and wet or dusty conditions. It is designed from inception for the type of rough use typified by these conditions; commercial units upgraded for this purpose make poor substitutes.
(http://www.inhand.com/electronics-glossary/52-electronics-glossary/233-rugged-computer accessed in January 2010)

Rural BPO

Rural BPO centres provide a ray of hope for smaller towns and villages. These new centres offer jobs in the IT service sector to young people, who would have been forced otherwise to migrate to big cities.
(http://www.livemint.com/2009/06/17212723/Rural-BPO-centres-provide-a-ra.html accessed in January 2010)

Simputer

A simputer is a self-contained, open hardware, hand-held computer, designed for use in environments where computing devices like personal computers are deemed inappropriate. Due to its low cost, it was also deemed appropriate for bringing computing power to the developing countries.
(en.wikipedia.org accessed in January 2010).

Tele-centre

A tele-centre is a public place where people can access computers, the Internet and

other digital technologies that enable them to gather information, create, learn and communicate with others while they develop essential digital skills.
(www.telecentre.org accessed in January 2010)

Virtual Marketing

Virtual marketing becomes increasingly an effective tool to reach distant markets. It offers product guides on the website and makes the booking of orders on the Internet possible.

Voice SMS

Voice SMS allows users to send and receive voice messages in the form of audio files.
www.pocketportal.net accessed in January 2010)

VSAT

A Very Small Aperture Terminal (VSAT) is a two-way satellite ground station with a dish antenna that is smaller than 3 m.
(En.wikipedia.org accessed in January 2010)

Wimax

Wimax is a telecommunications technology that provides wireless transmission of data using a variety of transmission modes, from point-to-multipoint links to portable and fully mobile Internet access.
(en.wikipedia.org accessed in January 2010)

2. Resource Guide

1. Digital Inclusion for Rural Transformation

TelecomLive: 2007

108 pages;

Mission 2007 Secretariat, MSSRF, Chennai

Providing a comprehensive view of the Mission 2007 and its achievements, the book was released on the occasion of the 4th Convention of the National Alliance from August 1-3, 2007. The book has three parts. Part 1 is a documentation of the tangible achievements of the Mission, as perceived by different stakeholders, including the government, corporate entities and the civil society. Part 2 showcases 11 successful ICT interventions/organizations drawn from different parts of the country. These include IGNOU, Gyandoot, Drishtee, Community Information Centres (CICs) of DoIT, Bhoomi, Media Lab Asia, Tata Consultancy Services Ltd., KCCs and various programmes of DoIT, Kerala. Part 3 provides information on the ICT Mission in other countries that are inspired by India. These include PAN-Africa e-Network, Mission Swaabhimaan of Nepal, Bangladesh tele-centres programme and the community e-centres of Philippines.

2. Empowering the Poor: Information and Communications Technology for Governance

and Poverty Reduction

Roger Harris and Rajesh Rajora: 2006

161 pages; $ 7

UNDP-APDIP (Asia-Pacific Development Information Programme), New Delhi

Presenting analyses of 18 case studies of projects that use ICT in India for the benefit of the poor, the authors rank the performance of these on a range of variables, including relevance, service delivery, community participation and empowerment, equality in decision-making and benefits, sustainability, replicability and prospects for being scaled up.

3. Every Village a Knowledge Centre—A Road Map

MSSRF: 2004

27 pages;

MSSRF, Chennai.

Catalyzed by the charismatic leadership of Prof MS Swaminathan, Mission 2007 was a coalition of concerned stakeholders drawn from government, public, private and civil society institutions. The Mission (now GGA) sought

to take the fruits of ICT to the rural poor in 6.5 lakh villages of the country in a time-bound manner. This called for forging partnerships across sectors and coming together to make the seemingly impossible task possible. The monograph provides an overview of the genesis, vision and plans of Mission 2007 at the time of its inception in 2004.

4. Achieving Convergence with National Missions and Other Initiatives

Mission 2007 Secretariat: 2007
96 pages;
Publisher: MSSRF, Chennai.

Presenting the proceedings of the Third Convention of the National Alliance held at IIT Chennai from July 28-29, 2006, the introductory chapters of the book provide an understanding of the guiding principles of the Mission. Chapter 3 shows the opportunities for convergence with various government programmes and missions, including the Health and Literacy missions. It also provides a documentation of a wide range of interventions and experiences shared by various participants during the convention. The debate on the sustainability of ICT interventions is presented in a separate chapter.

5. Transition to a Knowledge Society: Grameen Gyan Abhiyan,

GGA Secretariat: 2008
109 pages:
MSSRF, Chennai

Reviewing the progress of Mission 2007, the book documents the proceedings of the Fourth Annual Convention of the National Alliance for Mission 2007, held from August 1-3, 2007 at IGNOU, Delhi. It documents a variety of innovations and strategic partnerships facilitated by the Mission. It also presents a comprehensive description of the deliberations on how the Mission could transform itself into a national movement.

6. Toolkit for Setting up Rural Knowledge Centres

MSSRF: n.d.
19 pages;
MSSRF, Chennai

Providing step-by-step guidelines for setting up a rural knowledge centre, the booklet covers all aspects like social mobilization, needs assessment, community participation, connectivity, content development, technical aspects, including the hub-and-spokes model, management, services, monitoring and evaluation, and capacity building.

7. Information & Communication Technology for Rural Development: Cases from India

Subhash Bhatnagar, Robert Schware: 2000

230 pages; Rs 490

Sage Publications India Pvt. Ltd., New Delhi

Documenting the successful use of ICT in rural development, the book begins with a chapter that traces the history of ICT use in rural India, examines some of the problems that have afflicted the implementation of rural development programmes, and shows how ICT applications can help overcome them. It assesses the early efforts in ICT use and proposes a scheme by which to classify ICT applications. Sixteen case studies written by administrators, who lead projects in their areas, follow; these spell out the various applications of ICT that have made a difference in the delivery of services or products in rural India. Among the services covered are health care, milk distribution, disaster management, postal services, telephones, and services for the disabled. These applications of ICT cover the use of simple and inexpensive technologies at one end, and sophisticated satellite-based communications at the other.

8. Unlocking E-government Potential: Concepts, Cases and Practical Insights

Subhash Bhatnagar: 2009

351 pages; Rs 450

Sage Publications India Pvt. Ltd., New Delhi

Providing a conceptual and empirical basis for understanding the potential of e-government, the book gives practical insights for implementation of e-government projects and programmes at local, state or national levels. It also provides an overview of the global experience in implementing e-government programmes. It explores the potential impact of e-government on the cost of access, quality of service and governance for citizens and businesses as well as on transparency and corruption.

9. E-government: From Vision to Implementation—A Practical Guide with Case Studies

Subhash Bhatnagar: 2004

204 pages; Rs 395

Sage Publications India Pvt. Ltd., New Delhi

Based on an in-depth analysis of twelve case studies from six countries that are considered to be pioneers in developing e-applications, the book provides powerful and practical insights into emerging e-government trends

in the developing world. The author documents the impact and benefits of e-government on public sector reform, poverty reduction and empowerment.

10. E-Governance for Development: A Focus on Rural India

Shirin Madon: 2009

256 pages; Rs 4174

Palgrave MacMillan, London

Unpacking the theoretical concepts of development and governance in order to propose an alternative conceptual framework that encourages a deeper understanding of macro- and micro-level political, social and administrative processes within which e-governance projects are implemented, the book draws on over fifteen years of research in India during which time many changes have occurred in terms of the country's development ideology, governance reform strategy and ICT deployment. Three case studies are presented, each specific to a different social sector and located in a different state within India, to expose the rich context within which e-governance applications are implemented. The aim of this book is not to prescribe but to draw attention to the fact that technological solutions like e-governance should not overshadow the need to gain a deep understanding of the historical processes of development and governance that have evolved over time.

11. Reaching the Unreached: Community based Village Knowledge Centres & Village Resource Centres

Suchit Nanda and Subbiah Arunachalam: 2009

106 pages;

Jamsetji Tata National Virtual Academy (NVA), MSSRF, Chennai

In this publication, guidance is given on the procedure to be adopted for setting up VKCs and VRCs, which have satellite connections and telecommunication facilities. In 2000, the scientists of MSSRF hoped that, by 2007, all our villages will have knowledge centres. The GoI included 'knowledge connectivity' under its Bharat Nirman Programme, and provided funds for establishing 100,000 CSCs to service rural India. Private sector companies like ITC started expanding its e-Choupal Programme.

3. Resource Institutions and Programmes

Given below is a list of resource institutions which the authors feel have contributed significantly to this field. However, thisby no means is an exhaustive list and we are aware that there may be many other institutions doing equally valuable work. The list which is drawn up based on the familiarity of the authors with these institutions are presented under the following four categories: (a) Public and Government (b) Private (c) Cooperative (d) Civil Society Organization.

Public and Government

Indian Space Research Organisation (ISRO)

ISRO Headquarters, Antariksh Bhavan,
New BEL Road, Bangalore 560 094
India.
Tel: 23415275 or 22172296
E-mail: satish@isro.gov.in
Website: www.isro.gov.in

Satellite technology has opened up new vistas in the field of ICT. Two series of satellites have been developed by ISRO over the years. The INSAT series of satellites focus on communication whereas the IRS series deal with earth observation (EO), including the study of natural resources. ISRO has developed a variety of applications to harness this technology for the benefit of the common public. The EO applications, in particular, are meant to target the poor and the vulnerable.

