ACCESS TO KNOWLEDGE

Access to Knowledge in India

New Research on Intellectual Property, Innovation and Development

Edited by Ramesh Subramanian and Lea Shaver

BLOOMSBURY

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Cover image: One of the many havelis in Rajasthan

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Contributors

V. Balaji is the director for technology and knowledge management at the Commonwealth of Learning (COL), Vancouver, Canada. He received his PhD from the University of Madras and an MSc from the Indian Institute of Technology Kanpur (IITK). During 1991–2000, he served as the lead for information and communications technology (ICT) for rural development initiatives at the M. S. Swaminathan Research Foundation at Chennai, India. During 2001–10, he served as the leader for knowledge management at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and was involved in a number of ICT-for-agriculture efforts focused on extension and delivery of services to non-institutional stakeholders in agriculture. During 2008–10, he served as the convenor of a consortium of national and international institutes that promoted a number of innovative platforms, such as the Agropedia, and the application of open web Geographical Information System (GIS) in support of farm-level decisions, in micro-level drought monitoring and in applying contemporary learning technologies in agricultural education.

G. Dileepkumar serves as Global Extension Program Specialist at Iowa State University (ISU). Prior to joining ISU, Dileep worked at several international and national organizations in various capacities. He has seven years experience in implementing research and training projects. He has developed and sustained many innovations in linking research–extension–farmer–markets for agriculture and rural development. Dileep received a PhD in information and communication technology, MS in information technology in agriculture, MS in agricultural entomology and BSc in agriculture. His present work at ISU focuses on promoting innovations in information and knowledge management, ICT for international development and global extension.

Prashant Iyengar is a lawyer and legal scholar based in Bengaluru, India. In 2006, after a brief stint with the technology practice team at a major Indian corporate law firm, he was awarded a year-long fellowship by the Open Society Institute for research in open information policy. Subsequent to his fellowship year, he joined the Alternative Law Forum (ALF) – a research and advocacy NGO in Bengaluru – where he worked mainly on intellectual property advocacy and reform. Chapter 3 was written during the course of his employment with ALF. In 2009–10, he spent a year at Columbia University, New York, earning his master's degree in law – specializing in feminist theory, South Asian history and anthropology. He is currently back in Bengaluru as the lead researcher for a project on privacy at the Center for Internet and Society, Bengaluru.

Arjun Jayadev is an assistant professor of economics at the University of Massachusetts, Boston. His research focuses on the ways in which policy shifts that have occurred globally over the past three decades have affected distributional outcomes (measured in terms of income, wealth and power) and the welfare of the poor. He has published in various academic journals, including *Health Affairs, Journal of Generic Medicines* (with Joseph Stiglitz), *Journal of Development Economics, World Development* and *Cambridge Journal of Economics*, among others.

Dr Sudhir Krishnaswamy is presently a professor of law at Azim Premji University in Bengaluru where he leads a Law, Governance and Development Initiative. He studied law at the National Law School of India University, Bengaluru (BA LLB), and the University of Oxford (BCL and DPhil). He was previously a professor of law at the West Bengal National University of Juridical Sciences (NUJS), Kolkata, India, where he taught constitutional law and jurisprudence. Before NUJS he taught at the National Law School of India University, Bengaluru, and Pembroke College, University of Oxford. He has engaged with the government at various levels, including the Prime Minister's Committee on Infrastructure and the Kasturirangan Committee on Bangalore's Governance. He has published widely in various academic and non-academic journals and newspapers. His book titled *Democracy and Constitutionalism in India* was published by OUP in 2009. His research interests include constitutional law, administrative law, intellectual property law and reform of the legal system, legal profession and legal education in India.

R. Ajith Kumar is the chief program coordinator of agricultural informatics at the Indian Institute of Information Technology and Management, Kerala (IIITM-K). Prior to Joining IIITM-K (1997–2001), he worked with the informatics team group at MONSANTO Research Centre, India, and led the development of several innovative systems for genomic research. He is a recipient of MONSANTO Global Technology Innovation Award (Above and Beyond Award) for the development of outstanding innovative systems in genomic research. Since 2002, he has been working with IIITM-K and is involved in teaching of various courses and coordinating several innovative research projects. His team at IIITM-K has developed several innovative projects in the area of ICT in agriculture. KISSAN-Kerala is one such major project, coordinated by him, that has received several national and international awards and recognitions, including e-India National Award and Stockholm Challenge Global Award. He has also served as a co-principal of the consortium-based project under National Agricultural Innovation Project (NAIP) and coordinated the development of various open web GIS–based decision support systems in agriculture. He has more than twelve years of experience in design and implementation of several information systems projects in the area of agriculture, education and e-governance.

He received his masters in information science, MBA in systems management and advanced training course on information systems from Indian Institute of Science (IISc), Bengaluru. He is pursuing his research in information systems at Cochin University of Science and Technology and has several publications to his credit.

Chan Park is the general counsel to the Medicines Patent Pool in Geneva, Switzerland. Prior to joining the Medicines Patent Pool, he worked at UNITAID to conceptualize and implement the patent pool. Previously, he spent four years in Bengaluru and Delhi, India, working on issues related to intellectual property and access to medicines. As a senior technical and policy adviser at the Lawyers Collective HIV/AIDS Unit in India, he worked on a range of issues surrounding the implementation and interpretation of India's recently introduced pharmaceutical product patent regime. He is also a consultant for various international organizations, including the United Nations Development Programme, World Health Organization and UNITAID, on a range of issues relating to intellectual property and access to medicines. His publications include studies on the application of the 2005 Indian Patents Act, public health impacts of patentability criteria, policy implications of the definition of counterfeits and legal complexities around the definition of new chemical entities. He graduated from University of Pennsylvania and New York University School of Law and practiced as an intellectual property litigator at Wilson Sonsini Goodrich and Rosati law firm in San Francisco.

Dr T. V. Prabhakar is a professor in computer science and engineering at IITK, where he has been teaching since 1986. His major areas of interest are software architecture, semantic web and Indian language technologies. He has been working in the area of ICT in agriculture for the past seven years. His team at IITK has come out with several innovations in recent years, notably automatic tagging, knowledge models for semantic search and appliances for deployment, and has built several platforms like Agropedia for deploying learning objects, open access repositories and social networking, all adopted especially for use in agriculture.

Lea Shaver is an associate professor at Hofstra Law School, where she teaches intellectual property and transnational law. Prior to joining Hofstra, she served as an associate research scholar and lecturer in law at Yale Law School. As a resident fellow of the Information Society Project at Yale Law School, she directed a research program on access to knowledge. As part of this work, she oversaw research on intellectual property and development in seven countries and organized a major conference on the theme of access to knowledge and human rights. Her principal research interests include international intellectual property, law and technology, and human rights. Her work has been published in

Wisconsin Law Review, Wisconsin International Law Journal and *Washington University Global Legal Studies Law Review*, among other academic journals. She is the editor of *Access to Knowledge in Brazil: New Research on Intellectual Property, Innovation and Development* and the co-editor of *Access to Knowledge in Egypt: New Research on Intellectual Property, Innovation and Development*. A partial list of Lea Shaver's published research and works in progress may be found at http://ssrn.com/author=880999.

Ramesh Subramanian is a visiting ISP fellow at the Yale Law School and the Gabriel Ferrucci professor of computer information systems at the School of Business, Quinnipiac University, Connecticut. His current research interests include information systems security, history of technology, ICT4D and technology, law and public policy. His articles in these topics have appeared in the *Journal of Information Systems Security, The European Business Review, Journal of Global Information Technology Management, International Journal of E-Business Research, Information Systems Education Journal* and *Communications of the International Information Management Association*. He has edited *Computer Security, Privacy and Politics: Current Issues, Challenges and Solutions* (2008, IRM Press), *Peer-to-Peer Computing: The Evolution of a Disruptive Technology* (2005, IDEA Group Publishing) and *The Global Flow of Information: Legal, Social and Cultural Perspectives* (2011, NYU Press). He was the recipient of a Fulbright Senior Researcher grant in 2008–9 and studied the effects and consequences of Internet spread in rural India while being based at his host institution, the Indian Institute of Technology, Chennai. He also holds two US patents in the area of peer-to-peer computing.

Dr N. T. Yaduraju took graduate and postgraduate degrees from the University of Agricultural Sciences, Bengaluru, India, and PhD from the Reading University, United Kingdom. He undertook research and teaching in agronomy, weeds and weed management at the Indian Agricultural Research Institute, New Delhi (1976–2000). He served as the director of National Research Centre for Weed Science (NRCWS) at Jabalpur, India (2000–5), where he set up world-class facilities for weed science research and provided leadership at the national level. He has more than 200 research publications and is a fellow of the Indian Society of Weed Science (ISWS) and a recipient of the ISWS Gold Medal. As a national coordinator (2006–10) of National Agricultural Innovation Project (NAIP) – a World Bank–funded project implemented by the Indian Council of Agricultural Research (ICAR) – he promoted and sustained a network of highly reputed and competent professionals in contemporary agricultural information and knowledge management and facilitated the development and implementation of several projects totalling more than US$50 million in monetary support. Currently, he is working at ICRISAT as a special project scientist for ICT for development.

Foreword

Madhavi Sunder

India has long been a global leader in promoting access to knowledge as a human right. The Indian Patent Act of 1970, the first Indian patent law post-independence, self-consciously sought to promote the humanitarian needs of the country's fledgling democracy of hundreds of millions of people and adopted the principle of access to medicines for all. In so doing, India rejected the patent laws that had governed the country during the colonial rule, which required patents for 16 years in all inventions, including pharmaceutical drugs. As Indira Gandhi described the moral grounds of the Indian law to the World Health Assembly in 1981, India envisioned a world where 'medical discoveries would be free of patents and there would be no profiteering from life or death'.[1] The crucial distinction made in the Indian Patent Act of 1970 was to recognize patents in pharmaceutical processes but not products. So long as a company could develop an alternate way of producing a drug, it was legal. In addition, process patents were relatively short – five years from the date of grant or seven years from the date of filing, whichever was earlier – and an automatic 'licence of right' was to be available three years after the grant of the patent. This legal framework, along with government investment into laboratories, allowed Indian pharmaceutical companies to reverse engineer nearly every drug produced by foreign multinational companies. A booming generic drug industry in India ensued. Competition from generics, in turn, drastically lowered drug prices and facilitated access to medicines for the poor – not just in India but also in poor export markets, from Asia to South America to Africa. India became 'the pharmacy of the developing world'. Today, Doctors without Borders estimates that over 80 per cent of the antiretrovirals it prescribes to over 100,000 patients in the developing world are generics made in India. The Indian Patent Act of 1970 was also good economic policy: by 2005, India had the fourth largest pharmaceutical industry in the world, from which it earned US$3 billion annually.

The simple idea underlying India's post-Independence patent law – that minimalist intellectual property (IP) regimes allow developing countries to develop indigenous industry and meet the humanitarian needs of their people – had long been the conventional wisdom. Even the United States followed a similar path during its first 100 years. However, by 1995, with the establishment of the World Trade Organization (WTO), a new orthodoxy was developing, one urging developing countries to ratchet up their IP protections, harmonizing them with Western IP laws in order to secure foreign direct investment and incentivize innovation at home. With the establishment of

the WTO, IP rights were for the first time considered an international trade issue and came to be governed by a new international law, the Agreement on Trade-Related Aspects of Intellectual Property, otherwise known as the TRIPS Agreement. The TRIPS Agreement imposed, for the first time in history, high minimum standards for IP protection that all members of the WTO are required to recognize and enforce, on pain of trade sanctions. In the context of medicines, TRIPS requires all members to recognize patents in all areas of technology, including in processes *and products*, for 20 years (the only exception being for the least developed countries, which have until 2016 to implement patents in drug products if they had no such law in the past). There was little, if any, empirical evidence to back up the developed world's call for a one-size-fits-all approach to IP, and today most commentators agree the developing world was pushed, not pulled, into signing onto TRIPS. The resistance was understandable: TRIPS significantly affected access to knowledge in fundamental ways, from access to essential medicines to many other essential knowledge goods, from the farmers' seed to educational textbooks.

This illuminating book on access to knowledge in India shows how India has remained a global leader in promoting access to knowledge even as global law and policy makes that pursuit so much more difficult. In the pre-TRIPS era, India played a critical leadership role in the WTO advocating for important flexibilities that were incorporated in TRIPS, including the provision that developing and least developed countries be afforded 'transition periods' of a decade or more before needing to fully comply with the Agreement.[2] In 2005, India threw its considerable weight in the World Intellectual Property Organization (WIPO) behind a proposal by Argentina and Brazil and 13 other developing counties calling for the 'mainstreaming [of] the development dimension into all areas of WIPO's work and activities'. India condemned the idea, prevalent in WIPO at the time, that development meant teaching developing countries to enact stronger IP laws. As India stated in a pivotal debate that helped pave the way forward to WIPO's formal adoption of a development agenda two years later, the 'the real "development" imperative is ensuring that the interest of Intellectual Property owners is not secured at the expense of the users of IP, of consumers at large, and of public policy in general'.[3] In 2010, India boldly announced its willingness to grant compulsory licences on patented green technologies and pharmaceutical drugs, stating intellectual property 'is not an end in itself … It must address the developmental challenges in developing countries that are facing acute health and climate change problems'.[4]

In short, when it comes to access to knowledge, all eyes are on India. The chapters herein share the best practices of Indian legislators, activists and jurists working to ensure that IP laws serve human values. Developing countries can gain much in the way of 'technical assistance' by studying the ingenious substantive and procedural provisions of India's post-TRIPS laws, such as its new patent law, which has stricter standards for obtaining pharmaceutical patents than those

adopted by most other countries and patent opposition procedures that may be utilized by generic drug companies as well as by public interest advocates.

But India's contributions go further still. Indian intellectuals challenge and expand our understanding of what we mean by access to knowledge itself. At the first access to knowledge conference held at the Yale Law School in 2006, Lawrence Liang of India's Alternative Law Forum asked why the access to knowledge discourse in the developed world often limited itself to access to medicines – he urged that people around the world, rich and poor, have a right to share in cultural knowledge, from educational texts to music to literature to films, as well. Indian activists such as Vandana Shiva have decried biopiracy where Western corporations steal the knowledge of the developing world for their own private gain. As the contributors to this book suggest, access to knowledge and free culture must also be made on fair terms, without exploiting the poor. This rich volume offers important and diverse perspectives from the Global South on the concept of access to knowledge – a concept which is taken up in all our names but affects each country in its own way.

Notes

1 Indira Gandhi, World Health Assembly, 1981.

2 See generally, George K. Foster, *Opposing Forces in a Revolution in International Patent Protection: The U.S. and India in the Uruguay Round and Its Aftermath*, 3 UCLA J. INT'L L. & FOREIGN AFF. 283, 311 (1998).

3 Statement by India at the Inter-Sessional Intergovernmental Meeting on a Development Agenda for WIPO, 11–13 April 2005.

4 'Intellectual Property Not an End in Itself: India', 24 September 2010. Available at http://news.in.msn.com/international/article.aspx?cp-documentid=4420086 [accessed 7 June 2011].

Preface

Subbiah Arunachalam

The access to knowledge (A2K) movement, in the words of Lawrence Liang, attempts to destabilize the language of exclusive rights and property and to focus on the ideas of responsibility and obligation as part of the ecology of knowledge. Although knowledge is universal, the ecology of knowledge evolves over time and differs from country to country and hence the need to look at A2K from the perspective of different countries. It is for this reason the editors have embarked on this series of books on A2K of which this volume on India is the third. Both the editors are fellows of the Information Society Project at Yale Law School, undoubtedly a premier centre for research and advocacy in the area of A2K.

Often technology races so fast that most people and communities are unable to respond quickly. As Regis Debray, the French revolutionary, had said, 'We are never completely contemporaneous with our present'. Take, for example, the new technologies that help the visually challenged to engage with texts in accessible format and thus give them equal access to the written word. To realize this possibility, countries around the world should agree on standardized copyright exceptions. But not many countries have legislated such exceptions so far, and efforts to find an agreed solution have been fruitless. It is all too common in the pharmaceutical industry, for example, to withhold important new, more potent and less expensive drugs so the company could continue to earn its profits on a drug whose patent is still valid, never mind the hardships felt by poor patients. When Indian companies were ready to produce and market essential drugs at affordable prices, many traditional manufacturers were upset. It is precisely this concern for possible loss of revenue that led a group of publishers of science, technology and medicine journals a few years ago to hire a public relations consultant who advised them to tell blatant falsehoods with a view to stalling the advance of open access.

These are just a few examples of conflicts between elements favouring 'exclusive rights and property' and elements who want to promote 'responsibility and obligation'.

In this volume, Ramesh Subramanian and Lea Shaver have put together six chapters, including one each by them. One might wonder how anyone could cover A2K in India, a vast country with a long tradition of knowledge and culture. Yes, there are gaps, but the editors have achieved their goal admirably well by the judicious choice of topics and experts to write the chapters. The different chapters deal with traditional knowledge, libraries, medicine, technology-enabled rural development and agriculture.

In her introductory chapter, Lea Shaver tells what the book is about, defines access to knowledge, introduces the following chapters, and discusses a proposal for a human rights approach to future jurisprudence on intellectual property through the lens of A2K.

Sudhir Krishnaswamy explores the tension between the push for traditional knowledge protection and A2K in the context of the debates on traditional knowledge policy in India. By a careful survey of the past two decades of Indian domestic policy debates and legal reform, he provides us with sufficient evidence that A2K concerns pervade the traditional knowledge arena. While A2K advocacy resists the expansion of existing property rights, traditional knowledge advocacy attempts to carve out zones where existing property rights will not operate.

Prashant Iyengar examines the public library in India in the context of the A2K movement with justice, economic development and human liberty as the claims forming the nucleus of A2K.

Chan Park and Arjun Jayadev explore the conflict between patent rights and providing access to affordable medicines. They review some of the key developments in India, since the entry into force of the Patents (Amendment) Act of 2005, which introduced product patent protection for pharmaceuticals for the first time since 1972. There have been some notable successes for the access to medicines movement, they say, but can India continue to remain the developing world's pharmacy? They examine some of the key challenges and opportunities that lie ahead for India.

Chapters 5 and 6 look at translating knowledge from lab to land or from experts to grassroots workers. Ramesh Subramanian looks at ICT-enabled rural development and compares two projects in southern India following different implementation and sustainability models, one managed by an NGO and the other by a team led by an IIT professor. In Chapter 6, Ajith Kumar and colleagues address an important area, namely, information and knowledge for agriculture. Starting from the early days of extension services, they trace the history and importance of farming and agriculture in India, the emergence and growth of agricultural extension as a means to provide access to appropriate information to farmers. They discuss the success and failures of agricultural extension as a way to provide A2K to the farming sector in India and suggest possible ways to improve the performance of such extension approaches.

I hope the editors will bring out similar A2K reports on other countries.

Acknowledgements

In 2009, shortly after becoming a visiting fellow at the Yale University's Information Society Project, I was invited to participate in the Internet Service Providers' Access to Knowledge Global Academy Workshop. The workshop was truly enlightening to me. For two days, I came into contact with a global set of researchers and scholars from Argentina, Brazil, Egypt, China, South Africa, Ethiopia, India and the United States. We shared our deep interest and concern on changes wrought on society by information technology. Our discussions focused on international human rights, democracy, access to knowledge (A2K), freedom of expression and individuals' right to privacy. The workshop also celebrated the release of *Access to Knowledge in Brazil* – the first of a series of works focused on intellectual property, law and culture. I was pleasantly surprised and honoured when the series editor, Lea Shaver, contacted me soon thereafter and offered me a role in bringing an Indian instalment to fruition. I gladly accepted and thus started my wonderful collaboration with Lea. I extend my sincere thanks to all the wonderful contributors who patiently responded to our urgent requests, frequent comments and suggestions and demands on their already busy schedules. Without their contributions, there would be no book to speak of.

Ramesh Subramanian

Within the Access to Knowledge Series, this book will always have a special place in my heart as the capstone on three wonderful years spent at the Information Society Project at Yale Law School (ISP). Every scholarly work owes thanks and debts to many supporters. But I am particularly humbled to realize, for this particularly work, how many people must truly be acknowledged as what our torts professors refer to as 'but-for causes'. Without these people, this book truly could not have come about. They include Jonathan Fanton, Elspeth Revere and Kathy Im for their support at the MacArthur Foundation; Jack Balkin, Eddan Katz and Yochai Benkler for their roles in establishing A2K at Yale; Laura DeNardis for her indispensable encouragement and support; Frances Pinter for her vision in founding Bloomsbury Academic as an imprint dedicated to open access; and most importantly, Ramesh for joining me as my co-editor. I am also particularly grateful to Madhavi Sunder and Subbiah Arunachalam for graciously honouring our invitations to write individual foreword in light of the many demands on their time, both personal and professional. Finally, a special thank you is due to all the Yale ISP fellows – and especially to Perry Fetterman – for making this journey such an intellectually exciting and personally rewarding one.

Lea Shaver

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1

Access to Knowledge

From development to human rights

Lea Shaver

The present book is the third in a series of edited volumes featuring original research on the theme of access to knowledge, each title approaching this common subject from the vantage point of a particular country. The idea for this project was born in New Haven, at the Information Society Project at Yale Law School, and specially nurtured by Jack Balkin and Laura DeNardis. With funding from the MacArthur Foundation, a multi-year initiative was launched to stimulate and support original research by scholars from seven countries in the global South. Through a series of meetings and workshops, the participating authors benefitted from and built upon each other's insights. In the process, a view of access to knowledge and its challenges has emerged that is many times richer and more complicated than the initial vision from which we had started.

Prior volumes in the Access to Knowledge series focused on the situations of Brazil and Egypt, respectively.[1] This third volume continues the focus on the unique challenges and opportunities observed in the context of developing countries. *Access to Knowledge in India* features contributions from both well-established and rising scholars. Examining topics ranging from the pharmaceutical industry to the role of libraries, from agricultural innovation to traditional knowledge and rural Internet access, these authors make an important contribution not only to their particular fields of research but also to the emerging body of scholarship on access to knowledge generally. This has ripened into a truly international conversation, as is entirely appropriate given the broad importance of these concerns and the increasing tendency towards their global regulation.

In this introductory chapter, I aim to provide an orientation to the concept of 'access to knowledge' as well as to preview the contributions of the later chapters. This book begins with a basic introduction and then weaves in the insights and arguments of the following chapters. From this endeavour, a picture emerges of access to knowledge as a critical factor in economic growth and also as an aim in its own right through the lens of human development.

In addition to this introductory role, this chapter also aims to develop a particular argument of my own – in favour of a broader role for courts in vindicating access to knowledge concerns. Specifically, I argue that constitutional courts must explicitly acknowledge and work to resolve the tension between socioeconomic rights and intellectual property (IP) law. These tensions are, I suggest, much broader and more systematic than has heretofore been acknowledged. Introducing a human rights analysis can help reform a regulatory system that has been greatly abused and distorted to serve private interests at great cost to public ones.

Such a rights-based review could in theory be pursued by any number of national courts and international organizations. I believe, however, that the unique character of Indian constitutional litigation today – embracing socioeconomic rights and judicial innovation – offers a particularly promising opportunity to develop this type of case law. It is my hope that this book may serve as stimulus for a broader national and international enquiry into the challenge of access to knowledge and the role of the law in helping to meet it.

The access to knowledge perspective

Knowledge can come in many forms, including inventions, ideas and information. In all its forms, knowledge is not merely of intellectual interest. It is also useful in very practical ways. Knowledge can make people healthier, as when new scientific data drives a doctor to recommend a different treatment or when new and more effective medicines are introduced. Knowledge can provide new opportunities, as when communications technology helps a small businessperson or farmer sell his or her goods for a fairer price, or a textbook or website helps a student acquire new and useful skills. Even forms of knowledge that are primarily designed for entertainment – such as music, novels and movies – are part of a shared culture that connects us as a society and adds meaning to our lives.[2]

To a great extent, everything that makes our lives better depends on innovation, ideas and information. Quite often, the law treats such knowledge as the exclusive property of a particular individual or corporation. It gives a single owner the right to prevent anyone else from having access to use and benefit from it, sell goods based on it or improve upon it. This legal right to exclude enables the owner to charge others for access to the knowledge. Often, the price will be very expensive because the right holder can also exclude potential competition. The resulting higher prices are not an accident or unwelcome side effect of intellectual property protection. They are the very point. In theory, these higher prices will motivate greater production of knowledge than would have occurred in a more competitive market.

The access to knowledge perspective asks a simple question that is long overdue in intellectual property law and policy: As innovation progresses, who is able to benefit from it and who is not? What is the role of the law in determining who gets in the door and who is left outside? And might not these barriers to access actually have a negative impact, not only on those individuals who cannot afford the higher prices but also on economic growth and future innovation? It is in its diffusion and application that innovation achieves its social impact. This has an obvious importance for social welfare when we are talking about forms of knowledge that can make us healthier, better educated or more secure. The wide and rapid spread of knowledge also has a very important impact on economic growth. If businesses are slow to gain access to new technologies, ideas and information, this limits their productive potential. From the perspective of the public good, then, wide and rapid diffusion is essential.

But from the perspective of the person holding the intellectual property right, diffusion may or may not be a priority. For some innovations, pursuing rapid diffusion – offering the new product at an affordable price and seeking a large market – will make perfect business sense. For others, the right holder may see an advantage in restricting diffusion, charging a premium to a smaller pool of customers. In certain sectors, the right holder may realize that they can charge exorbitant fees and count on insurers or taxpayers to foot the bill. When this happens, intellectual property protection is in tension with the public interest in diffusion. It then becomes very important to ask whether our intellectual property policy is striking the right balance between business incentives and broader access.

The scholars, activists and policymakers affiliated with the access to knowledge movement are united in large part by their shared conviction that we have not appropriately balanced these concerns.[3] Rather, law and policy have swung far too far in the direction of excessive protection, serving private interests rather than public ones. A restored balance can only be achieved by a greater recognition of and emphasis on the value of access to knowledge. Thus far, the argument for legal reform to promote access to knowledge better has been directed primarily within the framework of development and trade. I suggest that it is time we supplemented this approach with a complementary one: taking seriously the importance of access to knowledge for human rights. This implies also recognizing a role for courts in promoting and defending these rights in the face of misguided intellectual property protectionism.[4]

Pharmaceutical patents and the right to health

Perhaps the most obvious intersection of intellectual property and human rights appears in the context of pharmaceutical patents and the right to health. From the Indian perspective, the tension between patent protection and affordability

of health care is particularly evident. Any discussion of access to knowledge as a human right would do well to start from this point.

In their jointly authored chapter for *Access to Knowledge in India*, Chan Park and Arjun Jayadev examine the impact that newly heightened intellectual property protections have had on India's role as 'the pharmacy of the developing world'. The 2005 Patent (Amendments) Act was enacted to implement India's international obligations under the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). These amendments reintroduced patent protection for pharmaceutical compounds in India for the first time since 1972. The Act also responded, however, to concerns expressed by civil society groups opposed to TRIPS about the impact of pharmaceutical patents on access to medicines.

Park and Jayadev document the unique successes of India's legislature in taking maximum advantage of the optional flexibilities available under the World Trade Organization (WTO) regime. India's implementing legislation set stricter substantive standards for obtaining pharmaceutical patents than those adopted by most other countries. It also enacted a number of new procedural safeguards, including patent opposition procedures, that may be utilized by generic drug companies as well as by public interest advocates.

For pharmaceutical companies, enormous potential profits are at stake in the implementation of these rules; for some patients, life itself may be at stake. Thus, it should come as no surprise that the Patents Act would become the focus of important litigation. According to Park and Jayadev, these cases are establishing 'a unique line of Indian jurisprudence that injects fundamental public health considerations into how patent law should be interpreted'. The Madras High Court upheld the constitutionality of a key statutory limitation on drug patents, noting the government's 'Constitutional obligation of providing good health care to its citizens'.[5] The Delhi High Court refused to grant an interim injunction against the off-brand marketing of a life-saving drug as inconsistent with the constitutional right to life of patients.[6] The Delhi Patent Office, too, has recognized the value to 'give a strict interpretation of patentability criteria, as decision … thereof shall affect the fate of people suffering from HIV/AIDS for want of essential medicine'.[7]

As Park and Jayadev take care to highlight, these cases do not represent the invocation of human rights to directly challenge intellectual property laws. Rather, they treat the right to health as a factor guiding the interpretation and application of the legislature's patent statute. It is thus far from clear that courts would have the stomach to defend the right to health by striking down 'TRIPS-plus' legislation, such as new protections for data exclusivity[8] or by mandating better administrative procedures for the issuance of compulsory licences – an option preserved under the 2005 Amendments but not yet effectively deployed. Meanwhile, a robust consideration for the right to health even in these limited contexts depends on the continued active advocacy of public health organizations. In this process, the authors suggest there is a danger that these

venues subsume the movement's energy for a deeper critique of pharmaceutical patents that is still very much needed. They also point out the instability of this uniquely Indian jurisprudence in the context of a broader, and perhaps unwise, reliance on British patent case law as a source of precedent.

Whatever its limitations, Indian jurisprudence on access to medicines is well ahead of the global curve in explicitly confronting the tension between pharmaceutical patent protection and the right to health. This may be seen by a comparison with jurisprudence in two other countries with sizeable generics industries: Brazil and Egypt. Here, I draw upon chapters contributed to the earlier volumes, *Access to Knowledge in Brazil* and *Access to Knowledge in Brazil*.[9]

Brazilian courts have long recognized a right to medicines as part of the constitutional right to health. So far, however, they have failed to draw a connection between this right and patent jurisprudence.[10] Traditionally, the Brazilian constitutional right to health has been guaranteed by the universal, free provision of medicines through the national health care system.[11] After Brazil introduced pharmaceutical patent protection post-TRIPS, however, drug prices increased dramatically.[12] Increasingly, Brazilian public health agencies have responded by rationing essential medicines, prompting patients to resort to the courts.[13]

For more than a decade, Brazilian courts overwhelmingly ruled on these cases by ordering provision of the medicines, holding that the right to health requires universal access to medicines and cannot yield to bureaucratic cost-savings rationales.[14] The Brazilian case law thus stands in stark contrast to the logic of the South African Constitutional Court in *Soobramoney*.[15] As Guise *et al.* detail, however, this line of jurisprudence may well not be sustainable in an era of much higher drug prices.[16] Recent decisions of Brazil's highest court have upheld some denials of medicines and reflect a struggle over whether to endorse cost-based rationing.[17] The solution, of course, lies in turning judicial attention from review of individual administrative decisions to the larger, structural questions: addressing the problematic patent rules that led to the unaffordable drug prices.[18] The Brazilian courts, however, have yet to follow India's example in this respect.

Egyptian jurisprudence offers a second point of contrast. In *Access to Knowledge in Egypt*, Bahgat and Wright surveyed the courts' recent case law on pharmaceutical patents.[19] Here, too, broad access to affordable medicines has been threatened by rising costs in the wake of TRIPS reforms.[20] Bahgat and Wright conclude that Egyptian courts have been reasonably strong in recognizing the implications of patent law for access to medicines.[21] So far, however, Egypt's courts have been hesitant to invoke explicitly a human rights framework. Bahgat and Wright argue that a rights-based foundation is urgently needed for Egyptian jurisprudence and policy to rise to the task of ensuring access to medicines.[22] Certainly, the future prospects for this jurisprudence will be much influenced by Egypt's current process of constitutional reform.

Education: from libraries to the Internet

Access to knowledge is not only a question of patent law, however. The broader scope of this framework may be highlighted by considering two additional aspects of access to knowledge explored in the forthcoming volume: the role of public libraries and efforts to close India's digital divide.

In a chapter exploring the history and future of India's public libraries, Prashant Iyengar seeks to step back from the access to knowledge movement's predominant preoccupation with intellectual property and communications technologies. If the task of access to knowledge is merely to ensure the widest dissemination of an unproblematic, unquestioned good, then surely the library is its highest symbol. But libraries themselves, Iyengar reminds us, have been the site of political contestation and negotiation over key questions of social justice, economic development and human liberty. Despite their grounding in a democratic ethos, the author argues, public libraries remain 'vigorously controlled sites' where a 'privileged clientele' is permitted to access 'approved' knowledge only. India's readers, of course, seek to satisfy their appetites in less-approved venues as well, giving rise to a thriving market in pirated books. Examining these conflicts in broad historical perspective, Iyengar asks what lessons may be offered for modern ambitions to promote access to knowledge.

Iyengar also contextualizes the public library, as the first in a line of technologies endorsed by the state, as a means for formal education and lifelong learning. The radio and television were each hailed in their time for their revolutionary educational potential. Of course, Iyengar reminds us, each proved 'spectacularly successful as mediums of entertainment' but ultimately failed to achieve its higher minded social goals.

Will this be the fate of the Internet in our own time? Such an outcome is suggested by the case of one market-based rural Internet initiative, detailed in Chapter 5 in this book. TeNeT began with considerable investment and lofty ambitions for advancing rural development through tele-medicine, crop advice and vocational training. Within three years from start-up, more than 3,000 franchises had been sold to kiosk operators. Today, however, the network has collapsed to as few as 100 centres still operating, and many of these at a loss. Video games and email have emerged as the predominant use of the technology, but the kiosks have not been profitable enough to sustain themselves. According to the company's CEO, the missing ingredient is valued content – the application side of the technology.

Not coincidentally, the content side of the equation emerges as a key strength of the more successful case study described in Chapter 5 by Subramanian. This model is the M. S. Swaminathan Research Foundation's Village Knowledge Centre initiative. Although the provision of information and communications technology (ICT) is a central component, the project is self-consciously defined in terms of what distinguishes it from a standard Internet kiosk. This vision

emerged from an earlier effort by the foundation that was focused on the collection, curation and dissemination of traditional knowledge. The Village Knowledge Centre model emphasizes centralized, active collection and editing of ideas and information relevant to the village context and of particular importance for human development. Topics include farming techniques, weather, government news, job and aid opportunities, loans, maternal health and hygiene, and educational accreditation. To disseminate this information to villagers, the programme has developed an infrastructure that emphasizes the human and community aspects as much as the technological. Subramanian reports that the Village Knowledge Centres are widely used, are valued by the community members and particularly benefit women and children.

Juxtaposing the contributions of Subramanian and Iyengar, it is tempting to conclude that the Village Knowledge Centres in fact represent an ideal model for the modern library. To be sure, the book itself has been marginalized here – in favour of the newsletter, radio address and instructional video – in a way many bibliophiles would deem scandalous. This model is responsive, however, to the criticism of Sarah Kamala that public libraries have catered to the recreational reading needs of a small elite, with books largely irrelevant to the lives of rural people, while completely ignoring the illiterate. In its emphasis on locally relevant knowledge, community management and transformative impact on community relations, the Village Knowledge Centre model comes close to the ideal of S. R. Ranganathan, profiled by Iyengar as a pioneer in Indian library science. A 1933 quotation of Ranganathan, highlighted by Iyengar, emerges as both relevant and prescient: 'Who knows that a day may not come … when the dissemination of knowledge, which is the vital function of libraries, will be realized by libraries even by means other than those of the printed book!'

Iyengar also reminds us that the library should be viewed within the broader ecology of access to content. During the golden age of India's public libraries, support and use of the institutions were high because the domestic printing industry was almost non-existent and foreign books were extremely expensive, even by the standards of the middle and upper classes. The comparative neglect of public libraries today may reflect their receding relevance, Iyengar notes, as privately acquiring books has become much more affordable. Towards this end, the author highlights competition among low-cost printers, lax copyright restrictions and a substantial grey market for pirated copies. The last is crucial. In Iyengar's words, 'it is the pirate industry that shows India up as a nation of voracious readers constantly endeavouring, against odds, to educate itself'. While commending the open access movement for lowering copyright barriers to certain materials, the author pushes us to resist the temptation to assume that the material produced and valued by the elite is the material that matters. Abstract notions of development, education and public benefit would do better, he suggests, to reckon with the real force of what people actually want and find useful.

Management of agricultural and traditional knowledge

The strength of the access to knowledge perspective has been in challenging the prevailing paradigm of intellectual property protectionism. Giving producers stronger monopoly control over information-embedded products, these critics note, does not necessarily result in more effective incentives.[23] The framing of access to knowledge highlights the costs of such unnecessary protection to values of inclusion and equity as well as competition and innovation. The access to knowledge paradigm also comes with weaknesses, however. Access to knowledge cannot merely be about eliminating intellectual property barriers, in the assumption that a more competitive marketplace will meet all our needs. Still less can we be content with 'access' in some passive sense of merely consuming already produced knowledge. Rather, our goal should be to empower broad sectors of society to participate not only as consumers of knowledge but also as coproducers. This in turn requires a greater reflection into the ways that knowledge is produced, shared and appropriated in our society.[24] In this vein, two contributions of this volume work to complicate the concept of access to knowledge and situate the true complexity of the task.

Chapter 6 by Kumar *et al*. explores these topics in the context of agricultural knowledge in India. It begins with the observation that despite the special importance of knowledge for improving agricultural yields and the special promise of the Internet as a vehicle for diffusing knowledge, very little relevant digital content exists. On YouTube, for example, how-to videos addressing farming techniques are vastly outnumbered by videos on cooking. Among those universities that have developed channels to share their knowledge in video format, none are agricultural universities. And although an agricultural science portal has been established within Wikipedia to encourage contributions to this field of study, coverage of even basic topics of agricultural science remains sparse and shallow. Conversely, current government efforts to diffuse agricultural knowledge have taken little notice of the potential of new communications technologies and Web 2.0 platforms. According to Kumar *et al.*, e-government and ICT4D initiatives have largely overlooked agriculture as a sector of potential. Formal agricultural extension centres remain the focus of agricultural improvement strategy, even as farmers report they acquire most information from their peers.

The contribution of Sudhir Krishnaswamy examines another type of knowledge management project: efforts to protect Indian traditional knowledge from 'biopiracy'. This goal has been pursued through both defensive and offensive uses of intellectual property law. On the defensive side, public interest advocates have challenged patents taken by foreign corporations based on traditional knowledge. While prevailing in the particular cases, Krishnaswamy suggests that these legal victories have achieved more in publicity than in real impact. Broad, proactive efforts were also organized to document Indian

traditional knowledge in databases and archives, both to preserve it against loss for future generations and to prevent foreign patenting.[25] These defensive efforts sit easily with the perspective of access to knowledge, as their fundamental aim is to keep traditional knowledge in the public domain. In greater tension, however, are the offensive strategies. One such approach is to encourage Indian companies to pre-empt foreign ones by acquiring patents first. Another is the effort to design special legal regimes recognizing a collective property interest in traditional knowledge, which could then be licensed for fees. To Krishnaswamy, modern state regulation of knowledge resources implicates the same troubling dynamics of earlier state management of natural resources. The risk is that the logic of agency self-preservation overwhelms the conservation goal, while vulnerable communities obtain no real benefits. A key difference between management of knowledge and management of forests, of course, is that the former is an infinitely renewable resource. Transforming this resource into property to be bought and sold is not necessary to its conservation and, Krishnaswamy argues, risks an ossification of the very knowledge commons from which it emerged.

These two chapters on traditional knowledge and agricultural expertise highlight a few common pitfalls of innovation policy. One of these is to assume that the challenge of knowledge production can be left solely to markets. As Kumar *et al.*'s examples highlight, markets respond to perceived demand and ability to pay. A passing interest of wealthy American consumers in spicing up their cuisine with South Asian flavours will motivate greater market response than the urgent need of rural farmers to protect subsistence crops from ruinous disease. For this reason, markets systematically fail to deliver knowledge that truly has a transformative potential, an ability to reach the most vulnerable sectors of society and promote equity, rather than reinforce stratification. At the same time, government programs, despite the best of intentions, often fail in their missions. Too often, effectiveness at serving the poor becomes a secondary question, relegated to the background as an agency caters to more powerful unintended constituencies.

The right to science and culture

Taken together, the five chapters described here highlight the complex challenges involved in efforts to promote greater access to knowledge. Whether we look to health or education, agriculture or rural development, traditional knowledge or modern technologies, knowledge makes all the difference. Yet it is not enough to treat innovation in the abstract. Once new knowledge is brought into existence, its social impact will be determined by whether its wide diffusion is encouraged or restricted. Achieving the right balance in intellectual property policy is a

necessary, but not sufficient, element in a broader access to knowledge strategy. It is also important to take account of institutional, societal and market forces that shape the knowledge ecosystem. What is the role of the law in this endeavour? Is law merely the handmaiden of access to knowledge policy, charged with executing the plan once it is properly conceived? Or can legal principles also help to guide our understanding of the problem and our search for solutions?

I suggest that the latter is possible, through the framework of the right to science and culture. This right is recognized in the statement of Article 27 of the Universal Declaration of Human Rights: 'Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits.'[26] In an earlier article, I offered a framework for understanding this little-studied and still-less-applied provision.[27] The text makes sense, I suggest, only when we appreciate that the treatment of media content and technological discoveries as market commodities is not inevitable but, in fact, highly political. Law and policy have a profound impact on whether inventions, ideas and information goods will be widely accessible or made artificially scarce. The right to science and culture is therefore best understood as expressing a commitment to preserve these varied forms of knowledge as a global public good. This commitment is grounded not only in a commitment to equality and inclusion but also on a recognition of the special character of knowledge as a resource that increases, rather than becomes depleted, the more widely it is shared. The purpose of this right is fundamentally at odds with the current direction of international intellectual property law, which pushes for ever greater privatization of knowledge.

Confronting this trend from the framework of the right to science and culture would have several advantages. Structurally, it provides a new legal foothold from which to push for sensible intellectual property reform. Courts and policy makers can 'stand on' human rights mandates in interpreting existing intellectual property treaty obligations and in opposing new ones. Rhetorically, it repositions the debate from one of mere national self-interest whereby each country seeks to obtain trade terms most favourable to its industries. It allows proponents of access and competition to take the moral high ground and focus attention on the public as beneficiaries of access and as rights claimants. Neither of these advantages is present in a framework that conceives of access to knowledge solely in terms of human development or economic growth. Recognition of the right to science and culture can go hand in hand with arguments based on other human rights, such as the rights to health, education and food. Its unique contribution, however, is to point the law away from a strategy of merely attempting to carve out limited exceptions to intellectual property protectionism in areas of special concern, such as pharmaceutical patents, to the need for broader, more fundamental legal reform. The framework of the right to science and culture may also help correct some of the rhetorical limits of the access to knowledge framework. The recognition of a right to

participate in cultural life (rather than merely consume copyrighted works) and to share in *the process* of scientific advancement (as well as in its benefits) emphasizes a more active role for individuals in the knowledge commons than might be presumed from the phrase 'access to knowledge'.

Conclusion: a role for the courts

To be sure, realizing the right to science and culture is not a simple task. Government policy in the areas of education, culture, Internet governance, rural electrification, research and development, technological standards setting and procurement all have roles to play. It is no simple matter to determine the best approach, from a policy perspective, or to specify when a government's failure to take access into account rises to the level of a violation of the right.

In certain contexts, however, the jurisprudential questions are simpler. This is particularly true where government action itself is a prominent barrier to enjoyment of the right, which judicial review can correct. This is the case, for instance, when intellectual property laws operate to impede wider access to new technologies or cultural content. Such laws should be treated as limitations on the right to science and culture – and other relevant rights such as health, education or food – and be carefully scrutinized. Not every limitation will necessarily constitute a violation of the right. Recognition that human rights are at stake, however, can serve to bring greater attention to countervailing public interests in the process of interpreting and applying intellectual property law.

Whether and how the right to science and culture may be actionable in India's courts is a question best taken up by Indian jurists. The lead has already been taken, however, in the context of pharmaceutical patents and the right to health. With care and time, this may yet evolve into a broader rights-based approach capable of guiding national and international efforts on access to knowledge in a more positive direction.

Notes

Portions of this chapter are adapted from earlier essays of the author: "Intellectual Property and Social Justice: An Invitation," published by New York Law School Law Review in 2011 and "Special Comment: Access to Knowledge in India" published by National Law School of India Review, also in 2011.