Village Resource Centres (VRCs)

ISRO is facilitating the establishment of two-tier rural knowledge/service connectivity, which includes a) VRCs at the block/taluka level and b) VKCs at individual village level. The target is to establish 4,500 VRCs by the end of the XI Five Year Plan. ISRO would like to partner with more institutions. In this partnership, ISRO provides:

- Connectivity through VSAT, associated communication equipment and low-end AV equipment.
- The requisite satellite bandwidth.
- Minimal hardware (EKG) and software connectivity necessary for tele-medicine.
- Software connectivity for tele-education.
- Natural resource database along with minimal query and analytical tools.
- Maintenance of equipment for the first three years.

The partner agencies are expected to carry out the following functions:

- Needs assessment through participative techniques such as PRA and RRA.
- Infrastructure for the knowledge centres—building with civil, electrical facilities to house the equipment, additional multimedia computers, etc.
- Providing manpower—at least 2–3 KWs at each VRC.
- Establishing referral services by linking up with expert centres, hospitals, local doctors, teachers, etc.
- Organizing the contents and regular updating of the same.
- Maintenance of equipment after the initial three years.

C-DAC

Advanced Computing Training School
No.1, Old Madras Road
Above Bank of Mysore
Near NGEF, Bengaluru - 560038
Karnataka (India)
Tel: +91-80-6611 6400/01/02/03,
080-25340861 and 080-66166314
E-mail: acts@cdacb.ernet.in
Website: http://www.cdac.in

C-DAC is an initiative of the GoI and the Development Gateway Foundation (DGF), in collaboration with IIT-Mumbai. Its mission is to alleviate poverty and nurture sustainable development by bridging the digital divide. The objective of the research and training centre is primarily to address the gap that exists between the developed and developing world in ICT applications and explore technical solutions to narrow the digital divide. C-DAC's R&D programme focuses on a) domain-specific, end-to-end solutions and b) domain-independent enabling technologies.

Language technologies

C-DAC has developed a number of language technologies, including Mantra (Machine assisted translation) and has released three software tools and fonts in Hindi, Telegu and Tamil.

India Development Gateway

C-DAC has also developed a portal called India Development Gateway (www.InDG.org) with the objective of reaching the un-reached, enabling partnership and collaboration, and providing Google search facilities for identified sectors.

Quarterly Newsletter

C-DAC has started a quarterly newsletter, called IC 4 D, in collaboration with Mission '07 with the following objectives:

- To test the scalability of existing solutions
- To transfer technology
- To network for collaborative research
- To build the capacity of rural technopreneurs

Vyapar/Pradarshani

This is an e-commerce application designed to cater to the need of rural producers. It serves as an information tool for the exchange of services and goods.

NATAK 3D

This is a tool that helps the user create three-dimensional plays.

Department of Information Technology (DoIT)

Electronics Niketan, 6 CGO Complex,
Delhi Secretariat, New Delhi 110002
Tel: +91-24363134
E-mail: secretary@mit.gov.in
Website: http://www.mit.gov.in/

DoIT is under the Ministry of Communications and Information Technology, GoI.

Common Services Centre (CSC) Programme

IL&FS Financial Centre
Plot C 22, G Block
Bandra Kurla Complex
Bandra East, Mumbai 400 051
Tel: +91-22 2653 3333/3232
Email: Alok.Bhargava@ilfsets.com
Website: http://www.csc-india.org/

The Infrastructure Leasing and Financial Services Ltd (ILF&S) implements the CSC programme, on behalf of the DoIT. One lakh centres are to be established with broadband connectivity through SWANs and wireless technology. The centres are expected to become viable and sustainable economic activities.

The CSC programme is being implemented in the PPP format at a total cost of Rs 7,420 crores. The partners include corporate houses, NGOs and infrastructure service providers. The CSCs are to be owned by village-level entrepreneurs. This represents

a seed capital and a facility into which different service providers will need to come in and animate the CSC. Various stakeholders include service providers in the fields of education, health, agriculture, and banking and financial access.

The project is structured at three levels. At the local level is the community centre, or VKC, run by a local entrepreneur. He/she services the local community and interacts with community members. At the state level, the governments and civil society organizations try to aggregate community needs and interface with the service providers at the local level. At the apex level, the DoIT facilitates the convergence of any kind of pan-India service that can be delivered through CSCs, for example, the National Literacy Mission, the National Rural Health-care Mission, etc. The government owns the services. Its function is to first offer the CSCs an incentive to other service providers. It will also fund the viability gap in those parts of the country where it is not viable for the private sector to operate. The primary mandate is the delivery of national programmes, governance services and empowerment services. Commercial services will also be offered.

National Informatics Centre (NIC)

A-Block, CGO Complex, Lodi Road
New Delhi 110003, India.
Tel: +91-24360563
E-mail: dcmisra@nic.in
Website: http://Home.nic.in

NIC is a premiere science and technology institution of the GoI, established in 1976, for providing e-government/e-governance solutions, adopting best practices, integrated services and global solutions in the government sector.

Open eNRICH

The DoIT's objective is to supply government content to the people and facilitate the supply of people's content to global networks. NIC has developed content management software called Open eNRICH in collaboration with UNESCO. This has been placed in the public domain and more than 59 countries have downloaded it. It is being used in rural tele-centres (see www.enrich.nic.in). NIC has used this tool to generate a website for Panchayati Raj Institutions (PRIs). Training to PRIs is being imparted on the use of this portal (see http//:Panchayat.nic.in).

Rural Soft

Scalable software for rural development and poverty alleviation schemes can be installed at the panchayat, block, DRDA and state levels, to facilitate the exchange of reports through e-mail.

Rural bazaar

For on-line marketing of rural products, adopted by Goa and Tripura, see http://ruralbazaar.nic.in.

Pria Soft

This umbrella software, catering to the administrative needs of PRIs, helps monitor accounts, thereby bringing transparency in PRI accounting. It has been adopted by Orissa, Madhya Pradesh, Tamil Nadu, Karnataka and Andhra Pradesh (see http://priyasoft.nic.in).

MGNREGA MIS

This provides transparency in rural employment guarantee schemes and has the potential to be converted into a payable service (see http://nrega.nic.in).

Rural housing

This is software for on-line monitoring of the Rural Housing Programme, Bharat Nirman component (see http://rural.nic.in).

Drinking water sanitation

This provides habitation-wise data on drinking water and sanitation (see http://ddws.nic.in).

Media Lab Asia (MLA)

C-235, First Floor, Defence Colony
New Delhi-110 024
Tel: +91-51553692
E-mail: md@medialabasia.in
Website: www.medialabasia.in

MLA is committed to taking ICT to the common man and is involved in research and design. It has been set up as a not-for-profit organization, in an initial collaboration with MIT, USA. It is supported by DoIT and works in the areas of health, education, livelihoods, disability and rural connectivity. It has developed a large number of ICT applications for rural areas, some of which are mentioned below:

eSagu

This is a personalized agricultural advisory system, which reaches out to 5,000 farmers in 30 villages of Andhra Pradesh. The Indian Institute of Information Technology (IIIT),

Hyderabad, is implementing the project.

aAQUA

Almost All Questions Answered (aAQUA) is a web-based discussion forum in which experts respond to queries from farmers.

DEAL

Digital Ecosystem for Agriculture and Rural Livelihood (DEAL) is a multimedia platform for the creation, sharing and dissemination of agricultural information among farmers and experts.

Digital Craft Revival (DCR)

DCR is a low-cost and localized CAD-based system for the design of carpets by the local carpet industry, and one for chikan embroidery for developing new chikan designs.

Sehat Saathi

This is a rural tele-medicine system.

Community Access for Sustainable Health (CASH)

CASH is used for strengthening health-care information systems through health data collection, deploying hand-held computers in villages.

Digital Health at Every Doorstep

These are affordable, biomedical and public healthcare diagnostic devices for mobile tele-medicine systems.

Virtual Physics Lab (VPL)

VPL helps schoolchildren carry out virtual experiments, to learn Physics.

Sanyog

Sanyog is an augmentative communication system for people affected with cerebral palsy. It is a multilingual (English, Hindi and Bengali) augmentative and alternative communication (AAC) system. It has the facility to construct simple sentences by the selection of icons. Individuals can form their own content on theme-based icon libraries.

Shruti

This is an embedded Indian language text-to-speech system.

International Crop Research Institute for Semi-arid Tropics (ICRISAT)

Patancheru 502324, Andhra Pradesh
Tel: +91-40-30713074
E-mail: v.balaji@cgiar.org
Website: www.vasat.icrisat.ac.in/

ICRISAT is a nonprofit, non-political organization that conducts agricultural research and capacity building for sustainable development with a wide array of partners across the globe. ICRISAT's mission is to help empower 600 million poor people to overcome hunger, poverty and a degraded environment in the dry tropics through better agriculture. ICRISAT belongs to the Alliance of Centres of the Consultative Group on International Agricultural Research (CGIAR).

Virtual Academy for Semi Arid Tropics (VASAT)

ICT has become an important strategy for on-line interaction and learning. To implement this strategy, ICRISAT established VASAT (Virtual Academy for Semi Arid Tropics). In India, ICRISAT is partnering with IIT, Kanpur, for information architecture (Agropedia), IIITM, Kerala, for the delivery architecture (the KISAN model) and NAARM, GB Pant University and ANGR Agri University (AP) for content. The VASAT hopes to breathe new life into the conventional agricultural extension system, which has not been very effective under the changed circumstances of agriculture today.

Indira Gandhi National Open University (IGNOU)

Maidan Garhi
New Delhi 110068
Tel: +91-29532707
Email: vc@ignou.ac.in
Website: www.ignou.ac.in
IGNOU offers distance education degree programmes in arts, science, commerce, social sciences and IT.

For the rural poor, IGNOU has started a large number of vocational education and training schools. There is also a great demand for bachelor degree courses because good quality institutions are non-existent in rural areas. IGNOU is ramping up long-distance learning through the training of teachers, using ICT and digitization of content, and is preparing for the availability of on-line content and examinations.

Tele-knowledge centres

The government has approved 8,000 tele-knowledge centres in blocks identified by Sarva Siksha Abhiyan. Tele-knowledge centres will facilitate the creation of block-level centres across the country. These centres will empower rural citizens with information and advisory inputs pertaining to civil services, agriculture, animal husbandry, human rights, legal literacy, consumer issues, HIV-AIDS awareness, family education, etc., through the use of ICT and distance learning.

National Informatics Centre (NIC), Kerala

NIC Kerala State Centre, CDAC Building
Vellayambalam, Thiruvananthapuram 695033, India
Tel: +91-471-2729894/2724529
Website: www.kerala.nic.in

NIC Kerala, one of the total solution providers of the Government of Kerala, is actively involved in most of the IT-enabled applications. It has motivated the working community in the government to make use of the latest state-of-the-art technology in its day-to-day activities, to provide better services to the citizens of Kerala. NIC's presence in Kerala includes the state centre at Vellayambalam, Thiruvananthapuram, and district centres, attached to the collectorate, at the respective district headquarters.

E-Alert Agramart

The AGMARKNET e-Alert system has been designed to facilitate the delivery of agricultural marketing information to various stakeholders (farmers, extension workers, researchers, traders, agri-business firms, government officials, etc.) through automated e-mails/SMS. It has been designed to strengthen the existing AGMARKNET delivery system in India. The application has been designed using ASP.net, with SQL server as the back-end database. The farmers/beneficiaries of AGMARKNET system can register their details through this system to get market price information of their choice via e-mail or SMS. Registered users of this system will get this information for a period of one month initially and, later, if need be, they can renew their registration. The e-Alert initiative overcomes the limitation of the traditional Internet-based delivery system, which has low penetration in rural areas.

Centre for Agricultural and Rural Development Studies, Agricultural University, Tamil Nadu

Dr.C.Karthikeyan
Department of Agricultural and Rural Management
Centre for Agricultural and Rural Development Studies (CARDS)
Tamil Nadu Agricultural University

Coimbatore - 641003, Tamil Nadu, India.
Tel: +91-422-6611259.
Email: karthikeyanextn@yahoo.com
Website: http://www.evelanmai.com/home.php

E-Velanmai

Owing to the lack of an appropriate technology transfer model, less than 20 per cent of the technologies generated by agricultural universities were being transferred to the farmers in India. Hence, an action research was carried out to test, verify and validate the ICT-based agricultural extension model called 'e-Velanmai' (electronic agriculture). The system is designed to address the agricultural problems of farmers through the dissemination of agricultural technologies by the scientists of TNAU directly to the farmers.

Kerala State IT Mission (KSITM)

ICT Campus, Vellyambalam,
Thiruvanthpuram, Kerala- 695 033
Tel: 0471-2726881
Email: response@keralamission.org
Website: www.itmission.kerala.gov.in

KSITM is a Society registered under the Travancore Cochin Literary Scientific and Charitable Societies Registration Act (Act 12 of 1955). As an autonomous nodal IT implementation agency for DoIT, Government of Kerala, it provides managerial support to various initiatives of the department.

E-krishi

Website: www.e-krishi.org

E-krishi is an initiative of the Kerala State IT Mission, to address the gap in agricultural information flow and transaction management. The e-Krishi is a market-driven, agricultural initiative that envisages facilitating and helping farmers to sell their produce, using the ICT network of Akshaya. Some 450 Akshaya centres are now functioning in Malappuram, providing a range of services like computer training, Internet browsing and e-Payment facilities (for utility bills). In the e-Krishi project, farmers and other stakeholders interact through Agri Business Centres with Agricultural Service Providers in the private, government and non government sectors. The vision of the project is to establish a connected farmers' community throughout Kerala, which has access to information about market demand, prices, good agricultural practices, quality agricultural inputs supported by a technology enabled, robust transaction platform that

facilitates all their off-line activities. The value of transactions in farm commodities through Akshaya Centres increased exponentially from Rs 50 lakhs during the pilot phase to Rs 35 crores in 2009.

Rajiv Gandhi College of Veterinary and Animal Sciences, Kurumbapet, Puducherry

Kurumbapet, Puducherry- 605009.
India.
E-mail: ragacovas@dataone.in
Website: www.ragacovas.com

Information kiosk for goat-keepers

The information kiosk with a touch screen is designed for the use of goat-keepers, to access the desired information to improve their knowledge on goat rearing. The computer-aided interactive knowledge kit on goat rearing is one of the knowledge dissemination methods designed and developed by Rajiv Gandhi College of Veterinary and Animal Sciences, Puducherry. The knowledge kit is user-friendly and compatible with any windows operating systems. The main menu has topics such as breeding management, feeding management, general management, young kids' management and housing management, with audio support.

State Wide Area Networks (SWAN)

Information Technology
Ministry of Communications & Information Technology (Govt. of India)
Electronics Niketan, 6, CGO Complex,
Lodhi Road, New Delhi 110003
Tel: +91-11-24369903
E-mail: sansad@mit.gov.in
Website: www.mit.gov.in

The scheme to set up State Wide Area Networks (SWAN) in 29 states and six Union Territories (UT) was approved by the GoI in March 2005, interconnecting each State/UT headquarters with the district headquarters, and each district headquarters with the block headquarters with a leased line that has a minimum speed of two MBs per second.

The objective of the scheme is to create a secure, close user group (CUG) government network for the purpose of delivering G2G and G2C services. The duration of the project is five years with a pre-project implementation period of 18 months. The project is being implemented as a central sector scheme with a Grant-in-aid from DoIT and the remaining fund from the State Plan Fund under the Additional Central Assistance (ACA) allocation.

The implementation of the SWAN scheme is in full swing across the country. The monthly status of implementation across the States/UTs is available on the DoIT Website.

National e-Governance Plan (NeGP)

Ministry of Information Technology
Electronics Niketan
6 CGO Complex, New Delhi
Tel: +91-24301378/9871091515
E-mail : sansad@mit.gov.in
Website: www.negp.gov.in

On 18 May 2006, the government approved the National e-Governance Plan (NeGP), under which various types of services will be provided electronically through the ICT platform to the citizens at their doorsteps through kiosks (CSCs). All state and central government departments have prioritized services, which they would like to provide electronically. The central government has approved 27 Mission Mode Projects (MMPs). Action has already been initiated on this project by the concerned departments.

Community Information Centres (CICs)

Technical Director
National Informatics Centre
Block A, 4th Floor, CGO Complex
New Delhi 110003
Tel: +91-24361276
E-mail: bulletin@nic.in
Website: www.cic.nic.in/

In August 2000, the DoIT implemented a scheme for setting up CICs at all the block headquarters of eight northeastern states—Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. The CICs provide Internet access, computer education, and training to the local community, government officers and schoolchildren, and IT-enabled services to facilitate citizens' interface with the government. The NIC set up 633 CICs in the northeastern states and 135 CICs in Jammu and Kashmir and provided maintenance support for them. All these CICs are connected through broadband and the VSAT Internet link. Every CIC is equipped with one server and five computers, VSAT, laser printer, dot matrix printer, modem, LAN hub, TV, Webcam, two UPS (1KVA, 2KVA), software, back-up engine alternator for power failure, and air-conditioner. Two trained operators selected by the state government run the CIC. After five years, the state governments are required to make alternative arrangements for self-sustainability of the centres.

Bhoomi, Karnataka

Special Secretary (Bhoomi)
Revenue department, Government of Karnataka
S.S.L.R. Building, K.R.Circle, Bangalore - 560001
Tel: 080-22113257
E-mail: bhoomi@karnataka.gov.in
Website: http://bhoomi.karnataka.gov.in/

Bhoomi is an e-Governance project in Karnataka, substantially funded by the Ministry of Rural Development, GoI, which successfully computerized all the land records of Karnataka. It makes available land records-related services to the citizens through kiosks. The first land record online kiosk in India was started in Sakleshpur. By March 2002, all 20 million land records, belonging to 6.7 million landowners in 176 sub-districts of Karnataka and covering 27,000 villages were computerized. Land records is a generic expression and includes records such as the Register of lands, or Khetwar Patrika, records of rights tenancy and crop inspection register (RTC), Khata (land register), Khirdi, mutation register, disputed cases register, etc. After the implementation of Bhoomi, the manual land records in all the operationalized sub-districts were declared illegal.