1 Nagla Rizk & Lea Shaver (eds), *Access to Knowledge in Egypt: New Research on Intellectual Property, Innovation and Development* (London: Bloomsbury Academic, 2010); Lea Shaver (ed.), *Access to Knowledge in Brazil: New Research on Intellectual Property, Innovation and Development* (London: Bloomsbury Academic, 2010).

2 See Lea Shaver & Caterina Sganga, 'The Right to Take Part in Cultural Life: On Copyright and Human Rights', *Wisconsin International Law Journal*, 27 (2010), p. 634. Available at http://ssrn.com/abstract=1437319 [accessed 2 May 2011].

3 See generally, Amy Kapcyznski & Gaëlle Krikorian, 'Access to Knowledge in the Age of Intellectual Property', 2010. Available at http://mitpress.mit.edu/books/full_pdfs/Access_to_Knowledge_in_the_Age_of_Intellectual_Property.pdf [accessed 2 May 2011]; Amy Kapcyznski, 'The Access to Knowledge Mobilization and the New Politics of Intellectual Property', *The Yale Law Journal*, 117 (2008), pp. 804–85. Available at http://www.yalelawjournal.org/images/pdfs/642.pdf [accessed 2 May 2011].

4 I have also developed these arguments in a recent article: Lea Shaver, 'The Right to Science and Culture', *Wisconsin Law Review*, 2010 (2009), pp. 121–84. Available at http://ssrn.com/abstract=1354788 [accessed 2 May 2011].

5 *Novartis v Union of India* (2007) 4 MLJ 1153, ¶ 19.

6 *Roche v Cipla*, I.A. 642/2008 IN CS (OS) 89/2008, ¶ 85.

7 *INP*+18 *v Boehringer Ingelheim*.

8 The term 'TRIPS-plus' refers to intellectual property protections that go above and beyond the requirements imposed by the Agreement on Trade-Related Aspects of Intellectual Property Rights. Data-exclusivity rights are one example. These would prevent generic companies from relying on existing clinical trial data to prove safety and effectiveness when introducing generic versions of existing drugs. The intended effect of data-exclusivity rights would be to give pharmaceutical companies a long period of legally enforced market exclusivity, even in the absence of a valid patent.

9 See Note 1.

10 See Monica Steffen Guise Rosina, Daniel Wei Liang Wang and Thana Cristina de Campos, 'Access to Medicines: Pharmaceutical Patents and the Right to Health', in Lea Shaver (ed.), *Access to Knowledge in Brazil: New Research on Intellectual Property, Innovation and Development* (London: Bloomsbury Academic, 2010), pp. 103–34. Available at http://leashaver.net/books/.

11 Guise *et al.*, 'Access to Medicines', pp. 105–6.

12 Guise *et al.*, 'Access to Medicines', pp. 113–15. TRIPS refers to the Agreement on Trade-Related Aspects of Intellectual Property, administered by the World Trade Organization.

13 Guise *et al.*, 'Access to Medicines', pp. 107–13.

14 Guise *et al.*, 'Access to Medicines', pp. 107–10.

15 *Soobramoney v. Minister of Health, Kwa-Zulu Natal*, 1997 (12) BCLR 1696 (CC) (emphasizing the reasonability of cost-benefit judgements in allocating limited health care resources and holding that the right to health and right to life did not entitle a chronically ill patient to publicly funded treatment that would have prolonged his life).

16 Guise *et al.*, 'Access to Medicines', pp. 110–13; Rizk & Shaver, *Access to Knowledge in Egypt*; Shaver, *Access to Knowledge in Brazil*.

17 Guise *et al.*, 'Access to Medicines', pp. 110–11.

18 See Guise *et al.*, 'Access to Medicines', pp. 126–7.

19 Hossam Bahgat & Rebecca Wright, 'Access to Medicines in Egypt: A Human Rights Approach to IP, Trade and Health', in N. Rizk & L. Shaver (eds), *Access to Knowledge in Egypt: New Research on Intellectual Property, Innovation and Development* (London: Bloomsbury Academic, 2010), 56–91. Available at http://leashaver.net/books/.

20 Bahgat & Wright, 'Access to Medicines in Egypt', pp. 57, 64–76.

21 Bahgat & Wright, 'Access to Medicines in Egypt', pp. 56–62.

22 Bahgat & Wright, 'Access to Medicines in Egypt', pp. 57, 80–85.

23 See Eric E. Johnson, 'Intellectual Property's Great Fallacy', SSRN Working Paper Series, 23 January 2011. Available at http://ssrn.com/abstract=1746343 [accessed 2 May 2011].

24 A foundational work on these questions is Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (New Haven, CT: Yale University Press, 2006). Available at http://cyber.law.harvard.edu/wealth_of_networks/Main_Page [accessed 2 May 2011].

25 Under US patent law, applicants may claim a technology or technique as a new and patentable 'invention', even where it is already widely known and used in another country, so long as it is newly introduced to the United States. 35 U.S.C. § 102(a)–(b). Description of the technology or technique in a printed publication, however, will prevent patentability in the United States, no matter where in the world the publication was made. Benkler, *The Wealth of Networks*.

26 Universal Declaration of Human Rights, G.A. Res. 217A, Art. 27, U.N. GAOR, 3d Sess., 1st plen. mtg., U.N. Doc. A/810 (Dec. 10, 1948).

27 Shaver, 'The Right to Science and Culture'.

2

Access to Knowledge and Traditional Knowledge Protection

The Indian experience

Sudhir Krishnaswamy

A key objective of the access to knowledge (hereafter 'A2K') movement is to liberate knowledge and culture goods from restrictive legal rules or market structures that result in inequitable distribution. Two types of arguments are advanced in support of this objective: first, philosophical arguments about the requirements of distributive justice and, second, aesthetic arguments about the nature of creativity and freedom that sustains knowledge and culture. Movements to protect and preserve traditional knowledge are often at odds with this central objective of the A2K movement as they push for restrictions on transfer and use of traditional knowledge and culture. They argue that categories like the 'public domain' and 'access to knowledge' are not adequately sensitive to the cultural and ethical settings in which traditional knowledge is created, preserved and regenerated as well as the political economy of knowledge transfers. These arguments may be described as the 'culture' and the 'politics' arguments, respectively. If these arguments are right, then the likelihood that traditional knowledge movements may participate in, and be inspired by, the A2K movement is limited or remote. In this chapter, I analytically review the development of traditional knowledge law and policy in India over the past two decades to show that these debates must critically inform and inflect the evolution of the A2K movement. While the goals of protecting traditional knowledge and enhancing access may seem irretrievably at odds, it is possible to align the culture and politics arguments for protecting traditional knowledge with a revised account of distributive justice and aesthetic freedoms that support the A2K movement.

In the academic literature on the protection of traditional knowledge, there are three types of arguments about the creation of new property regimes to protect traditional knowledge. Some argue that a new property right to protect traditional knowledge or culture is normatively or practically unsustainable.[1] Others argue that new property rights in traditional knowledge, even if possible, may be undesirable in the light of our commitments to promote

greater access to knowledge and culture. Two versions of this argument are made: first, by those who seek to advance 'the development of pragmatic, cost effective solutions to the problem of cultural appropriation'[2] and, second, by those who are unable to reconcile their precommitment to expanding the commons or the public domain with the institution of new property regimes in the field of knowledge and culture.[3] A third strand argues that property rights in traditional knowledge are imperative to remedy past wrongs and set right present-day inequitable distributions. Early contributors to this strand argued for *sui generis* property rights analogous to intellectual property rights,[4] while more recent contributions recommend a modified bundle of property-type entitlements by which to protect cultural heritage.[5]

The tension between the public domain and the protection of traditional knowledge has been explored in various writings.[6] More recently, Amy Kapczynski's analysis of the framing of the A2K movement recognizes that the A2K discourse revolves around a common opposition to Intellectual Property Law's excesses and hence to 'the extent that groups concerned with farmers' rights and traditional knowledge draw upon anti-technological discourses, this creates obvious possibilities for conflict with those advocates of free and open source software who see in new digital technologies a revolution in the making'.[7] While some tensions arise from the differential role that technology plays in these varied fields, the core concern is with the normative foundations of political mobilization and the proper place of property and the public domain in these fields.[8] Correa proposes that a reconciliation between the two movements is possible if 'the majority of the actors in the A2K movement do not seek the abolition of all forms of intellectual property rights, but the proper balance between public and private interests'.[9]

In this chapter, I explore the tension between the push for traditional knowledge protection and the A2K movement against the background of debates on traditional knowledge policy in India. A careful survey of the past three decades of Indian domestic policy debates and legal reform gives us significant evidence with which to assess the various legal strategies and political motivations that animate the traditional knowledge arena. I argue that the most successful policy strategy for the protection of traditional knowledge that is sensitive to both political and cultural arguments is one that fundamentally challenges the intellectual property framework. The key distinction between A2K advocacy and traditional knowledge advocacy is that while the former is pushing back against the expansion of existing property rights, the latter is carving out zones where conventional property rights regimes will not operate. To that extent, both groups seek to build a robust public domain; however, the legal character of the public domain is being reconfigured by the new traditional knowledge regimes.

This review of the defensive and offensive strategies in traditional knowledge protection in India suggests that the critics of the A2K movement misunderstand

the interaction between the culture and politics arguments as it applies to the traditional knowledge context. The defensive strategies of patent opposition and archiving have largely failed to prevent the misappropriation of traditional knowledge. However, the introduction of a new Section 3(p) in the Patents Act, 1970, which adopts a public domain strategy, despite its restricted operation in the Indian domestic jurisdiction, may well have the most significant impact on misappropriation of traditional knowledge and may well provide the format in which international treaty making may proceed. The introduction of geographical indication (GI) and plant varieties legislation has not yet yielded tangible socioeconomic benefits to identified beneficiaries. This is not merely because of faulty design of specific laws and policies but is a result of the institutional arrangements that develop around new property entitlements. While adopting a national perspective to the creation of new property rights may suggest a benefit to developing countries, any evaluation of the distributive impacts at a sub-national level indicates that the most significant beneficiaries are the economically well-off sections, including traders, manufacturers and state agencies. Hence, I conclude that institutionalizing new property entitlements in the field of traditional knowledge will not yield the intended results. Traditional knowledge protection advocacy should then shift attention to the contours of the public domain that best satisfies the political and cultural arguments that provide the strongest justification for such protection.

In 'The Emergence of Traditional Knowledge Policy' section, I briefly outline the emergence of traditional knowledge protection concerns in Indian domestic policy and identify the key defensive and offensive strategies for the protection of traditional knowledge. I then examine in 'Proposals for a Traditional Knowledge Legislation' section the proposals for an omnibus traditional knowledge legal instrument at national and international levels. While India abandoned the omnibus approach, the World Intellectual Property Organization (WIPO) has persisted with the creation of an international instrument on traditional knowledge and culture. In the 'Defensive Approaches to Traditional Knowledge Protection' section, I examine the impact of defensive strategies adopted against the misappropriation of traditional knowledge. These include patent oppositions against patents on traditional knowledge, the development of archives to be used as prior art in patent examination and the recent amendments to the patent law to treat traditional knowledge as a non-patentable subject matter. I examine offensive strategies to benefit from intellectual property in the 'Offensive Approaches to Traditional Knowledge Protection' section. These include the efforts of bodies such as the Council of Scientific and Industrial Research (CSIR), National Innovation Foundation (NIF) and others to transform traditional knowledge into patentable inventions, the use of the Geographical Indications Act, 2005, and the Protection of Plant Variety and Farmers' Rights Act, 2001, to protect traditional knowledge and deliver commercial benefits to traditional knowledge holders.

The emergence of traditional knowledge policy

The current concern with traditional knowledge policy in India may be traced back to the early 1980s, when activists and intellectuals alleged that India's biodiversity and cultural heritage was being misappropriated by multinational pharmaceutical businesses. Patents granted on products derivative of the neem, turmeric and basmati plants were the visible targets of the misappropriation charge. As these protests gained momentum and various antiglobalization groups joined in, the government was compelled to come up with a strategy to combat 'biopiracy'.[10]

The Indian biopiracy debates brought patents in particular, and intellectual property more generally, to the forefront of everyday public concern. Both the English and Indian-language press relentlessly covered the emerging stories and personalities, thereby framing the terms of national policy debates in this area of law. The intellectual property debate came to be framed around three problems. First, at the level of the nation state, biopiracy was seen to be a form of neocolonialism that rode on the back of the Trade-Related Aspects of Intellectual Property (TRIPs) Agreement, which India as a post-colonial country should reject. Second, it was perceived to be a property problem – where the failure to recognize the entitlements over traditional knowledge and culture had to be remedied by the creation of a new property regime over this field of knowledge. Third, it was understood to be an ecological and developmental problem that required renewed efforts at conservation and revitalization of this knowledge and the community of practitioners by granting public recognition and conferring economic rewards. Invariably, the participants sought to resolve one or more of these problems by their public policy prescriptions. Often the inherent conflicts or inconsistencies in any policy initiative that sought to achieve a combination of these objectives were ignored in the rapid push forward to advance solutions to the growing public disquiet on these issues. Further, there was no extensive empirical investigation into the likely economic, social or cultural benefits of a traditional knowledge policy that responded to any of these problems. Participants in these debates advanced creative solutions that drew on their analysis of the problem of traditional knowledge protection and urged the state to back their favoured solution. Two proposals secured significant support: first, to file patent oppositions in the EU and US patent offices and to have these patents declared invalid and, second, to enact a domestic law protecting traditional knowledge.[11]

The use of patent opposition procedures to protect the public domain was first initiated in the field of traditional knowledge protection. The Centre for Scientific and Industrial Research, a research institution of the Ministry of Science and Technology, Government of India, successfully challenged the turmeric and basmati patents. These were revoked and partially modified, respectively, by the United States Patent and Trademark Office (USPTO). Similarly, the patent granted on some characteristics of the neem plant was

revoked by the European Patent office after opposition on the grounds that these properties were known in India. This opposition was filed by non-governmental actors, namely, Dr Vandana Shiva, Director of the Delhi-based Research Foundation for Science, Technology and Ecology, Ms Magda Aelvoet of the Green Group in European Parliament and Ms Linda Bullard of the International Federation of Organic Agriculture Movements. They were assisted by Dr Fritz Dolder of the Faculty of Law in the University of Basel. The successful opposition proceedings against neem, basmati and turmeric patents did not have significant direct economic impact either by securing an export market or by ensuring freedom of operation for Indian companies or farmers in these countries. Hence, it is safe to conclude that the impact of these opposition proceedings was primarily symbolic as they conveyed the seriousness with which misappropriation of traditional knowledge was viewed in India.

Despite this initial success, opposition proceedings did not emerge as a significant strategy in the protection of traditional knowledge against misappropriation. The filing and granting of patents on what may be considered traditional knowledge continues unabated. A preliminary patent search carried out on an important anti-diabetic formulation in classical Ayurveda texts reveals that not less than forty recent patents have been granted by the USPTO.[12] If the 'misappropriation' of traditional knowledge continues unabated, then why have patent oppositions not been filed? While filing patent oppositions has developed into an important strategy in resisting drug, and more recently software, patents in India, the same is not true for traditional knowledge patents. The primary reason is that the patents on traditional knowledge are granted in the European Union, United States and Japan. An opposition strategy in these jurisdictions is too expensive to be pursued by the Government of India or non-governmental agencies. Second, some of the recent patents granted on traditional knowledge–based patents may be significant improvements or technological modifications of the existing knowledge, thereby avoiding the rules of anticipation in patent law. Third, it may be that the government was no longer concerned with opposing patents on traditional knowledge per se but only with who owned these patents. Therefore, by promoting a domestic patenting strategy where Indian researchers filed patents using traditional knowledge the government's primary concern was addressed. Fourth, the government was keen to develop archives and databases of traditional knowledge that could be used by patent offices worldwide to deny patents misappropriating traditional knowledge carte blanche rather than opposing them on a case-by-case basis.

The move away from patent opposition did not diminish policy initiatives in the field of traditional knowledge protection. Instead the Indian approach multiplied along diverse strategies that sought to achieve varied policy objectives[13]: equity considerations, conservation concerns, the preservation of traditional practices and culture, the prevention of appropriation by unauthorized parties of components of traditional knowledge and promotion

of its use and its importance in development. Given the diversity of these policy objectives, the 'protection' of traditional knowledge often requires the offensive use of Intellectual Property Law to secure the full scope of property rights protection; at other times, protection requires the defensive use of Intellectual Property Law to ensure that others may not misappropriate traditional knowledge. Where neither of these approaches is successful, advocates protecting traditional knowledge have proposed *sui generis* forms of protection. The Indian policy approach to traditional knowledge has developed along these trajectories. In the following section, I first explore the push for *sui generis* protection and in the subsequent sections turn to the defensive and offensive approach to traditional knowledge protection

Proposals for a traditional knowledge legislation

In this section, I will briefly consider the initiative to develop a *sui generis* traditional knowledge law in India and more recently at WIPO. In the mid 1990s, there was a rush to develop a new omnibus legal and policy framework to protect traditional knowledge.[14] The efforts of different nodal ministries resulted in several drafts of domestic legislation. Two domestic proposals received considerable attention. Mr Pravin Anand, a leading Intellectual Property Law advocate in India, proposed a model where perpetual but limited rights could be granted for community-based traditional knowledge. Licences to use this knowledge could be granted on the payment of a small fee to a collective rights management society that would administer the right to reproduce the knowledge and prevent distortion and harmful use. The second model mooted by Prof. N. S. Gopalakrishnan[15] involved an exclusive group right to manage all forms of traditional knowledge, folk science and technology. While this proposal does not elaborate the scope and content of the right, it does suggest that traditional knowledge holders shall have the right to restrain the commercial misappropriation of traditional knowledge through collective management trusts. The proposals present a striking contrast: while the former seeks to create a new property right with the right to exclude, the latter seeks to confer a limited right to restrain certain forms of commercial exploitation.

As neither of these legislative proposals is publicly available, these brief summaries are all I have to work with. Both proposals received critical attention at the ministerial level, but there has been no public process of deliberation or consultation and no progress on the legislative effort at the ministerial or parliamentary level. As several years have passed since these early debates, it now seems that this path of legislative development in domestic law is closed. The tepid conclusion of the domestic debate has now been eclipsed by the rapid developments in international forums.

Traditional knowledge protection has been on the agenda of several international institutions for over five decades. Various international forums have engaged with this agenda and generated legal instruments with differing legal status. The World Intellectual Property Organization–United Nations Educational, Scientific and Cultural Organization Model Law on Folklore (1989) is the first instrument to set out general principles to prevent the illicit exploitation of folklore in the context of intellectual property protection and culture. The International Labour Organization's Indigenous and Tribal People's Convention 169 (1989), while recognizing the unique claims of indigenous people within independent countries to their land and culture, identifies the need to incorporate their knowledge, technologies and value systems into the educational system.[16] The focus of international concern then shifted from culture to genetic resources (GRs) with the introduction of the concept of 'farmers' rights' in the Food and Agricultural Organization's International Undertaking on Plant Genetic Resources (1992) and the requirement of approval of traditional knowledge holders with equitable sharing of benefits before their wider application in Article 8(j) in the Convention on Biological Diversity (1992). The United Nations Declaration on the Right of Indigenous People (2007) goes further and mandates that states must provide redress through effective mechanisms for cultural, intellectual, religious and spiritual property taken without free, prior and informed consent. The varied levels of protection to diverse groups of people under different international legal instruments prompted the establishment of an Inter-governmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore (hereafter IGC) by WIPO to work towards an international legal instrument to ensure effective protection of traditional knowledge, traditional cultural expressions (TCEs) and genetic resources.

In the past decade, there has been an intense international effort to engage and transform existing institutions and to develop new policy frameworks that respond to A2K concerns. The relationship between A2K advocacy and the development of traditional knowledge treaty instruments at WIPO presents us with some insights into the influence of these discourses on each other. The Geneva Declaration on the Future of WIPO, 2004, was the product of an intense diplomatic effort by several NGOs over several months. The declaration observes that 'humanity faces a global crisis in the governance of knowledge, technology and culture'[17] and directs 'WIPO … to enable its members to understand the real economic and social consequences of excessive intellectual property protections, and the importance of striking a balance between the public domain and competition on the one hand, and the realm of property rights on the other'.[18] The declaration makes no mention of the traditional knowledge issue and does not prescribe any institutional or normative approach to this problem. The WIPO Development Agenda adopted by the WIPO General Assembly in 2007 after several rounds of negotiations

does respond to traditional knowledge by stressing an institutional response to these concerns. Item 16 of the 45 Adopted Recommendations under the WIPO Development Agenda stresses the need to 'consider the preservation of the public domain within WIPO's normative processes and deepen the analysis of the implications and benefits of a rich and accessible public domain'[19] in the norm-setting processes at WIPO. Item 18 goes further and urges the Inter-Governmental Committee on Traditional Knowledge at WIPO to 'to accelerate the process on the protection of genetic resources, traditional knowledge and folklore, without prejudice to any outcome, including the possible development of an international instrument or instruments'.[20] There is no acknowledgement of the possible tension between sustaining a rich public domain and creating a new traditional knowledge treaty regime. The draft A2K treaty[21] proposed by civil society groups recognizes 'the need to overcome disparities in wealth, development, and access to knowledge resources' and expresses a concern 'about private misappropriation of social and public knowledge resources'.[22] However, these concerns do not translate into substantive provisions that protect traditional knowledge. For example, the concern with misappropriation of traditional knowledge does not translate into an exclusion of traditional knowledge–derived patents in Article 4(1), which sets out an otherwise long list of exclusions of patentable subject matter. This cursory survey of the A2K discourse suggests that there is little appreciation of the conceptual and political linkages between the demand for a robust public domain and the urge to protect traditional knowledge.

Simultaneously, over the past decade, there has been an effort to develop a new international framework on traditional knowledge through the IGC process at WIPO.[23] The General Assembly has invested the Inter-Governmental Committee at WIPO with the responsibility to develop an international framework on traditional knowledge and TCEs. The early work of the IGC is best captured by the introduction of the Second Draft of the Policy Issues and Options paper which notes that

> Actual experience with TCEs/EoF protection has shown that it is unlikely that any single 'one-size-fits-all' or 'universal' international template will be found to protect TCEs comprehensively in a manner that suits the national priorities, legal and cultural environment, and needs of traditional communities in all countries. Forms of traditional creative expression and customary means of regulating their use, transmission, protection and preservation are diverse. Concerns have been expressed that attempts to codify and institutionalize protection of 'cultural identity' are undesirable and that a flexible and inclusive approach is preferable.[24]

However, the adoption of the Development Agenda at WIPO led to a renewed mandate to the IGC to 'submit to the 2011 General Assembly the text (or texts) of an international legal instrument (or instruments) which will ensure the effective protection of GRs, TK and TCEs. The General Assembly in 2011 will decide on convening a Diplomatic Conference'.[25] This renewed focus on

creating new international norms to protect traditional knowledge has yielded significant progress. At the conclusion of the 17th session, the secretariat has published three documents that present in advanced form legal protection for TCEs,[26] traditional knowledge[27] and genetic resources.[28] Though I cannot review these documents in detail in this chapter, they anticipate significant problems in reconciling traditional knowledge protection with existing intellectual property protection and sustaining a robust public domain. In this debate, the participants have switched hats: Japan and the United States warn against denuding the public domain, while India and Brazil push for stronger protections. There is no doubt that the IGC process has worked with renewed vigour due to the effort of the A2K movement to approve the Development Agenda at the WIPO General Assembly. However, there are strains between the proposals at the IGC and the core commitments of the A2K movement to promote unhindered access to culture and knowledge.

As discussed in this section, WIPO has persisted with an omnibus approach to traditional knowledge protection in order to develop an international convention to address all policy concerns in this area. In India, this omnibus approach has now fragmented in an attempt to achieve similar policy objectives through amendments to several existing laws and by developing new legislation in some fields. I will now turn to these initiatives in the next section.

Defensive approaches to traditional knowledge protection

A defensive approach to traditional knowledge protection seeks to ensure that the use and exploitation of traditional knowledge does not take place without the consent of the holders of this knowledge. A further objective would be to ensure that no intellectual property rights are created over traditional knowledge as this facilitates its misappropriation. The main focus of the defensive approach has been the problem of biopiracy of genetic resources and associated knowledge. As a result, the legal strategy has evolved around patent law reform and the creation of registers, databases and archives to prevent misappropriation and formulation of rules of access and benefit sharing. I will look to each of these in turn and assess their efficacy as a defensive strategy.

Patent law reform

The Patents Act, 1970, was amended in 2002 to introduce provisions that secured a defensive protection of traditional knowledge. Section 3 of the Patents Act, 1970, defines the scope of patentable subject matter. Section 3(p) was introduced, which provided that an invention that is 'in effect, traditional knowledge, or which is an aggregation or duplication of known properties of

traditionally known component or components'[29] is not an invention within the meaning of the Act. This exclusion of patentable subject matter is broad and relatively indeterminate in its scope. There is no definition of traditional knowledge in the Act or in any other domestic legislation. The courts will have to decide whether this phrase refers only to published materials or to knowledge that may be preserved in oral or pictorial traditions. Further, the courts will need to determine the number of years that knowledge must exist in order for it to be described as 'traditional'. Even if these preliminary interpretive problems were resolved, the court would have to go further to determine whether the bar in Section 3(p) is absolute, thereby rendering any invention that relies on traditional knowledge to be non-patentable, or relative, so that inventions that use traditional knowledge but nevertheless display a level of creativity and inventiveness would escape the bar. A third concern for the court to resolve is to effectively determine the level of inventiveness while comparing the different epistemological foundations of traditional knowledge and the knowledge format in which the patent application is made. In some ways, the court will have to mould the scope and effect of Section 3(p) in the manner in which Section 3(d) is presently being shaped by the courts.[30]

Sections 25(1)(k) and 25(2)(k) provide for any party to file oppositions to a patent application prior to grant of the patent on the grounds that 'the invention … is anticipated having regard to the knowledge oral or otherwise, available within any local or indigenous community in India or elsewhere.[31] Section 64(1)(q) provides that any person interested or the Central Government may file an application to revoke a patent that has already been granted on the same grounds. On a plain reading of these sections, it is unclear whether they seek to prevent the misappropriation of the 'traditional knowledge' sought to be excluded by Section 3(p) from patentability or deals with a different body of knowledge. This is particularly confusing as the definition of traditional knowledge adopted in academic literature more closely resembles that used in Sections 25 and 64.

The only material difference between the phrasing of the two sections is that Section 3(p) bars those inventions that are *in effect* traditional knowledge, while Sections 25 and 64 refer to inventions that are *anticipated* by traditional knowledge. Hence, it may be useful to reconcile the two provisions by concluding that Section 3(p) only bars such inventions that make no creative or transformative use of traditional knowledge. Sections 25 and 64 go further and modify the non-obviousness limb of patent examination by requiring that the rules of anticipation accommodate these forms of knowledge that were previously neglected in patent law analysis.

It is too early to assess the effect of the amendments to the patent law on the misappropriation of traditional knowledge. There has been no empirical research conducted on the number of applications refused on the grounds of

Section 3(p) or the number of opposition or revocation proceedings on the new anticipation rules regarding traditional knowledge. There have been too few reported cases where these issues have been agitated before the Intellectual Property Appellate Board or the High Courts and Supreme Court. Hence, this section concludes by noting that these strong defensive provisions in the amended Patents Act have the potential significantly to prevent misappropriation if there is sufficient awareness in the Patent Office and a body of interested business and civil society actors who will challenge such patents using the opposition and revocation proceedings.

Creating traditional knowledge archives

The creation of archives for the preservation of cultural artefacts and other cultural products has a history dating back to the days of colonial exploration and discovery. Independent India persisted with similar policies of maintaining archives and museums all over the country to showcase its historical and cultural inheritance.[32] The 1980s brought a new policy impetus to the task of creating archives. The preservation and conservation of traditional knowledge and its associated biodiversity came to be recognized as an ecological and economic imperative in the face of rapid deterioration of the habitats and livelihoods of the affected communities and the knowledge base sustained in these environments. For example, the breakdown in the social systems of patronage and the inter-generational transfer of knowledge has led to irreversible loss of un-codified folk medicinal knowledge.[33] The ecological concern for preserving biodiversity has driven the conservation agenda to the forefront of environmental movements all over the world. With increased attention to the beneficial use of biodiversity resources by local communities and new evidence of its misappropriation, the conservation agenda was extended to serve as a policy instrument against the appropriation of traditional knowledge.

There have been several initiatives to document traditional knowledge in India. The National Mission on Manuscripts under the Ministry of Culture has developed a bibliographic database of manuscripts over seventy-five years of age with aesthetic, intellectual or medical features that merit preservation. Further, they seek to digitize select manuscript collections to aid their preservation. While the National Mission on Manuscripts did not initially set out to act against misappropriation of traditional knowledge, it eventually had to contend with this possibility arising out of the database it developed. The Traditional Knowledge Digital Library (TKDL) supported by the Ministry of Science and Technology and the Ministry for Indian Systems of Medicine developed a database in which codified texts of Indian systems of medicine were translated into Western pharmacological categories so that these databases act as a prior art in the patent search process. These databases were set up primarily to conserve knowledge and to prevent

misappropriation of traditional knowledge. In addition such databases may catalyze research into traditional knowledge by domestic research scientists. The NIF database developed by the Honey Bee Network and the Farmers Rights Information System developed by the M. S. Swaminathan Research Foundation (MSSRF) are prominent examples of informal civil society-led centralized databases of traditional knowledge innovation and agricultural practices. The Navadanya initiative of the Research Foundation for Science Technology and Ecology invites farmers to assert their sovereignty over seeds and voluntarily pledge them to a centralized repository that will maintain these seeds in trust. These databases were set up to incubate and record local innovation that may be developed into products or commodities capable of formal intellectual property protection. A third form of database is the local community-controlled traditional knowledge database. The development of biodiversity databases at the village level by the National Biodiversity Authority acting under the Biological Diversity Act, 2002, is an example of a statutory mechanism for the creation of local storehouses of biodiversity and archives of local practices. The Foundation for the Revitalization of Local Health Traditions (hereafter FRLHT) has created Community Knowledge Registers (CKR) to document local health practices in order to revitalize these traditions by promoting their vigorous practice. A secondary objective for these registers is that they may serve as prior art in patent examinations. Third, the register may serve as the foundation for research and development in the field of traditional medicine and advance the frontiers of human knowledge in these fields.

As is obvious from the above account, the databases of traditional knowledge are varied in their objectives, their approach to conservation and the institutional arrangements. While some databases store physical embodiments of traditional knowledge, such as seeds and manuscripts, others maintain digital copies or digital stores of translated and enhanced traditional knowledge. Second, while some databases are designed as centralized repositories at the regional or national level, a large number of databases are local community controlled. Third, statutory backing is available for biodiversity-related databases, but the vast majority of databases are accumulated through private law mechanisms of voluntary pledges and gifts. Finally, while some databases are established and maintained by state agencies – at the central, state or local government levels – a majority of databases are maintained by private non-governmental civil society organizations or local collectives that may not have any particular legal form and identity.

With this diversity of features, it is difficult to characterize accurately the impact of this activity on the ownership and control of traditional knowledge in India. While an in-depth empirical study of all these various initiatives is beyond the scope of this chapter, I have carried out empirical work at two of these institutions, namely, the National Mission on Manuscripts and the

Foundation for Revitalization of Local Health Traditions. My analysis of the legal and policy concerns regarding A2K in these two initiatives is organized in two parts[34]: first, I will examine the issues relating to the access to traditional knowledge. Then I will assess the legal status of the database and its legal impact on intellectual property rights.

Accessing traditional knowledge

The traditional knowledge sought to be incorporated into an archive or database may be of three types. First, the knowledge may be in the public domain and readily accessible through written texts or commonly available information. Second, the knowledge may be available in existing public libraries and archives and access to this knowledge may be secured through inter-departmental communication. Third, the knowledge may be owned or possessed by private parties individually or collectively. It is access to the third type of knowledge that gives rise to serious policy concerns.

Statutes such as the Biological Diversity Act, 2002, police the access to genetic materials and put in place a regulatory framework to ensure that ethical considerations are incorporated into access protocols. In the absence of a general legal framework for access to other forms of traditional knowledge, this is regulated by the general law of contract and by the law of bailment, where materials are transferred in the absence of written contracts. Several statutes do not restrict access to traditional knowledge but provide for consequences arising out of such access. The Protection of Plant Varieties and Farmers Rights Act, 2001, does not regulate access to traditional knowledge but puts in process a method by which concerned individuals and groups may claim the right to benefit sharing from such registrations. The Patents Act, 1970, similarly provides that the source and origin of biological material used in an invention must be mentioned in the specification.

From the discussion above, it is clear that database creation in India has not adopted a nuanced legal position attentive to the legal and ethical principles that should apply in such cases. While the ordinary legal rules relating to pledges, bailment or gift will apply to the tangible property transferred in such cases, it is difficult to ascertain the legal status of the intangible property transferred to create these databases without a careful assessment of the facts and circumstances of the particular transfers. In any event, there has been concerted policy development to identify and respond to these key concerns at a national level.

Legal status of the archive/database

I may begin by paying some attention to the use of the term ‘registers’ to describe the databases created by FRLHT. Most often registers are documents maintained by the state that confer legal rights on the persons whose names

are included in the register. For example, we have an elaborate system of land registrations that operates as a primary evidence of a person's claim over land. The Plant Variety Register is another example of a register that confers rights to persons whose claims over a variety have been recognized. Databases, however, are a mere collection of data whereby information from diverse sources is collated and organized in a systematic fashion. They confer no legal interest on the persons whose names are entered and may be protected to some extent by Indian copyright laws.[35]

Presently, the creation of 'registers' and databases of traditional medicinal knowledge is not covered under any specific legislation. The Plant Biodiversity Registers made under the Rules 12(13) and 22(8) of the Biological Diversity Rules, 2004, are registers that record 'local biological resources, their medicinal or any other use and any other traditional knowledge associated with them'. While the rules provide for the method and manner of collection of such information and its custodianship, they are silent on the intangible property rights that may arise from such a register. To that extent the CKR, which contains information that forms a subset of the information contained in a People's Biodiversity Register (PBR), enjoys a similar legal status to that of the PBR as far as the protection of intangible knowledge is concerned. While it is argued that both these registers in effect transfer traditional knowledge from the private domain into the public domain, this legal consequence is expressly denied by institutional actors in the field.

While the CKR is termed a 'register', it is for all legal purposes a database of folk medicinal knowledge and practices. The primary objective of the CKR database is to contribute to the conservation and revitalization of the local health traditions and traditional medicinal knowledge. This objective is well served by the elaborate database format and validation process developed by FRLHT and implemented with the assistance of civil society organizations on the ground. The secondary objective of the CKR database is to operate as prior art in the patent examination process. For this objective to be met, the database must be accessible and intelligible to a person 'skilled in the arts' who is responsible for examining patent applications. In its present form, the CKR database does not adequately achieve this objective.

In the case of CKRs, the database is in the local language and preserved in the handwritten form in the custody of the local authority. These measures are designed to hinder the circulation of the database and avoid the threat that the database facilitates misappropriation of the traditional folk medicinal knowledge. However, these features of the CKR database prevent it from being treated as prior art in the patent examination sense. Hence, the CKR database may adopt only one defensive intellectual property strategy: either it may be prior art in the patent examination process for which it will need to be published in the appropriate form and made available to the patent examiners or it has limited circulation and does not facilitate exploitation. It seems that

the CKR initiative has opted for the latter position. This may well be the appropriate choice given that the TKDL database and other databases that were meant to serve as prior art have yet effectively to achieve that objective. In these circumstances, it is appropriate for the CKR database to perform its primary function of conservation and revitalization of traditional medicine and secure protection against misappropriation by getting suitable changes to the legislative framework in India.

In order to appreciate the need to clarify the status of traditional knowledge databases in India, it is useful to examine the approach adopted in Peru.[36] The collective knowledge of indigenous peoples may be entered in three types of registers. First, the Public National Register, which documents knowledge in the public domain and is open to all third parties. Second, the Confidential National Register, which contains knowledge in the private domain that may not be consulted by third parties. Any person may apply to get his or her knowledge registered in either of these two registers, and a federal agency called National Institute for the Defense of Competition and the Protection of Intellectual Property (INDECOPI) maintains them and regulates access. Third, local registers, which are organized by indigenous groups in accordance with their practice and customs. These registers are under the custodianship of the local community and governed by the customary laws and traditions of the community. Peruvian law clearly distinguishes between the database and the register, thereby granting legal certainty to this area of practice.

Hence, there is an urgent need to modify the database initiatives in India to assess seriously whether some traditional knowledge is private knowledge that is presently not available in the public domain. Hence, the register must distinguish between public and private domain knowledge and further distinguish between secret knowledge in the hands of communities. It is not enough to ensure that accessing this knowledge requires full prior informed consent. All exchanges of information from the collection to the publication stage should be bound by confidentiality obligations borne by the person recording the information and subsequently the custodian of the database. By maintaining the legal confidentiality of this information, the database agency will not prejudice future claims of the holder/owners of traditional knowledge to commercially benefit from their knowledge. It is necessary to go beyond the present framework adopted in the Biological Diversity Act, 2002, where Sections 19 and 20 seek to protect the transfer of knowledge and any biological resource outside the country but leave unregulated the commercial utilization of a resource within the country. The compulsory public domain strategy adopted under this legislation is seen to be necessary to achieve this objective. Instead India may choose to introduce new legislation, and amend existing legislation, in line with the Peruvian model where three databases with varied legal regimes are created that reflect the varied concerns of different stakeholders.

Second, it is necessary to bring about policy and legislative reform that accord to databases the legal status of 'registers' of traditional knowledge. By conferring on the database this legal protection, the register may become prima facie evidence of a person's claim over the knowledge and thereby assist challenges to patents and other misappropriations of traditional knowledge. The Biological Diversity Act, 2002, has provided for the creation of biodiversity registers but does not provide for a legal status for the entries recorded in such registers. The enactment of a Traditional Knowledge Registers Act provides for a legal status for the registers in one of two ways: first, the register may be given the status of a declarative register that recognizes that rights over traditional medicinal knowledge derive from ancestral rights rather than any acts of government. Such a register recognizes the rights that belong to traditional knowledge holders by inclusion in the register. Second, the register may be given the status of a constitutive register that puts the public on notice of the property rights over traditional medicinal knowledge enjoyed by its present holders.[37] The creation of such a registration framework would require the adoption of due process rules that allow applicants to be given a full opportunity to register their claims and further apply rules of priority and innovation to allow the settlement of disputes between the applicants. A legislative framework that puts in place such a registration regime would mirror the Geographical Indications Registry to a certain extent. The registration process should adopt the classification methodology used in Indian Systems of Medicine as developed by FRLHT in its documentation process for the CKR.

In this section, I have reviewed two defensive strategies adopted in India for the protection of traditional knowledge. I am unable to ascertain the impact of Section 3(p)'s exclusion of traditional knowledge from patentable subject matter as inadequate data is available at this point in time. I also argue that the failure to develop a legal framework to govern the various database initiatives has resulted in serious legal and ethical problems related to the process of creation as well as their ability to operate as prior art in the patent examination process.

Offensive approaches to traditional knowledge protection

In the previous section, I reviewed defensive approaches to traditional knowledge protection. In this section, I turn to policy initiatives that seek to develop property rights in traditional knowledge by facilitating individuals and communities acting in their own interest to secure conventional intellectual property protection or a suitably designed *sui generis* property regime. Such policies attempt to accommodate traditional knowledge within existing legal formats or, if that proves too difficult, to modify the knowledge suitably to ensure that property protection is possible. In India, two offensive strategies have developed in the

past decade: first, the emphasis on state-led patenting of traditional knowledge and, second, the state-led registration of GRs. I will look to each of these in turn.

By focusing on communities and individuals who operate out of the spotlight of urban intellectual property lawyers, organizations such as Sristi and the National Innovation Foundation (NIF) attempt to secure to innovators the fruits of intellectual property protection and venture capital funding and nurture enterprises to scale. Further the intensive patenting efforts of the Central Scientific and Industrial Research Labs use traditional knowledge as the base for further research and innovation, and this has led to the grant of several patents to scientists from these institutions.

Such an approach supposes the problem not to be with a property regime per se but only with who the beneficiaries of such a regime are and the terms and conditions under which one secures legal protection. Therefore, it is assumed that if the Indian state or other civil society actors were to develop facilitating structures that allow previously excluded peoples to access these property regimes, the market would take care of the rest. Ironically, the role of intermediaries, like the Traditional Knowledge Digital Library (TKDL) and the Foundation for Revitalization of Local Health Traditions, in generating databases of traditional knowledge or *ex situ* and *in situ* conservation sites for biodiversity, whether motivated by developmental or ecological concerns, may have inadvertently obviated the possibility of protection under existing patent rules.

The Trade-Related Intellectual Property Rights Agreement, 1994, recognized the right of members to protect 'indications which identify a good as originating in the territory of a Member, or a region or locality in that territory, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin'.[38] Though the protection of GIs has no necessary link to the protection of traditional knowledge, the Geographical Indications Act, 2002, was enacted in India to prevent the misappropriation and use of well-known product names such as Darjeeling tea and basmati rice and as a means to protect products that had developed in regional niches nurtured by local communities over the years.[39] However, recent developments in GI registration suggest that the creation of a new property right has unleashed varied interests that are not necessarily aligned with the objectives behind the Act.

As of 8 February 2011, 149 GIs have been registered, of which only four applications are from foreign countries. There are two key ingredients in a GI application: the applicant and the authorized user. The applicant is usually a collective of producers or any organization representing its interests. An authorized user is a producer or marketing company who registers themselves at the GI registry on the satisfaction of the standards set down by the authority. In a majority of applications before the GI registry, the applicant is a state department or a state agency.[40] Hence, it appears that the state stands in for the community, and one may claim that traditional knowledge is protected under the GI Law only if we conflate the community's interests with those of the state. The capacity

of the state to act as a neutral guide to local producers enabling them move up the value chain in other spheres of economic activity in India is seriously doubted. Further, the state's capacity to act as a custodian of natural or cultural resources has been modest. In this context, the grant of several GIs to the state as an attempt to protect traditional knowledge is symptomatic of the neo-colonialist state-centric discourse that traditional knowledge debates in India are trapped in.

In order for a GI Law to have significant welfare effects, one needs to ensure significant levels of collective action across the supply chain maintaining high levels of trust, which requires a fine balance between competition and cooperation.[41] The presence of the state as the applicant and proprietor of the GI will create a more complex set of incentives in this sector. In any event, the formation of a club of producers who determine the production standards to be set out in the specification of the GI inevitably includes or excludes certain parties. In the case of the Feni GI, the debate is between cashew feni distillers, who are included, and coconut feni distillers, who are excluded.[42] Similar issues arise with the inclusion of power loom weavers, together with handloom weavers in the case of the Pochampalli Silks GI.

In this section, I have examined whether offensive strategies for traditional knowledge protection have yielded significant economic or developmental benefits in India. The aggressive patent strategy may have assuaged national pride by enhancing CSIR's patent ranking internationally, but this initiative has not yielded any significant rewards. The NIF has made incremental progress as an incubator of some traditional knowledge-based innovations, but they are yet to produce a high-impact, national-scale innovation product. The GI Law has been monopolized by state or quasi-state agencies, which have secured the overwhelming majority of registrations under the law. Moreover, the process of formulating specifications in these applications may well end up excluding the most marginalized producers in the production chain, thereby denying them any potential benefits. Even among authorized users, significant efforts are necessary to ensure that the self-governance structures evolved by users, whether trusts, associations or societies, which manage the GI, function in a democratic and accountable fashion and with a great deal of legal ingenuity and insight into the political economy of communal creations.[43]

Conclusion

The debate on traditional knowledge protection in India broadly mirrors the multi-dimensional character of the debate on the regulation of information, knowledge and cultural resources.[44] However, the Indian policy debate on the protection of traditional knowledge has excessively characterized the problem to be an extension of colonialism, where wealthy Western nations

and multinational companies are seen to be expropriating 'our' indigenous knowledge for immense profit. The moral panic around neem, basmati and turmeric, among others, bears testimony to this view. The biopiracy agitators fail to interrogate the nationalist premise on which this argument stands. Is the threat of biopiracy merely one that comes from without? Would we be content if it were established that Indian pharmaceutical companies exploited this knowledge? The strong nationalist posture adopted obscures the effect of policies, which ostensibly protect national cultural resources but effectively transfer control over such resources to an elite state bureaucracy.