The scheme has generated direct employment for the educated rural youth at each of the sub-districts in the field of data entry and systems support, thus adding value to the rural economy. The system also enables the administrators to generate various reports based on the type of soil, land holding size, the type of crops grown, etc., which has helped the government make informed policy decisions. The project has been replicated by several states, five of which have successfully computerized land transactions.

Gyandoot

District Informatics Officer
NIC, Collectorate Campus
Dhar District, Madhya Pradesh, India
Tel: +91-7292-232168
E-mail: gyandoot@rediffmail.com
Website: www.gyandoot.nic.in

Launched on January 1, 2000 in Dhar District of Madhya Pradesh, Gyandoot (knowledge messenger) is a low-cost, self-sustainable and community owned rural Intranet project, connecting rural cyber cafes that cater to the daily needs of the masses. Computers in 34 village centres in the district were wired through an Intranet network. Local rural youth act as entrepreneurs for running cyber cafes-cum-cyber offices on commercial lines, without any salary or stipend. The computers in the network have been established in

soochanalayas (information kiosks) in gram panchayats; they provide the rural people with services for a fee. The services offered on the Gyandoot network are information on the prices of agriculture produce at auction centres, registration of applications, public grievance redressal, rural e-mail facility, village auction site, matrimonial site, information regarding government programmes, Sawaliram se puchiye (Ask the expert), free e-mail facility on social issues, avedan patra (application form), gaon ka akhbaar (village newspaper), e-education (shiksha gyandoot), employment news, below poverty line list, etc. The project has been replicated in several other districts of Madhya Pradesh and some states as well.

Akshaya

Akshaya State Project Office
Kochumadathil Building
T.C. 25/2241
Manjalikulam Road
Thampanoor
Trivandrum - 695 001
Tel: 0471-2324220
E-mail: aspo@akshaya.net
Website: www.akshaya.kerala.gov.in

There are 341 Akshaya e-kendras in 14 blocks of Malappuram District. Each kendra serves 1,200-1,500 households within a reach of 2 km. Over 0.6 million people have completed the e-literacy programme, making Malappuram the first e-literate district in the country. An investment of over Rs 300 million in Malappuram created direct employment for 2,400 local people. Due to IT literacy, the private sector has also started outsourcing data entry work to these centres. Besides this, the Akshaya e-kendras are now providing advanced e-learning, computer training, etc., due to the widespread demand for advanced training packages. Core components of the programme include a training centre, information kiosk, communication hub, e-governance cell and transaction centre. The services provided by the kendras include digitization and data management, hardware sales and maintenance, financial services, travel and tourism, multimedia, animation and designing centre, health care and product selling.

KISAN, Kerala

The Coordinator
KISAN- Kerala Project
KISAN Operations Centre
IIITM-K, Project Wing, NILA
Technopark Campus
Thiruvananthapuram 695581
Kerala, India

Tel: 91-471-2700965/2700947
Fax: 91-471-2700947
E-mail: info@Kisankerala.net
Website: www.Kisankerala.net

The Karshaka Information Systems Services and Networking (KISAN) is an innovative project by the Department of Agriculture, Government of Kerala, launched in collaboration with Indian Institute of Information Technology and Management–Kerala (IIITM–K), Farm Information Bureau, Kerala Agriculture University (KAU), Directorate of Agriculture, Department of Soil Survey, Department of Soil Conservation and Land Use Board. KISAN's mission is to develop and deploy information systems, networks, processes and services for agriculture in ways that lead to i) amelioration of farmers' distress and enhancement of their welfare, ii) increased farm productivity, and iii) better returns for farm produce and derived products. The objective of this project is to provide 'right information to the right person(s) at the right time in the right place(s) and in the right context', dynamically using a combination of advanced technology—portal, television-based mass media programmes, telephone-based call centres, mobile SMS-based advisories and broadcast services. The integrated model of the project ensures the speedy aggregation of relevant information from various sources, and dissemination through cross-media platforms.

KISAN has conceptualized and implemented Web-, television- and call centre-based modules. KISAN's Fertilizer Recommendation System (FRS) provides recommendation on fertilizers based on soil test reports provided to the farmers by various soil testing laboratories across the state. From KISAN's website, one can also download forms like Karshakothama Award application, Biogas Development form, Utilization certificate and subsidy forms. A farmer can post questions to experts and attach up to two images of crops showing symptoms of disease and pest attack for proper diagnosis. Experts and scientists from KAU research stations and Department of Agriculture answer questions.

Kisan Call Centre (KCC)

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Website: www.tcil-india.com

KCC is a fully funded project of the Ministry of Agriculture. It is being implemented by Telecommunications Consultants India Limited (TCIL), a GoI undertaking under the

Ministry of Communications and Information Technology. To access KCC, a farmer can dial a toll free number, 1551, from any part of the country to a network of 25 call centres, from 6 a.m. to 10 p.m. The farmer can seek the advice of experts in any of the 21 principal languages on any issue related to agriculture. About 50,000 calls are received every month. In three years, KCC has spread from the initial 40–50 seats to 144 in 25 states and UTs. KCC has created employment opportunities for students with a graduate degree in agriculture.

The International Institute of Information Technology, Hyderabad

Gachibowli, Hyderabad 500 032
Andhra Pradesh, India
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Website: http://www.iiit.ac.in

The International Institute of Information Technology, Hyderabad (IIIT-H) is an autonomous university, founded in 1998. It was set up as a not-for-proft PPP and is the frst IIIT to be set up (under this model) in India. IIIT-H was set up as a research university focused on the core areas of IT, like Computer Science, Electronics and Communications, and their applications in other domains. The Institute combines pioneering research with top-class education. It has evolved strong research programmes in a host of areas, with computation or IT providing the connecting thread, and with an emphasis on the development of technology and applications, which can be transferred for use to industry and society. A few companies have been incubated, based on the research done at the Institute.

e-Arik

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Website: http://www.earik.in/

An ICT application for agricultural extension project called e-Arik has been developed and sponsored by the Department of Scientific and Industrial Research and is being implemented by the Central Agricultural University, Arunachal Pradesh. The application provides agricultural extension services to the rural tribal farming community of Arunachal Pradesh. The project facilitates a web-based, single-window system for improved agricultural information and technology delivery to remote tribal villages through computers, the Internet, phones, radio and television. The project provides round the clock expert consultation on agriculture production, protection marketing

and weather information through knowledge portals and ICTs. The project also imparts computer training to the village children, school students, youth and farmers

Private

Qualcomm

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Qualcomm, a multinational telecom company, started out by providing contract research and development services with limited product manufacturing for the wireless telecommunications market. Today, it plays a central role in the rapid adoption and growth of 3G and next-generation wireless technology around the world.

Qualcomm believes in empowering citizens of the world through information connectivity and through effective partnerships. Its annual R&D expenditure is in the order of $ 1.0 billion. Among the important technology initiatives of the company are its Wireless Reach Initiative, its development of Media FLO technology and its BREW programme.

Wireless Reach

The Wireless Reach initiative creates sustainable 3 G projects through partnerships with government, civil society organizations and private sector companies. It seeks to empower underserved communities, with a focus on education, government, health care, public safety, etc. It has successfully demonstrated increased tele-density and Internet penetration in countries like Indonesia, Peru and China by placing cellular kiosks in the hands of villagers. In China, the kid tracker device, using QPoint location-based services, helps visually challenged individuals to seek help, in case of an emergency.

BREW Programme

This CDMA-based technology, which can empower rural India, is also compatible with other technology that can complement it. The third-generation CDMA technology is already matured and achieving scales dramatically. The main advantage of CDMA is that it can handle a variety of applications. Qualcomm has a one million-dollar fund to

promote applications under the BREW programme. In 2006, Qualcomm instituted five grants totalling $ 500,000 for the development of the most innovative proposals for a BREW community application in health care, education, public safety, governance and environment.

Reach Computing

The Reach Computing helps to provide web-based devices through the mobile phone. Personal computers and laptops are still out of the reach of many people, especially in the rural countryside. Based on a mobile platform, REACH enables high-speed Internet access, entertainment, communication and a multimedia experience for consumers. Qualcomm believes that Reach Computing will help advance the computing and broadband revolution in India. This device will make the benefits of the Internet more accessible to the poor.

Microsoft India—Unlimited Potential (UP) Programme

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Microsoft's UP Programme is committed to helping people benefit from ICT that is accessible, affordable and relevant to their needs. It believes in partnering with governments, NGOs, educators, academics and other stakeholders, to promote new avenues of social and economic empowerment for the underserved populations of the world. UP places special emphasis on young people, because they represent the future of our communities. Its efforts are focused on delivering solutions in three key, interrelated areas: a) transforming education, b) fostering local innovation and c) enabling jobs and opportunities. Some of the important projects are as follows.

Saksham

Saksham, the self reliant rural market initiative of Microsoft India, through its four levers of innovative business models, PPP, localized content and affordable solutions, is designed to address the issues that have so far affected the uptake of IT in the rural segment. It will not only provide local entrepreneurs with the opportunity to set up and manage these kiosks to provide locally relevant services, information and content but also provide the local Independent Software Vendor (ISV) community, with the opportunity to develop rural content and applications.

Jyoti

Project Jyoti aims at enabling sustainable livelihood opportunities in rural India. This entails setting up Community Technology Learning Centres (CTLC) in partnership with NGOs. Till date Microsoft has given grants to 14 NGOs in India, aggregating to Rs 47 crores and has set up a network of around 1,148 CTLCs.

IITM Microsoft Windows Technologies Lab

Inaugurated in February 2008 at IIT Chennai, the IITM Microsoft Windows Technologies Lab has been envisaged as a hub that will harness innovation through research, and provide a platform for the faculty and students to leverage the platform for a variety of research and trainings.

Project Shiksha for accelerating IT literacy

Launched in India in December 2003 by Bill Gates, Chairman, Microsoft Corporation, the project had a target of reaching out to 80,000 teachers by December 2008, a period of five years. Since then, Project Shiksha in India has impacted over 3, 82,000 government school teachers till date, and in the process, transformed the lives of more than 10 million students across the country. Under this programme, Microsoft India has partnered with 12 state governments (including Maharashtra, Uttaranchal, Andhra Pradesh, Karnataka, Gujarat, Bihar, Mizoram, Madhya Pradesh, Punjab, Rajasthan, Tamil Nadu and Uttar Pradesh) to set up 14 Shiksha Academies. With the objective to 'Empowering the future', this initiative is focused on delivering affordable software solutions, comprehensive training and curriculum leadership for students and teachers in government schools, thereby enabling them to adapt to the changing education environment in India.

Microsoft Innovation Centres

These are designed to provide local software communities with a comprehensive set of programmes and services to expand workforce skills, create jobs, strengthen innovation and improve competitiveness.

Microsoft E-governance Innovation Lab in New Delhi

The lab has been created to develop a new class of applications and solutions, especially for e-governance, and to create a framework and architecture to incorporate the use of IT in the working of government departments. The lab also conducts research for emerging technologies in the e-governance domain.

Tata Consultancy Services (TCS)

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Website: www.tataliteracy.com

TCS is one of the world's leading IT companies. Through its Global Network Delivery Model, Innovation Network and Solution Accelerators, TCS focuses on helping global organizations address their business challenges effectively.

Computer-based Functional Literacy (CBFL) Programme

TCS has developed multimedia-based software to impart functional literacy for adults in eight different languages. Material based on National Literacy Mission has been adopted for the CBFL methodology. The system uses low-end PCs to run the software.

According to an evaluation study carried out in Tamil Nadu, the programme, with an input of 40–50 hours over a period of three months, has been successful in making adults literate. The process calls for minimum skills from the teacher. Each teacher can handle a batch of 10–15 students. TCS is now in a position to scale up this programme with the help of suitable partner agencies.

Intel

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Website: www.intel.com/education

Intel sees ICT opportunities in the areas of education, health, commerce and social participation. It tries to introduce new ICT technologies in these focus areas through the pedagogy of 'Discover-Innovate-Enable-Standardize-Integrate'.

It has successfully developed WiFi and WiMax technology after carrying out trials at Pinjore, Uttaranchal and Baramati. It has invested 600 million dollars to make the technology mature.

Intel Learn Programme

ILP is part of the Intel Education Initiative, a global commitment in collaboration with

educators and government leaders worldwide, to inspire innovation in teaching and learning. Former Intel CEO, Craig Barrett, launched ILP in India in June 2004. The programme was first initiated in Malappuram District in Kerala, as a pilot project in collaboration with Kerala State IT Mission, Government of Kerala. It is a community based programme, in which people learn technology literacy, critical thinking and collaborative skills that are necessary to work and compete in the 21st century. The programme uses trained staff to guide 8–16-year-old learners through its 60 plus hours of structured curriculum.

ILP curriculum has been chosen for the Ministry of Human Resource Development, GoI's Pace Setting Programme. All Jawahar Navodaya Vidyalayas conduct the Pace Setting Programme during vacation as a part of providing quality education to children with little or no access to technology. The target group comprises children from nearby villages.

Hewlet Packard (HP)

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HP is a technology solutions provider to consumers, businesses and institutions globally. The company's offerings span IT infrastructure, personal computing and access devices, global services, and imaging and printing for consumers, enterprises and small and medium businesses.

Community Initiative at Kuppam

An innovative method is being used to develop a new generation of entrepreneurs helped by ICT. The programme helps to lower barriers to entrepreneurship by creating access to capital and technology, and providing training.

Digital Rural Theatre

This enables the participant to create his/her own virtual characters and drama. It generates revenue of $ 6 per show.

Multi Commodity Exchange (MCX)

Head CSR
Financial Technologies India Ltd., MCX
CTS No. 255

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Email: info@mcxindia.com
Website: www.mcxindia.com

MCX's core business deals with price information. It is India's number one electronic commodity exchange, with about 80 per cent share of the Indian commodity future market. It operates from over 600 cities with over 1,780 members and more than 21,000 trading stations. Connectivity is provided through VSAT, Internet, leased line, CTCL, etc. Real-time price and information dissemination takes place through its websites, India Post (Gramin Suvidha Kendra) and Info Vendors. It is the only commodity exchange in the world to have ISO/IEC 27001:2005 certification.

A sister concern, called National Bulk Housing Corporation, has been established to meet the warehousing needs of farmers. Banks have been linked to get loans for farmers. Information kiosks are being set up with the help of TERI.

National Commodity and Derivatives Exchange Ltd. (NCDEX)

National Commodity & Derivatives Exchange Limited
Akruti Corporate Park,1st Floor,
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Kanjurmarg (West), Mumbai - 400 078.
Tel : (+91-22) - 66406789
E-mail: askus@ncdex.com
Website: www.ncdex.com

NCDEX has objectives similar to those of MCX. It trades in 51 commodities of which 80 percent are farm commodities. The price at different mandis is made available to the farmers. Market information is also provided to farmers through trackers on TV screens. Information on weather station reports, e-learning, etc., is also provided. It is also in the process of establishing warehouses and end-to-end services for farmers. The organization believes that knowing future prices will help farmers migrate to a demand-based cropping system.

Arakay InfoNet Private Limited

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e-scribe

The CSC programmes will succeed only if commercially viable business models are developed. CSC is also visualized as a common point for multiple services. Hence, it should be managed like a TV channel. The system should enable live interaction in order to ascertain what needs to be delivered where. Arakay InfoNet Private Limited believes that people will be ready to pay if they have an interactive service. Hence, it has developed a software e-scribe, which allows easy-to-use interactive interface. The end-users have a poor paying capacity; therefore, donors, NGOs and government suppliers may be asked to pay for using this channel for delivery of free services.

Apollo Group of Hospitals

Indraprastha Apollo Hospitals
Sarita Vihar
Delhi-Mathura Road
New Delhi-110044
TEL: 011 - 26925801 / 26925858
Website: www.apollohospitals.com

Apollo Group's mission is to see how health can reach every single citizen of the country. Apollo group has 43 hospitals about half of which are in the suburbs or in rural areas. The first tele-medicine centre was started with the help of ISRO and inaugurated by Bill Clinton. Today, there are more than 500 tele-centres. This helps avoid the time and money wasted on travel. Hospitals on wheels, which are connected with tele-medicine centres, have also been started. Apollo Group is working on 'health super-highway', which will connect all doctors and hospitals. It will make it possible to get a second opinion at low cost and to have medical reports interpreted by experts. Doctors can keep abreast with the latest developments in the field. IBM has been a powerful partner in providing infrastructure support.

Drishtee Development and Communication Ltd.

Founder and Managing Director
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Drishtee Development and Communication Ltd. was founded by the social entrepreneur Shri Satyan Mishra, to create a sustainable and scalable platform for entrepreneurs,

to enable inclusive development of the rural economy and society through the use of ICT. Incorporated in October 2000, the company sought to make a paradigm shift in the delivery of government services in rural India. It sought to serve villagers directly rather than through government machinery. Contractual arrangements with state governments provided the bedrock on which Drishtee was able to build a network of sustainable franchises. Over time, the local entrepreneurs learnt to provide additional services to the surrounding villages like ICT training, regional job postings and even matrimonial services. The network began to be utilized increasingly as an outlet for commercial services like farm insurance, loan processing and equipment sales. More recently, Drishtee Knowledge Centres have also doubled up as rural BPOs.

Cooperative

Indian Farmers Fertiliser Cooperative Limited (IFFCO)

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Website: http://www.iksl.in

IFFCO, together with telecom giant Bharti Airtel and Star Mobitel, has promoted a joint venture called IKSL. Airtel has extended its network backbone to IKSL and also provide a sustainable income generating business opportunity to cooperative societies. The telecom products of Airtel are made available to farmers and people living in villages through cooperative societies. The same SIM card that is used for communication is turned into a powerhouse of knowledge for empowering people living in villages through relevant and pertinent information, provided by IKSL through a Value Added Service (VAS).

Civil Society Organization

International Development Research Centre (IDRC)

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IDRC considers development research as a collaborative venture to find long-term solutions to the problems encountered by developing countries. It works towards identifying, initiating and coordinating strategic relationships/networks to benefit poor and marginalized communities in developing countries.

telecentre.org

telecentre.org, a collaborative initiative of IDRC, Microsoft and SDC aims at connecting tele-centre networks, innovators, social investors and other interested groups. Tele-centre is a public place where people can access computers, the Internet and other technologies to develop their digital skills, gather information and communicate with others, sharing and exchanging best practices, experience, knowledge, innovations, products and services.