The creation of new property interests in traditional knowledge coupled with the aggressive patenting strategy adopted by CSIR and other government labs have to a certain extent conveyed the ownership over traditional knowledge to these state entities or to employees of these institutions. The number of filings of GIs by state agencies such as Handloom Promotion Corporations and Agricultural Export Promotion Agencies will result in quasi-governmental agencies claiming intangible property rights over a wide range of traditional knowledge products, ranging from seeds to handicrafts. Thus the effective nationalization of traditional knowledge would rival the nineteenth and twentieth century transfers of natural resources, such as forests to the hands of the colonial forest department. Gadgil and Guha have explored the scale and perversion of this expropriation whereby state bureaucrats developed into a breed of rent-seekers over forest lands, to the exclusion of tribal communities.[45] The enactment of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, is a belated recognition of the failure of state regulation of forests to the exclusion of its original inhabitants and an attempt to correct this historical wrong. There is little evidence to suggest that the state bureaucracies constituted by the recently enacted Biological Diversity Act of 2002 will conduct themselves any differently. Second, art historians remind us of the role of active borrowing (read copying!) in the creation of weaving and art traditions such as ikat, as well as the influence of political movements such as Vinoba Bhave's Bhoodan movement on the aesthetic practices of the Pochampalli silk weavers. By freezing this tradition within an intellectual property format, we hinder this rich process of creativity enabled by a culture of sharing and borrowing. Hence, a property strategy threatens to ossify cultural creativity and starve the commons on which such knowledge is built.

The defensive strategies adopted, so far as they have relied on the aggressive protection of the public domain by refusing to grant property rights over traditional knowledge, may well ensure that no further misappropriation of traditional knowledge takes place while its continued use and revitalization may proceed unhindered. The use of effectively designed databases and archives as prior art may contribute to this defensive strategy and provide the knowledge foundations for the sustenance and renewal of these traditions.

This assessment of the historical evolution of traditional knowledge policy in India suggests that it is unnecessary to assume that access to knowledge and

traditional knowledge policy are irreconcilable. A careful review of the policy experience in India suggests that this opposition is neither necessary nor evident in the Indian experience. The review, in the sections above, of an intellectual property–based strategy for the protection of traditional knowledge has not effectively redistributed the benefits to the holders and practitioners of traditional knowledge. Further, it does not directly revitalize or resurrect the cultural practices that create traditional knowledge and may even hinder them. This chapter explains the nature and circumstances of this failure in Indian traditional knowledge policy. These conclusions invite a critical enquiry into the normative basis for the claim that the solution to traditional knowledge protection is more intellectual property, and I hope to focus on this issue in my future work.

Notes

1 Stephen R. Munzer & Kal Raustiala, 'The Uneasy Case for Intellectual Property Rights in Traditional Knowledge', *Cardozo Arts and Entertainment Law Journal*, 27 (2009), pp. 37–97; J. Chen, 'There's No Such Thing as Biopiracy … and It's a Good Thing Too', *McGeorge Law Review*, 36 (2005), pp. 1–32.

2 M. F. Brown, 'Culture, Property and Peoplehood: A Comment on Carpenter, Katyal, and Riley's "In Defense of Property"', *International Journal of Cultural Property*, 17 (2010), pp. 569–79.

3 Richard Stallman, 'Biopiracy or Bioprivateering'. Available at http://stallman.org/articles/biopiracy.html (accessed 9 June 2011).

4 N. S. Gopalakrishnan, 'Protection of Traditional knowledge – Need for a Sui Generis Law in India', *The Journal of World Intellectual Property*, 5(5) (2002), pp. 725–42; S. Ghosh, 'Globalization, Patents, and Traditional Knowledge', *Columbia Journal of Asian Law*, 17 (2003), pp. 73–120.

5 K. A. Carpenter, Sonia Katyal and Angela Riley, 'In Defense of Property', *Yale Law Journal*, 118 (2009), pp. 1022–125.

6 M. Sunder & A. Chander, 'The Romance of the Public Domain, *California Law Review*, 92 (2004), pp. 1331–73; Doris Estelle Long, 'Traditional Knowledge and the Fight for the Public Domain', *John Marshall Review of Intellectual Property Law*, 5 (2006), p. 317.

7 A. Kapczynski, 'The Access to Knowledge Mobilization and the New Politics of Intellectual Property', *Yale Law Journal*, 117 (2008), pp. 803–4.

8 Carlos M. Correa, 'Access to Knowledge: The Case of Indigenous and Traditional Knowledge' in G. Krikorian & A. Kapcynzski (eds), *Access to Knowledge in the Age of Intellectual Property* (New York: Zone Books, 2010).

9 Correa, 'Access to Knowledge', p. 247.

10 Pat Mooney coined the term. For the initial use of the term in Indian discourse, see V. Shiva, *Biopiracy: The Plunder of Nature and Knowledge* (Cambridge, MA: South End Press, 1997).

11 For a useful discussion on the effect of IPRs on holders of traditional knowledge, see G. Dutfield, *IPRs, Trade and Biodiversity* (London: Earthscan, 2002), pp. 61–71.

12 These are the results of a study carried out by the author in collaboration with the Foundation for Revitalization of Local Health Traditions, Bangalore.

13 C. Correa, *TK and Intellectual Property* (Geneva: UNQO 2001).

14 Suman Sahai, 'Indigenous Knowledge and Its Protection in India' in C. Bellman, G. Dutfield & R. Melendez-Ortiz (eds), *Trading in Knowledge: Development Perspectives on TRIPS, Trade and Sustainability* (London: Earthscan, 2003), pp. 184–9.

15 Gopalakrishnan, 'Protection of Traditional knowledge'.

16 See Article 13.

17 Available at http://www.cptech.org/ip/wipo/genevadeclaration.html (accessed 13 June 2009).

18 Available at http://www.cptech.org/ip/wipo/genevadeclaration.html (accessed 13 June 2009).

19 WIPO Development Agenda 2007. Available at http://www.wipo.int/ip-development/en/agenda/recommendations.html (accessed 14 June 2011).

20 WIPO Development Agenda 2007. Available at http://www.wipo.int/ip-development/en/agenda/recommendations.html (accessed 14 June 2011).

21 Available at http://www.cptech.org/a2k/a2k_treaty_may9.pdf (accessed 3 May 2011).

22 Preamble to the Draft A2K Treaty. Available at http://www.cptech.org/a2k/a2k_treaty_may9.pdf (accessed 3 May 2011).

23 For a recent history of reform efforts at WIPO and WTO, see G. Dutfield, *Intellectual Property Rights and the Life Sciences Industries* (London: Ashgate, 2003), pp. 218–28.

24 WIPO/GRTKF/IC/4/1.

25 Agenda Item 28, 'WIPO General Assembly Thirty-Eighth (19th Ordinary) Session 22 September to 1 October 2009'. Available at http://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_15/wipo_grtkf_ic_15_ref_decision_28.pdf (accessed 3 May 2011).

26 'The Protection of Traditional Cultural Expressions/Expressions of Folklore: Revised Objectives and Principles'. Available at http://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_17/wipo_grtkf_ic_17_4.pdf (accessed 3 May 2011).

27 'The Protection of Traditional Knowledge: Revised Objectives and Principles'. Available at http://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_17/wipo_grtkf_ic_17_5.pdf (accessed 3 May 2011).

28 'Genetic Resources: Revised List of Options and Factual Update'. Available at http://www.wipo.int/edocs/mdocs/tk/en/wipo_grtkf_ic_17/wipo_grtkf_ic_17_6.pdf (accessed 3 May 2011).

29 Section 3(p) Patents Act, 1970.

30 *Novartis AG v Union of India* (2007) *Madras Law Journal*, 4, p. 1153; *F. Hoffmann-La Roche Ltd. v Cipla Limited* (2008) *Delhi Law Times*, 37, Patents and Trademarks Cases 71 (Delhi High Court).

31 *Glochem Industries v Cadila Healthcare*, Writ Petition No. 1605 of 2009, High Court of Bombay. Available at http://www.indiankanoon.org/doc/499132/ (accessed 3 May 2010).

32 Mahua Chakrabarti, *Museums of India: A Journey through the Age* (Germany: VDM Verlag Dr Müller, 2010).

33 D. Shankar & P. M. Unnikrishnan, *Challenging the Indian Medical Heritage* (Delhi: Foundation Books, 2004), pp. 10–12.

34 For a broad overview, see Emily Hudson, 'Cultural Institutions, Law and Indigenous Knowledge: A Legal Primer on the Management of Australian Indigenous Collections', Melbourne Law School Legal Studies Research Paper No. 201, January 2007. Available at http://ssrn.com/abstract=955977 (accessed 3 May 2011).

35 For a historical and conceptual analysis of registration in land law, see Alain Pottage, 'The Originality of Registration', *Oxford Journal of Legal Studies*, 15(371) (1995), pp. 388–93.

36 Law Introducing a Protection Regime for the Collective Knowledge of Indigenous People Derived from Biological Resources 2002.

37 UNU-IAS Report, *The Role of Registers in Databases in the Protection of Traditional Knowledge* (2004). Available at http://www.ias.unu.edu/binaries/UNUIAS_TKRegistersReport.pdf (accessed 9 June 2011).

38 Article 22.1, TRIPs Agreement, 1994.

39 Claude Garcia, Delphine Marie Vivien, C. P. Gracy, G. Devagiri & C. G. Kushalappa, 'Geographical Indications Associated Crops and Biodiversity in the Western Ghats'. Available at http://www.mnhn.fr/colloque/localiserlesproduits/17_%20Paper_GARCIA_C.pdf (accessed 3 May 2011).

40 Delphine Marie Vivien, 'The Role of the State in the Protection of Geographical Indications: From Disengagement in France/Europe to Significant Involvement in India', *The Journal of World Intellectual Property*, 13(2) (2010), pp. 121–47.

41 D. Rangnekar, *The Socio-Economics of Geographical Indications: A Review of Empirical Evidence from Europe*, ICTSD-UNCTAD Intellectual Property Rights and Sustainable Development Issue Paper No 8. Available at http://www.iprsonline.org/unctadictsd/docs/CS_Rangnekar2.pdf (accessed 9 June 2011).

42 D. Rangnekar, *Geographical Indications and Localization: A Case Study of Feni*, CSGR Report University of Warwick, 2009. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1564624& (accessed 3 May 2011).

43 For a more optimistic view on the role of GIs in development, see N. S. Gopalakrishnan, Prabha S. Nair & Aravind K. Babu, 'Exploring the Relationship between Geographical Indications and Traditional Knowledge: An Analysis of the Legal Tools for the Protection of Geographical Indications in Asia', ICTSD-UNCTAD Intellectual Property Rights and Sustainable Development Working Paper August 2007. Available at http://www.measwatch.org/autopage/file/MonMarch2009-14-28-16-GIandTKGopalakrishnan.pdf (accessed 13 June 2011).

44 Susan K. Sell & Christopher May, *Intellectual Property Rights: A Critical History* (New Delhi: Viva Books, 2008).

45 Madhav Gadgil & R. Guha, *This Fissured Land: An Ecological History of India* (Delhi: Oxford University Press, 1992).

3

Public Libraries and Access to Knowledge (A2K)

A history of open access (OA) and the Internet in India in the nineteenth and twentieth centuries*

Prashant Iyengar

Introduction

This sounds rather formidable, but if someone wants a special book, he merely goes to the librarian in his own local free library and asks for it. The librarian looks at his catalogue and if the book is not available gives the reader a form to fill in. The form is forwarded to the regional bureau where it is checked with all catalogues of all the libraries in the region. If it is held in stock it is forwarded by post. If it is not in the region, the request is sent on to the National Central Library. There it is checked with all other regions, and if the books is [*sic*] in any library in England which lends books, it is forwarded to the library asking for it. The only charge to the borrower is the postage.
Langton Gould-Marks, 'Public Libraries in England', 22 June 1947[1]

The user enters the web address for Technofriends (www.technofriends.in) in the browser's address bar. The browser then contacts the local nameserver and asks for the IP address of the webserver. If the local nameserver has this information in its cache, it passes this on to the client browser. If not, it sends back the reference to the Root DNS Servers. The client browser then gets in touch with the ROOT DNS Server and asks for the IP address of www.technofriends.in. The Root DNS server, then gives back a reference for .in DNS servers. The client then gets in touch with the .IN DNS servers for the IP of www.technofriends.in. The .IN Server then returns a reference to the name server of TECHNOFRIENDS.IN. Client then contacts the TECHNOFRIENDS.IN nameserver to get the IP of www.technofriends.in. The TECHNOFRIENDS.IN nameserver returns the IP Address of www.technofriends.in. Client browser then connects to the IP Address and gets the content.
'How Does DNS Work', Technofriends[2]

*The chapter title is adapted from Lawrence Liang's (forthcoming), 'A Brief History of the Internet from the 15th to the 18th Century'.

At the start of the first Yale Access to Knowledge Conference in April 2006, Professor Jack Balkin articulated three elements of what the 'access to knowledge' (A2K) movement stood for. First, *A2K was a demand of justice*. Second, it was *both an issue of economic development and an issue of individual participation and human liberty*, and last, *A2K was about intellectual property (IP), but it was also about far more than that*.[3] Leaving aside, momentarily, the first two points of Prof. Balkin's nuanced analysis, I take that he even considered it important to state his third point expressly as a telling indication of the extent to which the daily drama of IP has come to dominate the modern-day A2K movement. Like the term 'Y2K'[4] in its time, A2K has come to bear an irresistibly new-age, techno-savvy allure. Various A2K enterprises – 'open source', 'open access' (OA), 'open medicine' and so on – have as their primary object the circumvention of rigid IP regimes, often with the aid of Information and Communications Technology (ICT). To that extent, the discussion of any 'knowledge' activity that does not primarily involve a major IP or ICT twist – libraries, for instance – appears almost unfashionable in A2K circles. It's *so* twentieth century.

This 'narrow' conception of A2K inherits the concept of 'knowledge' uncritically, as if it were a settled 'good' (in both senses), and sets up its problem as one of simply improving the distribution of knowledge. The prescriptions of the modern A2K movement seem to be reducible to two components – OA and ICT. Written from this perspective, one could imagine an A2K study on Indian libraries as observing the following template: (1) an introductory lament on the state of disrepair of Indian libraries; (2) statistics that animate this state of lack and the role that high prices of books have to play; (3) the importation of already articulated international principles of OA; (4) the invocation of studies that highlight, internationally, the economic gains and savings from a combination of OA and ICT, especially for developing countries; and concluding finally with (5) policy prescriptions, possibly a word thrown in relating to the progress already achieved on the path to open accessing everything. The point I am making here is that A2K is not just a movement, but it is also a distinctive genre of writing. Fidelity to this genre would mean that this study would contribute nothing substantially to the concept of A2K and would merely occupy its predestined space as a case study confirming a global trend towards OA.

In this chapter, I attempt to write against the current of this genre. I examine the public library in India with a view to seeing what account of the A2K movement can emerge at the end of such a study of Indian libraries. Such an enquiry views the library as the site of the negotiation of various claims – including justice, economic development and human liberty as in Prof. Balkin's conception – and focuses attention on these claims as forming the nucleus of A2K. If libraries are the answer (and even if they are not), then one needs to ask what the questions have been. And who's asking?

A glimpse into the nearly two-century-long history of the Indian library movement (discussed in 'History of the Library Movement in India' section) reveals

Table 3.1 India – key demographics

Population[a]	Persons	1,028,737,436		
	Males	532,223,090		
	Females	496,514,346		
	Rural–urban distribution[b]			
	Rural	72.2%		
	Urban	27.8%		
Literacy rate[c]		Persons	Males	Females
	Total	64.8%	75.3%	53.7%
	Rural	58.7%	70.7%	46.1%
	Urban	79.9%	86.3%	72.9%
	Mobile phone users	827 million (April 2011)		
	Internet users	42,000,000[e] (September 2008)		
	Graduates	48.7 million (2005)[f]		

[a] 'Census Data 2001: India at a Glance: Population', Census of India – Office of the Registrar General and Census Commissioner, India, 10 May 2009. Available at http://www.censusindia.gov.in/Census_Data_2001/India_at_glance/popu1.aspx [accessed 3 May 2011].

[b] 'Census Data 2001: India at a Glance: Rural-Urban Distribution', Census of India – Office of the Registrar General and Census Commissioner, India, 10 May 2009. Available at http://www.censusindia.gov.in/Census_Data_2001/India_at_glance/rural.aspx [accessed 3 May 2011].

[c] 'Census Data 2001: India at a Glance: Number of Literates & Literacy Rates', Census of India – Office of the Registrar General and Census Commissioner, India, 10 May 2009. Available at http://censusindia.gov.in/Census_Data_2001/India_at_glance/literates1.aspx [accessed 3 May 2011]. Literacy, for census purposes, is defined as the ability to read and write with understanding in any language. 'A person who can merely read but cannot write is not classified as literate. Any formal education or minimum educational standard is not necessary to be considered literate'. K. Ramamoorthy, *Literacy in the Context of Constitution of India*. Ministry of Law, Justice and Company Affairs, 2002. 10 May 2009. Available at http://lawmin.nic.in/ncrwc/finalreport/v2b1-5.htm [accessed 3 May 2011].

[d] Anon, 2011. TRAI: Press Release: Highlights of Telecom Subscription Data. Available at: http://www.trai.gov.in/WriteReadData/trai/upload/PressReleases/827/Press_Release_15_April-11.pdf [Accessed June 20, 2011].

[e] 'Internet and Mobile Association of India'. 10 May 2009. Available at http://www.iamai.in/reports1.aspx [accessed 3 May 2011]. 'I-Cube 2008 Summary Report (Modified)_31.pdf', 10 May 2009. Available at http://www.iamai.in/Upload/Research/I-Cube%202008%20Summary%20Report%20(Modified)_31.pdf [accessed 3 May 2011].

[f] Sunil Jain, 'Graduates in India? 48.7 million', *Rediff News*, 19 December 2005. Available at http://in.rediff.com/money/2005/dec/19guest1.htm [accessed 15 February 2009].

that both the questions and their authors have changed over time. While voluntary associations of 'public-spirited individuals' were, almost exclusively, the engines of the library movement in India during its first century, since Independence the management and furtherance of public libraries have fallen entirely into the hands of the patriarchal state. As one would expect, the imperatives that govern voluntary associations in the running of public libraries are somewhat different from those that are observed by the state. From being vehicles for the arousal of nationalist sentiment, to promoting adult/universal education, to promoting local language policies, to being interfaces between the local and the global, the public library has performed various roles at different times in its history.

The changes in the ownership and roles of the public library have been duly accompanied by changes in the collections that they house, and so one question that becomes important to ask is what *kind* of 'knowledge' do libraries house? Who decides? And how do people access the knowledge that gets left out?

The constituencies that public libraries have served have changed significantly. For instance, until at least the middle of the past century, fiction was the most popular category of works that circulated in libraries. This is no longer the case and it is worthwhile to investigate why. What knowledge do people desire and how do they gain access to it?

While public libraries in India tend to languish due to insufficient financial support, other factors contribute to the slippage of patronage. However, the crisis of libraries is not the same as the crisis of 'public reading'[5] in India. As inadequate as the facilities in Indian public libraries may be, the library does not exhaust the avenues available through which people may (and do in fact) cheaply access the kind of knowledge that they desire. As a corollary, the kind of information that they may, by and large, appear to desire may not correspond to the kind of 'knowledge' that the OA or library movements have been privileging. The point I am attempting to make here is that although public libraries are conceived as embodiments of a particular liberal egalitarian ethos,[6] in truth they are vigorously controlled sites where privileged clientele may gain access only to approved knowledge. This could be a valuable lesson for the A2K movement, which has, at best, remained agnostic towards structural questions of knowledge and at worst has been complicit in the continued privileging of certain forms of (accredited/refereed) knowledge over others.

In 'History of the Library Movement in India' section of this chapter, I outline the progress of the library movement in India over the past two centuries. At first glance, these details of the history of the Indian library movement may appear to be of little relevance to a *globalized*, IP-focussed A2K agenda. However, if one reads this history not merely in order to pay homage to what went before but, instrumentally, with the intention of establishing patterns of continuity and identifying recurring themes in the struggle to make knowledge accessible, such a reading may suggest some useful directions that the A2K movement, at least in India, may progress towards.

The introduction of information technology into Indian libraries in the late 1980s was greeted with enthusiasm by the librarian community. More recently, there have been various legislative attempts at creating 'digital libraries' and repositories of electronic theses and dissertations to expand access to materials. 'The Indian Library Goes Digital: e-Resources and Digitizing Collections' section of this chapter evaluates the success of these initiatives.

The 'Conclusions: Bibliomania in the margins – How Indians Read' section of this chapter makes a start at the sort of study on Indian readership I have set up as one of the goals of this project. A reading of the preceding sections might suggest that public libraries are the only mode through which the ordinary public has access to printed materials. This final section broadly asks what are the residual modes, other than libraries, through which people access materials that they desire access to.

History of the library movement in India

The library has, for long, occupied a favoured position in policy discussions concerning the educational upliftment of and growth of public opinion among citizens. As the physical embodiment of abstract knowledge accumulation, libraries have been regarded historically as crucial spaces that enabled the emergence of an informed (thus, empowered[7]) citizenry. Like many countries, public libraries in India now form an integral component of the municipal services that citizens can expect to have access to in most towns and cities. Several states in India have Public Library legislations and are home to, by official accounts, flourishing networks of library systems.[8] The Indian Library Association (ILA), formed over seventy years ago, currently has a membership touching 4,000, of which about 270 are institutional members.[9] The ILA recently organized its 53rd Annual All India Library Conference in December 2007 – a testament to the fairly robust state of affairs in the Indian library movement. If the state of the library system in India appears to be in a more vibrant state than its counterparts in other countries inhabiting the same socio-economic neighbourhood, this has been on account of strides made in the library movement in the first half of the past century. India has been home to one of the pioneers in the field of Library Sciences, S. R. Ranganathan, a mathematician-turned-librarian who formulated the acclaimed Colon Classification system of classifying books.[10] His 'Five Laws of Library Science' (1931) acquired a canonical stature in the early days of Library Science and may be viewed as one of the first articulations of OA principles anywhere. While there is much to celebrate about the Indian public library system's history, in reality, today, public libraries in India are, with notable exceptions, visibly in a state of neglect.[11] This section offers a brief glimpse into the various stages of the progress of the Indian library movement.

Various studies on public libraries in India broadly designate three broad stages in which the development of public libraries in India took place.[12]

Phase I – establishment

> I have no knowledge of either Sanscrit [*sic*] or Arabic. But I have done what I could to form a correct estimate of their value. I have read translations of the most celebrated Arabic and Sanscrit [*sic*] works. I have conversed, both here and at home, with men distinguished by their proficiency in the Eastern tongues. I am quite ready to take the oriental learning at the valuation of the orientalists themselves. I have never found one among them who could deny that a single shelf of a good European library was worth the whole native literature of India and Arabia. The intrinsic superiority of the Western literature is indeed fully admitted by those members of the committee who support the oriental plan of education.
>
> T. B. Macaulay, 2 February 1835

> [A] half-dozen monkeys provided with typewriters would, in a few eternities, produce all the books in the British Museum.
>
> Jorge Luis Borges, 'The Total Library', 1939

The first phase of the Indian library movement lasted through the course of the nineteenth century. During this phase, the character of libraries began their transformation from private collections 'that housed mostly manuscripts for the sole provenance and purview of feudal rulers and aristocrats' into 'public and civic institutions that boasted community pride and interest in their mostly print collections'.[13] By the middle of the nineteenth century, public libraries had been established in the three presidency towns of Bombay, Calcutta and Madras.[14] The organization of the Calcutta Public Library during this period, in particular, was along radically egalitarian lines – created as it was, in 1835 by the citizens of Calcutta, as a library 'of reference and circulation, which would be open to all ranks and classes without distinction and sufficiently extensive to supply the wants of the entire community in every department of literature'.[15] By the turn of the century, the library was said to have housed around a hundred thousand books although its administration had 'weathered its way to a standstill'.[16]

It was during this period that the first colonial legislation mandating the free supply of all books to 'designated' libraries was introduced in India in 1867.[17] This was, paradoxically, at the foot of a statute that had overtly sought to regulate the freedom of printers to publish.[18] Importantly, both the 1867 Act as well as the post-independence 'Delivery of Books "and Newspapers" (Public Libraries) Act, 1954' speak only of physical delivery of books to libraries,

while remaining silent on the actual terms governing the public's access to these venues.

Two parallel developments during this period also had a bearing on the progress of the library movement – the advent of public education in English following Macaulay's Minute on Education and the parallel growth of the vernacular presses, which played a significant role in the cheap diffusion of literature in India.[19] Besides these, the spread of the Indian Railways and the expansion of the Indian Postal Service also contributed towards extending the avenues through which people could access books.

By the end of the nineteenth century, libraries had become fairly popular in several cities and towns. During the last decade of the nineteenth century, the number of libraries and 'reading rooms' in Madras, Bombay and Calcutta had witnessed a threefold increase.[20] The foundations had been laid for the flourishing of a public library system in various parts of India during the course of the next century.

Phase II – consolidation

> The potentiality of a well-developed Rural Library Service for the uplift of the masses is enormous.
>
> Our ideal should be to have a national frame-work of libraries with a *taluk* as the ultimate unit, with the district library as the next higher reservoir, directing and co-ordinating the work of the *taluk* libraries, and central library in each of the linguistic areas linking up the district libraries. To bring about such a system, the nation should put before itself a definite programme with a definite time-limit, say 30 years or even 50 years, within which the system should be developed fully.
> S. R. Ranganathan, 9th Annual Conference of Madras Non-Gazetted Educational Officers, 23 December 1927[21]

> The apex of the library system, as contemplated in the Five-Year Plan, will be the National Central Library and its vast base will be made up of about 160 city libraries and about 400 rural library systems, academic libraries and industrial libraries … Each Development Block will have about 100 villages occupied by a lakh of people … Each development block should aim to have ten copies each of 1000 books, which will cost them Rs. 50,000.
> S. R. Ranganathan, All India Library Conference, 1 June 1953[22]

In its second phase, a period of furtive activity spanning roughly the first half of the twentieth century, the library movement came gradually to become associated with the rise of anti-colonial nationalism[23] and began to be regarded

as a vehicle both for adult education and 'cultural renaissance'. Successive 'Government of India Acts' in 1909 and 1919 introduced a system of *diarchy* in India whereby certain areas of administration such as education (including libraries), public health and land revenue came under the exclusive purview of elected, provincial Legislative Councils comprising mostly Indian members. Thus, for instance, in 1920 the Legislative Council of the State of Madras issued a grant of Rs 20,000 for the purpose of encouraging public libraries in recognition of their potential to 'serve as stimulative centres for national awakening and public spirit'.[24] Prominent public libraries were established during this period in various centres, most notably the Central Library at Baroda that was established through the patronage of the king, Maharaja Sayajirao III, Gaekwar of Baroda. The following account describes the extraordinary progress that this library network had achieved by as early as May 1913:

> Baroda city had its Central Library, comprising Reference and Lending Departments with a book stock of 40,000 volumes. Twenty-five thousand more books were awaiting addition as soon as more space was provided … Two of the three *prant* (district) libraries had been established and thirty-six of the thirty-eight towns had provided their own libraries. Two hundred sixteen of the four hundred twenty-six large villages had founded their libraries. Even the small villages had come forward and had initiated their own libraries. There were 140 travelling libraries as well.[25]

Similar progress was witnessed in the southern state of Andhra where libraries appear to have been somewhat at the nucleus of local politics. As one commentator had remarked, the typical Andhra library 'is not a mere store-house of books but is a centre from which all the healthy activities of the village, social, religious, literary and political also proceed'.[26]

In 1903, Lord Curzon bought up the rights of the Calcutta Public Library and merged it with the East India College Library. The new institution was christened the Imperial Library and was opened to the public in January 1930. It was also made a 'Designated' library under the Press and Registration of Books Act, so that a copy of every book published in the country was required to be sent to it. Further, it was designated a public lending library, a fact that appears to have been not too widely known, at least until much later.[27] Today, the library houses one of the richest collections of publications on the British period of Indian History.[28]

In 1918, the first All India Librarians Conference (AILC) was held in Lahore, with thirty-one members attending from across the country.[29] This was soon to become a regular event[30] and the Indian Librarians Association (ILA) was an outgrowth of the AILC held in Kolkata in 1933.[31] Likewise, a regional association called the Madras Library Association (MLA) was formed in January 1928 to promote 'the book habit' and by March 1928 could boast of over 240 members on its rolls.[32] In the annals of the history of the Indian

library movement, the efforts of the MLA during this period, especially one of its founders, Dr S. Ranganathan, deserve special mention. Ranganathan was a mathematician-turned-librarian and was the first librarian appointed to the library at the University of Madras. At a conference in 1927, he outlined plans for an extensive interconnected rural library system that, owing to strong political support, rapidly became the blueprint for rural library services in the entire region.[33] As mentioned previously, he was one of the pioneers, the early hackers, in the developing science of classification and his 'Five Laws of Library Science' was one of the earliest articulations of the egalitarian ethos that underlies the librarian's mission. The salience of Ranganathan's *Five Laws* in the context of the objectives of the A2K movement merits a short elaboration of the principles outlined and is given in the box below.

The Five Laws of Library Science – S. Ranganathan[34]

1 Books are for use.
This 'law' was posited in opposition to the then prevailing ethic of fetishized 'preservation' books by absolutely barring access to them, even from the very people who sought them. Here Ranganathan announces that it is time to 'declare amnesty for books and free them of their chains' and advocates a new organizational ethos – the recognition of the rights of users to free and unhampered use of books'. He recognizes that carelessly framed institutional policies – for instance, regarding the location of the library, the hours it was open to the public, the architecture of the library itself and the skill of its staff – could interfere with the substantive realization of this law's goals. 'Books are for use', importantly, casts a positive obligation on the custodians of books to ensure their use.

2 Books are for all.
Though rather tersely framed, this is one of Ranganathan's most extensively theorized laws and occupies a large chapter in his book. Briefly, the law demands that the rights of every class of users be recognized equally irrespective of age, gender, class, location/distance or disability. Not content with merely an abstract statement of this non-discriminatory principle, he elaborates on various contexts within which this principle was to be realized. Thus, 'books are for all' would have to be reflected in the location of the library, the selection of books, in the funding for special rural outreach programs, selection of library staff, design of the library

interiors and so on. This principle would insist on every reader being supplied his or her book uniquely suited to his or her tastes. It places an onus on the librarian to actively inform herself about the needs and demands of her immediate clientele and to respond to those demands. Going further, it demands that the librarian adopt positive measures to reach out to those who would normally be unable to access libraries – the sick and infirm, prisoners undergoing imprisonment and so on. Under this conception, the library was cast as a uniquely open, barrier-less space organized on radically egalitarian principles.

3 To every book its reader.
This law posits that every book has its own unique reader and that it was the duty of the librarian to take all necessary steps to see that the book finds its audience. This is done through a range of processes – from appropriate arrangements of book shelves to the organizing of book readings and lectures or performances. Ranganathan conceives of the librarian as a salesman of the idea of reading and considers it her duty to increase the market for books through her efforts.

4 Save the time of the reader.
This principle mandates the adoption of institutional policies and administrative procedures that are directed towards saving the time of the reader. These included the adoption of the open access system where readers were free to browse books placed on shelves as opposed to ordering them from a catalogue and the adoption of classification and cataloguing systems that would make it easy for readers to locate books on shelves. The governing principle in all cases would have to be the convenience of the reader over administrative convenience.

5 The library is a growing organism.
The last of Ranganathan's principles is one of institutional design – libraries should be designed to allow them to grow since 'an organism that ceases to grow will petrify and perish'. Thus, for instance, the classification system should be open ended to allow for new categories of knowledge to emerge, and space in libraries should be designed to allow for changes to be made and for different kinds of users to occupy it. The library, including its administrative policies, must be kept 'open source' – to accommodate emergent uses.

Ranganathan was also instrumental in drafting the first state public library act for the State of Madras, which was enacted by the state legislature in 1948.

Village libraries were set up during this period through governmental effort in the states of Assam, Bihar, Bombay, Orissa, Punjab, Cochin and some other provinces and states, and according to one estimate in 1942 there were 13,000 village libraries in India.[35]

By March 1954, the country reportedly had '32,000 libraries with a book stock of about 7.1 million volumes; an amount of Rs. 9 million (US$1.89 million) was spent on library services'.[36]

All in all, this was an extremely fertile period for the library movement in India, and the following important changes were observable:

1 The public library came to be regarded as a companion to pedagogy at a time when the idioms of pedagogy themselves were undergoing vast changes. Thus, from being the primary instrument for achieving 'adult education', libraries became more broadly the vehicles of 'non-formal' education. The focus of education shifted from the 'camel' model[37] to 'lifelong education', and libraries were seen as facilitating such continuing education, beyond the qualifications one acquired through schooling. Libraries were, thus, the first preferred technology of the state for mass non-formal education. Over time, they came to be replaced, in turn, by radio, the television and the Internet – each of which were spectacularly successful as mediums of entertainment but failed ultimately in realizing the benignly pedagogical purposes for which they had been introduced by the state.[38]

2 It was during this period that 'library science' emerged as a discipline in its own right, as opposed to a vocational skill that one acquired through apprenticeship. This development of a technique into a discipline occurred worldwide with at least an equal intellectual contribution having come from Indians, most notably Mr S. Ranganathan, to the technique of classification. Unfortunately, this initial period of indigenous experimental and extensive research did not endure for long, and formal library science courses today merely teach adherence to prevalent dogmas about classification.

3 With the University of Madras beginning to offer undergraduate degrees in Library Science, and other institutions following its lead, a professional class began to take shape of librarians who were skilled in the specialized task of requisitioning, inventorying, classifying and curating printed material. While the library movement hitherto had been propelled by the efforts of social reformers, and men and women of diverse motivations, as well as librarians, in the course of the next half century, it was to become the sole preserve of librarians. This professionalization unfortunately did not translate into a heightening of

their status, however, and despite repeated laments, to this day librarians continue to be accorded a somewhat stepfatherly treatment at best and, at worst, are relegated to a janitorial status.

Phase III – expansion

It should be open to everyone. This will be a national monument. There will not be a single individual who does not have the right to enjoy it. It will have such an influence on the mind, it will so elevate the soul, it will so excite the heart that it will be one of the most powerful ways of proclaiming the illustriousness of the French Republic.
Minister of the Interior, France – Inaugural of the Louvre, August 1793[39]

Old residents of Calcutta will, I have no doubt, welcome the transformation of what was a citadel of power into an abode of learning. Formerly, this palace was the preserve of State dignitaries and bureaucrats. Today it is a temple of learning for whoever seeks to worship at its altar. Formerly it was a place which imposed decisions on the people, regardless of what they wished or needed. Today it is a storehouse from which the nation can derive its intellectual sustenance in accordance with its wish and its needs. The noble building, and ground which formerly catered for the proposed rulers of the land will henceforth be the resort of even the humblest seeker of knowledge and truth.
Maulana Azad, renaming and inaugural of the National Library of Calcutta, 2 February 1953[40]

The decades following independence in 1947 continued some of the progress achieved in the previous half century. Internationally, in 1948, UNESCO issued a Public Library manifesto at the second session of its General Conference summarizing the aims and key missions of public libraries. In its current iteration,[41] the manifesto affirms UNESCO's belief in the public library as a 'living force for education, culture and information, and as an essential agent for the fostering of peace and spiritual welfare through the minds of men and women'. It recognizes that 'Constructive participation and the development of democracy depend on satisfactory education as well as on *free and unlimited access to knowledge*, thought, culture and information' and conceives of public libraries as being 'local gateways to knowledge'.[42]

In 1948 the Imperial Library at Calcutta was renamed the National Library, and in 1951 the Delhi Public Library was created under the aegis of the UNESCO.

Under the new Constitution that India adopted in 1951, the responsibility of overseeing libraries was given to the states exclusively. This led to an uneven growth of libraries across states and a complete abandonment of all plans for installing a nationwide framework of public libraries.

In 1954, the Delivery of Books Act was passed, which made it mandatory for publishers in India to deposit a copy of every book they published with the National Library in Calcutta; the Asiatic Society (Central) Library, Bombay; Connemara Public Library, Madras; and the Delhi Public Library. A national bibliography, based on books received under this Act, is published by the Central Reference Library, Calcutta.[43] By 1954, reportedly, the country had 32,000 libraries with a book stock of about 7.1 million volumes.[44]

An Advisory Committee (Sinha Committee) appointed in 1957 recommended the development of public libraries along a hierarchical model with the national central library at the apex, followed by state central libraries, district libraries, block (sub-district) libraries and *panchayat* (village) libraries.[45] However, this has not been implemented to date.

Beginning in 1948, over the next half century, ten states would enact Public Library legislations analogous to the Madras Public Libraries Act.[46] These legislations typically install a hierarchical network of libraries within the state with the State Central Library at the apex followed by several district and village-level libraries and reading rooms. Funding for these libraries is provided from out of excise levies or levies on property tax.

The new Copyright Act enacted in 1957 incorporated an extensive list of 'fair dealing' exemptions, including the right of public libraries to make up to three copies of books that were not available for sale in India. Research users of previously unpublished library resources were given the fair dealing right to reproduce them in publications provided the reproduction was accompanied by an identification of the author. At a general level, the statute protected 'fair dealing' uses of literary, artistic, musical and dramatic works from the ambit of infringement if the purpose was for private use, including for research. This potentially made the public library amenable to a range of uses by its members without the fear of prosecution.

In 1972, the Raja Rammohun Roy Library Foundation (RRRLF) was established by the government of India to spread library services all over the country in active cooperation with state governments and enlisting the aid of voluntary organisations. The foundation matches the funds of the states for purchasing furniture and books, organizing conferences and seminars, and providing mobile library service to the rural areas and advises the central government on all matters relating to library development in the country.[47] Until the year 2000, the foundation had extended support to over 31,000 public libraries in India, despite which the rural library services in India continue to languish as this telling account by the director of the RRRLF reveals:

> The condition of the majority of rural libraries, particularly, in the heartland of India, is extremely miserable. Many of them do not have their own building, some are located in small thatched huts and some share a room and time with their institutions. Very few libraries can provide reading-room facilities even. Storage facilities are also very poor. Stock of reading materials is insignificant. Moreover, the service is highly irregular and uncertain. All these does not encourage people to use libraries. There is also the dearth of suitable reading materials in regional

languages. The demand for books in rural libraries is mainly limited to light literature in regional language.[48]

Estimates of the total number of public libraries in India today vary between 50,000 and 60,000. While this is a huge number by any standard, reports on the quality of these libraries cast an ominous shadow on their ability to meet the A2K needs of people. The box below draws on Sarah Kamala's account of the public library system in the southern Indian state of Andhra Pradesh. It provides us with a glimpse into what may be regarded as a typical sample of the problems afflicting public libraries in India today.

A snapshot of public libraries in Andhra Pradesh – Sarah Kamala[49]

Number of public libraries

State Administration Report (1984–5)

- 749 libraries in urban areas out of which 424 were operating in thirty cities and large towns (with a population of 75,000 or more).
- The number of other towns in the state is 222 out of which library service exists in 188 towns.
- No library in thirty-four towns and 166 urban areas.
- Out of 1,222 villages with a population above 5,000, which are required to have a public library according to the AP Libraries Act, only 346 villages had a functioning library.
- Out of 12,080 villages with a population between 1,000 and 5,000, only 928 villages had a library. 2,820 villages were provided with mobile libraries and aided libraries.
- None of the 16,408 villages with a population less than 1,000 had a library.
- There are only 1,540 village *panchayat* libraries out of 21,493 village *panchayats* existing in the state as per the 1991 census. This amounts to fewer than 1 in 10 villages having any library facility.

State of public libraries

According to Sarah Kamala, the public libraries in Andhra Pradesh suffer from the following defects:

- They cater exclusively to the recreational and light reading needs of a small strata of the upper and middle classes while ignoring completely the needs of illiterate users.

- They are passive institutions and do not actively participate in engendering change and development in the community. Their impact on the community is minimal.
- Books have little bearing on the real lives of people and are generally seen as not being useful to rural people.
- State financial support is weak and the government does not consider libraries as suitable agencies for the dissemination of information regarding their own policies.
- Personnel in charge of libraries are not given autonomy to incur expenditure on furniture or to acquire new books.

Reasons for the decline in the public library movement since independence

Kamala traces the decline in the library movement in Andhra Pradesh since independence to the following factors:

- Interest in the library movement waned after independence after the enactment of public library legislation transferred the maintenance and growth functions of public libraries to statutory authorities. As Kamala puts it, 'It seemed to signal that the government will do all that was needed for library development, and that the efforts of individuals were no longer needed'.
- The growth in the number of libraries did not keep pace with the growth in population, resulting in decreasing levels of access.
- The salaried and unmotivated librarians and library staff started keeping users at a distance, greatly diminishing the popularity of libraries.
- The centralized system of administering public libraries undercut the authority of the local librarian to cater to the local needs of the people.
- Book acquisition was centralized and the same sets of books were supplied to every library. There was no choice for selection of books according to local interests and no provision for the rotation of books among libraries.
- Funds were inadequate to allow for continuous purchase of new books.

Accounts abound of the dissatisfactory state of affairs in public libraries during the latter half of the past century. Capping these was the damaging indictment delivered by the then general secretary of the IFLA, Mr Paul Nauta, who remarked during a visit to India in 1992 that 'Indian libraries were still in the 60's or the 70's at most'.[50]

From the early 1990s, Indian libraries began using computers to inventory their collections, and by the turn of the twenty-first century, library science, much like everything else, was firmly in the throes of an Information and Communications Technologies revolution. The creative deployment of IT by public libraries has, in some cases, demonstrably enhanced their popularity. This may be seen, for instance, in the manner in which the Delhi Public Library has successfully, over the past five years, succeeded in improving its patronage despite a widely perceived decline in the 'reading habit'. This was achieved reportedly through a reconfiguration of their book procurement policy, the introduction of new services (for instance, the opening of a new children's section) and the offering of free public Internet services on the premises.[51]

Reflections on the Indian library movement

In addition to the introduction of IT into the library, the wide circulation of concepts like the 'knowledge society' and 'information society' within official policy circles has succeeded in making the march towards an information society a major priority, and are frequently held up as evaluative criteria for state action.[52] For libraries, this has meant a shift in the perception of their roles – from being positioned, at least on paper, as key players in the mission to advance universal education, libraries have come to be regarded as being both the repositories of untapped local information resources and 'gateways to the global'.[53] This has led to a heightened emphasis on networking, digitization and electronic archiving, about which more details are provided in the next section. Before parting from this section, however, I would like to record three observations on the history of the library movement in India.

Libraries, literacy, education and knowledge

The origins and spread of the library movement in India were closely linked to the need to expand literacy and to make available alternate channels of education in the wake of the rise of nationalism in the country. In S. R. Ranganathan's ideal conception, the public library existed in a dialectic relationship with the community within which it was located. On the one hand, it was meant to serve as the nucleus of the community and actively shape the opinions of that community – hosting lectures, organizing readings and conducting adult literacy classes and so on. In turn, the character and contents of the public library itself were to be determined reflexively by the community – for instance, a library located in an agrarian setting would, under

this conception, predominantly house materials that were useful to farmers to strengthen their position in their own communities. However, under the new 'Knowledge Society' model as described by the National Knowledge Commission of India, the library is reconstituted using a purely economic frame into a mere distributional node where global knowledge gets transmitted to local recipients expressly to facilitate the transformation of these recipients into 'knowledge workers'[54] who can then be appropriated as factors in the emerging global knowledge economy. While one needn't rush to the conclusion that such an appropriation will be undesirable, it would serve us well to think more broadly of the imagination that the public library *ought*, ideally, to subserve.[55]

My point is that through much of its history, the Indian library has been conceived instrumentally as the venue for the furtherance of some transcendent social (literacy), economic (knowledge society) or political (freedom, national integration) goal. Perhaps a bottom-up approach that consults and privileges the local community's more modest aspirations may yet revitalize the flagging library movement.