UNDP

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Solutions Exchange Network

Solutions Exchange Network, an initiative of the United Nations agencies in India, is harnessing the power of Communities of Practice to help attain national development goals and the Millennium Development Goals (MDGs), leveraging the knowledge, experience and energies of development practitioners towards the common objective of problem-solving. So far, the Solutions Exchange Network has established eleven communities of practice, namely, AIDS, Decentralization, Disaster Management, Education, Food and Nutrition Security, Gender, ICT4D, Maternal and Child Health, Micro-finance, Water, Work and Employment, and Climate Change.

The ICT for Development (ICT4D) community was launched on November 23, 2006 in New Delhi. The community has discussed, among other issues, the CSC scheme, the use of ICT in literacy programmes, ICT and livelihoods, remote sensing in agriculture, the setting up of and the running of Community Radio stations, e-governance and the role of ICT in local content creation. The ICT4D community had 2471 members, as of February 5, 2010.

UNESCO

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UNESCO is a Specialized Agency of the United Nations. Its main objective is to contribute to peace and security in the world by promoting collaboration among nations through education, science, culture and communication, in order to further universal respect for justice, for the rule of law, and for the human rights and fundamental freedom, which are affirmed for the peoples of the world, without distinction of race, sex, language or religion, by the Charter of the United Nations.

Community Multimedia Centres (CMCs)

UNESCO has promoted CMCs that have pioneered community radio all over the world. However, the combination of radio with new communication technologies and the Internet are found to be significantly more effective and this is the direction in which the CMCs would like to progress. In this project, villagers themselves benchmark their success and try to improve on it. They adapt generic content to suit their own needs. CMCs learn to network and support themselves. UNESCO is in the process of scaling up these activities, based on its experience of developing 10 different models in South Asian countries, including a few in India, which are all community owned and operated. It has set up centres of excellence in sharing and providing for knowledge development. One of the tools used at CMC sites is Open.enrich, which has been developed in collaboration with NIC.

JN Tata National Virtual Academy (NVA), MSSRF

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The JN Tata NVA Project has its origin in a pilot-project initiated in 1998 by MSSRF with a small grant from the International Development Research Centre and the Canadian

International Development Agency in which the concept of an information village was first tested. The NVA was set up in 2003, with the idea of training rural youth as KWs, who would become the torchbearers of the knowledge revolution in rural India. A Fellowship Programme was developed to orient rural leaders and local experts to mobilize communities and prepare them for the ICT revolution.

The NVA Project has a three-tier structure with a national hub at MSSRF, Chennai, a block-level hub called VRC, which services a number of VKCs through the hub-and-spokes model.

The NVA serves as the secretariat of the GGA and has organized various events on behalf of the National Alliance. The GGA has over 400-member institutions, drawn from the public and private sectors, the government and civil society.

NASSCOM Foundation (NF)

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NF was established about two decades ago, to leverage ICT to empower and transform the lives of the underserved. The Software, a 40-billion-dollar industry, had emerged just through self-help and entrepreneurship. Ninety-nine per cent of the players were first-generation entrepreneurs. These entrepreneurs realized that whereas they were successful in creating wealth, they were not doing anything for half of the country living below the poverty line. They saw an opportunity to apply their global competence to the development needs of the country. This was the genesis of the Foundation.

NF runs an ICT4D Programme with financial support from Microsoft, connectivity from Tata Teleservices, and technical support from Qualcomm. Starting in 2006, 65 VKCs have been established so far with the support of 20 grass roots organizations. The Foundation aims to set up about 100 such centres in nine states of India. Over 90 per cent of these centres are community centres.

United Nations International Children's Emergency Fund (UNICEF)

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Website: www.unicef.org

UNICEF believes in promoting health, education and equality protection for every child.

e-warehouse Project

UNICEF's e-warehouse was formally inaugurated by Prof M S Swaminathan at the 4th national convention of Mission '07 (www.unicefiec.org). The warehouse includes information on the following themes:

- Reproductive and child health
- Child development and nutrition
- Child's environment
- Elementary education
- HIV/AIDS
- Child protection
- Strategic planning, monitoring and evaluation
- Behaviour change communication
- Advocacy and partnerships
- Emergency

IEC materials under these topics can be located with search options.

International Foundation for Fair-trade and Development (IFFAD)

Operations Office
P.O. Box 365
500 Main Street
New Windsor, MD 21776-0365
Tel: 800-423-0071
Website: http://www.serrv.org

IFFAD is a not-for-profit organization, working for the benefit of the disabled producers, rural women and traditional artisans of India. Its mission is to promote social and economic development of disadvantaged and marginalized people through the production and marketing of goods and services through just and fair-trade practices. Providing marketing support services, supply chain management and capacity building are the main activities at IFFAD. The target groups include the physically and mentally challenged, traditional artisans, women's SHGs and rural people in general.

Virtual Platform for Rural Artisans

IFFAD has set up a virtual platform to connect rural artisans with urban buyers. The project has been in operation for the last six years, in collaboration with IIT Kanpur.

Indian Society of Agribusiness Professionals (ISAP)

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Website : www.isapindia.org

ISAP is a non-government, non-profit organization incorporated in 2001, under Section 25 of the Indian Companies Act. It is a network of agriculture and allied sector professionals in India and developing countries. It is a growing network encompassing over 15,000 registered associate members, comprising agri-experts, partner NGOs, over individual users and researchers. One of ISAP's initiatives has been to set up and operate the KCC in Madhya Pradesh, in collaboration with the state government.

Technology for the People (TFTP)

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TFTP was founded as a technical support organization to promote developmental issues through appropriate technology and support the use of ICT in expanding the existing activities, in the areas of education, hygiene, child rehabilitation and economic empowerment. It facilitates innovative ways in which technology can be leveraged to bring about economic empowerment of the marginalized communities. TFTP provides services ranging from field studies, skill mapping, training and evaluation for non-profit organizations, and donor agencies in the development sector. The income from these services is utilized to support the activities of the resource centres in Hyderabad, field projects and research.

4. About the Contributors

Contributing Institutions

India Tobacco Company

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Kolkata-based ITC was incorporated on August 24, 1910 under the name of Imperial Tobacco Company of India Limited. As the Company's ownership became progressively Indianized, the name of the Company was changed from Imperial Tobacco Company of India Limited to India Tobacco Company Limited in 1970 and then to I.T.C. Limited in 1974. In recognition of the Company's multi-business portfolio, encompassing a wide range of businesses—cigarettes and tobacco, hotels, IT, packaging, paperboards and specialty papers, agri-business, foods, lifestyle retailing, education, stationery, and personal care—the full stops in the Company's name were removed, effective from September 18, 2001. The Company now stands rechristened 'ITC Limited'. Its annual sales turnover in 2009–10 was about US $ 6 billion.

In 1990, leveraging its agri-sourcing competency, ITC set up the Agri Business Division to export agri-commodities. The Division is today one of India's largest exporters. ITC's unique and now widely acknowledged e-Choupal initiative began in 2000 with soy farmers in Madhya Pradesh. It extends to ten states today, covering over four million farmers. ITC's first rural mall—Choupal Saagar—was inaugurated in August 2004 in Sehore. On the rural retail front, 24 Choupal Saagars are now operational in the three states of Madhya Pradesh, Maharashtra and Uttar Pradesh.

TCS Innovation Labs

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Tata Consultancy Services (TCS) is one of the world's leading IT companies. Through its global network delivery model, Innovation Network and Solution Accelerators, TCS focuses on helping global organizations address their business challenges effectively. About 160,000 TCS associates serve 800 plus clients in 42 countries. Its annual sales

turnover in 2009–10 was Rs 23,044.45 crores.

TCS's flagship research centre, TCS Innovation Labs—TRDDC—was established in 1981 when IT had barely emerged as an industry. Today, TCS has a global network of laboratories that provide an environment for sophisticated IT research in leading-edge technologies as well as in various domains. TCS Mobile Agro Advisory System has evolved from the efforts of TCS Innovation Labs–Mumbai, which researches into sensor as well as speech recognition. The company has also used an internally developed interactive voice response (IVR)-type platform packet interactive multimedia response (PIM2R), which uses the inexpensive data channel for transferring rich content.

MS Swaminathan Research Foundation (MSSRF)

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MSSRF was established in 1989 to impart a pro-nature, pro-poor, pro-women and pro-sustainable livelihoods paradigm of technology development and dissemination. The bottom-line of its research, education and outreach programmes is social inclusion in access to resources, including information, and access to relevant technologies. Since 1997, the Foundation has been promoting a model of community-based knowledge centres for sustainable rural development, using ICT-enabled development (ICT4D). MSSRF's work in the sector has received national and international recognition. MSSRF has also triggered a national movement for bridging the digital divide, under the leadership of its founder chairperson, Prof M S Swaminathan.

Source for Change (SFC)

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SFC was founded in 2007 by three young social entrepreneurs under the aegis of Ajay G. Piramal Foundation, (more specifically Grassroots Development Laboratory) at Bagar Village in Rajasthan. SFC is an all-woman rural BPO company that aims at empowering women by providing them employment opportunities. SFC also aims to give rural women a platform to be financially independent and thus achieve greater social standing.

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TARAhaat Information and Marketing Services Ltd., a Delhi based social enterprise promoted by DA, was established in 1983 as an international research, development and consultancy organization. DA has had a substantial impact on the creation of sustainable livelihoods and employment for rural people in India. Its efforts have been recognized through numerous national and international awards, including the prestigious United Nations Sasakawa Environment Prize, the Stockholm Challenge Award, the KlausSchwab Award for Outstanding Social Enterprise, the Jawaharlal Nehru Prize of the Indian Science Academy, and the UN Global 500 Roll of Honour.

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Drishtee Development and Communication Ltd. was founded by the social entrepreneur Shri Satyan Mishra, to create a sustainable and scalable platform for entrepreneurs, to enable inclusive development of the rural economy and society through the use of ICT. Incorporated in October 2000, the company sought to make a paradigm shift in the delivery of government services in rural India. It sought to serve villagers directly rather than through government machinery. Contractual arrangements with state governments provided the bedrock on which Drishtee was able to build a network of sustainable franchises. Over time, the local entrepreneurs learnt to provide additional services to the surrounding villages like ICT training, regional job postings and even matrimonial services. The network began to be utilized increasingly as an outlet for commercial services like farm insurance, loan processing and equipment sales. More recently, Drishtee Knowledge Centres have also doubled up as rural BPOs.

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Ekgaon Technologies, established as a private limited company on October 1, 2002, provides technology and management support for knowledge management, strategic decision-making and business development. It works towards increasing the efficiency of value chain process, and enables access to financial services, technology and information services for primary producer communities across South Asia. The OneMIS system developed by Ekgaon Technologies enables the community owned FIs to access formal FIs like banks, venture capital firms, ect. It creates a decentralized management information system, increases efficiency of fund management and reduces credit cycle.

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Index

aAQUA 176
Advanced Computing Training School 172
agri-advisory service 34, 44, 55
Agricultural value chain 58, 59
Agriculture-related query redressal system 55
Akshaya 13, 44, 77,78,79,93,101,183
Akshaya Centre Entrepreneurs (ACE) 78
Akshaya Centres 44, 78, 79
All India Radio (AIR) 7, 39, 41
Annual Convention of GGA 10
Apollo Group of Hospitals 192
Application developer 14,16,17,96
Arakay InfoNet Private Limited 191
Army of KWs 77, 92
As quoted in Madon 2009 72
ASHAs (primary health workers) 64
Avaaj Otalo 42
Back-end support 20
BASIX 50, 52, 90
Basket of services 14, 20,101,102
Bharat Nirman Programme 7
Bhoomi 2,13,69,70,71,72,73,100,182
Bill Gates 77,188
Biometric identification 51
BookBox 81
BREW Programme 186
Brij Kothari 79, 80
build-own-operate-transfer (BOOT) model 74
Business correspondent initiative 52
business model 2,15,37,68,70,99
Business process outsourcing (BPO) 2, 50
Business-to-consumer (B2C) services 74
C K Prahalad 15
C-DAC 172
CDMA 16, 17,162
Centre for Agricultural and Rural Development Studies 178
Common Service Centres (CSCs) 4
Community Access for Sustainable Health (CASH) 176
Community e-Centres of Philippines 11
Community Information Centres (CICs) 181
Community Initiative at Kuppam 190
Community Multimedia Centres (CMCs) 40,195

Community radio policy 7, 39
Community radio18, 22, 39, 40,102
Community Technology Learning Centres 85
Community video 93, 94, 95,102
Computer literacy 5, 77, 79, 82, 92,101
Computer-based functional literacy (CBFL) 76,189
Confederation of Indian Industries 3
Conservation action plans 32
Cooperative model 38,100
DEAL 176
Deccan Development Society (DDS) 39
Department of Information Technology (DoIT) 4,173
Design of a new video game 82
Development Support Centre 40
Digital Craft Revival (DCR) 176
Digital divide 2,4,6,10,14,15,77,78,92,98,99,162
Digital Games for Literacy 81
Digital Green13, 40, 43, 44
Digital Health at Every Doorstep176
Digital photographs 36
Digital Rural Theatre 190
Drinking water sanitation 175
Drishtee Case 146-152
Call centres 148,150
Drishtee Development and Communication Ltd 146
Drishtee knowledge centres 146
Employment generation 151
Income generation 151
kiosk operators 150
Organizational Structure148
Revenue model 148
rural BPO associates150,151
rural BPOs 146
Satyan Mishra 146
Drishtee Development and Communication Ltd 83, 89, 97,192
Drishtee e-commerce portal 57
Drishtee's Community Video Unit (CVU) 94
e- Health 4, 5, 10,64
E-Alert Agramart 178
e-Arik 185
Early warning system 25,44,45,48,101
e-Choupal Case 108-115
Agricultural Produce Marketing Committee Act 113
Choupal Pradarshan Khet 110

Dynamic content 113
ITC collection centre 109,110
kaccha adat 109
material handling systems 110
mobile choupals 113
pakka adat 109
personalized content 113
Static content 113
e-Choupals 4,19,56
E-Commerce 4,6,10,57,66,83
Eco-profiling 30, 31
Edu-Sat 8
e-Education 5,81,82
e-education for STEM (science, technology, engineering and math) 82
E-Governance 4,5,8,9,34,49,60,66,68,72,74,79
E-government 13,63,66,67,68,69,73,83,100
Ekgaon Case 153- 159
Business Correspondent 153,154,155,156
Ekgaon Technologies 153
Mobile-based application 156
OneBrowser 155
OneForms 155
OneMIS 153,154,155,156,157,158,159
Portable thermal printer 156
Portfolio management 154
Stockholm Challenge—GKP Award 2007 153
Technology framework 153
Vijay Pratap Singh Aditya 159
World Vision 157,159
Ekgaon Technologies 52
E-krishi 179
e-Literacy 10,13,76,78,79,92,93,101
E-literate District 78, 93
Emergency Prevention System (EMPRES) 45
EMPRES 45, 46
End-to-end 59
Entrepreneurial model 98
Ernst and Young 3
e-Sagu 2,13,32,33,36,37,38
e-scribe 192
e-Seva 67,73,74
E-Velanmai179
Kerala State IT Mission (KSITM) 78,179
e-warehouse project 197

farmer-to-farmer exchang e 19,57
FES 32
Financial Technologies India Ltd 53
Fisher Friend 17, 23
Forest Rights Act (2006) 65
Foundation for Ecological Security
Free services 30
Futures and spot prices of commodities 55
Gartner Inc. 3
Generic queries 36, 38
Geographical Information Systems 25
Geo-informatics 65
GGA Secretariat (2008) 64
GGA Secretariat, 2007 19, 24, 50, 51, 64
GGA Secretariat, 2007 and 2008 65
GGA, 2008 18
Global Positioning System 27,163
Government-to-Consumer (G2C) services 9, 49,73,74,78
Grameen Bank 50, 86
Grameen Gyan Abhiyan 6, 10
Gramin Suvidha Kendra (GSK) 38, 53, 54
Grant-based model 99
graphics interface 38
Grass Roots Development Laboratory 89
GREEN Foundation 43
grievance redressal 5,68,69
GSM 16,163
Gyan Choupals 10
Gyandoot 13,67,68,69,100,163,182
Hand-held devices 3,4,18,40,51,52
Harvansh Yadav 21
Health informatics 64
Hewlet Packard (HP) 190
Hub-and-spokes model 6, 7,8,87
Hybrid PC8, 163
ICT market in India 3
IFFCO Kisan Sanchar Ltd. (IKSL) 37
IFFCO Tokio General Insurance Co Ltd 47
IITM Microsoft Windows Technologies Lab 188
Inclusive banking 5, 13,50,51,62
India Development Gateway 172
Indian Farmers Fertiliser Cooperative Limited (IFFCO) 193
Indian Institute of Information Technology (IIIT) 33
Indian Institute of Information Technology and Management, Kerala (IIITM-K) 40

Indian National Tsunami Early Warning System 45
Indian Society of Agribusiness Professionals (ISAP) 198
Indian Space Research Organisation (ISRO) 8,171
Indicorps Fellows 89
Indira Gandhi National Open University (IGNOU) 177
Information kiosk for goat-keepers 180
Information Services 101
Infosys 2,88
Integrated Mission for Sustainable Development 27
Integrated warehousing 55
Intel 189
Intel Learn Programme 189
Interactive community radio 102
Interactive Radio 13, 25,39,40,41
Interactive TV 102
International Crop Research Institute for Semi-arid Tropics (ICRISAT) 177
International Development Research Centre (IDRC) 10,193
International Foundation for Fair-trade and Development (IFFAD) 197
Internet phones 102
INTEWS 45
IRS series 26
IRS–P6 satellite 27
IT majors 88, 91
Jamsetji Tata National Virtual Academy (NVA) 8,170,195
Joint initiative of India Post and MCX 54
Jyoti 85,188
Kerala State IT Mission (KSITM) 78,179
Kiosk owners 57, 84
Kiosks run by women's SHGs 73
Kisan Call Centre 32,34,36,37,184
KISAN Kerala On-line Agri Video Channel 40
KISAN, Kerala 183
Knowledge entrepreneurs 68
Knowledge services 3, 4, 56, 93, 96, 97, 99, 100, 101
Knowledge Value Chains 92, 96
Lab-to-land 125
Language technologies 172
Land-to-lab 125
Land-to-land 125
Lead agency 96, 97
Link-to-link 58
Land records 5,9,68,69,71,72
Literacy 5,13,76,79,80,81,82
Locust watch 13, 45, 46