Libraries and leisure

In his fascinating article 'Museums: Leisure between State and Distinction',[56] Nick Prior suggests that in order to understand the nature of the museum 'one must grasp the institution as an allotrope – an element with dual properties'. On the one hand, he says that 'the marriage of museums with discourses of taste, connoisseurship, and high culture connected them with the struggle for a refined identity that was so crucial to the historical position of the bourgeoisie'. Hence, 'the museum became a contributory badge of quality fought for by ascendant social groups in the struggle for symbolic power. For this reason, museums tended to exclude in the act of distinction, symbolically purifying themselves of lower historical tendencies and visitors'.[57]

On the other hand, he acknowledges that 'museums also catered for shifts in the structure of governance, peeling away older remnants of monarchical or aristocratic grandeur and religious servitude'.

> National publics were now encouraged to exploit the operation of new leisure regimes and partake of the moral benefits offered by the museum as a repository of civilization's highest values. Governing forces also recognized the role that museums could play in the regulation of social behavior, 'civilizing' the population as a whole and making the visit an instance of self-amelioration.

Prior imputes this allotropic quality of museums to what he terms as the 'double-bind of modernity in which aspirations to social exclusivity and expert control vied with what were increasingly more inclusive strategies of public mobilization and "improvement" coordinated by state agencies'.[58] It was also 'coterminous with the formation of mass leisure and urban cultures *in which*

groups previously excluded from the halls of (artistic) learning gained increased access to the cultural capital deployed for visual consumption in museums and other venues'.[59]

Prior's account of museums as allotropes offers a useful prism for us through which we may view the history of the emergence of public libraries in India. In a country whose literacy is only now hovering around the two-thirds level, the library was every bit an institution around which a new bourgeois identity was sought to be forged through the nineteenth century.[60] However, as the speech of Maulana Azad quoted above shows, the inauguration of the library was also an intense moment of democratic possibility where those who were traditionally excluded could, at least notionally, gain access.

On balance it is difficult to say which of these dual qualities predominates with Indian public libraries. The primary clientele of public libraries comprises students appearing for various public examinations. Although they may harbour bourgeois ambitions, the public library, in this case, is decidedly *not* a site for the kind of 'artistic learning' that Prior has in mind. The public library in India tends more towards Public Education (with its emphasis on the factual instruction) rather than towards the Public Museum. In this avatar, the public library approximates to Adorno and Horkheimer's famous description of amusement under late capitalism as being the 'prolongation of work':

> It is sought after as an escape from the mechanised work process, and to recruit strength in order to be able to cope with it again. But at the same time mechanisation has such power over a man's leisure and happiness, and so profoundly determines the manufacture of amusement goods, that his experiences are inevitably after-images of the work process itself. The ostensible content is merely a faded foreground; what sinks in is the automatic succession of standardised operations. *What happens at work, in the factory, or in the office can only be escaped from by approximation to it in one's leisure time*.[61] (emphasis added)

This 'work' function becomes even more pronounced with the public library being reconfigured as an 'extremely important element of the foundation of a knowledge economy'.[62] It remains to be seen in what ways this reconfiguration plays out.

Libraries and reading

> I say, O Sir! Where would your Bengali education, Bengali literature, Bengali language, Bengali religion, Bengali piety, Bengali blank verse be, if the Bengali Mahabharata and Ramayana did not sell at Battala for fourteen annas.
>
> Playwright Amritlal Bose, *c.* 1880[63]

In the introductory chapter to their book *Reading, Society and Politics in Early Modern England*, Kevin Sharpe and Steven N. Zwicker remind us 'that reading

has a history, that its forms and practices have a past, that it is neither universal nor natural but socially specific and culturally constructed'. Reading, they say, 'is neither natural nor ubiquitous, … geography, race and class are among the determinants that enable and delimit literacy'.[64]

The authors trace the roots of modern reading practices in Europe to the rise of humanism and the Protestant reformation. While humanism 'educated and enabled readers to perform their own readings, and to construct their own, often dissenting, values and polities', the Protestant Reformation laid emphasis on 'individual conscience and personal scripturalism, on each godly man's reading and wrestling with Scripture, and ultimately democratized the word'.[65] The authors argue that the modern reader 'emerged from the new availability of texts and techniques, *the marketing not only of books but of hermeneutic strategies*' (emphasis added).[66]

In her insightful essay, 'Disciplining the Printed Text: Colonial and Nationalist Surveillance of Bengali Literature',[67] Tapti Ray points out that far from engendering a culture of private cloistered reading, the arrival of book in India gave birth to new forms of urban performance – for instance, men were frequently employed as readers, to read to the women of reasonably well-off households – and it was not uncommon for the literate few in villages and towns to read out publicly for the benefit of minor audiences.[68] Reading, then, was not so much a private contemplative act but an aide for shared public meaning-making activities.

In her nuanced account of the circulation of fiction in Indian libraries in the nineteenth century, Priya Joshi grapples with the problem of the near-total absence of textual records of the Indian reader in the historical record. This is because, as Joshi says, 'All readers, including those being read to, consume entirely in the privacy of the mind so that the act of reading as such leaves almost no textual or representational byproducts'.[69]

Joshi turns to the print archive of the nineteenth century to offer her glimpses of 'the novels that were available to literate Indians, where and how and something about the conditions under which Indians availed themselves of this reading matter'. She says,

> [This archive also] yields information on local conditions of printing and publishing, on the role of the emerging serial press, and the ways in which books were purveyed and discussed, translated and adapted through the nineteenth century. In short, this quantitative archive provides the social context in which the British novel was consumed in nineteenth-century India. *From it we learn that because of Paternoster Row's pricing policies and the nascent Indian publishing industry, books were either too expensive or too elusive for purchase, and the public circulating library came to be an institution through which most Indian readers, and many British ones as well, availed of at least through the 1920s.* (emphasis added)[70]

To an extent, the later growth of the library movement in India may be seen to have been hampered by the flourishing print industry in India that, since the

early nineteenth century, had begun selling books at extremely cheap rates and helped to popularize the spread of a culture of reading. The rise of nationalism during the nineteenth century, coupled with a religious 'reawakening', created and sustained a demand for more books in regional languages. Competition among printers, the laxity of copyright restrictions and the predominance of religious/folk themes in books that were in high demand ensured that prices of books remained well within the means of most users. To this day, prices of books in India are fairly low, and where they are not, market practices (piracy) quickly step in to compensate. Possibly one of the reasons why public libraries in India have not been such a big sell apart from among students preparing for public exams is that from the beginning the popular demands of the reading public have been fairly met by an extremely cheap print and publishing industry. More recently, relatively cheap access to the Internet either directly from home or from cybercafés[71] has resulted in increasing numbers of Indians turning to the Internet as an inexpensive channel by which to satisfy their informational needs.

Against this context, it is likely that one of the causes of the failure of India's library movement has been its failure to learn from and leverage these new and varied modes of reading among its audience.

The next section outlines some initiatives by the government that aim to bypass what it sees as the primary drawback of the library system (distance) in delivering assured A2K.

The Indian library goes digital: e-resources and digitizing collections

> Who knows that a day may not come in which dissemination of knowledge will be effected by direct transfer, in the *Dakshinamurthy* fashion … that a day may not come when the dissemination of knowledge, which is the vital function of libraries, will be realised by libraries even by means other than those of the printed book!
> S. Ranganathan, 1933[72]

> Mission 2007 aims to provide knowledge connectivity to every village of India by August 15, 2007 … Following the launching of Mission 2007 … some developments have taken place … These include:
> The VKC [Village Knowledge Centre] is based on the principle of an integrated and appropriate use of the Internet, cable TV, cell phone, community radio, and the vernacular press. To begin with, VKCs will be established in the 240,000 panchayats and local bodies. With the help of loud speakers and FM radio, they will be able to cover all the 600,000 villages in the country.

It is obvious that if we can achieve convergence and synergy among the numerous on-going as well as emerging programmes, *the goal of achieving a rural knowledge revolution by August 15, 2007, can become a reality*.
M. S. Swaminathan, *The Hindu*, 25 November 2005[73]

The proliferation in the past two decades of personal computers, the expansion of information and communications technology, and the Internet have led to the displacement of the industrial information economy by a new 'networked information economy' where information becomes the 'core structuring fact' of the economy.[74] The capacity to access networked information assumes a crucial significance in this new economy, being the arbiter of both prosperity and freedom. ICT has been viewed in official circles in India as an instrument of what Ravi Sundaram has termed a 'temporally accelerative'[75] development through which we Indians could transcend our 'historical disabilities' and achieve parity with the incumbent masters of the world. The following excerpt from a report submitted by the National Task Force on Information Technology (NTFIT) in 1998 captures the stakes involved in this new scenario:

> For India, the rise of Information Technology is an opportunity to overcome historical disabilities and once again become the master of one's own national destiny. IT is a tool that will enable India to achieve the goal of becoming a strong, prosperous and self-confident nation. In doing so, IT promises to compress the time it would otherwise take for India to advance rapidly in the march of development and occupy a position of honor and pride in the comity of nations.[76]

In line with these aspirations, the NTFIT report places special emphasis on the content industry as potential sources of income and employment generation and makes several recommendations with a view to promoting availability and access to information. Among them, the following[77]:

> 80. *All the reports generated out of the R & D works funded by the government and its agencies will be made available for wider dissemination and commercial exploitation*. The government will ensure establishment of a suitable mechanism for collection, compilation and timely publication (hosting) of such information in the electronic form.
>
> 81. *It will be made mandatory for all the universities or deemed universities in the country to host every dissertation/thesis submitted for research degrees on a designated Website*.
>
> 82. It will be maximally ensured that any information or report collected by the government will be in electronic form at the entry point itself. Similarly, all the information to be made available to the public by the government, such as budget documents, customs and excise rules, railway time tables, telephone directory, maps including public domain digitised maps, etc. will be made available in the electronic form.

> *83. The national, regional and other public libraries will be required to develop databases of their holdings which will be hosted on a designated website for free access to users.*
>
> *99. A pilot project on digital library development, based on indigenous software, will be initiated. The project will be time-bound and implemented at one of the suitable existing libraries to serve as a model.* The software so developed can be distributed to other organisations to accelerate the development of digital libraries in the country.
>
> *100. Virtual libraries provide extensive information and instant access to users through information networks. The Government will promote a pilot project for creation of a model virtual library. The virtual library will be enabled to work out suitable copyright arrangements with the relevant publishers for providing the service.* (emphasis added)

As is evident, this policy was fairly forward looking and liberal in its outlook. In the sections that follow, I will take up the progress of two types of initiatives that were spawned as a result of this policy: electronic archiving of theses and dissertations and digital libraries.

Electronic repositories of theses and dissertations

Following the NTFIT Report mentioned above, the University Grants Commission (UGC) issued the UGC (Submission of Metadata and Full-Text of Doctoral Theses in Electronic Format) Regulations in 2005 in order to 'effect systematic creation, collection and compilation of metadata of doctoral theses in a standardized format, and to commence the process of submission of theses in electronic format in all universities'.[78]

The 'Background Note' attached to the regulations recognizes that the theses collections in most Indian libraries are difficult to access and remain 'an untapped and underutilized asset, leading to unnecessary duplication and repetition of efforts'. The UGC's Regulatory Framework aims at evolving a mechanism to improve the quality, accessibility and availability of Indian theses.

> Electronic version of theses provides broader exposure to research students through greater accessibility. It offers opportunities to use new forms of creative scholarship through use of interactive elements, multimedia, hyperlinks, etc. It provides opportunities to research students for professional development as they learn the basic skills of scholarly publishing in electronic format.[79]

While the regulations deal fairly minutely with the various details of setting up a National Database of Theses, metadata formats and so on, some of its key prescriptions are summarized below:

1. The regulations make it mandatory for doctoral students to create a record for their theses on the website of the Indian National

Theses Database. (At the time of writing no such database had been established.)

2 The regulations oblige universities to make it a mandatory requirement for all doctoral students to submit electronic versions of their doctoral thesis. The university was charged with providing assistance in this task.

3 The PDF format was the preferred standard for submission. However, other formats such as MS-Word, RTF, PS, LaTeX, HTML or any other standard format could, optionally, also be accepted.

4 Each university was required to get an 'Author Approval Form' signed by the students for assigning non-exclusive rights to the university to archive and disseminate the thesis.

5 Each university was responsible for evolving an appropriate copyrights policy relating to the doctoral thesis, 'which may be included in the IPR policy of the university'. Thus, putatively, the regulations demanded the definite articulation of policies through which the university's intellectual assets were to be maintained and curated.

6 All universities were required to install an e-theses repository to facilitate e-submission, archiving, maintenance and access to the repository.

7 It was recommended that Open Access International (OAI)-compliant open source software be used to set up these e-theses archives (e.g. D Space, Virginia Tech's ETD software, e-prints etc.).

In line with the regulations, several universities have set up functioning electronic repositories of electronic theses and dissertations. Details of the collections of some of the more prominent of these repositories are supplied in the Table 3.2 below:

Table 3.2 Statistics on electronic theses and dissertation projects in India

Name	Subject	Size of collection	Platform	Submission procedure/ access
1. IIT Mumbai (http://www.library.iitb.ac.in/~mnj/etd/)	Sciences/ engineering	3,128 – master's dissertations 1,533 – doctoral theses	Greenstone	NA/only bibliographic details accessible
2. Indian Institute of Science, etd@IISc (http://etd.ncsi.iisc.ernet.in/)	Sciences	428	Dspace	Online/full text

3. Indian Institute of Science, ePrints@IISc (http://eprints.iisc.ernet.in/)	Sciences	12,916	Eprints	Online/full text
4. Indian Institute of Astrophysics (http://prints.iiap.res.in/)	Sciences	4,401	Dspace	Online/full text
5. Vidyanidhi-Digital Library and E-Scholarship Portal, University of Mysore (http://www.vidyanidhi.org.in)	Multi-disciplinary	100,000 bibliographic records 5,000 full-text theses	Dspace	Online/full text
6. National Institute of Technology, Rourkela (http://dspace.nitrkl.ac.in:8080/dspace/)	Sciences	760	Dspace	Online/full text
7. National Institute of Oceanography	Sciences	2,890	Dspace	Online/full text
8. C. V. Raman Research Institute (http://dspace.rri.res.in/)	Scientific Research and Archives	3,576	Dspace	Online/full text
9. OpenMed (http://openmed.nic.in/)	Medical	2,400	Eprints	Online/full text
10. Indian Statistical Institute, Bangalore (http://library.isibang.ac.in:8080/dspace/)	Sciences			
11. IIT Kanpur (http://172.28.64.70:8080/dspace/)	Sciences/ engineering			

Note: Figures are as of 8 May 2009.

Over the past five years, there has been a healthy growth in the number of Electronic Repository Projects being undertaken by universities and the list given in the Table 3.2 is only a sampling of a few of the more successful of

these initiatives. While these projects are devoted exclusively to making theses and dissertations accessible, the next section looks at various government-funded initiatives to host more diverse materials, including books and archival materials, on the Internet under various 'digital library' initiatives.

Digital libraries

'Digital library' is used in India to describe two different types of projects – consortium-based subscriptions to electronic resources for universities (sometimes labelled 'virtual libraries') and document digitization projects. Both are taken up independently in the sections below.

Consortium subscriptions/virtual libraries

There are currently two large government-funded consortiums for electronic resources that have universities and institutions as their main beneficiaries. Although these are exclusive libraries and are not 'public libraries' in the sense of being accessible to the public at large, they represent an important investment of public funds by the state on information resources.

AICTE-INDEST In December 2002, the Ministry of Human Resource Development (MHRD) and the All India Council for Technical Education (AICTE) – a statutory body, established for the coordinated development of technical education throughout the country – initiated a consortium to collectively subscribe to various Electronic Resources for Technical Education. Named the 'Indian National Digital Library in Science and Technology' (INDEST) and headquartered at the Indian Institute of Technology, New Delhi, the consortium subscribes to twenty-one leading full-text electronic resources[80] and six prominent bibliographic databases.[81] Currently, the consortium has a membership of 868 institutions, the subscription for forty-seven of which are borne entirely by the Ministry of Human Resources and Development. Sixty institutions receive funding from the AICTE.[82]

The consortium boasts significant financial savings of between 22 and 95 per cent (average over 80 per cent) through its pricing agreements with publishers as well as better terms of agreement for various electronic resources.[83]

Reflecting on the benefits of the system, Jagdish Arora *et al.*[84] note,

> The access to e-resources for the beneficiary institutions under the INDEST Consortium has increased from the present level of access to e-journals from 100 to 500 to more than 4000 journals in case of IITs and IISc which is comparable to world class institutions like MIT. Similarly, access level for Category II institutions (NITs/RECs etc.) have [*sic*] increased to around 780 e-journals from almost no access at present.
>
> The consortium is expected to trigger remarkable increase in sharing of both print and electronic resources amongst participating library through its Web site.

> Moreover, with subscribed resources accessible online in electronic format, the member libraries would have less pressure on space requirement for storing and managing print-based library resources. Moreover, all problems associated with print media such as their wear and tear, location, shelving, binding, organizing, etc. would not be an issue for electronic resources.

UGC-INFONET Close on the heels of the successful implementation of the INDEST Consortium, the UGC initiated its own Library Consortium project, christened 'INFONET', in December 2003. The consortium provides current and archival access to more than 5,000 core and peer-reviewed journals and nine bibliographic databases from 23 publishers[85] in different disciplines. So far, 153 universities out of 171 that come under the purview of UGC[86] have been provided differential access to subscribed e-resources. These e-resources cover almost all subject disciplines, including arts, humanities, social sciences, physical sciences, chemical sciences, life sciences, computer sciences, mathematics and statistics, and so on. The programme is wholly funded by the UGC. The consortium has also launched an Associate Membership Programme through which private universities and other research organizations may join the consortium for selected e-resources.

Like the INDEST, the INFONET Consortium claims major savings in terms of 'cost avoidance', the 'difference between cost paid by the consortium for member institutions for e-resources and cost payable by individual universities in case they subscribed the resources on their own'.[87] According to one estimate, the consortium has led to a national saving of 'Rs. 113.20 crores (USD 22.6 mn) in 2004 and Rs. 228 crores (USD 45 mn) during 2005 with overall figure of Rs. 345 crores (USD 69 mn) approximately, considering the fact that the same resources on list price would have cost Rs. 130.11 crores (USD 26 mn) and Rs. 257 crores (USD 51.5 mn) for each of those years 2004 and 2005 respectively'. Instead, the Consortium was able to negotiate rates as low as Rs. 16.91 crores (US$ 3.2 mn) and 25.92 crores (US$ 5.2 mn) for the corresponding periods.[88]

Digitization projects

One of the benefits of the installation of the ICT-based 'knowledge society' as a key developmental goal for India has been the attention and support that digitization projects have received from the central government. Where previously the development of libraries was seen as a matter exclusively within the purview of the states, the central government has, of late, and acting through the Union Ministry of Information Technology, been extending liberal financial and technical assistance to projects that create open digital libraries on the Internet by digitizing archival materials as one of the partner countries for the Carnegie Mellon University-led project to digitize a million books and host them for free on the Internet under the banner of the 'Universal Library'. As the website of the 'Universal Library' states,

> It is proposed to create the Universal Library with a free-to-read, searchable collection of one million books, available to everyone over the Internet. Within 10 years, it is our expectation that the collection will grow to 10 Million books. The result will be a unique resource accessible to anyone in the world 24 × 7, without regard to nationality or socioeconomic background. …
>
> Thus, a first step was to demonstrate the feasibility by undertaking to digitize 1 million books (less than 1% of all books in all languages ever published). This was achieved in the 2006–2007 timeframe. We continue to digitize books at 50 scanning centers all over the globe to achieve the long term objective. We believe such a project has the potential to change how education is conducted in much of the world.[89]

An overview of some of the main digitization projects currently being undertaken in India through government support is given in Table 3.3.

Although the materials made available through these digitization projects tend to be archival, out-of-copyright information, their utility as a free public resource is enormous. While these efforts (with the exception of the Digital Library of India project) usually tend to be uncoordinated, and not overtly a part of a public library scheme, their utility lies in their *coordinate effect*[90] of enriching the information environment as a whole.

Digital libraries, the Internet and A2K

The Indexed Web contains at least 13.15 billion pages.
Maurice De Kunder, 19 April 2009[91]

The Library of Alexandria was the first time humanity attempted to bring the sum total of human knowledge together in one place at one time. Our latest attempt? Google.
Brewster Kahle, founder, The Internet Archive[92]

In 1989, Tim Berners Lee proposed a global hypertext project called the 'Worldwide Web' that was designed to allow people to work together by combining their knowledge in a web of hypertext documents. The fundamental architectural principles of this system were decentralization (intelligence was to be located at the nodes rather than at the centre), non-discrimination between different platforms, speed, allowance for heterogeneity of content and scalability. The project was meant to install a system that would enable information to reach users and vice versa as swiftly and intuitively as possible, while not discriminating between users or kinds of information transported. The five years following the initiation of the project witnessed an explosion in the quantity of information on the Internet. While initial attempts were made to 'order' this information along hierarchical lines – for example,

Table 3.3 Overview of government-aided digitization projects in India (2008)

Name	Subject	Size of collection
1. V. V. Giri National Labour Institute (an autonomous body of Ministry of Labour and Employment, Government of India)[a] (http://www.indialabourarchives.org)	Labour-related records	Almost 7 gigabytes of data comprising eight major collections (nearly 50,000 printed pages and 100 hours of taped interviews)
2. Digital Library of India – twenty-two institutions collaborating as a part of the Carnegie Mellon University's 'Million Books Project'. The project is funded by the Ministry of Information and Technology (http://www.new.dli.ernet.in/testpage.html)	Various	297,219 books comprising approximately 80 million pages (10 May 2009)[b]
3. Judgments Information System (http://judis.nic.in)	Law	Decisions of various courts in India
4. National Databank on Indian Art and Culture	Art and culture	25.08 lakh pages (5,826 books) 54,724 digital images 189 hours of video 300 hours of audio (till 30 November 2008)[c] (It is proposed to digitize 25,000 rare books, estimated to be 50 lakh pages)
5. Traditional Knowledge Digital Library – Collaborative Project of Council of Scientific & Industrial Research (CSIR), Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy (AYUSH) (http://www.tkdl.res.in/tkdl/langdefault/common/home.asp?GL=Eng)	Ayurveda, Unani, Siddha and Yoga	Total of 142 books (224 volumes) (October 2008)[d] (These are not available openly to the public)

[a] 'Digital Archives'. V.V. Giri National Labour Institute. 10 May 2009. Available at http://www.vvgnli.org/digital_archives.htm [accessed 3 May 2011].

[b] 'Scanning Centre Wise Report as on 10/May/2009'. Digital Library of India: Indian Institute of Science, 10 May 2009. Available at http://www.new.dli.ernet.in/testpage.html [accessed 3 May 2011].

[c] 'Targets of the Project'. National Databank on Indian Art and Culture: Pilot Project, 10 May 2009. Available at http://ignca.nic.in/ndb_targets.htm [accessed 3 May 2011].

[d] 'About TKDL'. Traditional Knowledge Digital Library. 10 May 2009. Available at http://www.tkdl.res.in/tkdl/langdefault/common/Abouttkdl.asp?GL=Eng [accessed 3 May 2011].

Gopher, Yahoo and so on – the quantity of information on the web rapidly outgrew the capacity of any one organization to husband such vast amounts of data. While search engines made the task of finding information easier, they came with problems of redundancy of their own – early search engines could retrieve the text you were searching for, but not always from the most relevant sources. It took the genius and entrepreneurship of two doctoral students from Stanford University to radically alter the browsing experience through the invention of the Google search engine. Google was built in order to solve the problem of the *quality* of information that one received in search results, and the solution was based not on any novel advancement in artificial intelligence but by a return to one of the shibboleths of the academic and library system – the plain old academic citation system. The Google PageRank system was overtly inspired by the academic citation system and uses the number of incoming links to a page to determine its popularity and relevance. The result is that, as John Battelle puts it, 'In the past few years, search has become a universally understood method of navigating our information universe. Put a search box in front of just about anybody and he'll know what to do with it'.[93]

In a way Ranganathan's *Five Laws of Library Science* described in the previous section attempted, in his time, to install an analogue system of free, frictionless flow of relevant information between dispersed nodes that were called libraries. Although the two kinds of networks appear similar in their intentions, they are divided by a fundamental alteration in the orientation of the user who has, through using the Internet, 'moved from a stance of *exploration* ("What's out there?") to *expectation* ("I want to find something that I know is out there")'. Now we go online expecting that everything we want to find will be there.[94] It remains to be seen what shape a public library would have to take to cater to a clientele accustomed to the 'expectation' mode of receiving information.

The various digital library projects outlined above have resulted in a greater basket of information resources being accessible to the average Indian Internet user than ever before. To that extent, they may be seen as initiatives that enhance the opportunity of certain classes of citizens to 'better exercise their reasoned agency' – one of the measures of 'development' proposed by Amartya Sen.[95]

Before I conclude this section, I owe an explanation for the fancy subtitle of this chapter – 'A History of Open Access (OA) and the Internet in India in the Nineteenth and Twentieth Centuries'. The idea that I want to convey is that the early library movement in India, as elsewhere, divulged distinctively *Internet-like* aspirations – as manifested in its ambition to plug masses of distributed readers into a network of information and books. When Ranaganathan is defining the Five Laws of Library Science, he is in fact prefiguring and prophesying the foundational principles of the Internet itself. I am conscious

of the anachronism involved in the use of the phrase 'Internet-like' to describe libraries; however, I think it serves us well in this instance and reminds us that the Internet is *not* a vast digitized 'library' (with the latter's censorial proscriptions on who may enter and access what content and be a part of which community of readers), but rather the library is a vastly diminished Internet. As one commentator wryly puts it,

> The Library of Congress contains 82.6 terabytes of data. Consumers can store, in their homes on a consumer-grade 1 terabyte hard disk drive, one percent of all of the data stored in the Library of Congress. But consumers don't want the Library of Congress, and they don't want millions of Word documents. They want to store multimedia files, and that ups the ante by an order of magnitude. …
>
> One terabyte is enough space to hold 17,000 hours of compressed MP3 music, or 1,700 hours of CD-quality music. Not bad.[96]

Although it is tempting, in the face of this expansion of storage capacity, to predict the imminent death of the library, there is room for circumspection.

In his book *The Anarchist in the Library*, Siva Vaidyanathan recounts his impressions of a visit to the new technologically backed library in Alexandria. He notes,

> [The new library] is not a real library for Egyptians. It's a tourist site, a mark of pride, but it's not a center of exploration for an eleven-year-old child who came to Egypt with his family from the Sudan. It's not a community meeting place that fosters social capital. It's a shrine and a museum, but little more.[97]

With regard to libraries subscribing to 'digital libraries' of the nature outlined above, he poses the following problem:

> So imagine this: An electronic journal is streamed into a library. A library never has it on its shelf, never owns a paper copy, can't archive it for posterity. Its patrons can access the material and maybe print it, maybe not. But if the subscription runs out, if the library loses funding and has to cancel that subscription, or if the company itself goes out of business, all the material is gone. The library has no trace of what it bought: no record, no archive. It's lost entirely.

For Vaidyanathan, this is not a good model for a library and, according to him, may as well be 'a computer terminal in a copy shop'. Digital libraries especially on the consortium subscription model may enhance the range of materials that we have access to and reduce substantially the time we take to locate them; however, they also export ownership and control over the archive to agencies outside the library. The digital library exists in binary mode – in either an 'on' or 'off' state – and the switch is not controlled locally. To that extent, it would be advisable to evaluate the access promises of digital libraries from the prism of national interests.

Conclusions: bibliomania in the margins – how Indians read

> Addressing the Library Association's Conference at Scarborough, Mr. F. M. Gardner urged that the training of library staff was a vital need and said 'I know of no library in this country which systematically trains in book knowledge and tries to make that knowledge a primary qualification'. He referred to 'assistants who have nothing but a hearsay knowledge of any modern novelist of repute', and who would be quite incapable, say, of assessing the comparative importance of Beverly Nichols and Pandit Nehru as authorities on Indian affairs … The test of a good librarian is … that readers with a genuine instinct for books are given positive encouragement and the correct lead to satisfy this instinct.
> 'Librarian's Job', 5 June 1948[98]

> Bishnu Kumar Sharma, a stocky, bearded book vendor near the lush green Oval Maidan in Mumbai, inhabits the lowest rung in the piracy chain … He and his poorly educated tribe learn of best sellers through customers, know the value of rare books, and help book collectors trace out-of-print editions … 'He creates a mechanism to find out which books are moving fast, in what discipline, and at what price,' explains Subrahmanyam. 'He prints these books, sometimes in a well-known press'.
> *Asia Times Online*, 23 April 2004[99]

Whether conceived of as sites of leisure or as vanguards of adult education, there is a widespread perception in India that public libraries have been unsuccessful in their assigned role. While it is true that they continue (especially in the case of the four large national libraries and various state central libraries) to enjoy patronage by a narrow class of clientele comprising students appearing in public examinations and academic researchers, they have largely been ignored by the wider public. One may identify a range of factors, both intrinsic and extrinsic, that contribute to this state of neglect – including official apathy, heavily centralized procurement policies that disregard local demands, the widespread availability of cheap reading materials especially in regional languages, the mass popularity of cinema and television as the preferred modes of entertainment and so on. Further, and although this is not particularly reassuring, this decline in the popularity of public libraries in India is consistent with the overall decline of public libraries in other parts of the world (for instance in the United Kingdom[100]).

If public libraries in India are inadequate, and access to the Internet is still not so widespread as to reach a significant portion of the population, then how do people read? I begin this section with two quotidian vignettes on A2K in India that may not directly be related to libraries but form an important component of the environment within which public libraries operate in this country.

1 In June 2008, in separate incidents, irate schoolchildren in the state of Andhra Pradesh[101] and Karnataka[102] staged marches protesting the inadequate supply of free textbooks from the government. While one may, rightly, regard these as instances of glaring government ineptitude, it is also possible to see here an instance of the vocalization of the urge to be educated immediately, now, for *free*. Textbook publishing in India is in most cases state-organized and heavily subsidized so that at least while in school students may largely expect to be supplied with the bare minimum of reading materials suited to their educational levels. While this is no substitute for a well-organized public library system, it is still heartening considering that constant access to printed materials is often a catalyst that sustains literacy.

2 The following account of a pirate bookstore appeared in an article in the *International Journal of Higher Education*:

> Stacked to the ceiling in one shop alone were pirated copies of 70,000 books, from copies of first-year chemistry books, to reproductions of pricey medical texts – *enough copies to stock a large American-university bookstore*.[103]
>
> The three-year old Anti-Piracy Committee … actively works with The Publishers' Association – UK and the American Publishers' Association to create awareness about the copyright issue through its workshops and seminars and to contain the malaise. In about 150 raids conducted by these bodies through their attorney … in the past 3–4 years, about 2,50,000 pirated copies of books have been seized.[104]

While the first vignette cited above confirms that there is certainly a demand for 'knowledge', I think this demand is restricted to knowledge that is relevant for earning accreditation. At least, no similar demonstrations have been held demanding the installation of libraries generally. Lest we take this as a determinative indicator of the knowledge demands of the Indian public, however, the rampancy of book and media piracy confirms both that the public's tastes exceed the mundanely informational and that there is an urgency and impatience to these demands such that their satisfaction will not await delivery through formal channels if it can be helped. More than the publishing industry, it is the pirate industry that shows India up as a nation of voracious readers constantly endeavouring, against the odds, to educate itself. More than librarians, it is pirates who have demonstrated the canny 'book knowledge' and the drive that enables them to fulfil Ranganathan's injunction to deliver 'each book to its reader'.

Public libraries in India operate in an environment that includes a system of government subsidy, a 150-year-old, low-cost publishing industry and a flourishing piracy trade in books, so that the particular shortcomings of the library movement in some corners is offset to an extent by an ecology of cheap print and media materials. If one of the objectives of the library movement has been to bridge the income gap in accessing materials, the widespread cheap

availability of these materials is definitely one of the important factors that impacts on the popularity of public libraries in India.

The development of the networked information economy and the widespread diffusion of information technology give rise to new opportunities for both learning and entertainment. The profusion of materials that have become accessible to Internet users over the past two decades has succeeded in reconfiguring the approach of users toward information, from one of *exploration* to *expectation*.[105]

But, as Geert Lovink reminds us, 'Open Access only exists for those who have made it to the machine and are literate enough to login'.[106] To that extent, 'celebrations of inclusion' by the OA movement appear as so much 'rhetoric that hides actual existing exclusion mechanisms'.[107] The persistence of traditional exclusion mechanisms notwithstanding, we may be encouraged by an anecdote that Ravi Sundaram recounts in his 'Recycling Modernity'[108] about Selvam, a lower caste typist who taught himself programming by 'devouring used manuals, and simply asking around'. According to Sundaram, this gestures to a 'world of informal technological knowledge existing in most parts of India, where those excluded from the upper-caste, English-speaking bastions of the cyber-elite learn their tools'.[109]

Current statistics reveal that as little (or as many) as 40 to 60 million Indians are active users of the Internet.[110] Viewed as a percentage of the population, this is a meagre 4 to 6 per cent. However, this is close to the total number of graduates in India (48.7 million[111]) and is adding users at a much higher rate than the number of new graduates every year (2.5 million[112]). This hints at a degree of techno-literacy higher than the figures of actual literacy would permit. A recent survey[113] indicates that the Internet boom in India has been led not by the metros but smaller and non-metro towns, where the number of Internet users has risen sixty-nine times and thirty-three times respectively since 2000. According to the report, 'More than 60% of information seekers look for general information on the net and 45% look for educational information'.[114]

So while older forms of access barriers persist, the Internet remains a potential resource for self-learners who are 'merited' out of formal channels of education. Yochai Benkler, in *The Wealth of Networks*, points out the 'coordinate' benefits of access to the Internet – a search on Google delivers an 'information product' that is not made possible by cooperation between various sites but rather their simple coordinate existence.[115] Without doing much more, by virtue of their mere existence on the Internet, open educational resources significantly enrich the information environment that we inhabit.[116]

As the recent successes of the Delhi Public Library have demonstrated, this presents a valuable opportunity for public libraries to reinvent themselves by adjusting to the changes in the informational environment. For librarians, the arrival of the computer and the Internet have added a new vibrancy into their profession. The concept of Open Access and Open Source Software in particular has been received enthusiastically among library professionals in India, and this

is tellingly revealed if one views the archives of the 'LIS-Forum' mailing list – a popular discussion forum for Library and Information professionals in India.[117]

As I suggested in the opening paragraphs of this chapter, I would like to end with some summary reflections on what the A2K movement could possibly learn from the Indian library movement.

First, I think it would be productive to think of what shape the A2K movement may take if it were to be reconceptualized, following S. R. Ranganathan's prescription, as *selling the idea of reading (and also, by extension, viewing and listening)*. So far, the movement's thrust has been on passively making 'information' available, on the assumption that its audience will take shape automatically.

Second, just like the librarians in the library movement, the modern A2K movement depends for its existence on the availability of the curatorial labours of trained armies of programmers and computer technicians. It remains to be seen whether the fate of these new-age 'coolie-techs' will ultimately mirror that of the librarians who are, in India, relegated to the janitorial class. There appears, as yet, no 'Indian' Jimmy Wales on the horizon. Just like with libraries, in the A2K movement it is possible to squat on a lot of information – to be a 'node' of that information – without in fact being 'knowledgeable' about it.

Third, Sarah Kamla makes an important point about the decline of public libraries in India in the aftermath of the takeover of the library mission by the state. While the energetic entry of the Indian government into the realm of digital libraries and repositories is welcome, it would be disadvantageous if this resulted in the withdrawal of individual enterprise from the field. Thankfully, there are signs that individual and government efforts at supplying information have been complimentary so far rather than conflicting. Thus, for instance, the availability of court decisions from government websites has not impeded (and has in fact spurred) individuals from hosting sites that build on this material.

Last, I think the public library movement in India has, in some senses, been a casualty of the various discourses that have been woven around it – whether that of promoting literacy, adult education, economic growth and so on. Neglected in these discourses have been the actual aspirations and desires of the local community. This is a danger that the modern A2K movement would do well to avoid – to be so completely sold on its own beneficial rhetoric as to be blinded to what people truly want and find useful.

Notes

1 Langton Gould-Marks, 'Public Libraries in England, 22nd June 1947', *The Hindu Speaks on Libraries* (Madras: Kasturi & Sons Ltd, 1992), pp. 66–8.

2 Vaibhav Pandey, 'How Does a DNS Work?', Technofriends, 1 June 2008. Available at http://technofriends.in/2008/06/01/how-does-a-dns-work/ [accessed 13 February 2009]. See generally, 'Domain Name System', Wikipedia, 12 February 2009. Available at http://en.wikipedia.org/wiki/Domain_name_system [accessed 3 May 2011].

3 'What Is Access to Knowledge?' Balkinization, 21 April 2006. Available at http://balkin.blogspot.com/2006/04/what-is-access-to-knowledge.html [accessed 20 July 2009].

4 From the Wikipedia entry on Y2K 'The Year 2000 problem (also known as the Y2K problem, the millennium bug, the Y2K bug, or simply Y2K) was a notable computer bug resulting from the practice in early computer program design of representing the year with two digits. This caused some date-related processing to operate incorrectly for dates and times on and after January 1, 2000 and on other critical dates which were billed "event horizons"'.

5 Adapted from the title of Priya Joshi's fascinating account of public libraries in India in the nineteenth century. Priya Joshi, 'Reading in the Public Eye – The Circulation of British Fiction in Indian Libraries *c.* 1835–1901', in S. Blackburn & Vasudha Dalmia (eds), *India's Literary History: Essays on the 19th Century* (New Delhi: Permanent Black, 2006).

6 In his recent book 'The Anarchist in the Library', Siva Vaidyanathan reminds us that 'the library is not just functionally important to communities all over the world; it embodies Enlightenment values in the best sense. *A library is a temple devoted to the anti-elitist notion that knowledge should be cheap, if not free – doors should be open*'. Siva Vaidhyanathan, *The Anarchist in the Library: How the Clash between Freedom and Control Is Hacking the Real World and Crashing the System* (New York: Basic Books, 2005).

7 The threat that free public access to knowledge (A2K) could pose to power was evident to mid-nineteenth-century lawmakers in the United Kingdom, who lobbied against the first system of public libraries on the grounds that it would make the working classes even more unmanageable than they already were.

8 To illustrate, the state of Karnataka in south India claims a network of libraries that includes nineteen City Central Libraries, twenty-seven District Central Libraries and over 3,000 village libraries with a cumulative membership of over a million registered members. 'Some Facts and Figures of Karnataka Public Libraries', *Karnataka Public Libraries System*, 1 September 2003. Available at http://www.kar.nic.in/publib/SOMEFACTS.htm [accessed 15 February 2009]. As salutary as these figures are, they say nothing about the kinds of collections these libraries house, the frequency of visits by patrons, the number of books issued and the kinds of books that are popular. In general, public libraries in India have tended to be little more than hangouts for students studying for various public service examinations, and their collections tend to be focused on this narrow clientele.

9 'ILA Membership', *Indian Library Association* 2001. Available at http://www.ilaindia.in/ [accessed 15 February 2009].

10 For a complete description of this system and other contributions of S. R. Ranganathan, see Eugene Garfield, 'Tribute to S. R. Ranganathan, the Father of Indian Library Science – Part 2. Contribution to Indian and International Library Science', *Current Comments*, 7(7) (1984), pp. 45–9. Available at http://www.garfield.library.upenn.edu/essays/v7p045y1984.pdf [accessed 3 May 2011].

11 A letter to the editor of the *Deccan Herald* provides an instance of the dissatisfaction with the level of service of public libraries in the south Indian state of Karnataka. Abdul Majeed Khan, 'City Public Libraries in Shambles', 8 July 2008. Available at http://www.deccanherald.com/Content/Jul82008/editpage2008070777524.asp [accessed 11 February 2009].

12 See Jashu Patel and Krishan Kumar, *Libraries and Librarianship in India* (Westport, CT: Greenwood Press, 2001), p. 81. Available at http://www.questia.com/PM.qst?a=o&d=101358000 [accessed 10 February 2009]; R. Bhattacharjee, *Public Library Services in India: Systems and Deficiencies*, International Federation of Library Associations and Institutions, 2002. Available at http://www.ifla.org/VII/s8/annual/cr02-in.htm [accessed 10 February 2009].

13 See Note 5.

14 The Calcutta Public Library (est. 1836) and the Madras Literary Society (est. 1818) had both paying members as well as a policy that permitted entry gratis to students and 'respectable strangers visiting the City'. See 'What Is Access to Knowledge'.

15 'The National Library – Expansion to Be Stepped Up – Maulana Azad's Assurance – 2nd February 1953', *The Hindu Speaks on Libraries*, pp. 103–8.

16 'The National Library'.

17 The Press and Registration of Books Act, 1867.

18 See Margarita Barns, *The Indian Press: A History of the Growth of Public Opinion in India* (London: Allen & Unwin, 1940). However, Priya Joshi's account of the ease with which books seemed to circulate unhindered through the course of latter half of the nineteenth century despite the existence of this legislation casts some shadow of doubt on whether the Act was in fact ever used for the purpose of censorship. See Note 4 at p. 293.

19 See, for instance, Ulrike Starke's fascinating account of the influential role of the Newal Kishore Press in Lucknow in promoting Hindi literature across North India during the latter half of the nineteenth century. Ulrike Starke, 'Hindi Publishing in the Heart of an Indo-Persian Cultural Metropolis – Lucknow's Newal Kishore Press (1858–1895)', in S. Blackburn & Vasudha Dalmia (ed.), *India's Literary History*.

20 Relying on a census of 'Scientific and Literary Societies' titled 'Annual Reports of the Administration of the Madras Presidency', Priya Joshi reports that 'between 1887 and 1900, the number of scientific and literary societies in the Madras Presidency increased almost three fold from 146 institutions in 1887 to 401 in 1900. Annual membership figures varied greatly in these institutions from 5 members or visitors to 14,532'. From a similar report – *Thacker's India Directory* – she finds 'proportionate increases in the number of libraries and reading rooms for other regions as well, Calcutta went from having 49 libraries and reading rooms in 1886 to 137 in 1901; an almost three fold increase, while the number of such institutions in Bombay increased over five fold from 13 in 1886 to 70 in 1901'.

21 '9th Annual Conference of Madras Non-Gazetted Educational Officers – 23rd December 1927', *The Hindu Speaks on Libraries*, pp. 14–16.

22 'Establishment of Libraries – Dr. Ranganathan's Plan – 4th June 1953', *The Hindu Speaks on Libraries*, pp. 128–9.

23 Bipan Chandra, for instance, suggests that the easy availability of literature on the Soviet Union at the Dwarkadas Library in Lahore founded by Lala Lajpat Rai influenced Bhagat Singh and Sukhdev – two of India's revolutionary names – who began to look upon the Soviet Union as the state nearest to their ideal. Bipan Chandra, *Nationalism and Colonialism in Modern India* (New Delhi: Orient Blackswan, 1979), p. 230.

24 'Library Movement in Madras – 20th May 1920', *The Hindu Speaks on Libraries*, p. 3.

25 See Note 12.

26 'Indian Libraries Movement – Cocanada Conference – 5th January 1924', *The Hindu Speaks on Libraries*, pp. 4–6. The impetus to the library movement in this state seems to have been owing to the efforts of prominent social reformers, including Veeresalingam Pantulu (1848–1919) and S. V. Narasimhasastry. The former, in particular, was a noted champion of adult education, including women's education, and was instrumental in the renaissance of Telugu literature during the early part of the nineteenth century.

27 In 1926, over two decades after its designation as a public library, the librarian of the Imperial Library, Mr J. A. Chapman, issued a 'Plea for Popular Patronage' in *The Statesman* declaring that the Imperial Library was 'prepared to send its books to

approved persons in India and Burma' upon payment of postage, but without any subscription charges being levied. 'The Indian Imperial Library – Plea for Popular Patronage – 16th January 1926', *The Hindu Speaks on Libraries*, pp. 7–9.

28 'Establishment of Libraries – Dr. Ranganathan's Plan – 4th June 1953', *The Hindu Speaks on Libraries*, pp. 128–9.

29 'Librarians' Conference – 5th January 1918', *The Hindu Speaks on Libraries*, pp. 1–2.

30 The AILC continues till this day and in December 2007 the 53rd AILC was held at Hyderabad.

31 There appears to be some confusion regarding the exact nature of the AILC of 1933. The website of the ILA describes it as the *first* AILC; however, according to news reports, at least two previous AILCs appear to have been held in Lahore in 1918 and 1929, respectively. See 'History: ILA', Indian Library Association. Available at http://www.ilaindia.in/ [accessed 11 February 2009]. See also 'All-India Library Conference – Sir P. C. Ray's Address – 27th December 1929', *The Hindu Speaks on Libraries*, pp. 36–7.

32 'The Madras Library Association – An Appeal – 30th March 1928', *The Hindu Speaks on Libraries*, pp. 21–22.

33 '9th Annual Conference of Madras Non-Gazetted Educational Officers – 23rd December 1927', *The Hindu Speaks on Libraries*. Madras: Kasturi & Sons Ltd, 1992, pp. 14–16.

34 S. R. Ranganathan, *The Five Laws of Library Science* (Madras: Madras Library Association, 1931). Available at http://hdl.handle.net/10150/105454 [accessed 29 May 2011].

35 Zahid Ashraf Wani, 'Development of Public Libraries in India', *Library Philosophy and Practice* (2008). Available at http://www.webpages.uidaho.edu/~mbolin/wani.htm [accessed 12 February 2009].

36 Neeta Jambhekar, 'National Policy on Public Libraries in India'. *World Libraries*, 5(2) (1995). Available at http://www.worlib.org/vol05no2/j_v05n2.shtml [accessed 12 February 2009].

37 The educational theory is based on the belief that before the journey begins, one can be given food (in this case education) that is meant to last the entire journey. In educational terms, this theory places emphasis on acquiring qualifications through formal education from childhood and ceasing abruptly with graduation from a university.

38 See, for instance, Sevanti Ninan's detailed account of the use of television to promote pedagogy by the Indian state. According to Ninan, 'The history of television education in India is the history of the origin of the medium'. Sevanti Ninan, 'Electronic Pedagogy: Hit or Miss?' *Through the Magic Window – Television and Change in India*, first edition (New Delhi: Penguin Books, 1995), pp. 100–16.

39 Quoted in Nick Prior, 'Museums: Leisure between State and Distinction', in Rudy Koshar (ed.), *Histories of Leisure*, illustrated edition (United Kingdom: Berg Publishers, 2002), pp. 34–5.

40 'The National Library – Expansion to Be Stepped Up – Maulana Azad's Assurance – 2nd February 1953', *The Hindu Speaks on Libraries*, pp. 103–8.

41 The manifesto has been amended twice in 1972 and more recently in 1997.

42 *UNESCO Public Library Manifesto*, UNESCO/IFLA, 1997. Available at http://www.unesco.org/webworld/libraries/manifestos/libraman.html [accessed 11 April 2009].

43 Jambhekar, 'National Policy on Public Libraries in India'.

44 Jambhekar, 'National Policy on Public Libraries in India'.

45 Jambhekar, 'National Policy on Public Libraries in India'.

46 (1) Madras (Tamil Nadu) Public Libraries Act (1948), (2) Andhra Pradesh Public Libraries Act (1960), (3) Mysore (Karnataka) Public Libraries Act (1965),

(4) Maharashtra Public Libraries Act (1967), (5) West Bengal Public Libraries Act (1979), (6) Manipur Public Libraries Act (1988), (7) Kerala Public Libraries Act (1989), (8) Haryana Public Libraries Act (1989), (9) Mizoram Public Libraries Act (1993), and (10) Goa Public Libraries Act (1993).

47 See note 36.

48 R. Bhattacharjee, *Public Library Services in India*.

49 Sarah Kamala, 'Creating a Second Village Library Movement', in Brij Kothari (ed.), *Reading Beyond the Alphabet* (California: Sage Publications, 2003), pp. 169–85.

50 'Libraries Today: In 60s Not 90s – 7th February 1992', *The Hindu Speaks on Libraries*, pp. 288–9.

51 'Press Release: DPL Success Story: Membership and Usage Increase Substantially', *Delhi Public Library*, 23 December 2008. Available at http://www.dpl.gov.in/Press.pdf [accessed 8 May 2009].

52 For instance, the 'Vision 2020' document prepared in 2002 by the Planning Commission of India to guide the country's progress 'conceives of India evolving into an information society and knowledge economy built on the edifice of information and communication technology (ICT), of which telecommunications is the springboard'. *India Vision 2020* (New Delhi: Planning Commission, 2002). Available at www.planningcommission.nic.in/reports/genrep/pl_vsn2020.pdf [accessed 10 May 2009].

53 See, for instance, the 2007 Working Report by the National Knowledge Commission on 'Access to Knowledge'.

54 'National Knowledge Commission – Letter to the Prime Minister', 7 December 2006. Available at http://www.knowledgecommission.gov.in/downloads/recommendations/LibrariesLetterPM.pdf [accessed 8 May 2009].

55 Simultaneously, one needs to regard the public library's educating mission with a healthy degree of suspicion – both on account of its abysmal actual performance in furthering public education to any appreciable degree as well as the fact that 'modern education' itself is the child of the industrial age and is designed to serve primarily the ends of industry. As Gustavo Esteva and Madhu Prakash point out, 'Modern Education was born when a new conviction arose in Europe that man is born stupid and lacks vital competence unless he is educated. Everywhere education is promoted in the name of equality and justice. It is presented as the best remedy for the oppressive inequalities of modern society'. However, they caution, 'It produces exactly the opposite. No matter how much every society invests in education, most people fail to reach the end of the process and are disqualified as unfit for a manmade world'. The increasing frustration that ordinary people experience with modern education is leading more and more of them to reject the model and recover 'little by little their old art of learning in which every baby is an expert. Given the fact that education is the economization of learning, which transforms learning into the consumption of a commodity called knowledge, people recover their own notion of learning to live. Since the noun education imposes a radical dependence, of any educator, upon the public or private system of education, they substitute for it the verb "to learn", which re-establishes the autonomous capacity to keep a creative relationship with the others and with nature. People acknowledge that to know is a personal experience, and that the only way to know, to widen the competence to live, is *to learn from the world, not about the world*'. Gustavo Esteva and Madhu Prakash, 'Education', in Vinay Lal and Ashis Nandy (eds), *The Future of Knowledge and Culture: A Dictionary for the 21st Century* (New Delhi: Penguin Books India, 2005), pp. 84–9. It is worth asking in our context whether the public library is such a site that fosters learning *from* the world and not merely *about* the world.

56 Prior, 'Museums'.

57 Prior, 'Museums'.

58 Prior, 'Museums'.

59 Prior, 'Museums'.

60 For instance, in his *Five Laws*, S. Ranganathan recounts an anecdote in which a particular municipality sought to locate its new library on the outskirts of the town in order to keep out 'all sorts of fellows' who may otherwise land up at its doorsteps if the library was more centrally located. In contrast to this approach, Ranganathan advocates that access to the broadest possible section of the public be made one of the central tenets of the public library.

61 Adorno, T. & Horkheimer, M., 1944. The Culture Industry: Enlightenment as Mass Deception. *Marxists.org*. Available at: http://www.marxists.org/reference/archive/adorno/1944/culture-industry.htm [Accessed June 20, 2011].

62 'National Knowledge Commission – Letter to the Prime Minister'.

63 Tapti Roy, 'Disciplining the Printed Text: Colonial and Nationalist Surveillance of Bengali Literature', in Partha Chatterjee (ed.), *Texts of Power: Emerging Disciplines in Colonial Bengal* (Calcutta: Samya, 1995).

64 Sharpe, K. & Zwicker, S. eds., 2003. *Reading, Society, and Politics in Early Modern England*, Cambridge, U.K: Cambridge University Press. P.1.

65 *Ibid*, p. 3.

66 *Ibid*, p. 4.

67 Roy, 'Disciplining the Printed Text', pp. 30–63.

68 There is evidence of the existence of this kind of 'public reading' among the urban poor in Victorian England alongside the Protestant Reformation with its strictures on private reading. John Plunkett and Andrew King provide an account of such readings among the Costermongers of London in their Reader on Victorian Print Media. See Henry Mayhew, 'The Literature of Costermongers', in John Plunkett and Andrew King (eds), *London Labour and the London Poor*, Volume 1 (London: Griffin, Bohn & Co., 1861), pp. 25–6. John Plunkett and Andrew King, *Victorian Print Media: A Reader* (Oxford and New York: Oxford University Press, 2006), pp. 271–4.

69 Priya Joshi, 'Reading in the Public Eye: The Circulation of British Fiction in Indian Libraries – 1835–1901'. In S. H. Blackburn (ed.) *India's Literary History: Essays on the Nineteenth Century* (New Delhi: Permanent Black, 2004), pp. 280–327.

70 Joshi, 'Reading in the Public Eye'.

71 For an interesting account of the importance of cybercafes in bridging the digital divide in India, see Anikar Haseloff, 'Cybercafes and Their Potential as Community Development Tools in India', 9 May 2006, p. 17. Available at http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN023010.pdf [accessed 10 May 2009].

72 S. R. Ranganathan, *The Five Laws of Library Science* (Madras: Madras Library Association, 1931). Available at http://hdl.handle.net/10150/105454 [accessed 29 May 2011].

73 M. S. Swaminathan, 'Every Village a Knowledge Centre', *The Hindu*, 25 November 2005, p. 10. Available at http://www.hindu.com/2005/11/25/stories/2005112504941000.htm [accessed 13 February 2009].

74 See generally, Yochai Benkler, *The Wealth of Networks: How Social Production Transforms Markets and Freedom* (New Haven, CT: Yale University Press, 2007).

75 Sundaram says 'Temporal acceleration was a significant part of the imaginary of developmentalism – this was inherent in the logic of 'catching up' with the core

areas of the world economy by privileging a certain strategy of growth that actively delegitamized [*sic*] local and "traditional" practices'.

76 Preamble, Government of India. Office of the Prime Minister. National Task Force on Information Technology and Software Development, 1998. Available at http://it-taskforce.nic.in/prem.htm [accessed 3 May 2011]. This view corresponds to what Ravi Sundaram terms as the first 'fable of electronic capitalism' in which "India's access to western modernity (and progress) would obtain through a vast virtual universe, programmed and developed by Indians". See Ravi Sundaram, 'Recycling Modernity: Pirate Electronic Cultures in India', in Geert Lovink and Shudhabrata Sengupta (eds), *Sarai Reader 01: The Public Domain* (New Delhi: Waag Society for Old & New Media, 2001).

77 Government of India. Office of the Prime Minister. *Task Force on Information Technology and Software Development: Information Technology Action Plan: Part III – Long Term National IT Policy*, 1999. Available at http://it-taskforce.nic.in/actplan3/chap5.htm [accessed 3 May 2011].

78 UGC (Submission of Metadata and Full-Text of Doctoral Theses in Electronic Format) Regulations, 2005.

79 UGC (Submission of Metadata …) Regulations.

80 Respectively, ABI/Inform Complete, ACM Digital Library, ASCE Journals, ASME Journals (+ A M R), ASTM Standards & Digital Library, Capitaline, CRIS Ind. Information, Digital Engineering Library (DEL), EBSCO Databases, Elsevier's Science Direct, Emerald E-Books (Business Management & Economics Collection), Emerald Full-Text, Emerald Management Xtra, Engineering Science Data Unit (ESDU), Euromonitor (GMID), IEEE/IEE Electronic Library Online (IEL), IEL Digital Library, Indian Standards, INSIGHT, Nature, ProQuest Science (formerly Applied Science & Technology Plus) and Springer Link. For the latest list, See *E-Resources List*. INDEST-AICTE consortium. Available at http://paniit.iitd.ac.in/indest/eresources.html [accessed 2 May 2008].

81 Respectively, COMPENDEX on EI Village, INSPEC on EI Village, J-Gate Custom Content for Consortia (JCCC), MathSciNet, SciFinder Scholar and Web of Science. For the latest list, See *E-Resources List*. INDEST-AICTE consortium. Available at http://paniit.iitd.ac.in/indest/eresources.html [accessed 2 May 2008].

82 'Members', Indian National Digital Library in Engineering Science & Technology, 2011. Available at http://paniit.iitd.ac.in/indest/members.php [accessed May 6, 2011].

83 Arora, J. & Agrawal, P., 2003. Indian Digital Library in Engineering Science and Technology (INDEST) Consortium: Consortia-Based Subscription to Electronic Resources for Technical Education System in India: A Government of India Initiative. Available at: http://arizona.openrepository.com/arizona/handle/10150/105608 [Accessed June 20, 2011].

84 Arora, 'Indian Digital Library'.

85 Respectively, American Chemical Society, American Institute of Physics, American Physical Society, Annual Reviews, Blackwell Publishing, Cambridge University Press, Elsevier Science, Emerald, Institute of Physics, J-STOR, Nature, Oxford University Press, Portland Press, Project Euclid, Project Muse, Royal Society of Chemistry, SIAM, Springer Link, Taylor and Francis, SciFinder Scholar, MathSciNet, Royal Society of Chemistry (6 Databases), ISID and JCCC.

86 'Members', UGC InfoNet Digital Library Consortium, INFLIBNET Centre Ahmedabad, 2011. Available at http://www.inflibnet.ac.in/econ/members.php [accessed 6 May 2011].

87 Prem Chand *et al.*, 'Access to Scholarly Literature in Higher Education Institutions Under Inflibnet Consortium' (Panjab University, Chandigarh: INFLIBNET Centre, Ahmedabad, 2007), pp. 570–88, 8 May 2009. Available at http://202.141.12.214:8080/jspui/bitstream/123456789/531/1/CALIBER%202007%20(56)%20P-%20570-588.pdf [accessed 8 May 2009].

88 Chand, 'Access to Scholarly Literature', p. 577.

89 'About Us', The Universal Digital Library. Available at http://www.ulib.org/ULIBAboutUs.htm#visionBkMark [accessed 6 May 2011].

90 As Yochai Benkler notes in his *Wealth of Networks*:

> The fact that every such effort is available to anyone connected to the network, from anywhere, has led to the emergence of coordinate effects, where the aggregate effect of individual action, even when it is not self-consciously cooperative, produces the coordinate effect of a new and rich information environment.

91 Maurice De Kunder, 'The Size of the World Wide Web', 9 March 2011. Available at http://www.worldwidewebsize.com/ [accessed 29 May 2011].

92 John Battelle, *The Search: How Google and Its Rivals Rewrote the Rules of Business and Transformed Our Culture* (New York: Portfolio, 2005), p. 1.

93 Battelle, *The Search*, p. 4.

94 Battelle, *The Search*. p. 61.

95 Amartya Sen, *Development as Freedom*, reprint (New York: Anchor, 2000).

96 Robert Mitchell, 'When a Terabyte Isn't Enough', *Computerworld Blogs – Reality Check*, 27 March 2009. Available at http://blogs.computerworld.com/when_a_terabyte_isnt_enough [accessed 21 April 2009].

97 Vaidhyanathan, *The Anarchist in the Library*.

98 'Librarian's Job – 5th June, 1948', *The Hindu Speaks on Libraries*, p. 77.

99 M. Raja, 'India's Bootlegging Book Bandits', *Asia Times Online*, 23 April 2004. Available at http://www.atimes.com/atimes/South_Asia/FD23Df03.html [accessed 15 February 2009].

100 Leadbeater, C., 2003. *Overdue: How to create a modern public library service*, London: Laser Foundation. Available at: http://www.demos.co.uk/files/overdue.pdf?1240939425 [Accessed 20 June 2011].

101 'A Textbook Case', *The Hindu*, 18 June 2008, p. 3. Available at http://www.hindu.com/2008/06/18/stories/2008061859960300.htm [accessed 15 February 2009].

102 'Textbook Shortage Putting Students to Hardships', *The Hindu*, 18 June 2008, p. 3. Available at http://www.hindu.com/2008/06/18/stories/2008061851980300.htm [accessed 15 February 2009]. See also 'Students Demand Textbooks Supply', *The Hindu*, 7 July 2005, p. 3. Available at http://www.hindu.com/2005/07/07/stories/2005070708190300.htm [accessed 15 February 2009].

103 Martha Overland, 'Publishers Battle Pirates in India with Little Success', *The Chronicle of Higher Education*, 2003. Available at http://chronicle.com/weekly/v50/i30/30a04001.htm [accessed 11 May 2009].

104 Payal Verma, 'Publishers Losing Rs 400 Crore to Piracy Every Yr', Rediff.com, 31 July 2003. Available at http://www.rediff.com/money/2003/jul/31piracy.htm [accessed 25 February 2009].

105 See Note 70.

106 Geert Lovink, 'Introduction to Open Networks Power and Politics of Good Intentions', in Lipika Bansal, Paul Keller & Geert Lovink (eds), *In the Shade of*

the Commons – Towards a Culture of Open Networks (Amsterdam: Waag Society, 2006), pp. 123–4. Available at http://www.waag.org/project/shade [accessed 15 February 2009].

107 Lovink, 'Introduction to Open Networks'.

108 Sundaram, 'Recycling Modernity'.

109 Sundaram, 'Recycling Modernity'.

110 T. Ramachandran, 'Majority of Internet Users from Urban Areas: Survey', *The Hindu*, 15 February 2009, p. 12. Available at http://www.hindu.com/2009/02/15/stories/2009021555191200.htm [accessed 15 February 2009].

111 Sunil Jain, 'Graduates in India? 48.7 million', *Rediff News*, 19 December 2005. Available at http://in.rediff.com/money/2005/dec/19guest1.htm [accessed 15 February 2009].

112 Rhines, Gretchen, Betsy Cheney, Ruzzi Brown, and Karthik Muralidharan. *A Profile of the Indian Education System*, New Commission on the Skills of the American Workforce, National Center on Education and the Economy, 2005, 15 February 2009. Available at http://www.skillscommission.org/wp-content/uploads/2010/05/IndianEducationSystem.pdf [accessed 8 June 2009].

113 Rema Nagarajan, 'Small Towns Drive Internet Boom in India', *The Times of India*, 22 October 2007. Available at http://timesofindia.indiatimes.com/articleshow/2479520.cms [accessed 15 February 2009].

114 Nagarajan, 'Small Towns Drive Internet Boom'.

115 Benkler, *The Wealth of Networks*.

116 These two paragraphs have been reproduced from Prashant Iyengar, 'A Few Old Lessons (and Some New Ones) for Open Education in India', iCommons Lab Report, November 2007, p. 12. Available at http://www.icommons.org/static/wp-content/uploads/2007/12/icommons-lab-report-november-december-07.pdf [accessed 15 February 2009].

117 'LIS-Forum Info Page', 'LIS-Forum – Discussion Forum for Library and Information Professionals in India'. Available at http://ncsi.iisc.ernet.in/mailman/listinfo/lis-forum [accessed 11 May 2009].

4

Access to Medicines in India

A review of recent concerns

Chan Park & Arjun Jayadev

Introduction and background – patents, medicines and access in India

India has long been a central front in the struggle for access to affordable medicines. Because of its dynamic generic pharmaceutical industry, it has become what Médecins Sans Frontières (MSF) has called the 'pharmacy of the developing world' (MSF 2007). As a result, it has also been a key battleground on some of the most contentious issues relating to whether, and to what extent, countries retain flexibilities under the WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (the TRIPS Agreement) to ensure that patent protection does not come at the cost of access to safe, effective and affordable essential medicines.

Nowhere is the central role of Indian generic companies more visible than in the provision of affordable medicines to treat HIV. The advent of triple-combination antiretrovirals (ARVs) for HIV in the mid-1990s transformed what had been a fatal disease into a chronic, but largely manageable, lifelong condition. However, due in part to the high costs of these drugs that resulted from patent protection in developed countries, a vast inequity in access to life-saving treatment emerged: those fortunate few in the developed countries who could afford ARVs at costs exceeding US$10,000 per year and the vast majority of people living with HIV (PLHIV) in the developing world who were denied treatment (MSF 2008).

However, in 2001 an Indian generic company, Cipla, announced that it would provide generic versions of these life-saving ARVs at a price about thirty times less than the prices that the multinational pharmaceutical companies had been charging. Cipla, and shortly thereafter other Indian generic manufacturers, was able to enter the market with generic versions of these ARVs as a result of the fact that India, at that time under the Patents Act in force since 1972, did not recognize product patent protection. Now, with a host of other Indian generic makers having entered the market, the prices have fallen to less than US$87 per year – more than a 100-fold reduction in prices in a span of seven years (MSF 2008).

With the availability of cheap Indian generic ARVs, it became a realistic possibility to scale up treatment dramatically throughout the developing world. Between 2003 and 2008, the world witnessed an unprecedented scale up in treatment, placing almost 3 million PLHIV on treatment in the developing world (Joint United Nations Programme on HIV/AIDS 2008). By and large, these scale-ups were made possible with affordable generic drugs sourced from India.

Even today, the importance of Indian generic manufacturers in supplying affordable medicines throughout the developing world is hard to overstate. In sub-Saharan Africa, for instance, Indian generic ARVs account for 85 per cent of the total volume of generic ARVs supplied (Avafia, Burger & Hartzenberg 2006). When compulsory licences on several essential medicines were recently issued in places such as Brazil, Thailand, Malaysia and Indonesia, these governments looked to India in order to import affordably priced generic versions.

When India amended the Patents Act, 1970 (the 'Patents Act' or 'Act'), to come into full compliance with the TRIPS Agreement in 2005, there were grave concerns voiced by civil society organizations from both within India and throughout the developing world. The concern among international organizations was understandable: due to India's policy choice since 1972 of not recognizing product patent protection on pharmaceuticals, India's generic pharmaceutical industry had thrived and had become the largest supplier of affordable essential medicines throughout the developing world.

This chapter reviews some of the key developments in India, four years on, since the entry into force of the Patents (Amendment) Act of 2005, which introduced product patent protection for pharmaceuticals for the first time since 1972. Although there have been some notable successes for the access to medicines movement, many challenges remain, and the future of India's continuing status as the developing world's pharmacy remains unclear. This chapter examines some of the key challenges and opportunities that lie ahead for India.

'The Indian Generic Pharmaceutical Industry: 1947–2005' section examines the development of the Indian generic pharmaceutical industry during the pre-TRIPS era, demonstrating its continuing ability to manufacture generic versions of key pharmaceutical products, often at a fraction of the cost charged by originator companies. 'Analysis of Indian Patents Act/TRIPS Flexibilities: the 2005 Patent Act' section reviews Indian patent law from the perspective of the extent to which India has been able to incorporate some of the key TRIPS 'flexibilities' that can facilitate access to medicines. While there are several aspects of Indian law that could be improved, we conclude that Indian patent law is (or has the potential to be) uniquely progressive. 'Indian Courts – Recognizing the Right to Access to Medicines and Right to Health' section examines some of the key legal developments that have occurred in Indian courtrooms and patent offices since 2005. These decisions demonstrate that Indian patent

law jurisprudence is beginning to recognize the need to balance the state's obligations to protect the constitutional rights to life and health with patent protection and has the potential to create a uniquely progressive body of case law. Finally, 'Future Obstacles/Opportunities' section looks ahead to some of the key challenges and opportunities that lie ahead for India – issues that, depending on how they are resolved, have the potential to ensure that India remains a key supplier of affordable essential medicines to its own population and throughout the developing world.

The Indian generic pharmaceutical industry: 1947–2005

As is the case with many erstwhile British colonies, India inherited the statutory and legal framework of the United Kingdom when it gained independence in 1947. Among these colonial legacies was the Patents and Designs Act, 1911, which allowed for the patenting of a broad range of inventions, including for pharmaceuticals, for a period of sixteen years after the filing date (Mueller 2007: 506–9). During the colonial period and in the first decades after Indian independence, this law remained in place, during which time 'virtually no basic drug manufacture' happened in India, and the vast majority of patent applications were filed by foreigners (Mueller 2007).

The legal framework that allowed the Indian generic industry to thrive was not implemented until 1972, when the Indian Patents Act, 1970, came into force. The Patents Act was based on the recommendations of a report commissioned by the Indian government in 1957 and submitted two years later, commonly known as the 'Ayyangar Report', named after the jurist Rajagopala Ayyangar, who chaired the committee that drafted the report (Ayyangar 1959). The Ayyangar Report recommended a vast overhaul of the Indian patent system, observing that the system in place at the time 'has failed in its main purpose, namely, to stimulate invention among Indians and to encourage the development and exploitation of new inventions for industrial purposes in the country so as to secure the benefits thereof to the largest section of the public' (Ayyangar 1959). Portions of the report are worth quoting at some length, both because they lay out the philosophical underpinnings of the Indian law that followed and because they put into stark relief the fact that developing countries are now largely precluded from taking similar considerations into account when formulating their own laws in the post-TRIPS world.

In discussing the costs and benefits of a patent system, Ayyangar made the observation that simply having a patent system in place is insufficient to promote innovation and economic development:

> The advantages accruing to a nation's economy from rewarding inventors with the grant of [patents] are dependent on two main factors: (1) The country must

> be technologically advanced to maintain the rate of invention which is brought forth by the promise of the reward … (2) The patented invention must be worked in the country which grants the patents.
>
> From the above it will be seen that the monopoly created by the patent … offer[s] advantages which have been claimed for the system, only in the highly industrialised countries which have a large capital available for investment in industries and a high degree of scientific and technological education.
>
> It is further obvious however that the system would not yield the same results when applied to under-developed countries. (Ayyangar 1959)

Thus, Ayyangar recognized that a 'one size fits all' approach to formulating patent policy was inappropriate and that laws 'have to be designed, with special reference to the economic conditions of the country, the state of its scientific and technological advance, its future needs and other relevant factors … so as to minimise if not eliminate the abuses to which a system of patent monopoly is capable of being put' (Ayyangar 1959). Of particular importance to Ayyangar was the need to ensure the easy availability of affordable medicines. As such, he recommended that Indian law not provide patent protection for pharmaceutical products, in order to ensure that food and medicines are available to the public at reasonable prices (Ayyangar 1959).

Interestingly, this recommendation was based largely on Ayyangar's observation that this was the accepted practice at the time in virtually every European country (Ayyangar 1959). Of course, most countries today (with the exception of a handful of least developed countries[1] (LDCs) and non-WTO members) are legally prohibited from copying what was near universal European practice just a few decades ago.

Even after the Ayyangar Report was submitted to the Indian government in 1959, it would be over a decade before legislative changes were made to Indian law. 'As is not uncommon in Indian legislative measures, change came very slowly' (Mueller 2007). The 1970 Patents Act incorporated many of the recommendations of the Ayyangar Report; the most significant of which was to exclude pharmaceuticals from patentability. Thus, claims covering a pharmaceutical product itself were deemed to be unpatentable under the Act, and only processes patents were made available.[2] In addition, the patent term for even these process patents was shortened, to the shorter of five years from grant or seven years of filing,[3] and automatic 'licences of right' were made available three years after the grant of the patent. As such, a competitor would be able to obtain an automatic licence to practise the patent three years after grant on terms as agreed to by the parties, or failing agreement, on terms as set by the Patent Controller (Patents Act 1970 §§ 87, 88).

When in 1972 India adopted its patent law, which explicitly prohibited product patents in drugs, there was a fear that the country would not have

continued access to medicines as multinational companies lost control over existing markets and were disincentivized to bring new medicines into the country. Contrary to these expectations, however, India has managed to maintain a regular and steady production of the most state-of-the-art medicines over the past three decades. This in turn was due to a combination of factors, including the initial investment of government into laboratories (such as the Central Drug Research Institute), which enabled Indian companies to develop technical and technological expertise. As a result, Indian companies have managed successfully to reverse engineer virtually every viable drug produced by multinational pharmaceutical companies. The market share of multinational companies in India has declined from over 60 per cent in 1970 to about 25 per cent in the early 2000s (Chaudhuri 2005; Federation of Indian Chambers of Commerce and Industry 2005). The domestic pharmaceutical industry accounted for 70 per cent of active pharmaceutical ingredients and 80 per cent of formulations in India by 1999, making it 'possibly the only developing country in the world that has come this close to achieving so-called self-sufficiency in medicines' (Musungu & Oh 2006: 16). Furthermore, India is now the world's fourth largest producer of drugs (by volume) with eight per cent of the world's drugs being manufactured within its borders.

Within India, in most therapeutic sectors, the market leader is almost always a generic manufacturer. The generic market leader's price is lower than that of the originating firm, and market share is almost always dominated by the indigenous Indian industry (see for a particular example, *Roche v Cipla* section). Drugs are often produced and marketed in India without the presence of the patent owner in the Indian market.[4] Patent titling abroad appears to provide sufficient information for domestic firms to produce and distribute the molecule, and as long as there is adequate market demand in India these drugs will be produced for the domestic market by generics.

Table 4.1 considers the twenty top selling drugs in the United States in 2006. Among these, every molecule had a generic producer in India. However, for only six of these twenty cases did the patent owner market a brand in India, and in only two of these twenty was the patent owner the first to bring the drug to the Indian market.[5] Most patent owners had production units in India, but the majority chose not to launch their products in the country immediately. While this is not *prima facie* evidence to suggest that new drugs would not have been marketed in India except for the existence of generic firms, it is certainly reason to question whether multinational corporations would have an incentive to invest in the country, given its relatively small size of market for drugs selling at prices prevailing under patent protection.

The price of brand name patented drugs in the US market – as might be expected – is often orders of magnitude higher than generic versions in India. Such a comparison, it may be argued, overestimates the price-reducing impact of generic manufacturers, since the price that patent owners may charge in

Table 4.1 Entry into Indian market of top twenty brand name drugs

Brand* (molecule)	Patent owner	Brand available in India?	Molecule available in India?**	Was the molecule launched by the patent owner in India?
1. Lipitor (atorvastatin) [cholesterol]	Pfizer (United States)	N	Y	N
2. Nexium (esomeprazole) [gastroesophageal reflux]	AstraZeneca (United Kingdom)	N	Y	N
3. Prevacid (lansoprazole) [gastroesophageal reflux]	Novartis (Switzerland)	N	Y	N
4. Advair Diskus (fluticasone propionate) [asthma]	Glaxo Smith Kline (United Kingdom)	Y	Y	N
5. Singulair (montelukast sodium) [asthma]	Merck (Germany)	N	Y	N
6. Effexor XR (venlafaxine HCL) [depression]	Wyeth (United States)	N	Y	N
7. Plavix (clopidrogel) [coronary artery disease]	Sanofi-Aventis (France)	Y	Y	N
8. Zocor (simvastatin) [cholesterol]	Merck (Germany)	N	Y	N
9. Norvasc (amlodipine besylate) [angina]	Pfizer (United States)	Y	Y	Y
10. Lexapro (escitalopram oxalate) [depression]	Lundbeck (Denmark)	Y	Y	N
11. Seroquel (quetiapine fumarate) [schizophrenia]	AstraZeneca (United Kingdom)	N	Y	N

Brand* (molecule)	Patent owner	Brand available in India?	Molecule available in India?**	Was the molecule launched by the patent owner in India?
12. Protonix (pantaprazole sodium) [gastroesophageal reflux]	Wyeth (United States)	N	Y	N
13. Ambien (zolpidem tartarate) [insomnia]	Sanofi-Aventis (France)	N	Y	N
14. Actos (pioglitazone) [diabetes]	Takeda/Eli Lilly (United States)	N	Y	N
15. Zoloft (sertraline) [depression]	Pfizer (United States)	Y	Y	Y
16. Wellbutrin XL (bupropion) [depression/smoking]	Glaxo Smith Kline (United Kingdom)	N	Y	N
17. Avandia (rosiglitazone) [diabetes]	Glaxo Smith Kline (United Kingdom)	Y	Y	N
18. Risperdal (risperidone) [schizophrenia]	Janssen (Belgium)	N	Y	N
19. Zyprexa (olanzapine) [schizophrenia]	Eli Lilly (United States)	N	Y	N
20. Topamax (topiramate) [epilepsy]	Ortho-Mcneil (United States)	N	Y	N

Source: *Drug Topics 2006, **Mediclik.com.

the absence of competition from generics would be predicated on the market characteristics of Indian demand and thus would be lower. This said, an illustrative example of the cost savings afforded by generic manufacturers in India is to look at prices for the same product in Pakistan, which does not

have a large generics industry but which shares demographic, economic and disease profiles with India. Looking at eleven drugs used to treat hypotension and other cardiac diseases, Lele (2005)[6] found significant price differences. The lowest price at which these drugs were sold in Pakistan, where patents were in force, ranged from 195 per cent to 2012 per cent more expensive than in India, where generic equivalents were available.

As a result of this ability to produce high-quality, low-cost generics, Indian industry has expanded significantly both domestically as well as increasingly through export orientation and internationalization. The ability of Indian companies to produce at low costs, combined with competent certification and business models that encourage growth through exports, has meant that many developing countries have used Indian generic medicines as an affordable source of medicines for public health. Furthermore, Indian generics have recently become critical players in litigation surrounding generics access and patenting as they have begun to export to the markets of developed countries (Figure 4.1).

Chaudhuri (2005) shows that export revenues have increased significantly from 1996 onwards, although export activity increased in the late 1980s. In 1996, exports were about US$700 million, but by 2006 the figure was over US$3 billion. Export revenue constitutes about half of overall revenues of the industry, and for some companies, including Ranbaxy, Dr Reddy's, Lupin, Ipca and Orchid, their export intensity has been even higher (Chaudhuri 2005; Federation of Indian Chambers of Commerce and Industry (FICCI) 2005).

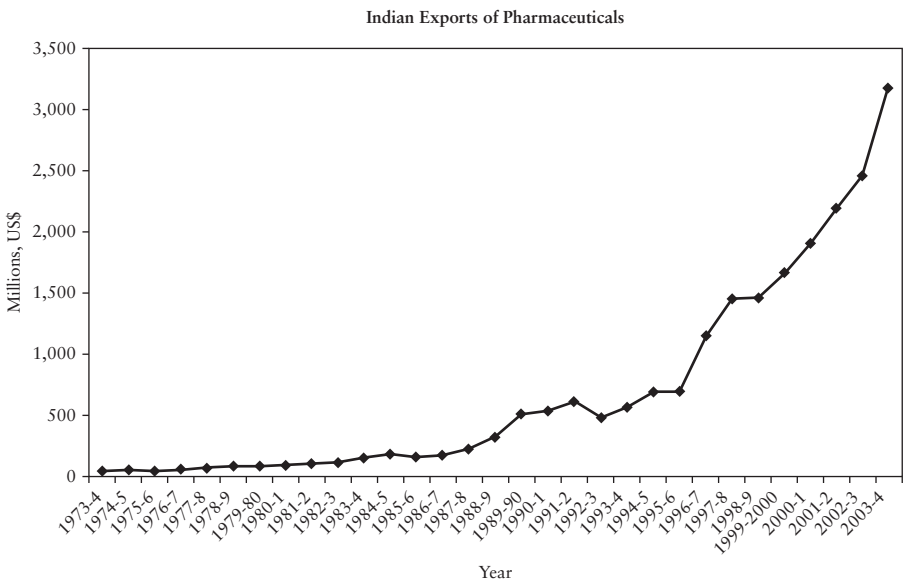

Figure 4.1 Indian exports of pharmaceuticals

Export orientation has changed from a focus on other developing country markets to developed country markets, which accounts in substantial part for the larger volumes in exports following 2000. While certainly a consequence of the maturity and vibrancy of Indian pharmaceuticals, this process can also be seen as a response to the TRIPS Agreement. Faced with the certainty of dwindling domestic markets, much of the industry began to focus on external opportunities, particularly on products that were going off patent. Indeed, one of the arguments made to minimize the threat that the agreement posed was to suggest that the immense export opportunities provided by lucrative developed country markets where previously patented drugs are going off patent were more than adequate to offset the losses of domestic markets as patented products gained protection within Indian jurisdiction. Estimates of the market size that might be available have ranged from US$40 billion to US$60 billion (Nath 2004).

This period of success for the generic industry, predicated on an intelligent industrial policy and opportunities provided by other markets, is however, potentially coming to an end. The challenges that are being faced are described in greater detail in 'Future Obstacles/Opportunities' section.

Analysis of Indian Patents Act/TRIPS flexibilities: the 2005 Patent Act

The TRIPS era

When WTO came into being on 1 January 1995 with India as a signatory, it signalled the beginning of the end for the patent regime that had allowed the Indian generic pharmaceutical industry to achieve self-sufficiency. Under the terms of the WTO-mandated TRIPS Agreement, India was obligated to make patents available 'for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application' (TRIPS Art. 27.1). Thus, no longer could India exclude from patentability inventions one (or more) particular area(s) of technology, and it was bound to make both products and processes eligible for patent protection. Further, the minimum term of patent protection required under TRIPS was twenty years, thus drastically extending the existing term of protection that India had provided to process patents on medicines.

However, as a developing country that had not previously recognized product patent protection on pharmaceuticals, India was eligible to take advantage of a ten-year transition period – until 1 January 2005 – in which to implement the obligations to introduce pharmaceutical product patent protection (TRIPS Arts. 65.2, 65.4). Although several other developing

countries were eligible to take advantage of this transition period, most did not. Only a total of thirteen developing countries notified the WTO of their intention to utilize this transition period, and even among these countries only six – Cuba, Egypt, India, Pakistan, Qatar and the United Arab Emirates – were still utilizing the transition period as of 2003 (Musungu & Oh 2006, 13). Notably, Brazil, which like India did not recognize product patent protection on pharmaceuticals prior to the TRIPS Agreement, declined to take advantage of the transition period and even extended retroactive patent protection to a large number of pharmaceutical products that were invented prior to the entry into force of the TRIPS Agreement (Brazilian Network for the Integration of Peoples (REBRIP) 2007). The grant of retroactive patent protection in Brazil has cost its health budget an estimated US$420 million in higher medicine prices between 2001 and 2005, and Brazilian civil society groups have recently challenged the validity of this law (Rosina *et al*. 2008).

Of course, during the intervening years between 1995 and 2005, several events put into stark relief the concerns over patent protection on access to essential medicines. First and foremost was the explosion of the AIDS crisis in Africa and other parts of the developing world, which exposed a yawning gap in basic access to patented ARV medicines between those living in the developed versus developing worlds. The inequity in access to life-saving AIDS medicines, and the global outrage this inequity generated, has been credited with spawning the global access to medicines movement (see, e.g. Kapczynski 2008; 't Hoen 2002).

Largely as a result of this unprecedented global mobilization (Kapczynski 2008), and the concerns that the movement generated among developing country governments, the WTO member countries agreed in 2001 on the 'Doha Declaration on the TRIPS Agreement and Public Health' (the 'Doha Declaration'), which reaffirmed the existence of flexibilities contained in the TRIPS Agreement that could be utilized to promote access to medicines, and it declared that TRIPS 'can and should be interpreted and implemented in a manner supportive of WTO Members' right to protect public health and, in particular, to promote access to medicines for all'.

Thus, India's decision to maximize its full complement of transition periods available under the TRIPS agreement and delay the implementation of product patent protection on pharmaceuticals had both foreseeable and unforeseeable advantages. Obviously, delaying the implementation of product patent protection allowed Indian generic companies to continue manufacturing affordable versions of patented medicines, thus allowing the country to become a major player in the global market. Less foreseeable was the fact that in the intervening period the access to medicines movement would be born: a well-coordinated network of scholars, activists and community-based organizations, which were highly motivated, increasingly sophisticated and 'remarkably aware of esoteric patent law developments' (Mueller 2007: 497).

Undoubtedly, it was the confluence of these two (and other) factors that was responsible for many of the unique provisions that were included in the Patents (Amendment) Act, 2005. Considerations of domestic self-interest in maintaining the sustainability of its generic industry, as well as intense pressure from civil society groups both within and without India, resulted in an unprecedented amount of public debate surrounding the pros and cons of the new patent regime in India. 'For the first time in independent India's history, national newspapers carried 4-column headline news covering "patents"'. The Patents Bill was also the topic of prime-time news on national TV channels' (Pillai 2005). The convenient (albeit accidental) alignment of interests between the domestic pharmaceutical industry and public health activists resulted in a post-TRIPS patent landscape for India that, while still imperfect, is (or has the potential to be) uniquely progressive in its ability to ensure that patent protection does not unduly hinder the objective of 'access to medicines for all'.

The following discussion discusses some of the more noteworthy provisions in the Indian Patents Act, 1970 (as amended), and their potential or likely impact on access to medicines, but it is in no way a comprehensive critique of the Indian Patents Act. (For more comprehensive critiques from varying political perspectives, see e.g. Basheer 2005; Gopakumar & Amin 2005; Mueller 2007.)

Patentability standards

Much of the discussion of TRIPS 'flexibilities', post-Doha, has been focused on the freedom countries have in determining whether, and on what grounds, to issue a compulsory licence on a patented medicine. By issuing a compulsory licence, a country is able to authorize, without the patent owner's consent, the import or production of generic versions of a medicine, often priced at a fraction of the cost of the patented version. Indeed, the Doha Declaration did recognize that countries have the 'right to grant compulsory licences' and 'the freedom to determine the grounds upon which such licences are granted'. And a handful of countries, including Thailand and Brazil, have taken advantage of this flexibility, and issued compulsory licences on several essential medicines.

However, the immediate effectiveness of a compulsory licence in significantly lowering the prices of medicines is largely contingent upon the existence of a pre-existing source from which to procure the generic medicine. Thus, for example, when Thailand issued a compulsory licence in 2007 for the heart medication Clopidogrel, it was immediately able to realize cost savings from about 70 baht (US$2.00) per tablet offered by the patent-holding company to 1.01 baht (US$0.028) per tablet from an Indian generic company – a saving of over 98 per cent (Third World Network 2007).

However, one of the main reasons that Clopidogrel was priced so low in India was the fact that competition for the drug in India is fierce. There are

no fewer than 41 separate brands[7] of Clopidogrel competing in the Indian market because it is not under patent in India (the patent application for the active compound was filed in 1987 – prior to India incurring any obligations under the TRIPS Agreement[8]). This is illustrative of what has been coined as the 'rule of five' – dramatic reductions in the prices of medicines are seen once five or more competitors enter the market for a given drug (Quick 1997). Thus, the dramatic and immediate cost savings that Thailand was able to achieve in issuing a compulsory licence were attributable, in large part, to the fact that the medicine in question was never under patent at all in India.

This highlights the importance of an often overlooked TRIPS 'flexibility' that is of particular significance in the Indian context: setting tougher criteria for patentability. By setting rigorous standards for patentability, countries may be able to significantly reduce the number of patent obstacles that may come in the way of generic competition. Although the TRIPS Agreement requires that patents be made available for 'inventions' that are 'new', involve an 'inventive step' and are capable of 'industrial application', none of these terms are specifically defined, and countries have considerable latitude in defining these concepts as they see fit (Correa 2007).

India's Patents Act contains some unique provisions that, taken together, potentially constitute the most rigorous patentability criteria in the world. Section 3 of the Patents Act, through its subsections lettered (a) through (p),[9] lists fifteen broad categories as 'not inventions within the meaning of this Act'. Of special relevance in the pharmaceutical context are provisions excluding from patentability the following: (1) natural substances;[10] (2) new uses of known substances;[11] (3) new forms of known substances, unless the new forms exhibit an increase in efficacy;[12] and (4) methods of treating humans and/or animals.[13]

In addition to these broad substantive safeguards contained in the Patents Act, there is one significant procedural bar on patentability that is of significance. Because India did not recognize product patent protection for pharmaceuticals prior to entering into the TRIPS Agreement on 1 January 1995, it was not bound to give retroactive effect to its TRIPS obligations. Thus, for all new drugs that were 'invented' before 1995, they would be ineligible, as a matter of law, for patent protection in India.