Last mile and last person connectivity 10, 14, 17
Malappuram 78
Matthew Kam 79, 81, 82
Media Lab Asia (MLA) 33,175
Microsoft Corporation 77,188
Microsoft E-governance Innovation Lab in New Delhi 188
Microsoft India—Unlimited Potential (UP) Programme 187
Microsoft Innovation Centres 188
Microsoft Research India 43
Microsoft's Unlimited Potential 77
Ministry of Communications and Information Technology, GoI 173
Mission '07 7, 11
Mission 2011 of Bangladesh 11
Mission Swaabhimaan of Nepal 11
Mithila paintings of Madhubani 57
mKRISHI 2,13,32,35,36,37,38
mKRISHI Case 116-123
Binary Runtime Environment for Wireless (BREW) 118
Golden Peacock Innovation Award (2008) 116
Grape farmers 118,119,120,121,122
handset screens 121
TCS's mobile-based agro advisory system 116
Vidarbha 119
Wall Street Journal Technology Award 119
Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE) 79
mobile-based educational games 79
Mr O P Bhatt 50
MSSRF Case 124-132
boundary institutions 126
hub-and-spokes model 126
Integrated application of a variety of communication channels 126
Jamsetji Tata National Virtual Academy (NVA) 132
Jamsetji Tata Training School for Leadership in Rural Knowledge Connectivity (JTS) 127
Knowledge networks 125
Lab-to-land 125
Land-to-lab125
Land-to-land 125
Stockholm Challenge Award (2001) 128
VKCs 126,127,128
Multi Commodity Exchange (MCX) 190
Multi Commodity Exchange of India Ltd (MCX) 53
Mutation 70,71,72,73
NASSCOM Foundation (NF) 196
NATAK 3D 173

National Alliance 6,7,24
National Commodity and Derivatives Exchange Ltd. (NCDEX) 191
National e-Governance Plan 8, 9,181
National Informatics Centre (NIC) 64,174
National Informatics Centre (NIC), Kerala 178
National Literacy Mission 76,174,189
National Remote Sensing Agency 27
National Rural Health Mission 64
National Watershed Development Programme 27
Network of content providers 96-97
Non-routine Information Service 101
Non-routine services 101
Normalized Differential Vegetation Index – NDVI 27
NREGA MIS 175
On-demand video services 40
OneMIS 52
On-line interaction 67
Open eNRICH 174
Optical data storage 102
PAN-African e-network 11
Participatory GIS mapping 30
Participatory video for agricultural extension 43, 44
Partnering with MFIs 51
Pay-to-use services 100
Peer-to-peer 58
Pest Alerts from FAO 45
Piramal Foundation 89
PlanetRead 13,79,80,81
Pria Soft 175
Price discovery 5, 13,50,52,53
Price realization 13, 37, 50,52,53,55
Prof M S Swaminathan 6
Project implementing agencies 27
Project Jyoti 85,188
Project Shiksha 77,188
Project Shiksha for accelerating IT literacy 188
Qualcomm 8, 17,186
Radio Bundelkhand 39
Raghav FM Mansoorpur 1 Radio Station 22
Raghav Mahto 22
Rajiv Gandhi College of Veterinary and Animal Sciences 180
Reach Computing 187
Record of Right Tenancy and Cultivation (RTC) 70
Remote banking accounts 51

Remote Sensing 25, 26, 27
Remote Sensing and Communication Centre for Gujarat 27
Routine Information Services 101
Routine knowledge services 101
Rural bazaar 175
Rural housing 175
Rural Innovation Fund 10
Rural Kiosk 17, 52, 72
Rural knowledge Centres 8
Rural Soft 174
Rural supply chains 50, 61
RuralShores 85
SAARC Disaster Knowledge Network 47
Sadguru Foundation 21, 27, 28
SADKN 45, 47
Sai Seva BPO 88
Sai Seva Business Solutions 88, 89
Sajjata no Sang 41
Saksham 187
Same language subtitling 79
Sangham Radio 39
Sanyog 176
Satyan Mishra 83, 89, 99
Sehat Saathi 176
Service interface provider 14,16,17,96
Service provider 14,15,16,17,19,20,38,57,59,60,88,96
SEWA Bank 50
Shrota Mandals 41
Shruti 177
Small-holder farmers 52, 58
Smart cards 51, 60
Smart phones 18,102
Social entrepreneurs 20,57,79,81,90,91,99
Solutions Exchange Network 34,194
Source for Change Case 133-138
- Bagar 133,134
- Business Process Associates 134
- Grassroots Development Laboratory 133
- Piramal Foundation 133,134
- Quality control and security system 134,135
- Rural clients 136,137
- Women-only BPO 133

Space Application Centre (SAC) 27
Specialized queries 38

Spot Exchange for Agriculture Produce (NSEAP) 53
Stanford HCI Group 42
State Bank of India (SBI) 50
State Data Centres 8
State Wide Area Network (SWAN) 8,180
Supply of agri-inputs at the farmer's doorstep 55
TARA Akshar 76
TARAgram 39
TARAhaat Case 139-145
Agri-advisory service 143
Business model 140,147
Development Alternatives 139
Digital inclusion initiative 144
E-governance services 141
Enterprise Development and Support Services (EDSS) 141
Enterprise package 141
Entrepreneurship development programme 142
Fastest literacy programmes in the world 143
Interactive Voice Response System 144
Lifelines India 141,145
Soochna se Samadhan 144
TARA Akshar 141,142,143,144,145
TARAdak 141
TARAgurus 142
TARAgyan 141
TARAhaat Information and Marketing Services Ltd 139
TARAkendras 139,140
The portfolio of products and services 141
Web-based business support system 142
TARAhaat's franchise model 84
Tata Consultancy Services 32,189
Technical PRA 29
Technology for the People (TFTP) 198
Technology provider 8,14,16,96
telecentre.org 194
TelecomLive 9, 11,35,83,93
Telecommunications Consultants India Ltd 11, 32, 34,184
Tele-knowledge centres 178
Ten Cs' framework 24
The International Institute of Information Technology, Hyderabad 185
The ToeHold Artisans Collaborative (TAC) 58
ToeHold Artisans 58
Tool trap 15, 23
Transaction cost 14, 35,38,55,56,57,62,73

Tribal Research and Training Institute (TRTI), Pune 65
TRTI-VGIS 65
Twin Cities Network Services Project (TWINS) 73
Udaan 95
UNDP 194
UNESCO 195
United Nations International Children's Emergency Fund (UNICEF) 196
Village Resource Centres (VRCs) 171
Virtual Academy for Semi Arid Tropics (VASAT) 177
Virtual marketing 6, 13, 50,57,58,59,166
Virtual OPDs 64
Virtual Physics Lab (VPL) 176
Virtual Platform for Rural Artisans 198
Voice mail 38
Voice-based Social Media for Rural India 42
VSAT 53, 61,166
Vyapar/Pradarshani 173
Weather Insurance 25, 44, 47
Web presence 67
Wipro 2, 88, 95

A Strategy Handbook for the Practitioner

In India, close to 400 million poor reside in rural areas, most of them in rainfed areas. Scientific research has revealed a vast untapped potential in rainfed agricluture where crop yields are lower than their potential by two to five folds. A large number of innovative projects and ideas have been tried to address this issue, although documentation has been uneven and fragmented. Drawing upon such experiences, the present handbook points towards new vistas and untapped opportunities in meeting the challenge of enhancing food security with limited water resources and improving the carrying capacities of rainfed areas to match the rapidly increasing population in these regions and elsewhere.

The handbook is presented in four volumes under a common framework. Each volume presents a selection of best practices, articulation of basic principles, and description of strategies that are known to work on the ground.

Volume I describes natural resource based strategies such as watershed development, community forestry, lift irrigation, animal husbandry, wasteland development etc.

Volume II deals with market-led interventions, such as addressing market imperfections, creating market opportunities, and building pro-poor value chains.

Volume III focuses on ICT enabled strategies such as plot specific farm advisories, market intelligence services, inclusive finance, and opportunities like rural BPO in the emerging ICT led service sector.

Volume IV dwells upon the difficult task of building the capacity of rural communities to implement livelihood projects and maintain productive assets. Social capital building is a crosscutting theme for all developmental interventions because it helps empower the people to take charge of their own developmental trajectories.

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Development
Support
Centre

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About DSC

Established in 1994, Development Support Centre provides knowledge based support to community based organizations, non-government organizations and government functionaries. DSC helps in capacity building of key functionaries in rural development, performs hand holding operations in the field, takes initiatives for policy changes, and carries out field studies and research projects related to issues in policy and practice. It directly implements key projects in more than 200 villages in rainfed and irrigated areas across two states i.e. Gujarat and Madhya Pradesh.

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