The cumulative effect of these provisions is potentially to reduce drastically the number of derivative patents that are common in the pharmaceutical industry. As fewer new medicines are being discovered, commentators have noted the increasing trend in the pharmaceutical industry to extend the patent term of existing medicines by seeking and obtaining patent protection on various secondary or ancillary features of a medicine. For instance, a recent report by the European Commission (EC) noted the decline in the number of new medicines reaching the market; the number of patent applications on pharmaceuticals had doubled from 2000 to 2007, with the vast majority (87 per cent) on 'secondary' patents – that is patents not covering the active

substance itself but various ancillary features, such as formulations, salt forms, methods of treatment and so on (EC 2008). The proliferation of so many secondary patents on existing medicines has facilitated a practice known as 'evergreening', whereby a patent-holding company is able to artificially extend the period of market exclusivity by obtaining injunctions against generic competitors by filing patent infringement suits on these secondary patents (United States Federal Trade Commission (USFTC)).

Patent oppositions

A key victory among public health advocates and the Indian generic industry was the retention of the pre-grant opposition procedures in the Patents Act. Despite intense pressure from the multinational pharmaceutical industry to eliminate the pre-grant opposition procedure, the Patents (Amendment) Act, 2005, not only broadened it but also included a provision for a post-grant opposition (§ 25). The pre-grant opposition provision allows for 'any person' to file an opposition at any time before the grant of the patent (§ 25(1)) on any of eleven specified grounds, and it requires the patent office to grant the opponent a hearing on request (§ 25(1)(k)). The retention of the pre-grant opposition procedure is in contrast to the general trend in other countries, and 'India remains one of only a handful of countries that still permit pre-grant opposition' (Mueller 2007). The United States, for instance, has no pre-grant opposition procedure and only allows for an *inter partes* re-examination of a patent after it has been granted (35 U.S.C. § 311).

A key amendment in the 2005 Act was to change the standing requirements for bringing a pre-grant opposition, from 'any person interested' to simply 'any person'. This change allowed for civil society groups to become involved in the patenting process by filing a number of pre-grant oppositions against patent applications pending before the Indian patent offices. Although several Indian generic companies have also taken advantage of this provision, the involvement of civil society in this process has been instrumental in advocating for an approach to patent policy that expressly takes into account public health considerations.

Indian courts – recognizing the right to access to medicines and right to health

Many of the provisions discussed above are relatively new to Indian patent law and, as such, have yet to be tested or construed in the Indian courts. Because of this, the true measure of their effectiveness in promoting access to essential medicines will not likely be known for years, as currently pending and future disputes wind their way through the patent offices and then the courts.

Although this will entail a fair amount of uncertainty in the short term, it also represents a unique, perhaps even historic, opportunity for non-traditional actors, such as civil society groups, to participate actively in setting judicial precedents that will shape how the new Indian patent laws will be construed and understood in the future. Given the opportunity, via the pre- and post-grant opposition procedures and other avenues, to engage in some of the core legal disputes that will shape the new law, civil society groups in India have advocated in the patent offices and the courts for the need for patent law and policy to take into account the impact of patent protection on access to medicines. Indeed, in the four years since the 2005 amendments have been in place, there have already been a handful of decisions that have the potential to foster a unique line of Indian jurisprudence that injects fundamental public health considerations into how patent law should be interpreted. At the same time, these cases are illustrative of the limitations inherent in using the law as the primary frame from which to advance the aims of the access to medicines movement.

Novartis v Union of India

One of the most controversial amendments in the 2005 Act, as mentioned, was the inclusion of Section 3(d) that, among other things, provided that the 'mere discovery of a new form of a known substance which does not result in the enhancement of the known efficacy of that substance' is not considered an invention under the Act. As the explanation to this section makes clear, a wide range of derivative patent claims that are common throughout the pharmaceutical industry, such as claims on a particular salt of an existing drug, or a specific polymorphic form, are deemed not to be patentable unless the new form 'differs significantly in properties with respect to efficacy'. Judging from the parliamentary debates, it is clear that the intent of the provision was to prevent a practice that is known pejoratively as 'evergreening', whereby patent holders seek artificially to extend the period of market exclusivity on a medicine by subsequently obtaining patent protection on secondary features of existing medicines, and were gravely concerned about the impact of broad patent protection on access to medicines throughout the developing world (Lok Sabha 2005).

Interestingly, several members of parliament raised the price differential of Novartis's anti-cancer medicine, imatinib mesylate (marketed as Glivec/Gleevec by Novartis) as compared to Indian generic versions (INR 125,000 (US$2,500) per person per month from Novartis versus INR 8,000–10,000 (US$160–200) per person per month from Indian generics) as a cautionary tale against overbroad patent protection and the potential effects of patent protection on medicine prices (Lok Sabha 2005).

In a strange twist of fate, Novartis's patent application for imatinib mesylate formed the underlying dispute of the single most significant test of

India's post-2005 Patents Act to date. Shortly after the Patents (Amendment) Act, 2005, came into effect in March 2005, Novartis's patent application for imatinib mesylate came up for examination in the Indian Patent Office in Chennai. Taking advantage of the expanded standing provision in the pre-grant opposition procedures in the Act, a civil society group – the Cancer Patients Aid Association (CPAA) – filed a pre-grant opposition against the pending application, as did several Indian generic companies. Novartis's application for imatinib mesylate did not claim the active ingredient as such (imatinib was initially patented in 1993, prior to India incurring any TRIPS obligations and was ineligible for a patent in India), but it claimed a specific polymorphic form of the mesylate salt of the active ingredient.

In the first test of how Section 3(d)'s prohibition on new forms of known substances would be construed, the CPAA and the generic companies claimed that the application failed to qualify as an invention under Section 3(d) of the Act (Park 2008). In January 2006, the patent office agreed with the opponents and denied Novartis's application, holding, among other grounds, that the application failed to meet the 'efficacy' requirement of Section 3(d). Not surprisingly, Novartis appealed to the Madras High Court the decision of the patent office in denying the application. In a somewhat more surprising move, the company also decided to challenge the validity of Section 3(d) itself, claiming, among other things, that the provision was inconsistent with the TRIPS Agreement and that it was violative of the Indian Constitution.[14] As a party to the litigation, the CPAA responded, in relevant part, that given the intention of parliament (as evidenced by the parliamentary debates), the legislative intent of this provision was perfectly legitimate: to allow the state to fulfil its fundamental duty to protect the constitutional guarantee of the right to life under Article 21 and to enact appropriate measures to prevent frivolous patents that could pose a threat to the supply of affordable medicines.

In the first court judgement to adjudicate any aspect of India's Patent Act, the Madras High Court dismissed Novartis' challenge on all grounds, holding that (1) an Indian court lacked the jurisdiction to declare a domestic statute as inconsistent with an international treaty, (2) that Novartis was not entitled to declaratory relief from the Court declaring Section 3(d) as inconsistent with TRIPS and (3) that Section 3(d) was not constitutionally void for vagueness and arbitrariness. In coming to the last holding, the Court observed, 'we have borne in mind the object of [Section 3(d)], namely … to provide easy access to the citizens of this country to life saving drugs and to discharge the Constitutional obligation of providing good health care to its citizens' (*Novartis v Union of India*, (2007) 4 MLJ 1153, para. 19). Thus, for the first time in Indian patent jurisprudence, a court explicitly recognized the state's constitutional obligations with respect to 'providing good health care to its citizens' as a central consideration when construing and interpreting patent law and policy.

Roche v Cipla

Although the *Novartis* judgement was remarkable for its affirmation of the legitimacy of public health considerations in interpreting patent law, its use doctrinally is limited due to the somewhat unusual set of underlying facts of the case. Although it recognizes and affirms the Indian Parliament's duty to consider its constitutional obligations of promoting public health when formulating patent policy, it is more difficult to read the judgement as instructing the courts themselves to take such considerations into account. However, following the *Novartis* decision, a judgement from the Delhi High Court, *F. Hoffman-La Roche ('Roche') v Cipla*, did precisely that.

Underlying the *Roche v Cipla* case was a suit brought by the multinational pharmaceutical company Roche against the Indian generic company Cipla for infringing its patent on erlotinib, a medicine approved for the treatment of lung cancer (*Roche v Cipla*, I.A. 642/2008 IN CS (OS) 89/2008). Pending the full adjudication of the underlying patent dispute, Roche sought an interim injunction against Cipla to prevent it from marketing its generic version. Cipla had filed a counterclaim against Roche alleging that the patent was invalid under Indian law. The Delhi High Court, in denying Roche's application for an interim injunction, concluded that it was bound to take into consideration the public interest, including the right to life guaranteed in Article 21 of the Constitution:

> The degree of harm in [if an injunction is granted] is absolute; the chances of improvement of life expectancy; even chances of recovery in some cases would be snuffed out altogether, if injunction were granted. Such injuries to third parties are un-compensatable. Another way of viewing it is that if the injunction in the case of a life saving drug were to be granted, the Court would in effect be stifling Article 21 so far as those would have or could have access to Erloticip are concerned. (*Roche v. Cipla*, I.A. 642/2008 IN CS (OS) 89/2008, para. 85)

Although the judgement of the Delhi High Court is currently under appeal in the Supreme Court, the Court's reasoning, if upheld, potentially opens the door to a form of jurisprudence that allows for what are essentially judicially created compulsory licences. The possibility will be discussed in more detail in Section 5 below.

Indian Network for People Living with HIV/AIDS v Boehringer Ingelheim

Although the various controversial provisions in the Indian Patents Act will eventually wind their way through the courts, it has been and will continue to be the patent offices that will make the initial determinations on many of the as yet unresolved questions relating to the patent law (Mueller 2007). Because of this, civil society groups in India have made a concerted effort to make the patent offices aware of the potential ramifications behind many of their decisions on access to

medicines. To date, various civil society organizations in India have filed several pre- and post-grant oppositions against patent applications relating to a variety of medicines. In addition to raising the various technical grounds of opposition as applicable (e.g. obviousness, Section 3(d), 3(e) etc.), the oppositions filed by civil society organizations are notable in that they have attempted to place each patent application in the context of the need to interpret and implement the law in a manner consistent with promoting access to medicines.

A recent decision by the Delhi Patent Office, in response to a pre-grant opposition filed by the Indian Network for People Living with HIV/AIDS (INP+), rejected Boehringer Ingelheim's patent application relating to a paediatric formulation of nevirapine, a critical first-line AIDS medicine. In considering the patent opposition, the patent office cited to the Madras High Court's judgement in *Novartis*, and agreed with the opponents that it needed to 'give a strict interpretation of patentability criteria, as decision … thereof shall affect the fate of people suffering from HIV/AIDS for want of essential medicine' (*INP+ v Boehringer Ingelheim*). Although the patent office recognized that these considerations did not constitute valid grounds of opposition under the Patents Act, it considered them as 'facts of law' (*INP+ v Boehringer Ingelheim*).

The foregoing discussion illustrates both the promise and limitations of the access to medicine movement's engagement with the law in advancing its goals. Undoubtedly, the precedent set by the *Novartis* decision paved the way for the Delhi High Court to explicitly consider public health considerations in its decision to deny Roche an injunction against Cipla, potentially laying down the doctrinal groundwork for a system of judicially created compulsory licences. Likewise, the Delhi Patent Office's recognition that it ought to give a 'strict interpretation of patentability criteria' on an application for an essential medicine represents a promising recognition by the patent office of the need to robustly apply the patentability standards in Indian law.

However, both the *Roche* judgement and the *INP+* decisions explicitly placed the need to promote access to medicines as background considerations within the primary legal framework of the patent law. The *Roche* decision stated, 'Undoubtedly, India entered into the TRIPS regime, and amended her laws to fulfil her international obligations, yet the court has to proceed and apply the laws of this country, which oblige it to weigh all relevant factors. In this background the Court cannot be unmindful of the right of the general public to access life saving drugs which are available and for which such access would be denied if the injunction were granted' (*Roche v Cipla*, para. 85). Similarly, the Delhi Patent Office took pains to note that the public health considerations raised by INP+ did not constitute a valid ground of opposition but stated that it would consider them as 'facts of law' in evaluating the technical grounds of opposition (*INP+ v Boehringer Ingelheim*).

To be sure, it would have been unacceptable within the existing legal framework for INP+ to argue, and for the Delhi Patent Office to accept, that

public health considerations alone are sufficient grounds for rejecting the patent application. However, the very unacceptability of such a prospect seems to reflect the inevitable consequence of what Amy Kapczynski has called the 'gravitational pull of law' in the framing processes across a wide range of access to knowledge (A2K) issues (Kapczynski 2008). While the A2K movement has been instrumental in recent years in shaping various aspects of intellectual property law, Kapzcynski argues, the law has had an equally powerful impact in shaping the movement, as the law's 'gravitational pull' has influenced the manner in which members of the movement have framed their goals in relation to it (Kapczynski 2008). The 'strategic' effect of the gravitational pull, she argues, 'leads groups to modulate their claims in narrow fashion in order to gain control over the instrumental power of the law' (Kapczynski 2008: 874). Thus, given the pre-existing legal framework (and cumulative gravitational force) of the TRIPS Agreement, the Patents Act and the Indian common law, civil society actors in India have correspondingly narrowed their claims to fit within these frames, such that a recognition of their concerns as relevant 'background' considerations are counted as successes.

None of this, of course, is to disparage the remarkable achievements that Indian civil society groups have thus far been able to attain. The potential for these early successes to form the basis of an Indian patent law jurisprudence that is uniquely responsive to the needs of public health is clear, and this could not have been accomplished without the involvement of civil society. What this highlights, rather, is the need to recognize both the opportunities and limitations inherent in engaging with the law to achieve the larger aims of ensuring access to essential medicines.

Future obstacles/opportunities

Although not without its shortcomings, the Indian Patents Act is, or has the potential to be, uniquely progressive in facilitating access to medicines. The various provisions of Section 3, if robustly interpreted and rigorously applied, have the potential to clear the Indian patent landscape of a large number of obstacles to generic production. The cases discussed above have the potential to represent the beginnings of a distinct brand of Indian patent law jurisprudence that is more responsive to the need to promote access to medicines. Some of the key opportunities and obstacles that we foresee in the months and years ahead will be discussed below.

Patent examinations

One of the unresolved issues in the wake of the Madras High Court's *Novartis* decision was the propriety of the Chennai Patent Office denying Novartis a

patent on its application for imantinib mesylate. Although Novartis had filed two separate petitions – one appealing the patent office's decision and the other challenging the validity of Section 3(d), only the latter petition was ultimately heard and decided by the Court. During the pendency of both petitions a body called the Intellectual Property Appellate Board (IPAB), with exclusive jurisdiction over all appeals arising from the patent offices, was officially created, and Novartis's appeal was thereby transferred to the IPAB.

Although the appeal before the IPAB has received considerably less attention in the media, its decision could be just as significant as the Madras High Court's. At issue before the IPAB is the question of how the 'efficacy' standard in Section 3(d) will be interpreted. As mentioned, Section 3(d) of the Act excludes any 'new form of a known substance' from patentability where there is no 'enhancement in the known efficacy' of that substance. As the explanation to this section makes clear, a wide array of common pharmaceutical derivatives are included within Section 3(d)'s ambit, and a 'significant difference in properties with respect to efficacy' must be demonstrated in order to be eligible for patentability.

There is a dispute, however, over precisely what 'efficacy' means within the context of this section (Basheer & Reddy 2008). Depending on how broadly or narrowly this concept is interpreted by the IPAB, Section 3(d) could either serve as an effective bulwark against many forms of secondary patents or be rendered largely toothless in preventing many forms of potential patent abuse. In order to illustrate why this would be so, it is necessary to explore in some detail some of the more common types of secondary patenting in the pharmaceutical context. As the National Institute for Health Care Management (NIHCM) observed,

> Drug manufacturers patent a wide range of inventions concerned with incremental modifications of their products, including minor features such as inert ingredients and the form, color, and scoring of tablets. In some cases, these patents may discourage generic companies from trying to develop a competitive product. In others, the generic company may 'design around' the new features. (NIHCM 2002)

However, even where a generic company is able to successfully 'design around' such new features, it is nevertheless possible for patent-holding companies to file a patent infringement suit on these secondary patents and obtain injunctive relief preventing the generic versions from coming to market (Correa 2002).

As the legislative history of Section 3(d) as discussed above makes clear, it was precisely this type of potential patent abuse that parliament intended to prevent (Lok Sabha 2005). But in adopting a loose definition of 'efficacy', in which essentially any significantly *beneficial* modification to an existing drug is considered to meet the enhanced efficacy test, the standard would be rendered essentially meaningless. This is because practically all such modifications that

are commonly patented, as routine as they may be, can be characterized as significantly *beneficial* in one way or another. For instance, it is common knowledge in the pharmaceutical industry that for some active drug molecules, converting the base compound into a salt form can have any number of useful effects (e.g. improved bio-availability, stability etc.) (Correa 2007). However, as Carlos Correa has also observed, 'patents on salts are one of the main avenues for the "evergreening" of pharmaceutical patents' (Correa 2007). Thus, if the standard of 'efficacy' in Section 3(d) is interpreted as satisfied upon a mere showing of significant *benefit*, then the primary purpose of parliament's intention in enacting Section 3(d) would appear to be undermined.[15]

The Madras High Court, in upholding the validity of Section 3(d)'s constitutionality, provided some indication that it favoured a more restrictive definition of 'efficacy':

> The position therefore is, if the discovery of a new form of a known substance must be treated as an invention, *then the patent applicant should show that the substance so discovered has a better therapeutic effect*. Darland's Medical Dictionary defines the expression 'efficacy' in the field of pharmacology as 'the ability of a drug to produce the desired therapeutic effect' and '*efficacy' is independent of the potency of the drug*. (*Novartis*)

By defining 'efficacy' to mean 'therapeutic' efficacy, the Madras High Court appeared to indicate that other benefits commonly claimed by secondary patents, such as ease of manufacturability, improved shelf life, better bio-availability and the like, would fail to pass muster under Section 3(d). However, the matter before the IPAB, which calls for an interpretation of Section 3(d) in relation to the specific facts of the case, will arguably provide more specific guidance to the patent offices as to the precise scope and meaning of the efficacy standard. It is clear that such guidance is urgently needed, as early indications are that the patent offices are granting patents that would appear to clearly fall within Section 3(d)'s ambit (Unnikrishnan 2008).

In addition, it remains to be seen whether the Indian courts can develop a line of jurisprudence that takes a marked shift away from traditional notions of the basic criteria for patentability. Particularly with respect to the inventive step requirement, Correa has recommended that 'the best policy from the perspective of public health would seem to be the application of a strict standard of inventiveness' (Correa 2007: 4). Despite the Delhi Patent Office's recognition that 'strict interpretation of patentability criteria' should be applied to patent applications relating to essential medicines, there is thus far little indication that this has become widespread practice. Rather, the current stance of the Indian patent offices appears to be to rely primarily on judgements from the United Kingdom. Indeed, when the Draft Manual of Patent Practice and Procedure was released for public comment in 2008, the National Working Group on Patent Laws (2008) objected to its heavy reliance on foreign judgements.

There is a dearth of Indian patent case law dating from the era during which the 1970 Patents Act was in effect. Perhaps inevitably, the courts and the patent offices have attempted to fill this vacuum by placing reliance on foreign judgements that interpret the basic criteria for patentability. However, because none of these judgements are legally binding in India, the possibility remains that the Indian courts can forge their own jurisprudence that takes into account the need to ensure access to affordable medicines in evaluating the basic criteria for patentability. Whether the Indian judiciary can be sufficiently weaned from its reliance on foreign precedent to allow this to happen remains to be seen.

Data exclusivity

One of the most significant unresolved issues with respect to India's TRIPS compliance is over the nature and scope of the protection it provides to clinical data submitted by originator companies during the drug regulatory process. Normally, in order for a drug to receive marketing approval from a drug regulatory authority (DRA), the applicant must submit a dossier of clinical data to show that the medicine in question is safe, effective and of good quality (World Health Organization 2006). This is generally only required of the first, or originator, drug applicant, and subsequent generic versions will only need to establish that they are chemically equivalent to the drug that has already been approved. Thus, a DRA, when presented with evidence that a generic drug is equivalent in all relevant aspects to an already approved medicine, it will only need to refer to the clinical data already in its possession to conclude that the generic version is also safe and effective (World Health Organization 2006). Not only does this practice dispense with the time and expense involved in requiring every drug applicant to conduct duplicative clinical trials but it also avoids grave ethical concerns over repetitive clinical trials on human subjects for a drug that is already known to be safe and effective (World Health Organization 2006). Such a process speeds the approval of generic competition into the market.

However, the United States and multinational pharmaceutical industry groups have argued that Art. 39.3 of the TRIPS Agreement requires India to implement a system of 'data exclusivity', whereby the DRA is legally prohibited from approving equivalent generic versions for a fixed period (usually between five and ten years) (United States Trade Representative (USTR) 2008; Pharmaceutical Research and Manufacturers of America (PhRMA) 2008). Indeed, for the past several years, India has been placed on the USTR's Special 301 'Priority Watch List' for failure to implement data exclusivity (USTR 2008). Countries that are placed on the 'Priority Watch List' are subject to retaliatory trade sanctions by the United States and thus serves as an effective tool to pressure countries to comply with the USTR's demands.

However, there is broad agreement between scholars, international organizations and independent panels that TRIPS does not require data exclusivity (see, e.g. Correa 2002; World Health Organization 2006). Indeed, these groups and individuals have warned that a system of data exclusivity would unduly delay the entry of generic competition and raise the costs of essential medicines, and they have advised developing countries against implementing data exclusivity. In fact, even the Indian government has explicitly recognized that TRIPS does not require date exclusivity but is nonetheless considering adopting it (Reddy & Sandhu 2007). In May 2007, the Indian government's inter-ministerial committee, headed by Satwant Reddy, the (retired) Secretary of Chemicals & Petrochemicals, issued a report (the 'SRC Report') on its recommendations for fulfilling India's obligations under Article 39.3 of TRIPS. The SRC Report, despite acknowledging that data exclusivity was not required as part of India's TRIPS obligations, somewhat obliquely recommended that India introduce a system of data exclusivity on pharmaceuticals after the expiration of a 'transition period' of unspecified duration. Upon expiration of this 'transition period', the report recommended that a five-year data exclusivity period be introduced (Reddy & Sandhu 2007).

Having understood the obligatory legal requirements around data protection, we now turn to data exclusivity as a policy choice, as recommended by the SRC Report to the government of India in 2007.

The question of 'protection' or 'exclusivity' around clinical test data arises in the first place as a result of the expense of generating such data. In order to probe the economic rationale of data exclusivity, it is useful to revisit the cost/incentive structure of the pharmaceuticals industry in general.

The pharmaceutical industry's overarching market incentive is the patent system. Patents are granted, typically, to pharmaceutical inventions (new chemical entities (NCE) or new molecular entities (NME)) for a period of twenty years in most countries around the world. Patents, a form of intellectual property, have been articulated as monopolies (albeit for a limited term) granted against the costs of drug discovery. While the exact terms and conditions of the patent system remain contested in several countries as diverse as the United States, Thailand, Brazil, South Africa and India – to name a few – the cost of drug discovery is also a contested figure.

A recent study,[16] drawing on prior work in the area, estimated the cost borne while producing a new drug at US$802 million. This figure has been accepted by the pharmaceutical industry and is frequently cited in support of industry positions. However, it has been criticized by others as being inflated, for (1) undervaluing government assistance in drug development; (2) overvaluing the cost of capital and opportunity cost; (3) overestimating the size, and therefore, the cost, of clinical trials; and (4) for relying on confidential industry data, which might be skewed.

It is important to note that the cost of clinical trials (the 'data' in question for the purposes of this chapter) is only a *part* of the total cost of drug discovery. Expectedly, estimates for the cost of clinical trials vary.

As a solution to the issue of increasing clinical costs, researchers have suggested a system of compensatory liability, whereby each producer would bear a cost of the clinical trials according to a given formula (see Sanjuan, Love & Weissman 2006). Whatever indeed that cost, it is a global cost – one set of clinical trials that applies to every regulatory agency anywhere in the world, even if it has to be submitted separately to each. Countries like India make up less than 1 per cent of the world's pharmaceutical market. For MNC pharmaceutical companies, India typically counts for much less of the world market. This means that when you factor in the premium pricing that MNCs charge, combined with the 'first mover advantage', it provides more than adequate incentive. This is provided, of course, that MNC pharmaceuticals take the opportunity to be the first movers – an opportunity they have but do not often take, as seen in the analysis above.

Limitations on injunctions

As mentioned above, the Delhi High Court's decision in *Roche v Cipla* raises some intriguing possibilities with respect to the future direction of Indian jurisprudence pertaining to the grant of injunctive relief in patent infringement cases involving essential medicines. Although it is far too early to state with any degree of conviction that Indian jurisprudence will head in this direction, the *Roche* judgement provides much of the doctrinal basis upon which a uniquely progressive view of patent enforcement could be forged in India. And though not discussed in the *Roche* judgement, there appears to be a firm basis in international law upon which such an approach could be justified.

As traditionally understood, and as codified in the TRIPS Agreement, a patent confers on the owner exclusive rights to prevent third parties from making, selling, using and so on of the patented product without the owner's consent (TRIPS Art. 28). Generally, the manner in which this exclusive right is enforced is through a court-ordered injunction – both at the preliminary stage (interim injunction) and upon a final determination of infringement (permanent injunction) – preventing the alleged infringer from making, selling, using and so on of the patented product. Clearly, the possibility of being enjoined from manufacturing or selling a product that arguably falls within the scope of an existing patent serves as the primary deterrent to entering the market in the first place – the mere threat of being prevented from selling its product, after having made huge upfront investments in bringing a product to market, could deter a generic company from making such investments at all.

However, the exclusive rights described in Article 28 of TRIPS are not absolute. There are recognized exceptions to exclusivity. Article 30 of TRIPS,

for instance, provides for limited exceptions to patent rights to be recognized in certain cases. This has been interpreted as allowing for a number of acts that would otherwise be considered patent infringement, such as the 'experimental use' exception (Third World Network 2003). In addition, compulsory licences, as permitted under Article 31 of TRIPS, represent yet another exception to the exclusive rights conferred by a patent, as compulsory licences, by definition, are issued without the consent of the patent holder.

However, there are instances where the exclusive right of a patent has been abrogated that do not fit neatly into either a limited exception under Article 30 or a compulsory licence under Article 31. In a 2006 US Supreme Court judgement (*eBay Inc. v MercExchange LLC*, 126 S. Ct. 1837), the Court overturned what had been a longstanding practice in the lower courts of automatically granting a permanent injunction upon a final determination of patent infringement. The Court held that 'the decision whether to grant or deny injunctive relief rests within the equitable discretion of the district courts, and that such discretion must be exercised consistent with traditional principles of equity, in patent disputes no less than in other cases governed by such standards' (*eBay Inc. v MercExchange LLC*, 126 S. Ct. 1837). Thus, even upon a final determination of patent infringement, the traditional four-factor test must be satisfied before an injunction could issue:

> A plaintiff must demonstrate: (1) that it has suffered an irreparable injury; (2) that remedies available at law, such as monetary damages, are inadequate to compensate for that injury; (3) that, considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a perpetual injunction. (*eBay Inc. v MercExchange LLC*, 126 S. Ct. 1837)

The lower court, on remand, applied these equitable factors and denied the plaintiff a permanent injunction, finding that monetary damages would be adequate (*MercExchange LLC v eBay Inc.*, 275 F. Supp. 2d 695 (E.D. Va. 2003)).

Essentially, the denial of an injunction despite a finding of patent infringement amounts to a compulsory licence, as the defendant is legally allowed to continue its infringing activities without the patent owner's consent, and the remedies are limited to monetary damages. However, the striking feature of such a 'judicially mandated' compulsory licence is that, as Christopher Cotropia has observed, it does not comply by the rather extensive procedural requirements of a compulsory licence contemplated under Article 31 of TRIPS (Cotropia 2008).

This, however, does not necessarily render the US Supreme Court's *eBay* decision inconsistent with TRIPS. As both James Love and Cotropia have argued, the *eBay* decision can be justified on the basis of Article 44 of TRIPS, which states, in relevant part, that while 'The judicial authorities shall have the authority to order a party to desist from an infringement' (Art. 44.1), it notes that 'where

these remedies are inconsistent with a Member's law, declaratory judgments and adequate compensation shall be available' (Art. 44.2) (Cotropia 2008; Love 2007). As Article 44.1 makes clear, the judicial authorities must be given the authority to issue injunctions as and when they are deemed necessary. However, Cotropia argues, 'the second sentence of Article 44.2 defines a universe of "other cases" where, if an injunction is "inconsistent with a Member's law, declaratory judgments and adequate compensation shall be available" … *eBay* is one of these "other cases," where the United States' remedies laws preclude an injunction under certain circumstances and compensation is awarded instead' (Cotropia 2008).

But once this analysis is accepted, then there is no conceivable reason why countries could not adopt more expansive views of what those 'other cases' may be. Clearly, the four-factor equitable test as described in *eBay* is neither mandated by TRIPS nor binding on any courts outside of the United States. There is no reason why the Indian courts (or parliament, for that matter) could not develop a more expansive test that specifically took public health considerations into account in determining whether an injunction is made available. Indeed, Justice Louis Harms of the Supreme Court of Appeal of South Africa foreshadowed in 2004 – two years before the *eBay* decision came down – that countries could move in this direction, particularly with pharmaceutical patents:

> [Permanent injunctions] are granted as a matter of course in South Africa. Otherwise it would amount to granting the defendant a compulsory licence. It is nevertheless foreseeable that in, say, pharmaceutical patent cases, *where public health concerns or the constitutional rights to health care arises*, a court may have to consider whether or not to leave the rights holder to a damages claim instead of a [permanent injunction]. (Harms 2004, emphasis added)

Viewed in light of the above, it is apparent that the Delhi High Court's reasoning in *Roche* is perfectly in line with Justice Harms's prediction that 'where public health concerns or the constitutional rights to health care arises', injunctive relief could be justifiably denied. Indeed, the *Roche* judgement cited *eBay* with approval: 'This view accords with the trend in the United States, where in [*eBay*], the Supreme Court of United States rendered a significant judgment relevant in the present context'. Having taken note of *eBay*, the Court went on to expand the traditional equitable principles of 'balance of hardships' and 'irreparable harm' beyond the parties to the dispute to explicitly encompass considerations of public health and the constitutional guarantees of right to life and health of the general public. In light of India's constitutional obligation, as recognized by the Madras High Court, to 'provide good health care to its citizens', it may even be viewed a positive obligation of the state to refuse the granting of injunctions where public health concerns are intertwined.

Of course, it remains to be seen whether the Roche judgement will stand on appeal and whether similar reasoning will be employed if and when a final

determination of infringement is made. Moreover, due to the lack of clarity in the Patents Act as to what constitutes adequate remuneration for compulsory licences, there is a danger that the monetary damages awarded in lieu of an injunction will be so high as to make the generic versions only marginally more affordable. Parliament could easily address both these concerns, of course, by making appropriate amendments to the Patents Act. It could, for instance, create a statutory presumption that monetary damages will suffice in cases of patent infringement where public health considerations are involved. And by implementing clear, predictable and affordable remuneration guidelines for compulsory licences, the courts would have guidance in calculating the appropriate damages. Nevertheless, even without parliamentary intervention, the principles laid down in the *Roche* judgement could potentially form the basis of a common law jurisprudence that could ensure the continued supply of affordable Indian generic medicines for years to come.

Future of Indian generics

Despite the welfare gains from Indian industrial policy towards pharmaceuticals over the past three decades, the signal policy implementation of the past decade – the amendment of Indian Patents Act to be compliant with the TRIPS Agreement – may serve to undermine this very success. The adoption of these laws has meant that the generic industry now faces unprecedented challenges. While patent protection is still contentious and many provisions of the Indian patent law are being tested in the courts, companies are scrambling to adopt different business models in anticipation of the drying up of their product chain as drugs invented post-1995 begin to replace pre-1995 drugs. In addition, there have been newer threats to the continued existence of the industry arising from considerations of international law. In particular, the global debates surrounding such issues as data exclusivity and counterfeit drugs are of as much concern to the Indian pharmaceutical industry as the imminent entry of multinational pharmaceuticals into the domestic market.

Despite the reasonable current growth of the Indian pharmaceutical sector, there is considerable uncertainty surrounding the revenue stream for Indian manufacturers. As Chaudhuri (2008) points out, the expected size of developed country markets (US $40–US $60 billion) that will open to Indian manufacturers is almost certainly an overestimation, since the revenues available in the market will certainly reduce following their opening to competition. Furthermore, as newer drugs enter the market, the segments that will be open to Indian exports will shrink as consumers and providers move to more current formulations. As such, the revenues provided by export markets, while substantial in the short term, do not represent a long-term viable strategy for Indian generic producers.

Given this, there has been substantial increase in research and development (R&D) by generic manufacturers and a series of high profile R&D partnerships

with multinational pharmaceuticals. The Indian industry appears to be split between those firms that wish to maintain the current model by trying to maximize the flexibilities provided by TRIPS and issuing patent challenges and those that are seeking international partnerships with the aim of becoming part of research-based pharmaceuticals.[17] Thus far, however, despite suggestions that India will become the new hub of pharmaceutical R&D because of the huge potential cost savings, there have been no significant successes in indigenous drug development thus far. There has, however, been a significant casualty in the form of the takeover of Ranbaxy – once the world's seventh largest generic company and the largest in India – by Daiichi Sankyo of Japan.

Among the ways in which drug development in India is likely to progress is through contract research and manufacturing services. Contract and clinical research tie-ups are likely to lead to different business models, while the growth in disposable income and increased potential for health care coverage are likely to sustain domestic revenue streams for the near future. This said, the most important and as of yet unanswered question is how and whether affordable access to medicines will be maintained with greater focus on, and enforcement of, intellectual property.

A few concluding thoughts

As the foregoing discussion indicates, the Indian generic pharmaceutical industry is in the process of undergoing a dramatic sea change – one that will likely continue in the coming years, absent significant policy changes. As the newer drugs come under patent protection in India under the new product patent regime, individual pharmaceutical companies will largely be left with two options: (1) shift to a globally oriented, generally pro–intellectual property segment that serves largely as the outsourced generics arm of multinational pharmaceutical companies or (2) continue to cater to the domestic and other developing country markets in those shrinking areas where patent barriers do not exist. The net result of this growing divergence in the domestic pharmaceutical industry will be that fewer players (and generally the smaller, less established ones) will continue to serve as providers of affordable medicines for the developing world, and the range of products that they will be able to provide will increasingly be limited.

There are, however, significant policy changes that are available to the Indian government to lessen the impact of these trends. For one, the patentability standards that exist in Indian law are already uniquely progressive, and their strict implementation has the potential to ensure that patent barriers to access are kept to a minimum. However, it is far from clear that these strict patentability standards are being applied in a uniform manner, and several patents that

would appear to be clearly excluded by existing law have been granted by the Indian Patent Office. The Indian government should provide clear guidance to the patent office to apply these standards strictly and rigorously.

For those instances in which patents on essential medicines are nonetheless granted despite India's patentability standards, India retains a host of TRIPS-compliant flexibilities that have yet to be utilized. The issuing of compulsory licences on patented medicines is one such flexibility. Despite the existence of substantive provisions for the issuance of compulsory licences that could have broad application in the access to medicines context, the administrative procedures remain needlessly complicated and without sufficient clarity or guidance. A reform of the compulsory licensing provisions that (1) states a clear policy in favour of granting compulsory licences for public health purpose; (2) establishes clear and predictable rules on when a licence will be granted and (3) clearly states what the terms and conditions of such licences shall be could potentially open a significant opportunity for domestic Indian producers to continue to provide affordable versions of patented medicines.

Finally, the Indian judiciary has, in the handful of cases that have come before it, shown a tendency to recognize the need to take public health considerations into account when interpreting and implementing the provisions of the Patents Act. Although the evolution of a robust body of case law on patents and public health will likely take years (if not decades) to develop in India, some of the core principles already laid down in the handful of judgements that have come down have the potential, if extended and broadly applied, to create an environment where patents do not come at the price of access to essential medicines. And as it has been from the start, the evolution of such a body of case law will inevitably depend on the active involvement of civil society, framing the issues, challenging conventional wisdom and pushing the envelope of what is possible in a post-TRIPS world.

Notes

1 LDCs that are members of the WTO (and thus bound by the TRIPS Agreement) are permitted to exclude pharmaceutical products from patent protection until at least 2016 (WTO 2001).

2 A 'product' patent is distinguished from a 'process' patent in that a product patent covers the final product itself (and thereby precludes others from manufacturing the product), whereas a process patent only covers the method by which one makes the product. Thus, the latter form of protection is decidedly narrower: the patenting of a particular process of manufacturing a medicine does not preclude competitors from entering the market with the same product, as long as the competitor is able to devise an alternative means of manufacture. Indeed Ayyangar specifically recommended that India provide process patent protection for medicines, as he was of the view that doing so would accelerate research in developing other processes by offering an economic inducement to the discovery of alternative processes

leading again to a larger volume of manufacture at competitive prices (Ayyangar 1959).

3 Although TRIPS now mandates a minimum of a twenty-year patent term as of the date of filing, many countries (including the United States) once started the term of the patent as of the date of grant of patent. In India, the term of a process patent on a pharmaceutical was based on a hybrid formula: the *shorter* of seven years from the filing of the patent application or five years from the grant of a patent. Thus, if company X filed a patent application on 1 January 1980, and the patent office granted the patent on 1 January 1981, the term of the patent would be five years from date of grant – that is 1 January 1986, as this would be the shorter of the two options. However, if the patent office did not grant the patent until 1 January 1985, the term of the patent would be seven years from date of filing, that is 1 January 1987.

4 One possible explanation for this is that the Indian market continues to be entirely too small and too competitive for patent owners to consider launching their brand names. Consider the case of Lipitor, Pfizer's blockbuster brand of Atorvastatin, which was the world's best-selling drug in 2006 with US$12.2 billion in sales worldwide. Lipitor has still not been launched in India, eight years after Atorvastatin was launched by domestic producers. The entire Indian market for Atorvastatin in 2006 generated Rs 226 crores or approximately US$50 million (representing less than 0.5 per cent of Lipitor's sales) and was represented by fifty-six brands.

5 These data are from ORG-IMS and were provided to us by CENTAD. We thank CENTAD for their use.

6 Lele 2005.

7 IMS data through CENTAD.

8 Under the TRIPS Agreement, there are no 'obligations in respect of acts which occurred before the date of application of the Agreement for the Member in question' (Art. 70.1). This means that because India did not recognise product patent protection for medicines prior to the entry into force of TRIPS in 1995, India is under no obligation to provide patent protection for medicines that were invented before 1995. Because the active ingredient for clopidogrel was invented in 1987, it was and remains unpatentable in India.

9 Subsection (g) of Section 3 was deleted from the Patents Act in 2002, thus resulting in only 15, not 16, subsections lettered (a) through (p).

10 Section 3(c).

11 Section 3(d).

12 Section 3(d).

13 Section 3(i).

14 These two petitions – challenging the patent office's rejection and challenging the validity of section 3(d) – were subsequently bifurcated, with the former being transferred to the newly created Intellectual Property Appellate Board (IPAB) and the latter heard by the Madras High Court. The matter before the IPAB is discussed in some detail in 'Future Obstacles/Opportunities' section.

15 Which is not to say, of course, that all patents on salts would thereby be valid and enforceable in India, as the patent would nonetheless have to independently satisfy the basic requirements of novelty, inventive step and industrial applicability. Other jurisdictions, notably the United States, have invalidated patents on salts on grounds of obviousness. *See Pfizer v Apotex*, 480 F.3d 1348 (2007) (invalidating Pfizer's patent on the besylate salt of amlodipine, as the benefits of converting amlodipine into its salt form would be obvious to a person skilled in the art). Regardless of whether Indian courts ultimately adopt a similar attitude with respect to their inventive step analyses, the point remains that section 3(d) would fail to achieve one of its primary legislative aims.

16 DiMasi *et al.* 2003.

17 Ranbaxy, for example, announced in 1993 that its mission was 'to become an international, research based company' (Chaudhuri 2008).

References

Avafia, T., Burger, J. and Hartzenberg, T. (2006), *The Ability of Select Sub-Saharan African Countries to Utilise TRIPs Flexibilities and Competition Law to Ensure a Sustainable Supply of Essential Medicines: A Study of Producing and Importing Countries*, TRALAC Working Paper No. 12, Stellenbosch.

Ayyangar, R. (1959), *A Report on the Revision of the Law in India Relating to Patents for Inventions*, New Delhi: Government of India.

Basheer, S. (2005), 'India's Tryst with TRIPS: The Patents (Amendment) Act, 2005', *Indian Journal of Law and Technology*, 1: 15.

Basheer, S. and Reddy, P. (2008), 'The 'Efficacy' of Indian Patent Law: Ironing Out the Creases in Section 3(d)', *Scripted*, 5(2): 232–66.

Chaudhuri, S. (2005), *The WTO and India's Pharmaceuticals Industry: Patent Protection, TRIPS, and Developing Countries*, Oxford, UK: Oxford University Press.

Chaudhuri, S. (2008), 'Ranbaxy Sell-Out: Reversal of Fortunes', *Economic and Political Weekly*, 43(29): 11–13.

Correa, C. (2002), *Integrating Public Health Concerns into Patent Legislation in Developing Countries*, Geneva: South Centre.

Correa, C. (2007), *Guidelines for the Examination of Pharmaceutical Patents: Developing a Public Health Perspective*, Geneva: ICTSD-UNCTAD-WHO.

Cotropia, C. (2008), 'Compulsory Licensing Under TRIPS and the Supreme Court of the United States' Decision in *eBay v MercExchange*', in T. Takenaka (ed.), *Patent Law and Theory: A Handbook of Contemporary Research*, London: Edward Elgar.

DiMasi, J. A., Hansen, R. W. and Grabowski, H. G.. (2003), 'The Price of Innovation: New Estimates of Drug Development Costs', *Journal of Health Economics*, 22: 151–85. Drug Topics (2006), Available at http://drugtopics.modernmedicine.com/ [accessed 14 June 2011].

EC (2008), *Pharmaceutical Sector Inquiry Preliminary Report*, DG Competition Staff Working Paper, 2008. Available at http://ec.europa.eu/competition/sectors/pharmaceuticals/inquiry/index.html [accessed 2 May 2011].

FICCI (2005), Competitiveness of the Indian Pharmaceutical Industry in the New Product Patent Regime. Mimeo.

Gopakumar, K. and Amin, T. (2005), 'Patents (Amendment) Bill 2005: A Critique', *Economic and Political Weekly*, 40(15): 1503–5.

Harms, L. (2004), *The Role of the Judiciary in Enforcement of Intellectual Property Rights; Intellectual Property Litigation under the Common Law System with Special Emphasis on the Experience in South Africa*, Geneva: WIPO Advisory Committee on Enforcement.

Joint United Nations Programme on HIV/AIDS (UNAIDS) (2008), *Report on the Global AIDS Epidemic*, Geneva: UNAIDS.

Kapczynski, A. (2008), 'The Access to Knowledge Mobilization and the New Politics of Intellectual Property', *Yale Law Journal*, 117: 804–85.

Lele, R. D. (2005) 'The Prescription that Changed Practice', *IDMA*, 36(40).

Lok Sabha, Government of India (2005), *Lok Sabha Debate*. Available at http://164.100.24.230/Webdata/datalshom001/dailydeb/22032005.htm [accessed 2 May 2011].

Love, J. (2007), 'Compulsory Licensing of Copyright under Article 44.2 of the TRIPS, in Light of eBay', KEI Research Notes. Available at http://www.keionline.org/index.php?option=com_content&task=view&id=68 [accessed 2 May 2011].

MSF (2007), 'Indian Court Ruling in Novartis Case Protects India as "Pharmacy of the Developing World"'. Available at http://www.doctorswithoutborders.org/press/release.cfm?id=2096 [accessed 2 May 2011].

MSF (2008), *Untangling the Web of Antiretroviral Price Reductions*, 11th edition, Geneva: Médecins Sans Frontieres.

Mueller, J. (2007), 'The Tiger Awakens: The Tumultuous Transformation of India's Patent System and the Rise of Indian Pharmaceutical Innovation', *University of Pittsburgh Law Review*, 68: 491–642.

Musungu, S. and Oh, C. (2006), *The Use of Flexibilities in TRIPS by Developing Countries: Can They Promote Access to Medicines?* Geneva: South Centre.

Nath, K. (2004), 'Kamal Nath's Statement on the Ordinance Relating to Patents (Third) Amendment', Ministry of Commerce. Available at http://commerce.nic.in/pressrelease/pressrelease_detail.asp?id=1309 [accessed 2 May 2011].

NIHCM (2002), *Changing Patterns of Pharmaceutical Innovation*. Washington, DC: NIHCM Foundation.

National Working Group on Patent Laws (2008), 'Comments on Draft Manual of Patent Practice and Procedure'. Available at http://www.ipindia.nic.in/ipr/patent/Patent_Manual_Feedback/NATIONAL_WORKING_GROUP_ON_PATENT_LAWS_NEW_DELHI.pdf [accessed 2 May 2011].

Park, C. (2008), *Defining the Concept of 'New Chemical Entity' in the Drug Regulatory and Patentability Contexts: A Discussion Paper*, New Delhi: WHO-SEARO.

PhRMA (2008), Special 301 Submission.

Pillai, M. (2005), 'India: India's Patents Bill, 2005 – Is It TRIPS Compliant?' Lex Orbis. Available at http://www.mondaq.com/article.asp?articleid=31717 [accessed 2 May 2011].

Quick, J. (1997), *Managing Drug Supply: The Selection, Procurement, Distribution, and Use of Pharmaceuticals*, West Hartford, CT: Kumarian Press.

REBRIP (2007), 'Organizations Contest the Constitutionality of Brazilian IP Law'. Available at http://lists.essential.org/pipermail/ip-health/2007-November/012027.html [accessed 2 May 2011].

Reddy, S. and Sandhu, G. (2007), *Report on Steps to Be Taken by Government of India in the Context of Data Protection Provisions of Article 39.3 of TRIPS Agreement*, New Delhi: Ministry of Chemicals and Fertilizers, Government of India. Available at http://chemicals.nic.in/DPBooklet.pdf [accessed 2 May 2011].

Rosina, M., Wang, D. and Cristina Campos, T. (2008), 'Access to Medicines: Pharmaceutical Patents and the Right to Health', in L. Shaver (ed.), *Access to Knowledge in Brazil*, New Haven: Yale Law School.

Sanjuan, J., Love, J. and Weissman, R. (2006), *A Cost Sharing Model to Protect Investments in Pharmaceutical Test Data*. CPTECH policy brief number 1, 18 April 2006.

't Hoen, E. (2002), 'TRIPS, Pharmaceutical Patents, and Access to Essential Medicines: A Long Way from Seattle to Doha', *Chicago Journal of International Law*, 3: 27–46.

Third World Network (2003), *Manual on Good Practices in Public-Health-Sensitive Policy Measures and Patent Laws*, Penang: Third World Network.

Third World Network (2007), 'Thailand Issues Compulsory Licence to Buy Plavix Generics from India', TWN Info Service on Trade and WTO Issues. Available at http://www.twnside.org.sg/title2/wto.info/twninfo080706.htm [accessed 2 May 2011].

Unnikrishnan, C. (2008), 'Patent Denied in US, but Granted in India', *Mint*, 15 January. Available at http://www.livemint.com/2008/01/14235738/Patent-denied-in-US-but-grant.html [accessed 2 May 2011].

USTR (2008), *2008 Special 301 Report*, Washington, DC: USTR.

World Health Organization (2006), 'Data Exclusivity and Other 'TRIPS-Plus' Measures, Briefing Note: Access to Medicines'. Available at http://www.searo.who.int/LinkFiles/Global_Trade_and_Health_GTH_No3.pdf [accessed 2 May 2011].

5

ICTs and Access to Knowledge in Rural India

A comparative study of two models of deployment

Ramesh Subramanian

Introduction: India's disparate development

India's economy passed the US$1 trillion mark in 2008 (*The Economist* 2008a). It is one of the few countries experiencing economic growth despite the current global economic downturn. From 2003 to 2008, India's GDP registered a 9 per cent average annual growth (*The Economist* 2008b). This growth rate diminished to about 7 per cent during 2008–10, but many analysts predict that India's growth is likely to continue into the future with an average annual rate of 6.3 per cent from 2008 to 2030 (*The Economist* 2008b). Much of India's growth has been led by the service and industrial sectors, which have grown at 10.7 per cent and 9.4 per cent, respectively, in 2008 and 2009 according to India's Finance Minister P. Chidambaram, as stated in his 2008–9 union budget address (Chidambaram 2008).[1] India's IT sector has contributed heavily to the country's growth story. The IT industry provides direct and indirect employment to approximately 5 million people, according to NASSCOM, India's software industry trade association (NASSCOM 2008). Today, the results of more than ten years of sustained growth are becoming visible. Indian cities bustle with commerce, and middle-class Indians are experiencing rising wages in all sectors. The wage increases have generally occurred in urban areas, especially in the IT and services industries. With rapid income growth, the vast Indian middle class (numbering approximately 400 million) is becoming one of the fastest, and largest growing consumer societies and marketplace coveted by much of the developed world's marketers. Indian cities are experiencing a construction boom with new Western-style skyscrapers, shopping malls, entertainment complexes and upscale restaurants – all thronging with eager shoppers and patrons. The mobile telephone is ubiquitous even among the lowest of wage earners. In fact, as Edward Luce points out, there is an air of optimism and confidence in today's India that did not exist even a decade ago (Luce 2007).

Yet despite these developments, India still lags far behind in the sphere of human development. India's population, which is around 1.2 billion, is expected

to surpass China's by the year 2030. The 2007–8 Human Development Report (HDR) published by the United Nations Development Program (UNDP) gives India a Human Development Index (HDI) score of 0.619, which places it in the 128th position among 177 countries. The adult literacy rate of India in 2005 (as reported in (UNDP, 2007) 2007–8) was 61 per cent, behind countries like Namibia, Morocco and Equatorial Guinea. It is clear that the physical and social infrastructure required for enabling a higher quality of living and development has not kept pace with the country's economic growth. While cities and urban areas have benefited from the economic growth, vast tracts of rural India are still largely underdeveloped and untouched by technological developments in urban areas. More than 700 million Indians live in rural areas and far-flung villages that do not yet have basic services such as electricity, sanitation and water, much less knowledge-enhancing technologies such as telecommunication services.

The importance of access to knowledge (A2K) as a measure of human development has been clearly stated by many development experts. The UNDP's HDR of 2006 lists three essential elements for human development: long and healthy life, knowledge and a decent standard of living (UNDP 2006). A 'knowledge economy' is increasingly being seen as indispensable to development. For the fruits of India's economic growth to truly reach a majority of its people, A2K is critical.

India's low HDI rating has led many in India publicly to express concern that the much trumpeted growth story of the past seventeen years has not permeated to much of Indian society, a majority of which (approximately two-thirds of the population) lives in rural areas untouched by developments in urban areas. In fact, approximately 70 per cent of the entire Indian workforce is engaged in some form of agricultural endeavour, far removed from the development and technologies that are visible in urban India. Many in India have argued in recent times that unless technological developments that have enriched urban India are made accessible to those in rural India, wide disparities in income and quality of life would escalate, making the current growth unsustainable, which would, at worst, result in unrest and chaos.

Many reasons could be given to explain the lack of knowledge-enhancing technologies in rural India. One important reason is the prohibitive cost of connecting India's vast rural areas with telecommunications. A second is the non-availability of appropriate, cost-effective technologies that work in remote rural areas that experience extreme weather and environmental conditions. Telecommunications technologies faltered during the first four decades after India's independence from British rule. The socialist model adopted by the government emphasized Soviet-style central planning. Self-sufficiency was the over-abiding 'mantra' propagated by the government. Large public-sector monopolies were created, with little incentive to innovate and adopt new technologies. Newer technologies, especially those emanating from abroad, were strictly controlled through very restrictive licencing systems that dissuaded the private sector from

entering areas such as telecommunications. Capitalism was widely viewed as a 'sin' by the government policy makers. Telecommunications was considered a luxury and thus not considered critical for development. The government viewed energy, manufacturing, nuclear technology and so on as more important for development. Research and development in the govern-run telecommunications sector was non-existent. As late as the year 2000, India's rural teledensity (number of telephone lines per 100 people) was only 0.68 (Subramanian 2008). The third, and perhaps the most important, reason for the urban–rural disparity pertains to the social and cultural milieu that is more apparent in rural India and less so in urban centres. India has been for long a class-based society, where class was strictly determined by which caste one was born into. The caste system was legally abolished in 1950 by the Constitution of India and has generally disappeared in urban India. However, it still persists in rural India. Often, people belonging to one caste are not welcome in establishments run by members of another caste, which causes serious impediments to the notion of equal access to education, technology and knowledge, among other things.

Information and communications technologies (ICT) for development: policies and projects take root

By 1984, Indian policy makers had begun to accept the stark reality – that four decades of 'planned' growth and a socialistic outlook that engendered restrictive business and industrial policies had failed India and had not caused any appreciable positive change in the people's living conditions. A persistent disparity continued to exist between urban and rural India. The policy makers were finally forced to undertake radical economic reforms, starting in 1984, due to a worsening debt crunch and balance of payment situation. India came under strong pressure from international lending agencies to restructure its economy. This finally forced successive Indian governments towards liberalizing the Indian economy. Since 1984, developmental efforts have gained much stronger focus, coinciding with the gradual liberalization of India's economy coupled with the above-mentioned growth of India's IT sector. Today there is increasing emphasis on narrowing the 'digital divide' by bringing IT developments, especially telecommunications and the Internet, to rural areas. ICTs are considered the vehicles for bringing economic development to rural India.

Currently the issue of rural development through telecommunications is being addressed at several levels: the governmental, non-governmental (through NGOs), private-enterprise and scientific/research levels (at academic and research institutions). New telecommunications policies that more clearly reflect the new economic, political and technological realities emerged during the last decade of the twentieth century. These were announced in 1994 as the

'National Telecom Policy' and fine-tuned in 1999. One of the objectives of the new National Telecom Policy of 1999 was the provision of universal service to all uncovered areas, including rural areas (Subramanian 2008).

The new policies have opened up the telecommunications arena to private enterprises, and this has led to the development of greater telecommunications infrastructure in the country. At the end of 2007, India's rural teledensity stood at 7 (Kaushal 2007). This figure, while still much lower than other countries such as China, still denotes a significant improvement of rural teledensity figure of 0.68 over the year 2000. In the meanwhile, aided by improved licencing policies, mobile telecommunications have taken a quantum leap. In June 2009 alone, India added 11.9 million new wireless subscribers, taking the total subscription base to 464.82 million (*The Economic Times* 2009).

Today, several 'A2K' projects are underway in rural India. The projects are varied in nature. Some are sponsored by governmental agencies while others are run by NGOs. Some of them focus on the technological aspects, that is improvements to telecommunications and Internet technologies to bring information technology to rural India (i.e. the hardware), whereas others focus on the accessibility and informational aspects (i.e. form and content). The projects also use different approaches or models, with some focusing on sustainability through social entrepreneurship, some on a 'corporate' model that is aimed at providing channels and easier access to farmers to the markets, and others focusing purely on community development through information dissemination, without specific business models. The last model mentioned aims to uplift and enhance rural communities with the aim of making them more knowledge-aware, to eventually enable them to become sustainable communities. Many of these projects have been studied, or are currently being studied, by researchers. However, as noted (in *The Economist* 2005), the biggest problem in A2K and ICT4D projects is that it is very difficult to determine the real usefulness of these projects, especially with regard to rural development. In fact, there seems to be no effective data collection methodology for studying the efficacy of these projects. In such a situation, it would be best, as suggested by the *Economist* article, to simply ask the villagers themselves on how useful they see these attempts to be – that is a qualitative approach.

Objectives

The main objectives of this chapter are

- to study and analyse two types of rural ICT4D projects in southern India focusing specifically on the rural knowledge creation, management and dissemination aspects; and

- to report the results of a field study comparing the two models and factors that influence the success or failure of the two types of projects.

I hope that this study will provide critical information on current knowledge-based development efforts in rural India – where they have succeeded and where they have not. The lessons from this exercise will be of great value to policy makers, NGOs and researchers in identifying and designing more effective programs and plans for rural connectivity and 'A2K' schemes.

Methodology

This is a combination of a qualitative study and one based on a survey of prior work in the area. I conducted literature reviews and analysed the advances and adaptations that have been made to wireless Internetworking technology in the Indian context. I identified key scientists and project associates, especially in Tamil Nadu, who are currently involved in various rural connectivity projects. I interviewed them in India with a view to learning more about the pilot projects and implementation details. I also visited many of the rural areas where Internetworking projects are underway and qualitatively studied the nature and uses of the applications, along with some specific economical and social indicators that can be correlated to the use of Internetworking technology. This was done using a combination of long interviews and published data. I conducted long interviews of rural women in order to learn and understand more about their views of democratization as well as their views on the emerging role of rural women in commerce, entrepreneurship and technology. (A 'long interview' is 'a sharply focused, rapid, highly intensive interview process that seeks to diminish the indeterminacy and redundancy that attends more unstructured research processes. The long interview calls for special kinds of preparation and structure, including the use of an open-ended questionnaire, so that the investigator can maximize the value of the time spent with the respondent' (McCracken 1998). According to McCracken, the long interview process enables the researcher to delve deep into the mind of the subject and learn more about the world as it is perceived by him or her. This type of data collection method also provides a subject's critical interpretation of an event or development as experienced by him or her.)

Prior work

Subramanian and Arivanandan (2009) listed a number of studies of the application of ICT in rural areas by government, NGOs and academic and

non-academic institutions. I have listed them here. Hollifield and Donnermeyer studied factors that influenced individual-level adoption of new communication technology among the residents of four rural Midwest communities in the United States (Hollifield & Donnermeyer 2003). They examined demographic, community and employment influences on the adoption of Internet technology and use of email. Their study revealed that more than 50 per cent of the respondents used email and 60 per cent used the world wide web. The study also revealed that adoption of new technology was influenced by age, gender, economic and education variables. The study also suggested that demand for information technology would increase if locally owned businesses were encouraged to adopt technology. Finally, the study concluded that policy makers and rural development experts need to recognize the complexity of rural social networks and the advantages of using multiple starting points to encourage the diffusion of new information technology. The findings of Hollifield and Donnermeyer parallel those of Srinivasan (2004), who identified factors like language, workload, caste and geographical location of the people and their correlation to technology adoption and use in rural India. Cecchini and Scott (2003) described various issues with ICT projects in rural India, such as the cost of information infrastructure, inadequate or absent connectivity, unstable power supply, the role of small entrepreneurs in sustainability of ICT in rural areas, the accessibility of ICT by rural women and poor, disparities between gender and the caste of the ICT operators and trainers.

A UNDP case study undertaken by Gurumurthy, Singh and Kasinathan (2005) concerning TeNeT,[2] n-Logue[3] and Development of Humane Action (DHAN) Foundation[4] explored the appropriate ownership models for rural pro-poor ICT initiatives in the Melur area near Madurai in Tamil Nadu. They felt that the community-based model, which focused on providing community service through ICT, is more effective in the rural areas than other business models (such as the social entrepreneurship model promoted by TeNeT).

T. T. Sreekumar in his study of the Gyandoot ICT project (Dhar district of Madhya Pradesh) and TARAhaat kiosks project (Madhya Pradesh) highlighted the role of gender in rural ICT projects. He states,

> In the Indian context, the analysis of the patterns of inclusion in rural cyber kiosks shows that non-participation, particularly by women, is an important drawback in ICT-based projects. Contrary to popular belief, these social enterprises are not inclusive enough, and the social factors that perpetuate inequalities in rural areas are in fact reinforced by the projects rather than eliminated. The participation of women and the underprivileged in these projects is abysmally low and this is strikingly in contrast to the projected image of these initiatives as being overly sensitive to issues of gender and social divisions. (Sreekumar 2007)

The TARAhaat-established kiosks were found to be overly dependent on the support of the local elite class. These elite people controlled the social milieu in the domain of activities often offered by the kiosk. Sreekumar suggests that in

order for the tele-centres to function in this environment they invariably have to accept the traditional social divides, including the gender divide, instead of striving to transform them.

The literature reveals certain recurring themes, such as the influence of social liabilities such as class, caste, economic background, education, geographic location and so on, *in addition to* the availability and accessibility (or lack thereof) of the technology itself. The problem of sustainability of rural kiosks is also discussed by some researchers. Not surprisingly, reports emanating from *internal* project personnel take the view that these projects are very successful – which conflict with other research results by *outside* researchers. Notable among the 'doubters' is Kentaro Toyama, who has researched on this topic and has published results that show that there are numerous reasons why rural kiosks in India might fail (Toyama 2005; Toyama *et al*. 2005). These reasons include extreme poverty, lack of perceived value and appropriateness of cost of operations.

This study seeks to build upon existing research but provides a different perspective – a comparative analysis of two ICT4D or A2K models. I focus on two such ongoing projects at a micro-level, focusing on specific projects and individuals in the affected communities. They are the Village Knowledge Centres (VKCs) project initiated by the M. S. Swaminathan Research Foundation (MSSRF), Chennai, India, and the Indian Institute of Technology Madras's (IITM) TeNeT-based ICT4D projects.

The following were the primary research questions for this project:

1. What are the differing *business models* adopted by these two types of projects?
2. What *technologies* are used in these projects? What are the differing architectures used?
3. What, if any, are the different Internetworking applications and prototypes currently deployed?
4. What are the educational, social and economic consequences of these projects in the communities they are deployed?
5. Is any one model more successful? If so, what factors can be attributed to project success?
6. What are the impediments to success of rural development projects?

In what follows, I focus on these questions with respect to the two projects under the following themes: (1) genesis of the projects; (2) implementation of the projects (including technologies used for telecommunication, knowledge collection and storage, and knowledge dissemination); (3) data and evidence collected during field visits; (4) analysis of the two projects, including a

discussion of how this study maps into the A2K Index proposed by Lea Shaver (2007) and (5) conclusions on the effects and consequences of rural ICT vis-à-vis A2K and development.

Project 1: MSSRF'S VKCs

MSSRF is a non-profit organization founded by the noted Indian food and agricultural scientist, Dr M. S. Swaminathan. The foundation was registered in 1988 to research, advance and promote coastal systems, biotechnology, biodiversity, eco technology, food security and information, education and communication in developing countries, with a specific focus on India. In 1998, the foundation started the 'VKC' project. The idea was to select villages in rural Tamil Nadu and the Union Territory of Pondicherry (both in southern India) and provide adequate telecommunications infrastructure that would enable the dissemination of appropriate information regarding farming, education, health, weather, governmental news, job, loans and aid opportunities. The objectives were to reduce the digital gap and gender divide in rural India using technology – especially telecommunications technology. Each VKC would serve one or more villages and would act as the knowledge repository for the villages it served.

Pertinent information was stored in databases in these sites, with appropriate technology for easy access and dissemination of this knowledge to persons seeking them. The long-term objective was eventually to set up VKCs in each of the approximately 638,000 villages in India, thus creating a nationwide rural knowledge repository.

The three-tier hub and spokes model

The MSSRF's VKC project uses a three-tier hub and spokes model. The highest tier (i.e. Tier 1) is the state-level hub at the MSSRF headquarters in Chennai, India. The informatics centre at the state-level hub is connected by Internet Service Providers (ISPs) and the Indian Space Research Organization's (ISRO) uplink satellite through a Very Small Aperture Terminal (VSAT) antenna to universities, scientific institutions, governmental agencies and other panels of experts. Information from these external sources are collected, collated and transmitted using the VSAT connection to the next tier, Tier two.

Tier 2 is the Village Resource Centre (VRC). Each VRC serves as a hub, typically connected to twenty to thirty VKCs spread over a 60-km radius. The VRC is designed to act as a rural library and technology resource centre. Each VRC consists of at least three networked computers, one scanner, two web cameras, Internet access, one printer, one digital camera, solar backup facility

and training rooms. Each VRC is also connected to other VRCs and the MSSRF headquarters in Chennai through satellite link-ups, in collaboration with the Indian Space Research Organization (ISRO). The ISRO–MSSRF network uses one of the extended C-band transponders of ISRO's satellite INSAT-3A. Users at each VRC and at the headquarters in Chennai can communicate through video and audio links provided by the satellite connection (ISRO 2004). The VRCs at various rural locations are connected to the Tier 1 state-level informatics centre hub (and ISRO satellite) through VSAT. Internet connectivity to the various VRCs is achieved through the ISRO–MSSRF network.

The VRCs in turn provide network connectivity to the VKCs, which serve a particular village. The VKCs form Tier 3 of the MSSRF architecture. Each VRC is connected to the VKCs and other VRCs using Motorola very high frequency (VHF) radios for voice and data transmission. However, in actual practice, it was noted that this technology posed restrictions on transmission speeds as well as the size of the files transmitted. As a result, starting in 2001, spread spectrum wireless technology was introduced for VRC–VKC and VKC–VKC communications (Senthilkumaran & Arunachalam 2002). The VKCs are usually equipped with desktop computers, printer, radio communications equipment, wireless tower antenna, a video kiosk and applications such as desktop publishing. The applications vary from VKC to VKC, depending upon specific need.

Genesis of the MSSRF's VKC project

The VKC project was started at Villianur, a village in Pondicherry. This location was chosen because of MSSRF's experience and knowledge of the village, which also was the centre for its 'bio-village' project. The bio-village project was started in 1991. Its mission was to provide the above-mentioned service with a specific 'pro-poor, pro-women and pro-nature' foci. The VKC project is purely developmental in nature. The cost of setting up a VKC is Rs 200,000 (US$4,500) approximately. This cost is completely borne by MSSRF, which in turn receives aid from international aid agencies such as the International Development Research Center (IDRC), Canada, and Japanese aid agencies for implementing the project.

Typically, MSSRF field officers identify a village to set up a VKC. They identify and train project associates and create a core group of associates who then canvass the idea of setting up a VKC with village leaders, politicians and land owners. Public meetings are held to 'sell' the benefits of VKCs to the villagers. Here, the role of women's 'self-help groups' (SHGs) is invaluable. Women's SHGs were initiated by NGOs in India. The first SHG was started in 1985 by Mysore Resettlement and Development Agency (MYRADA), an NGO located in Mysore in the State of Karnataka (Fernandez 2007).

In 1990, the state government-run Tamil Nadu Women's Development Corporation started implementing an NGO-supported project to empower

women in the state. The women's SHGs purport to help socially and economically disadvantaged women by providing them with training, micro-loans and ways to organize in small groups. Each SHG consists of about fifteen women in a village. Women belonging to these SHGs are the first point of contact to MSSRF field officers, and help the field officers in gaining a familiarity and foothold in the villages.

Once the initial contact is made, and the idea of the VKC is 'sold', MSSRF sets certain conditions that are required to be met by the village in question:

- The village must provide a room that is open to and accessible by all members of the community. This condition is very important because, as noted earlier, India's villages are still mired in the class and caste system, which inhibits certain castes and classes from using such centres.
- The village must also pay for the cost of electricity and telephone connection to the VKC.

Once the villagers agree to the idea and the conditions, MSSRF sets up the VKC. A local individual is identified and selected to be the VKC's volunteer operator. This individual, mostly a woman from the village with at least high school education (even though there have been some exceptions to this rule based on an individual's ability), is then trained by MSSRF on basic computer operations and applications. The volunteer is given training in O/S, MS Office Suite, Adobe PageMaker and Photoshop, Visual Basic, Visual C++, HTML, voice recording, Zip and Unzip utilities and voice and data transmission in a wireless infrastructure. The selected person also receives a small honorarium of Rs 1,200 (approximately US$28) per month.

Technology and operations in a typical VKC

Each VKC has one or more desktop computers, at least one printer, radio communications equipment, a wireless tower antenna mounted on top of the building and, in some cases, a video kiosk. These are maintained by the villagers. According to Senthilkumaran and Arunachalam (2002), the villagers fully understand the importance of the VKC – 'Even in times of clashes between different groups (common in Indian villages), the VKC and its equipment are not damaged.'

The videos enable visitors to play and watch video-tutorials on farming, health and other topics. The computers have Microsoft Office, Net Meeting, games, publishing software, databases containing information pertaining to health, education, agriculture, commodity prices, government job vacancies and so on. The information in the databases is updated at regular intervals (sometimes daily) by downloading the updates from the VRC servicing the VKC. Each VKC also has a public address system using which the VKC

volunteer is quickly able to disseminate critical and useful information to the homes in the village. In addition, each VRC and VKC has complete training videos and CDs for the Microsoft Unlimited Potential Program (MUPP). This is a program from Microsoft to 'provide nonprofit organizations with funding to support technology training programs ranging from learning basic computer skills to using advanced business productivity applications (Microsoft Corporation 2008).'

Each VKC selects and helps promising youth to undergo various types of computer skills training. The training sessions are held at the appropriate VRC. Additional online, video and CD-based training materials and exam practice materials are available for use by the trainees at the local villages through the VKCs.

Technology and operations at a VRC

As noted above, the VRC forms the hub of activities for a cluster of VKCs. Local project staff maintain the systems at the hub. The wireless system and web server administration are taken care of by the Informatics Centre of MSSRF in Chennai. The VRC creates and maintains numerous databases pertaining to agriculture, commodity prices, livestock health and welfare, medical data, governmental data, grants and aid availability from various agencies of the government, women's welfare-related data and so on. Each VRC has a fully equipped library containing magazines and other publications in local languages. The VRC also develops and maintains web portals in Tamil, the local language, to disseminate information on the above-mentioned issues. Each VRC also uses DTP tools to publish a Tamil-language newspaper *Namma Oor Seidhi*, which translates to 'Our Town's News'. This paper contains news and events of interest to villages served by the VRC. As can be seen, a key aspect of the VRC concerns the creation and updating of relevant content to suit local needs. The VRC plays the role of a 'value addition centre'. The VRC at Villianur (which has subsequently been relocated to Pillayarkuppam) has generated around one hundred databases to fulfil the specific information needs of the local communities. Most databases are updated on a daily basis. A considerable amount of information is accessed from local sources. Many of the databases are in multimedia form for the benefit of illiterate people (Senthilkumaran & Arunachalam 2002).

Field visits and observations

I undertook several field trips to observe the actual operations of the VRCs and VKCs. The interviews and field trips took place between August 2007 and February 2008. I interviewed villagers (including school-going children), technicians associated with the centres, the kiosk owners and VKC volunteers.

The MSSRF's VRCs and VKCs that I visited are located in the Union Territory of Pondicherry, located about 100 km south of Chennai, a major metropolis in southern India. Pondicherry is generally more developed than Tamil Nadu, the state that lies adjacent to it. The literacy rate in urban areas is 82 per cent, whereas the literacy rate in rural areas is 54 per cent. The villages that I visited were all within one hour's bus journey from the city of Pondicherry (the capital city of the Union Territory of Pondicherry). However, I observed that the transformation from an urban to a rural setting occurs quite drastically. Within a few miles outside of the city, the land is covered with farmlands and villages where many of the city services (i.e. indoor plumbing, reliable water supply, reliable supply of electricity, public sanitation etc.) are significantly less prevalent. The following paragraphs summarize my observations at one VRC and VKC that were the most representative of the VRCs and VKCs that I visited.

Pillayarkuppam

Pillayarkuppam is a village of about 4,500 people located about forty-five minutes from Pondicherry by road. The VRC at Pillayarkuppam consists of a modern building complex equipped with a VSAT antenna, computers, printers, battery packs, training rooms and even a small radio station. The VRC's VSAT antenna dish rises prominently from the surrounding farmlands. The coordinator of the Pillayarkuppam is a retired veterinary doctor, Dr A. K. Thiagarajan. Dr Thiagarajan explained that the MSSRF's VKC project originated from an earlier, 'bio-village' project, started in the village of Villianur in 1991. MSSRF noticed a preponderance of local traditional knowledge which it wanted to collect, store and disseminate to the local population. This led to the birth of a VKC. MSSRF project officers insist on the term 'VKC' rather than 'information kiosk' or 'Internet kiosk'. During interview, Dr Thiagarajan explained that MSSRF's founder, Dr M. S. Swaminathan, felt that the term 'kiosk' implied a commerce-oriented business centre, which is very different from the purely community development philosophy of MSSRF projects. Dr Swaminathan did not want the VKCs to be just a commercial enterprise, but he wanted to bring in the idea of a shared 'commons' – which is perhaps a leftover from the ideals of socialism engendered by India's first prime minister, Jawaharlal Nehru. Dr Thiagarajan also repeated the claim that MSSRF's projects were aimed towards being 'pro-poor, pro-women and pro-nature'. Villianur was soon connected to several VKCs and became a hub or VRC. In 2005, the VRC was shifted to a more spacious location at another nearby village, Pillayarkuppam. In the following sections, I describe my observations of a VRC and a VKC.

The VRC houses spacious and clean administrative offices with three computers, a scanner, books, magazines and newspapers. The training rooms contain computers, multimedia and projection equipment. There is a computer lab that consists of several computers and appropriate software applications.

I observed a group of women working on editing the VRC's information website and using publishing software to publish the VRC's newspaper.

The Pillayarkuppam VRC controls fourteen villages by being the hub of info-tech services. The VRC disseminates a plethora of information using a combination of wireless (satellite and short wave radio transmission) as well as wired telecommunications infrastructure for connecting to the Internet. The information disseminated includes government employment schemes, commodity prices, information and education on health and hygiene, results of examinations, computer training, women's health issues, government loan schemes (i.e. loans for purchasing motors and other farm equipment) and government-issued certificates (such as birth and marriage certificates).

In addition, the VRC also serves as a resource centre offering training in dairy improvement projects such as clean milk production in association with Ponlait, the milk co-operative that supplies milk to much of the Union Territory. It also publishes the newspaper *Namma Oor Seidhi* for the surrounding villages (ninety-eight in number at the end of 2007). Dr Thiagarajan showed the VRC's library and a bio-lab that collected and categorized native herbs and other flora. The VRC also provided training in animal husbandry and maintained a 'sperm bank' for the artificial insemination of cows. The sperm bank contains numerous temperature-controlled flasks for transporting the sperm to the farms. The VRC imparted training in artificial insemination techniques to local farmers.

The ICT side of the VRC is managed by project associates and technical staff – all recruited and trained from the villages that the VRC serves. One of the project associates working at the VRC is Ms Bhagyalakshmi. She revealed that she had originally worked as a volunteer at another village VKC, located in Kizhur. She had been 'promoted' to her current position because of her interest, enthusiasm and ability to pick up the necessary skills. Prior to her current job, she had been involved with a women's SHG in her village. She also revealed that even though she hailed from a village that did not have any private school, she had moved closer to the VRC's location in order to send her children to a good private school. She was knowledgeable in basic computer skills and was able to train others.

During my visit, I met a group of fifty local farmers who had been brought there for training in livestock care. They were shown audio-visual presentations and lectures by a veterinarian. The audio-visual presentations had been downloaded earlier using the satellite link-up with the Chennai headquarters. I also observed a group of youth attending classes in Microsoft Access™ (database) software in preparation for taking a Microsoft Certification exam. The training was imparted through a grant from the MUPP. The trainers were either external experts or those trained earlier by MSSRF.[5]

The project associate, Ms Bhagyalakshmi, opined that the whole VRC concept was very empowering to the women in villages, as they not only gained information on various issues related to health and women's issues but also

were often selected to run the VRCs themselves, earning a small honorarium of Rs 1,500. She also noted that women were not given any preference (despite MSSRF's stated policy of being 'pro-poor, pro-nature and pro-women') – either in the access to the VRC or in employment and training opportunities. Despite this, the preponderance of women working in the VRCs led me to believe that the concept of VRC was indeed a vehicle for the enhancement and education of village women.

Embalam

Embalam is a town of 4,000 people, located about forty minutes from Pondicherry. It is served by a VKC, which is connected to the regional VRC at Pillayarkuppam. The VKC is operated by two women, Malathi and Indira Gandhi. Both have completed high school and have completed the Microsoft Unlimited Potential Project training program.

The VKC is located within a small village temple's premises. It is equipped with a computer, printer, a video kiosk and a public address system. The VKC is connected to the VRC by a microwave link. The antenna is located on the roof of the building. The interior of the VKC is very basic and Spartan, in comparison to the much more up-to-date facilities of the Pillayarkuppam VRC. The computer has applications such as Microsoft Office, desktop publishing and e-conferencing software. The VKC downloads current information such as weather updates, coastal tide information, commodity procurement prices, high school examination results and other information pertaining to farmers as well as general and women's and health information from the VRC's databases. Important weather-related information and the arrival of examination results are broadcast to the entire village using the public address system.

The VKC maintained two-way audio-conferencing with the VRC. When a problem occurred with any of the computing, the local associate troubleshot and then requested pertinent information via the audio-conferencing tool to the VRC if further help was required. During my visit, I observed an e-conference (video conference using Microsoft Net Meeting application software) in progress with another VKC located nearby. Since the power supply in this village was spotty, uninterrupted supply of power was ensured through a bank of batteries.

The project associates informed me that the VKC was mostly used by children and women. Occasionally men used the VKC for preparing and printing letters. (In addition to the honorarium that they receive, the project associates operating the VKC are allowed to charge nominal amounts for services such as preparation of letters, loan applications and printing.) I interviewed school children, who all seemed aware of the VKC and its functions. The village children were very comfortable using the VKC and visited it for checking examination results, for online or CD-based MUPP training, to play computer games, to check the online newspapers and for CD-based science lessons.

Women visited the VKC for health and reproductive health information. The men that I interviewed informed me that some of them used the VKC for information on the weather and commodity prices. It was interesting to note that most of them indicated that much of the information that they needed was available on cell phones, which almost all village farmers possessed. This was an interesting fact and was proof of the prevalence and rapid spread of cellular phones in even rural areas of India.

Overall, the observations led me to conclude that the Embalam VKC is a successful project and had proved its worth to the villagers it served. Through interviews with the various village people, I learned that the VKC was viewed as a symbol of prestige to the village. In fact, its success had prompted the heads of nearby villages to request MSSRF to set up such centres in their villages. The women who worked in the VKC seemed empowered and confident. One of them even had an opportunity to travel to Tunisia for the World Summit on the Information Society (WSIS) in 2005 as a Jamsetji Tata National Virtual Academy (NVA) Fellow. The NVA, set-up in 2003, is endowed by a grant from the Tata Education Trust, a charitable organization, and supports MSSRF's ideals.

Impressions from the MSSRF'S VKC project

The previous sections provide a small but illustrative sample of the many field visits. I visited many more locations and interviewed a variety of people. The samples above provide a very good representation of the MSSRF's VKC project and help provide a window into the facts on the ground as they pertain to the spread and effects of Internet technologies in rural India.

Based on the 'data' obtained through this study, I believe that the effects of the spread of the Internet to rural areas in India has generally been very successful in empowering women and providing them with appropriate information on various health, hygiene and reproductive issues. As seen from the sections above, the training programs offered through the MSSRF's VKC project have enabled women to learn more about computers and the Internet, and has even provided them with meaningful job opportunities as well as opportunities to lead in the areas of education and health. As noted earlier, one of the project associates I interviewed was empowered enough to move her family from her (remote) village to one that was closer to a better school, in order to afford her children with better educational opportunities. All the MSSRF project associates that I interviewed or observed were women. They were confident and knowledgeable about their environment and the world outside their villages. They were leaders in their villages, and would, I believe, be good role models to female children in their villages. The VKCs also provided opportunities for the associates to engage in entrepreneurship, by offering for-payment services such as letter writing, loan preparation and document printing services.

The VRCs, with their bigger and more developed technical infrastructure, seem to offer more services that are relevant to the farmers (i.e. men). The men seemed to take advantage of the training facilities at the VRC level and used the VKCs to get weather reports and market price information. The villagers value the newspaper produced by the VRC and depend on these traditional forms of news dissemination to learn about the news and government-sponsored schemes. During my visit to the Pillayarkuppam VRC, I even observed one villager who had walked several miles in order to enquire about the non-delivery of that month's newspaper. The children who I interviewed in the villages were all very aware of the VKC and appreciated its role as a venue to get online examination results and to learn more about subjects such as computers and science.

Another area that I tried to study was the role that caste played in the success of a VKC in a village. Unfortunately, I could not gain much information that could lead to any definitive conclusions. Most of the associates that I observed and interviewed indicated that caste did not play any role in the functioning of the VKC. However, at a VKC in one village populated predominantly by members of a lower order caste, the project associates mentioned that people from a neighbouring village of higher caste people avoided using the VKC, even though it provided valuable services. This shows the extent to which caste plays a role in the utility of the VKCs – even when it is a clearly perceived utility, certain caste members avoid using a VKC purely because it is located in the 'wrong' village. I plan to investigate the role of caste in attracting or detracting the use of a VKC in a particular village in a future study.

Project 2: The TeNeT group's projects

Genesis of TeNeT's projects

'TeNeT' is the Telecommunications and Computer Networking Group in the Department of Electrical Engineering at IITM. The institute is considered to be among the top technical schools in the world. The TeNeT group's vision is to develop 'world-class technology at an affordable price' (TeNeT group n.d.). The group's researchers focus on addressing the 'pressing needs of India and other developing countries by market-driven product development, strengthening of Indian telecom/networking industry, technical training and education, and driving telecom/IT policy' (TeNeT group n.d.). The group's founder and director is Prof. Ashok Jhunjhunwala, a professor of electrical engineering and pioneer in the field of telecommunications technology and development in developing countries.

Technological innovations at TeNeT

In line with this vision, TeNeT developed a new 'corDECT' wireless local loop (WLL) standard in the late 1990s (Balaji, Gonsalves & Kumar 2002). The corDECT WLL technology is based on the DECT (Digital Enhanced Cordless Telecommunications) standard, which was a technology standard developed in the late 1980s in Europe and published as a standard in 1992 (European Telecommunications Standards Institute (ETSI) 2005). Even in the late 1990s, India's rural telecommunications connectivity was vastly underdeveloped. The teledensity was in the range of 0.68 to 1.5. Even though there was telecommunications connectivity – fibre-optic cable – up to the 'block' or 'district-headquarters' level over much of India, the problem was the lack of connectivity over the last few miles, where 85 per cent of India's villages are located. The lack of infrastructure was attributed to the high cost of laying copper wires over much of rural India. The solution that was promoted by the TeNeT group was the corDECT WLL technology. This technology provides a telephone line and 35/70 kbps Internet connection in a 30-km radius. The WLL exchange and transmission tower can be set up in the town connected to the Bharat Sanchar Nigam Limited (BSNL) network. The prime advantages of this technology were its ability to operate in very warm conditions (up to 55 degrees Celsius), with a low power requirement of 1 kW. The TeNeT group felt that this technology could be used for connecting India's villages, provide appropriate information to the villagers, develop the rural economy and provide job opportunities in the rural areas.

The TeNeT group developed a WLL product using this technology, in collaboration with Midas Telecommunications Pvt Ltd, a telecommunications start-up incubated by TeNeT, and Analog Devices, USA. In the early 2000s, the corDECT technology became a good example of a successful transfer of technology from the lab to the industry, when it was selected by major telecom corporations in India, such as BSNL and Reliance Communications.

The TeNeT model is rooted in indigenous technology and social entrepreneurship. This model essentially works as a three-tier architecture, much like the MSSRF's VKC project described earlier. Tier 1 consists of n-Logue, a company incubated by the TeNeT group. n-Logue acts as the overall technology provider as well as synthesizer of data from the government, educational institutions, banks, hardware and software providers and so on. n-Logue is the overall manager of the network and provides the necessary technology and business support to the next layer, which is the 'local access provider' (LAP) layer.

n-Logue's business model is to use the WLL technologies from Midas Telecommunications to set up a series of WLL transmission towers located at the village-level district headquarters. Each of these centres would then be an LAP (Tier 2), providing services to Internet kiosks that would be set-up in

the villages (Tier 3). The village kiosks would communicate to the LAP centre through a transmission tower and antenna. The village kiosks form the third tier of the architecture. They are connected to the LAPs by WLL receivers (antennae mounted on top of the kiosks).

The TeNeT group's approach, like the MSSRF's VKC project, is to bridge the rural information gap by creating village-level kiosks that would act as information resource centres to the locals. However, the business model is different. Unlike MSSRF, which is purely development-oriented model largely funded by aid agencies and NGOs, the TeNeT model envisaged the creation of rural entrepreneurship at two levels: the LAP level and the village Internet kiosk level. This, it was hoped, would provide a sustainable model for rural development.

The social entrepreneurship model promoted by TeNeT

In this model, n-Logue would sell the Midas corDECT WLL technology to a local entrepreneur at a district headquarters or similar town that has fibre-optic connectivity provided by BSNL or other telecommunications company. The LAP would run a centre that would have the corDECT switch developed by Midas and computers that served information, maintained the network communications status, email and so on. Setting up an LAP centre would cost Rs 1,200,000 (or about US$26,000), and the village-level kiosks (named 'Chirag' – which means 'lamp' – kiosks) would cost about Rs 50,000 (or about US$1,100) (*The Economic Times* 2002) and would have the following: touch typing tutoring software, computer education software, photography and movies on CD, desktop publishing, Microsoft Office suite, email/voice & video mail, e-government access facilities (to access, fill and submit government forms such as birth and death certificates, land deeds etc.), rudimentary video conferencing facilities, tele-medicine and veterinary diagnosis facilities, agriculture-related information and so on. The cost would also include training and maintenance.

Unlike the MSSRF model, the local entrepreneur who owns and operates the Chirag kiosk will charge for the use of these services. This is the model of social entrepreneurship that the TeNeT project aims for. According to Dr Jhunjhunwala (2004), Director of TeNeT, this model is most likely to succeed and make rural India into engines of growth. In Jhunjhunwala's view, ICT for rural development based on the financial aid and grant models will not scale as well as or as efficiently as the social entrepreneurship model, which lets locals decide on the types of services offered and set charges for such services.

The bouquet of services offered

This model of social entrepreneurship wedded to ICT also provides flexibility in terms of the type and variety of applications and services provided to a target community. In order to promote, nurture and mentor social entrepreneurs in the

rural ICT arena, TeNeT created the Rural Technology and Business Incubator (RTBI) in October 2006. RTBI's focus is on rural programming, development, technology and business incubation. It has divided the rural ICT and development sphere into the following 'venture sectors', namely, agriculture, vocational training, financial inclusion, education, energy and water management.

As mentioned earlier, RTBI's role is to develop, enable and mentor social entrepreneurship using the technologies developed at TeNeT. For example, using the n-Logue kiosks, a Chirag operator could focus on providing veterinary services via the Internet. Videos and photographs of sick animals could be transmitted for synchronous long-distance consultation from veterinary specialists located elsewhere. In this case, video and photographic equipment may have to be installed. Similarly, long-distance health care for humans can also be facilitated by providing equipment for blood-pressure checking or ECG at Chirag centres, the readings of which could be transmitted instantaneously through Internet-based video and audio-conferencing to medical experts, who could then make a more reasoned diagnosis. In the commercial realm, low-cost bank ATMs can be placed in the centres, with the available network connectivity. Farmers could request and get advice on crops to plant for the next season, prices of commodities in the market, and crop diseases from qualified agricultural experts. Other applications include vocational training and education.

Field visit: Thiruvallur

Thiruvallur is a town located 42 km from Chennai. The town also serves as the headquarters of Thiruvallur District in the state of Tamil Nadu. The approximate population of the town is 50,000. Thiruvallur is the location of an LAP. The Thiruvallur LAP served thirty-two active kiosks at the time of the field visit on 5 December 2007. The Thiruvallur LAP is an example of a failure of the social entrepreneurship model. The operator of the LAP centre had presumably abandoned the project, and the operations were thus being taken over directly by TeNeT, under the supervision of Ms Scotlin (a project officer for TeNeT RTBI).

The LAP centre acted as the control centre that monitored the connectivity status of the village kiosks (Chirag centres) that were served by it. The LAP also attended to complaints from kiosk operators in the villages as well as requests for technical help in repairing fixed relay stations (FRS), which are essentially the antenna that connects the village kiosks to the LAP centres. The LAP acted in conjunction with n-Logue, the provider of the corDECT hardware as well as applications.

The LAP centre is located in a small building near the centre of the town. The distinguishing feature is the imposing n-Logue transmission tower (which is generally taller than wireless transmission towers as the signals have to reach a distance of 25 to 30 km). The building houses the corDECT switch, modems

and desktop computers. One of the desktop computers is connected to the switching equipment to monitor the status and performance of the transmission through modems, repeaters and the kiosk antennae.

During the field visit, two n-Logue technicians were getting ready to visit some Chirag kiosks in the surrounding villages in response to requests for service from the Chirag operators. One of the Chirag kiosks that I visited was located in a small village, Chinnammapet. The village did not have any paved roads, and even though it was located within 15–20 km of Thiruvallur (the district's headquarters), the village is very rural and underdeveloped.

The Chirag kiosk in Chinnammapet was (at the time of the field visit) operated by Mr Anandan. The kiosk consisted of a couple of desktop computers, which had Internet browsing applications, typing lessons as well as desktop publishing tutorials. The centre had the n-Logue antenna mounted on its roof.

The kiosk was a 'for-profit' operation, and all services such as web browsing, email, computer games, computer-aided lessons, scanning and so on had separate service charges, listed inside the kiosk. The kiosk operator, Mr Anandan, did not seem very happy with the technology and support provided by n-Logue. During the interview, he indicated that there were chronic connectivity problems, which were not conducive to attracting students who could use the centre. He only had five registered students at the time. He was operating at a loss.

I accompanied the n-Logue technicians and visited several Chirag kiosks during the day. In all the village kiosks that I visited, the problems seemed to be the same: connectivity issues and service issues. These were accompanied by competition from other similar kiosks located in the vicinity. It was also the case that some of the villages were connected to broadband Internet services by cable operators using satellite dish antennae, thereby nullifying the usefulness of the Chirag kiosks.

It was clear that the entrepreneur operating the kiosk at Chinnammapet was not making a profit. His ability to serve some of the community's 'needs' was limited, and the technology seemed inadequate. It also seemed clear from interviewing him that he had been promised much more technical assistance, and the sustainability and attractiveness of the project had been oversold to him. The kiosk also did not have direct communications facilities with the LAP centre at Thiruvallur. All communications, complaints and service requests had to be handled using private cellular phones. There was no transfer of knowledge between the LAP and the Chirag kiosk, nor were there any training programs offered to the operators of the kiosks.

Field visit: Mayiladuthurai

Mayiladuthurai is located 281 km south of Chennai and is a town in Tamil Nadu's Nagapattinam district. The field visits were done in February 2008.

The LAP centre located in this town offered a contrast to that in Thiruvallur. The LAP is considered a successful example of TeNeT's ICT4D efforts. The access centre is operated by Mr Vijay Iyer, a local entrepreneur who runs the centre professionally. The centre employs a full-time sales person and has its own technical lead person and technical assistants and other office staff. The centre has the capacity to operate 200 connections (to village 'Chirag' kiosks) and is currently operating 75 such connections. The centre provides connectivity to not only village kiosks but also to the office of the district's Chief Administrative Officer (Collector). The Collector's office uses the connectivity provided by the access centre as a secondary mode of connection to the rest of the community and the world.

The LAP's centre operates on the principle of offering quality service to its customers. Accordingly, it strives to keep delays in service to a minimum. The focus is on rapidly getting a non-functioning system back to working condition. The centre offered two types of service: 75 hours of connectivity for Rs 550 per month or unlimited hours for Rs 1,000 per month. Mr G. Ashokan, the centre's sales officer, acknowledges the increasing reach of Internet services offered by the state-run telecommunications company, BSNL. BSNL has gradually been increasing its offerings to more and more rural areas. However, Ashokan says that the service offered by his centre was superior to that offered by BSNL, which proved to be a competitive advantage. During the interview with the centre's staff, I also got the impression that the management of n-Logue was not very responsive to their needs and that it was the initiative and drive of the owner, Mr Vijay Iyer, that enabled the centre to get appropriate and reasonably quick responses from n-Logue. This included technical service as well as training in the n-Logue technology.

The centre's transmission tower was mounted on the building roof, and the centre has desktop computers, corDECT switch and modems like the other LAP centres I visited. The access centre provided support to various Chirag kiosk applications such as web browsing, email services, printing, games, education and desktop publishing software. Mr Ashokan explained that because of the quality of service provided by the access centre, one or two new Chirag kiosks were opened every month. Advertisements placed in local newspapers were the primary selling technique, in addition to direct-person canvassing. Mr Ashokan explained that in order for an access centre to succeed and make a profit, it was critical to select the right person to open and operate Chirag village kiosks. The village kiosk operator should have the necessary business acumen, communication abilities and sufficient finances to operate the kiosk successfully. I inquired about caste-related accessibility issues in the villages where Chirag kiosks were located. Mr Ashokan replied that the LAP made sure that kiosks were located in central business areas even in villages, so as to facilitate easy access to all people in a village.

Field visit: Perambur village Chirag kiosk

The Perambur village is located about 15 km from Mayiladuthurai and has a population of 8,000. If the surrounding villages are included, the population that this kiosk serves is 30,000. The operator of the kiosk is Mr Thiagarajan.

The Chirag kiosk consisted of two Internet-enabled desktop computers and a printer. The kiosk also operated a 'Public Call Office' (PCO), which is a public telephone service provided by Reliance Telecom Limited, a large private sector telecommunications company in India. The PCO was connected to the public switched telephone network (PSTN) using a WLL from the nearby town of Mayiladuthurai. The kiosk was connected to the n-Logue LAP's access centre wireless network by a rooftop antenna. The antenna and other equipment were financed by loans from the Khadi Village Industries Commission (KVIC) and the State Bank of India. This kiosk thus had connectivity through two wireless sources – n-Logue and the Reliance Telecom WLL. Thiagarajan seemed very satisfied with the technical service and support he received from the Mayiladuthurai LAP centre (which is also commonly referred to as n-Logue). He rated the overall service as 'good'.

I conducted a detailed interview with Mr Thiagarajan about the operations, uses, impediments and success stories of the kiosk. The details are given here.

The kiosk had the usual collection of desktop publishing software, Internet browsing and Microsoft Office. In addition, the kiosk also offered services like computer-based education, computer games, vision care and video conferencing. Villagers used the kiosk for making complaints or requests for service pertaining to basic rural infrastructure such as roads needing repairs, road paving and electricity service in the villages. The villagers could use the kiosk's computers to do this for a fee of Rs 10 (US$0.25). They also used the kiosks to connect to government office web sites to request certificates (such as death, birth etc.), and for videoconferencing with family members abroad. (Mr Ashokan explained that the villages surrounding this kiosk had 'exported' several family members to work as labourers in Persian Gulf countries.)

The villagers saw many benefits in using the kiosk but, most importantly, they appreciated the reduced time for managing a variety of personal chores, such as getting a photograph taken (for passport and other identification purposes), filling out government and loan applications, for applying to government jobs, for reading web-based government notices, for filing complaints to local authorities, for birth and death certificates, for land allocation and for online employment renewal. Unlike the MSSRF's VKCs, women did not seem to use the kiosk to obtain general and reproductive health information. Instead, according to Thiagarajan, the village women were provided the information by government health workers who periodically visited the villages and went door-to-door offering the information and services. Thiagarajan also noted

that the village children did not generally use the kiosk, as they were unable to or unwilling to pay the Rs 10 per-hour charges.

Tie-ups

However, while the kiosk did not impact the women and children of the villages, it did act as an anchor for many village-based employment projects in conjunction with n-Logue and private industry. For example, ITC, one of the three largest Indian conglomerates, realized that it could employ rural people to make incense sticks, which is an approximately US$50 million business in India. ITC collaborated with n-Logue and, through n-Logue's Chirag kiosks, employed village labourers for making incense sticks (ITC's 'Mangaldeep' brand). Marketing support for the villagers was provided by n-Logue. Thus the kiosks were used as a focal point for non-IT related rural employment and entrepreneurship. In addition, Thiagarajan's kiosk also maintained a small lending library with a small collection of books. Users would typically pay a small fee for borrowing a book. This library was also set-up with a tie-up between n-Logue and a book seller. n-Logue has negotiated tie-ups with credit-card companies, which enables the kiosk operators to make online purchases and even offer such services to their customers. There was also a tie-up between n-Logue and the German company Bosch to provide loans to villagers and farmers to buy tools and equipment.

Field visit: Kollumangudi village Chirag kiosk

The village (population of 4,500) is located about 15 km south-east of Mayiladuthurai town. The kiosk serves twenty neighbouring villages, covering about 30,000 people. The Chirag kiosk here is another example of a well-run rural entrepreneurship effort. The kiosk is modelled as a learning centre and consists of a library, a tutoring centre (offering online tutorials), a computer skills training centre and a rural business process outsourcing (rural BPO) centre. The operator is Mr Kasinathan.

The centre has about twenty-five registered students taking computer courses, consisting of both men and women, and some housewives. The courses offered cover IT basics, IT tools, PC troubleshooting, HTML, databases, project management, Photoshop, Tally (financial software), typing and data entry. The centre offers preparatory courses for a diploma in computer applications. According to Kasinathan, many past students who had successfully completed the courses were also waitlisted to become teachers in local government-run schools.

Users of the kiosk, in addition to taking courses, also use the Internet to get information on a variety of subjects. Many use 'Kijiji', a subsidiary of eBay. Kijiji is a network of online communities where local classified advertisements

could be posted (i.e. similar to Craigslist, http://www.craigslist.com). They also use the Internet and web browsing facilities to apply for passports and to register complaints against certain government services. Kasinathan also runs a 'rural BPO', performing back-end information searches for http://www.zook.com, a provider of real-time information services in mobile space. The BPO currently has two seats, providing services for sixteen hours and employing two part-time workers. In addition, Kasinathan also uses locals to roll incense sticks for ITC, a tie-up facilitated by n-Logue.

Analysis

In the above narrative, I focused on two basic models of rural ICT projects. The MSSRF's VKCs are a purely service-oriented, developmental model that depends on NGOs and aid organizations to provide a plethora of ICT-enabled services to rural areas. The TeNeT n-Logue projects focus on using indigenous technology to provide the last mile connection to rural areas. But this model is completely different from the former. In the TeNeT n-Logue project, the focus is on developing sustainable rural development through entrepreneurship. It was envisaged that the Chirag kiosks set-up in the TeNeT project would provide a variety of services, which would include Internet connectivity and access to governmental and other community-supportive documents and other information. The Internet usage would be charged. In addition, other services such as document preparation, games, printing and some educational services would also be provided, depending upon the individual operator's ability and inclination. I visited many VKCs and Chirag kiosks, in addition to a few VRCs and the LAP centres. I also visited the MSSRF state-level informatics hub in Chennai, the TeNeT group at IITM, Chennai, and the n-Logue headquarters in Chennai. However, in the above text, I chose to feature representative samples of the MSSRF's VKCs and TeNeT/n-Logue's Chirag kiosks. In the following analysis, I combine observations and impressions made at all of the villages visited and collate data from various sources.

Philosophy

Both MSSRF and n-Logue follow the same general philosophy as regards rural development – that is to leverage ICT to connect India's large, underdeveloped rural population with a view to bringing the fruits of development to rural areas and to promote education and well-being among the rural youth.

However, in terms of specific focus, the two differ. MSSRF projects follow a policy of being 'pro-poor, pro-women and pro-nature'. This philosophy

has been explicitly stated by Dr M. S. Swaminathan, the founder/Director of MSSRF. In fact, Swaminathan did not want the village Internet access centres to be referred to as 'kiosks', as the term is generally used more in a commercial context. MSSRF develops locale-specific, demand-driven content, organizes training and awareness activities, establishes links with local institutions and identifies and trains local 'knowledge workers' who will staff the VRCs and VKCs. In Dr Swaminathan's mind, a kiosk was a commercial location or shop where services were provided for a fee. Swaminathan wanted every rural citizen to have access to knowledge as a matter of right. As a result, the MSSRF's VKCs are completely free for the use of all rural citizens. No fees are charged.

The TeNeT model, while fully acknowledging that IT is the main enabler for rural development, follows the philosophy of fostering rural entrepreneurship for sustainable development. This philosophy permeates all layers of the TeNeT projects. Starting from the top tier, n-Logue is a for-profit start-up that uses hardware (i.e. corDECT switch) from Midas Communications. Both n-Logue and Midas have been incubated by the TeNeT group. In the second tier, the LAPs (access centres) are entrepreneurs at the district-headquarters level. Each access centre services twenty or thirty village kiosks (Chirag kiosks), also operated by village entrepreneurs. The Chirag kiosks constitute the third tier. The LAP entrepreneur typically buys the equipment and synthesized databases and other applications and software from n-Logue. The LAP entrepreneur also markets the concept of the village-level kiosk to local village-level entrepreneurs, who pay for the equipment such as computers and the antenna/receivers. In some cases, they also pay for other services, such as maintenance. The village entrepreneur (Chirag kiosk operator) then sells services to the local villagers. Thus, at every level, the TeNeT model provides services for a fee. Accordingly, the types of services offered at the kiosks vary according to demand and the potential to earn revenue. Social development is only an indirect outcome in the approach.

Data communications technology

The two projects differ considerably in the technologies they use. At the top tier, MSSRF uses VSAT antennas to transmit to and receive data from an ISRO's INSAT-3A satellite. The ISRO–MSSRF's VSAT network uses the extended C-band and consists of several 'nodes', which represent the VRCs and various locations, with Chennai as the central node. Each node can transmit data at 1.5 Mbps and receive data at 384 Kbps. At the second tier, VRCs extend the network to the VKC (the third tier) using Wi-Fi, Spread Spectrum, VHF radio and WLL.

MSSRF has been generally flexible to the rapid changes in the telecommunications sector. It has adopted new and emerging transmission technologies whenever possible and appropriate in order to extend the reach of

its knowledge network. In this, it has depended on international aid agencies, the government of India's space and satellite communications infrastructure as well as commercial vendors such as Motorola (for its VHF duplex radio link for transmitting data between VRCs and VKCs, mostly using funding agencies and grants).

However, TeNeT has relied on indigenous technology developed at the department of Electrical Engineering, IITM. This technology, namely, the WLL corDECT switch, is manufactured by Midas Communications, a venture incubated at TeNeT. Midas switches are, in turn, marketed by n-Logue (another venture incubated at TeNeT), which supplies the hardware to LAPs, which have a role similar to MSSRF's VRCs. All the hardware required – such as the LAP's n-Logue transmission tower, the necessary modems, the antenna located at the village-level kiosks, the repeaters that re-transmit signals from the base stations – are supplied by n-Logue and developed by Midas. The results of this approach of using only indigenous technology to provide rural Internet connectivity have been mixed, as shown in the next few sections.

Effects and consequences

In an effort to understand the effects and consequences of the spread of ICT, and more specifically the Internet in rural India, I interviewed numerous subjects connected with these two projects, attended workshops, met and spoke to villagers and reviewed media articles and opinion pieces in journals. I also reviewed much technology policy and rural development literature emanating from the government.

My conclusion is that India's effort at bridging the digital divide and enhancing rural development has only been a qualified success. However, the two projects that I studied experienced varying degrees of success.

MSSRF

During interviews and field visits, I did not hear anything negative about the MSSRF projects. In fact, the MSSRF projects, with their emphasis on determining the needs of a specific village and tailoring their offerings to that village, along with their focus on poverty reduction through the enhancement of village women, are clearly a success. All the VKCs that I visited were operated by women, who seemed enfranchised and empowered, and enjoyed the status of provider of needed services to the villages. These women were aware of the world and environment around them. They attended training sessions, regional and national workshops and even attended some international events, with funding provided by MSSRF or an international aid agency. They were clearly those who completed at least a basic level of school education and were able to show aptitude in computer applications. They, thus, could be considered

as model figures for aspiring youngsters in the villages. At the least, they were self-sufficient.

The children in these villages definitely benefited directly from the VKCs. They used the VKCs to undergo online and computer-assisted training in various subjects, play computer games and browse the web. They also used the Internet connectivity to check their government-school examination results.

The village men who were interviewed seemed to benefit from the VKCs only partially. While aware that the VKCs provided information pertinent to them, such as weather and commodity prices information, and animal husbandry and agricultural information, they seemed to suggest that such information was also available to them through their cellular phones. Cellular phones are rapidly spreading all over India, including rural India. In fact, cellular telephony has clearly transcended the urban–rural divide in India, aided by favourable government policies that have resulted in very low acquisition costs to the rural populace. Over 11 million new wireless subscribers were added in the month of June 2009 alone (*The Economic Times* 2009). Many governmental and NGO-operated websites as well as telecommunications companies provide such information through 'short message services' (SMS) facilities. During the period of the study, a majority of men using the VKCs primarily used them for letter writing, printing documents, loan applications and so on.

According to A. Masilamani, a doctoral candidate at IITM who is researching the effects of rural technologies in south India, there were still some lingering and unresolved issues with the VKCs. The first was the connectivity issue. In Masilamani's opinion, connectivity problems often hindered more extended use of the VKCs. The connectivity problems were caused by poor supply of electricity in the villages, poor communications due to malfunctioning equipment and adverse weather conditions. At least one of the VKCs that I visited (Thirukanchi) did not yet have Internet connectivity. Thus this village was unable to access web-based information (such as examination results). In order to get such information, the VKC simply requested the Pillayarkuppam VRC or a neighbouring VKC for the necessary information, which was then relayed to them in disks or CDs by human messengers. Other information requested by this VKC was simply conveyed by the VRC by telephone, which was then conveyed to the village through the public address system.

Another problem noted by Masilamani was the persistence of caste-related issues in the villages. Despite MSSRF's intense efforts at preventing caste-based issues from limiting the access and use of the VKCs, and the 'equal and unrestricted access' commitment agreed to by the villagers, both Masilamani and I observed that there were strong caste-based undercurrents in some of the villages. Most villages in Tamil Nadu and Puducherry have a Dalit (or lower caste) 'colony', often situated a short distance away from the main town or village. This locational separation is historical, dating from the days before India banned the practice of the caste system in 1950. Despite

governmental efforts to bridge the gap between castes, the problem has persisted and prevailed. 'Lower caste' villagers often expressed a discomfort in visiting and using VKCs located in the 'rest' of the village populated by 'upper castes'. In some cases, an entire village is inhabited only by lower caste Dalits (e.g. Thirukannur, Thirukanchi and Abishekakuppam). Villagers who were interviewed in Thirukanchi revealed that despite the facilities available at the VKC and the clear utility value, upper caste people living in neighbouring villagers (which did not have a VKC) did not come to the Thirukanchi VKC. Senthil Kumaran, project manager of the MSSRF project, noted in an interview that in the early days of the MSSRF project, VKCs were located in private houses. However, that practice was discontinued as it led to problems. In some cases, the problem of unequal accessibility was caused due to caste divisions. In some other cases, it was 'class' (or wealth) based.

Masilamani also noted that the success of a VKC finally depends on its perceived usefulness to families and the community. This notion of usefulness to the family and community is paradoxical to the philosophy of rural development and poverty reduction that has been espoused by MSSRF. For instance, the people who were interviewed in the villages almost uniformly stated that they use the VKC and VRCs to gain knowledge and an education (through training and certification), with a view to *leaving* the village for an urban area to seek work. In fact, many of the farmers interviewed stated that in the future there would be no independent farmer, as all cultivation and agriculture would be taken over by commercial conglomerates. Thus, the *raison d'être* for the MSSRF project could become detrimental to the growth and prosperity of villages and village communities, if the same villagers leave the village for better opportunities in urban centres after gaining knowledge through the VKCs and VRCs!

On the whole, the MSSRF project was given a positive reaction by the interviewees. However, reactions to the TeNeT project were not as uniformly positive.

TeNeT

Prior to visiting TeNeT's sites, I interviewed several of its project associates. One piece of information that I gleaned early in these interviews was the fact that the Chirag kiosks were not doing very well in terms of sustaining themselves. According to Mr Anamoy Ranjan, CEO of n-Logue, the company was founded in 2001 and rapidly expanded and set up almost 3,000 kiosks by 2004. However, by 2005–6, the failure rate of these kiosks started increasing rapidly. By 2007, many of this study's interviewees put the number of active kiosks to be under 100, even though an exact number was not available. Partly to address this decline, TeNeT started another initiative called the RTBI in mid-2006. The RTBI focused on enhancing the viability of rural kiosks by focusing on a few

core areas, such as basic education, health, agriculture, vocational education, financial inclusion and enhancing occupational and livelihood opportunities.

The project associates interviewed during this study were involved in one or more of these focus areas and were conducting field studies on how the existing rural kiosks could be tailored (or retrofitted) to serve one or more of these focus areas. This project was in its initial stages during the period of the study. I undertook field visits of existing kiosks in the Thiruvallur and Mayiladuthurai districts to study their functioning.

My observations in the Thiruvallur district led to conclude that the Chirag kiosks there were functioning sub-optimally. Their impact in spurring rural entrepreneurship, much less rural development, was questionable. According to Scotlin (a project associate at the RTBI), the problem was primarily due to poor management. At the time of our meeting, Ms Scotlin was overseeing the management of the LAP centre in Thiruvallur, as well as the kiosk operators and technicians, because the real operator of the LAP had abandoned the project and absconded. The poor management resulted from a variety of reasons, often emanating from the top, that is n-Logue, the technology provider. n-Logue was faulted by many interviewees for not undertaking a rigorous selection process in selecting the entrepreneurs who applied to operate the LAP centres. Some of the entrepreneurs were 'fly-by-night' operators purely motivated by the possibility of earning quick profits, rather than developing a gradual and sustainable business. They neither understood the technology nor attempted to provide 'out-of-the-box' solutions. The LAP operators frequently oversold the merits and profit potential of village-level Chirag kiosks to rural entrepreneurs who were often untrained and technically underprepared. In some cases, the LAP operators sold the kiosk services to the village entrepreneurs and abandoned the project, causing great financial losses to the village kiosks operators who were not financially well off in the first place.

Scotlin stated that there were rampant management problems with the LAPs. There were inadequate numbers of people to manage the LAP centres, and some were hobbled by corruption and 'get-rich-quick' motives mentioned above. Scotlin also debunked the idea that the kiosks were used for development-oriented activities. She stated that most of the kiosks in the Thiruvallur district were not used by women or girls even for the purposes of computer-assisted tutoring. Instead, many of the kiosks were being used only to play computer games. Anandan, one of the kiosk operators, mentioned that connection problems and inadequate service by n-Logue were primary reasons for his failing kiosk.

In some cases, the kiosks were merely used as excuses or proxies to demonstrate the presence of technology rather than their usability or usefulness to rural development. For example, the Besant LVR Teacher Training Institute at Veeraraghavapuram maintained a kiosk that was used by just one operator/technician. My impression was that the training institute maintained the kiosk

as proof of the availability of computer and Internet access to students, even though it was not used by the students at all! In some villages, n-Logue kiosk operators had to compete with other Internet kiosks set-up by other funding agencies and NGOs. In most of these cases, the other competing kiosks adopted more up-to-date commercial communications technology (such as cable-based Internet connectivity). This provided better connectivity performance that n-Logue's technology. However, since the Chirag operators had already invested large sums of money into the n-Logue technology, they were thus locked into what increasingly appeared to be obsolete or underperforming technology.

Anamoy Ranjan, n-Logue's CEO, attributed the high failure rate of the Chirag kiosks to the fact that n-Logue did not have an adequate set of products and services (such as education, health and agriculture) to offer to the kiosks. He acknowledged the efforts taken by RTBI to address this deficiency and mentioned that the easiest application area to enter would be education. He felt that online tutorials for the high school examinations would do well and that parents would be willing to pay for their children's education.

However, at the time of the interview in March 2008, he was still unsure about the actual bouquet of products that would be offered by n-Logue (and thus the kiosks). Ranjan stated that 'in markets where one has never been, there will be a process of gradual discovery to find out what products work, etc.' He also stated that the entrepreneurial model would succeed better with kiosk operators who had a reasonable educational background than those who did not have any such background. The question, however, is whether n-Logue and the kiosks would come up with the list of products soon enough to prevent further failures. Ranjan also did not mention the inadequacies of the technology (such a poor connectivity) and poor service that were pointed by various kiosk operators.

Overall, Ranjan felt that the n-Logue project's impact was limited because the kiosks were not benefiting everybody in the villages. Only a few benefited from them – mainly students who used them for education, to improve test scores and for fun. He also continued to feel that the entrepreneurial model would work best in larger villages (rather than the smaller ones) as they offered more scope for making money.

Of the various TeNeT sites I visited, those associated with Mayiladuthurai seemed most satisfied with the technology and business potential offered by TeNeT. This was apparent during my own experiences at the Mayiladuthurai LAP centre and the visits to the village kiosks in the surrounding villages. The LAP centre is run by Mr Vijay Iyer, a local entrepreneur. He is assisted by his sales point-person, Mr Ashokan. Out of the LAP's capacity of 200 kiosk connections, seventy-five were operational in 2008. The Chirag kiosks that I visited were well run, and there was evidence that they offered suitable business and revenue potential to the entrepreneurs who operated and owned them.

According to Ashokan, even four years earlier the villagers around Mayiladuthurai had no knowledge of the Internet. However, by early 2008 (when I made field visits to the area), almost all villagers knew about the Internet. One primary use of the Internet communications was to communicate with relatives who lived abroad, either using email or conferencing.

The A2K Index

The A2K Index proposed by Shaver (2007) and mentioned earlier is an important effort to quantify A2K as well the developmental effects of such access. The index looks at A2K from five broad categories: education for literacy, access to the global knowledge commons, A2K goods, legal and policy framework, and effective innovation systems. Each category is divided into one or more measurable *areas* (e.g. the category 'A2K goods' consists of measurable areas such as 'affordability of knowledge goods' and 'purchasing power'), which are further fine-tuned into *measurable indicators* (e.g. access to medicines, cost of Internet connectivity, number of cell phone subscribers etc.). (See Table 5.1.)

While the study was not based on these specific indicators, I think that it would be illustrative to apply the findings to the indicators, at least in a qualitative sense.

Education for information literacy

The measurable areas in this category are 'educational achievement' and 'informational literacy'. In this study, it was found that informational literacy was clearly a focus of the MSSRF project. While educational achievement was not a direct focus, the presence of programmes such as the MUPP and other information such as that pertaining to farming, training in livestock and animal husbandry, and the access to information pertaining to women's and children's health all pointed to efforts in appropriate rural education. This intensity of focus did not exist in the TeNeT programmes, where the focus was more on creating revenue streams through offering services.

Access to global knowledge commons

Both the MSSRF and TeNeT projects aimed at providing Internet access. There were efforts to provide web-based information in local languages, rather than expanding the linguistic fluency of the rural populations that they served. Over time, it was clear that these populations attained a fluency in the terminology of computers, the Internet and the web. There were, however, some indications that some of the TeNeT kiosk operators were not as focused on enabling their customers to attain Internet terminological fluency as they were interested in making a profit from the venture. To that extent, it would seem that MSSRF,

Table 5.1 Access to knowledge indicators (from Shaver 2007)

Category	Area	Indicator
Education for information literacy (IL)	Educational achievement	Secondary education completion
		Tertiary enrolment rates
	Informational literacy	Direct assessments of IL
		Survey using proxies for IL
Access to the global knowledge commons	Linguistic fluency	% speaking a global gateway language
		Weighting languages by knowledge base
		Survey of linguistic fluency
	Internet access	ITU estimated Internet users
		Survey of actual Internet users
		Digital divide indicators
A2K goods	Affordability of knowledge goods	Access of essential medicines
		Cost of Internet connection
		Number of cell phone subscribers
		Cost of basket of knowledge goods
		Survey of A2K goods
	Purchasing power	GDP per capita, adjusted for purchasing power parity
Legal and policy framework	Freedom of expression	Freedom house civil liberties score
		A2K freedom of expression score
	Balanced IP regime	IP protections exceed international norms
		Scope and effectiveness of exceptions
		Conformance to model IP policies for A2K
Effective innovation systems	New contributions to knowledge	Survey of innovation in public centres
		Survey of innovation in private firms
		Metrics specific to high-value innovation

with its clear focus on development and poverty alleviation, scored over TeNeT in the area of achieving linguistic fluency.

A2K goods

It was not clear from the study of both projects if such A2K projects really enhanced the purchasing power of the target populations. 'Knowledge goods' can include medicines, cell phones and Internet connection costs, to name a few. In India, these are not strictly within the purview of these projects. Rather, these are controlled by the government though appropriate policies and ministerial interventions. One important policy result has been the setting up of 'common service centres' (CSCs) in most of India's villages through a public–private partnership. Implementation of the CSCs started in earnest in late 2008, and a discussion of its structure, implementation, success and failure is outside the scope of this chapter. Both the projects thus provide access to the Internet, at costs that have been designated by the government. But such access was free to users in the MSSRF project, whereas the TeNeT project charged customers for Internet connectivity.

Legal and policy framework

The issues of freedom of expression and intellectual property (IP) protection, which fall within this category, affect the MSSRF project only indirectly. It can be argued that increased A2K ensures that the populace is more aware of protected and fundamental rights in a democracy. From that viewpoint, both MSSRF and TeNeT enhanced the freedom of expression. The issue of IP protection does not play a big part of MSSRF, as it clearly uses both indigenous and imported technologies only in the form of aid from philanthropic and developmental agencies. TeNeT, however, focused on developing indigenous technologies, which were then spun off to create technology start-ups. These projects were within the purview of legal IP regimes. Over that past decade, urged by the World Intellectual Property Organization (WIPO), India has adopted wide-ranging policies towards ensuring IP protection that meets international norms.

Effective innovation systems

The TeNeT project, with its focus on developing appropriate indigenous technologies for rural applications and development, has proved to be a leader in innovation and has provided a platform for newer innovations in additional application domains. However, the TeNeT technologies have also come under criticism for not being robust enough and failing too frequently, as noted earlier. One of the biggest complaints about TeNeT technology was that while it worked well enough in the laboratory, it failed under real-life conditions. This could have been due to inadequate testing and lack of quality control procedures. Interviews with many associates in the TeNeT project also indicate

that there was too much focus on 'going it alone' and developing end-to-end products even when newer technologies became available over time from foreign manufacturers. Thus, one can say that even though TeNeT provided a platform for innovation, and was focused on indigenous innovation, the overall innovation climate has not gained just from the TeNeT project. Innovation is a national prerogative and should therefore be a collaborative effort jointly achieved through government and private and public partnerships.

Conclusions

Early in this chapter, I set out the following objectives:

- to study and analyse two types of rural ICT4D projects in southern India, focusing specifically on the rural knowledge creation, management and dissemination aspects;
- to report the results of a field study comparing the two models and factors that influence the success or failure of the two types of projects.

In the preceding discussion, I have attempted to analyse the two models of ICT4D projects in rural India. By the end of 2010, approximately 108 MSSRF's VKCs and 18 VRCs were operating successfully, according to Subbiah Arunachalam, a fellow at MSSRF (Arunachalam 2010). By contrast, only a handful of TeNeT Chirag kiosks were still in operation, even though there had been hundreds of such kiosks even two years earlier. Based on this fact, and the discussions in the earlier sections, it would be tempting to conclude that the purely community developmental model of MSSRF has proven to be more useful and successful than the social-entrepreneurship-based, indigenous-technology-focused TeNeT model.

However, such a conclusion would be too facile. The story of ICT4D projects in India is more complex. For instance, it is quite possible that proper screening and adequate training of the n-Logue LAP franchisees helped in achieving a better success rate for TeNeT's Chirag kiosks. In addition, if TeNeT had been able to accept earlier that its indigenously developed technologies were not adequate in the field, then remedial actions could have been taken. The following were some of the problems with n-Logue's 'offerings' that kept coming up in many interviews with TeNeT project associates:

- poor and underperforming technology;
- lack of appropriate selection and training of franchisees;
- power shortages in rural areas, which further adversely affected the performance of n-Logue equipment;

- the lack of good 'application products';
- inadequate bouquet of products and services, with the model of services offered varying widely across kiosk operators – no standard franchise model;
- poor marketing;
- inadequate translation of management's vision;
- a technology-focused hubris that seemed to emanate from the project's leaders, who refused to accept some of the technology's failures and seemed to believe that technology could solve all problems;
- failure of the project's leaders to foresee the proliferation of cellular telephones in rural India, which nullified some of the relevance of the Chirag kiosks' abilities to be an information resource to rural communities.

Despite these glaring problems, I encountered some successful Chirag kiosk and LAP operations, such as those in Mayiladuthurai. The critical success factor here was the entrepreneurial drive and marketing ability of the LAP operator, Vijay Iyer. He was a college-educated businessman who was able to get together a good team of locally savvy sales persons and technicians. He carefully cultivated relationships with local governmental authorities. He often travelled to the n-Logue headquarters in Chennai and demanded that his technicians be given adequate and timely training. He also made sure that n-Logue technicians responded promptly to his service requests.

One could thus conclude that a mix of education, business knowledge, social stature, appropriate contacts in the local government, persistence in getting service from n-Logue and drive in educating customers and the village kiosk operators, and providing an appropriate product mix to these operators all helped in the success of Iyer and the Mayiladuthurai TeNeT LAP.

The MSSRF project has generally enjoyed more success than TeNeT project. Some contrasting features of the MSSRF project, vis-à-vis the TeNeT project, are as follows:

- MSSRF's VKCs are not focused on any single individual entrepreneur but on a whole village or community.
- The entire village community has to 'buy into' the project.
- An 'advance team' develops a relationship with villages over a period of at least six months before setting up a VKC.
- The focus is on community development and poverty alleviation, not on profit making;

- MSSRF was not wedded to any specific technology. It may be noted that right from the start, MSSRF used multifarious technologies acquired from the private sector (i.e. the Motorola VHF duplex radios, satellite transmission and VSAT antennas from the ISRO). More recently, noticing the rapid spread of cellular telecommunications services in India, MSSRF has teamed with cell phone providers to offer some service to rural communities.
- MSSRF has also made sure that it offers a rich bouquet of products and applications leveraging all of the above technologies.
- In my observations, I noticed that MSSRF offered a high level of support to the VRCs and VKCs – in contrast to the TeNeT project.

Despite the success of MSSRF projects, it is quite questionable that a purely developmental model that depends only on external funding agencies may be sustainable in the future. This is especially so in the context of the rapid proliferation of cheap cell phone-based services offered by telecommunications companies. Given that cell phones can 'push' a variety of information relevant to the specific needs of various communities using publicly available data, one can question the very reason for existence of VKCs in rural areas. Why should villagers depend on information from a VKC, when they can get the same information from their cell phones? Thus, it is not clear whether the advent and rapid expansion of cell phone usage would completely kill the VKCs. An additional worry is the possibility that funding for many of the VKC projects may dry up eventually.

Subbiah Arunachalam (2010) mentioned in interviews that in states such as Maharashtra MSSRF is slowly moving away from the 'free' service, community development model, to a fee-based model. In his view, the MSSRF's VKCs offered specific, appropriate services to targeted rural populations through its VKCs. Thus, the target populations would be willing to pay for such services that could not entirely be provided by cellular telephone companies.

In conclusion, I believe that, overall, the MSSRF project has proven to be more resilient and adaptive to changes in the environment and has thus survived and continues to provide services to rural India. TeNeT has suffered adversely from the fallouts arising from poor technology, lack of adaptability and poor management and vision. It would be interesting to study if the MSSRF model would survive in the future or be consigned to history. Keeping this in mind, I have developed a list of questions around which I plan to develop hypotheses to test in future studies:

1 How are rural development projects keeping up with the exponential developments in technology?

2 How to compare the effectiveness of the different models adopted by rural ICT projects?

3 How sustainable are the 'community-oriented' projects, especially when funding from international aid agencies dry out?

4 What are the real costs and benefits to society at large from rural development projects, and how to quantify them?

5 What are the limitations of such projects, and what could be the reasons for the same?

I hope that this study and the questions posed will provide the basis for further research in this field.

Notes

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1 India's GDP growth in the year 2010 was 8.6 per cent (*The Economist* 2011). Its growth rates in the industry and services sector were 8.2 per cent and 8.7 per cent, respectively (Ministry of Finance 2011).

2 TeNeT is the Telecommunications and Computer Networking Group in the Department of Electrical Engineering at IITM. The TeNeT group's vision is to develop 'world class technology at an affordable price'. TeNeT has incubated numerous ICT4D projects.

3 n-Logue is a start-up incubated by the TeNeT group. Its business model is to use WLL technologies from Midas Telecommunications (another start-up incubated at TeNeT) to set up a series of wireless transmission towers at district headquarters to connect villages.

4 DHAN is an NGO focused on rural development in south India, located in the city of Madurai, in Tamil Nadu State.

5 It is interesting to note here that the rural students were taught material that was almost similar in content to that used at the elite Indian Institute of Technology's Information Systems course, where this author taught during the Fulbright Grant period. Only the language of instruction was different.

References

Arunachalam, S. (2010), The MSSRF's VKC Project, Personal Interview.

Balaji, A., Gonsalves, T. A. and Kumar, R. (2002), 'The corDECT Wireless Local Loop: Capacity Predictions', 1999 IEEE International Conference on Personal Wireless Communication, Jaipur, India.

Cecchini, S., and Scott, C. D. (2003), 'Can Information and Communications Technology Applications Contribute to Poverty Reduction? Lessons from Rural India', *Information Technology for Development*, 10: 73–84. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=904333 [accessed 4 May 2011].

Chidambaram, P. (2008), 'Government of India: Union Budget and Economic Survey'. Available at http://indiabudget.nic.in/ub2008-09/bs/speecha.htm [accessed 5 May 2009].
The Economic Times (2002), 'n-Logue to Set Up About One Million Net Kiosks – Economic Times'. Available at http://articles.economictimes.indiatimes.com/2002-08-06/news/27362607_1_kiosks-logue-rural-areas [accessed 4 May 2011].
The Economic Times (2009), 'India Adds 11.9 mn Telecom Subscribers in June'. Available at http://economictimes.indiatimes.com/News-by-Industry/119-mn-telecom-users-added-in-June/articleshow/4838311.cms [accessed 14 October 2009].
The Economist (2005), 'Reports: Behind the Digital Divide', 374(8417): 21. Available at http://www.economist.com/opinion/displaystory.cfm?story_id=3714058 [accessed 4 May 2011].
The Economist (2008a), 'India's Soaring GDP: Showers Turning to Storms'. Available at http://www.economist.com/finance/displaystory.cfm?story_id=11507693 [accessed 4 May 2011].
The Economist (2008b), 'As India Grows It Will Reshape the World Around It: India's Future'. Available at http://www.economist.com/agenda/displaystory.cfm?story_id=12327126 [accessed 4 May 2011].
The Economist (2011), 'India's Economy: Calling on the Gods'. Available at http://www.economist.com/node/18291557?story_id=18291557 [accessed 5 March 2011].
ETSI (2005), 'Digital Enhanced Cordless Telecommunications (DECT): A High Level Guide to the DECT Standardization' (No. ETSI TR 101 178 V1.5.1 (2005-02)). Available at http://pda.etsi.org/exchangefolder/tr_101178v010501p.pdf [accessed 8 March 2011].
Fernandez, A. P. (2007), 'History and Spread of the Self-Help Affinity Group Movement in India'. International Fund for Agricultural Development (IFAD). Available at http://www.ifad.org/operations/projects/regions/pi/paper/3.pdf [accessed 4 May 2011].
Gurumurthy, A., Singh, P. J. and Kasinathan, G. (2005), 'TeNeT, n-Logue and the DHAN Foundation: Exploring Appropriate Ownership Models for Rural Pro-Poor ICTD Initiatives', in S. Ó. Siochrú and B. Girard (eds), *Community-Based Networks and Innovative Technologies*, New York: UNDP.
Hollifield, C. A., and Donnermeyer, J. F. (2003), 'Creating Demand: Influencing Information Technology Diffusion in Rural Communities', *Government Information Quarterly*, 20: 135–50. Available at http://www.sciencedirect.com/science/article/pii/S0740624X03000352 [accessed 4 May 2011].
ISRO (2004), 'Inauguration of ISRO-MSSRF Village Resource Centre (VRC) Project by Prime Minister'. Available at http://www.isro.org/pressrelease/Oct14_2004.htm [accessed 5 May 2009].
Jhunjhunwala, A. (2004), *Applications and Services Through E-Kiosks Towards Enabling Rural India*. Presented at the Building E-Community Centers for Rural Development Workshop, Indonesia. Available at http://www.adbi.org/files/2004.12.08.cpp.marketing.services.ecommunity.pdf [accessed 4 May 2011].
Kaushal, I. (2007), *Telecom in India*. Presented at the ITU-Capacity Building Workshop on Information Society Statistics: Infrastructure and Household Indicators, Bangkok. Available at http://www.itu.int/ITU-D/ict/conferences/bangkok07/doc/11.%20Telecom%20in%20India.pdf [accessed 4 May 2011].
Luce, E. (2007), *In Spite of the Gods: The Strange Rise of Modern India*, first edition, New York, USA. Doubleday.
McCracken, G. (1998), *The Long Interview*, Newbury Park, CA: Sage Publications.
Microsoft Corporation (2008), 'Microsoft Unlimited Potential – Community Technology Skills Program Grants'. Available at http://www.microsoft.com/about/corporatecitizenship/citizenship/giving/programs/up/grants.mspx [accessed 5 May 2009].
Ministry of Finance, G. O. I. (2011), 'Economic Survey 2009–2010'. Available at http://indiabudget.nic.in/es2009-10/chapt2010/chapter01.pdf.

NASSCOM (2008), 'Strategic Review Feb 2008'. Available at http://www.nasscom.in/upload/5216/Strategic_Review_Feb2008.pdf [accessed 5 May 2009].

Senthilkumaran, S. and Arunachalam, S. (2002), 'Expanding the Village Knowledge Centers in Pondicherry', *Regional Development Dialogue*, 23(2): 65–88.

Shaver, L. (2007), 'Defining and Measuring Access to Knowledge: Towards an A2K Index', Yale Law School. Available at http://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=1021&context=fss_papers [accessed 4 May 2011].

Sreekumar, T. (2007), 'Cyber Kiosks and Dilemmas of Social Inclusion in Rural India', *Media, Culture and Society*, 29(6): 869–89. Available at http://mcs.sagepub.com/content/29/6/869.short [accessed 4 May 2011].

Srinivasan, J. (2004), *The Effects of E-Governance Implementation on Women: A Study of the Sustainable Access in Rural India (SARI) Project, Madurai*, Master's Thesis, Indian Institute of Information Technology, Bangalore.

Subramanian, R. (2008), 'The (Continuing) Evolution of India's Telecom Policies', *Communications of the International Information Management Association*, 8(3): 33–47.

Subramanian, R., and Arivanandan, M. (2009), 'Rural Development through Village Knowledge Centers in India', *Communications of the International Information Management Association*, 9(2): 101–120.

TeNeT group, I. (n.d.). 'Mission – TeNeT Group – IIT-M'. Available at http://www.tenet.res.in/Aboutus/Mission/index.php [accessed 8 March 2011].

Toyama, K. (2005), *The Challenges of Sustainability*. Presented at the ADBI – CPSC Regional Joint Workshop on Managing Sustainable e-Community Centers, Agra, India. Available at http://www.kentarotoyama.org/talks/2005%2005%2004%20Challenges%20of%20Sustainability.ppt [accessed 4 May 2011].

Toyama, K., Kiri, K., Menon, D., Pal, J., Sethi, S. and Srinivasan, J. (2005), *PC Kiosk Trends in Rural India*. Presented at the Seminar on Policy Options and Models for Bridging Digital Divides, Tampere, Finland. Available at http://research.microsoft.com/en-us/um/india/projects/ruralkiosks/PC%20Kiosk%20Trends%20in%20Rural%20India.doc [accessed 4 May 2011].

UNDP (2006), 'Human Development Report 2006'. Available at http://hdr.undp.org/hdr2006/pdfs/report/HDR06-complete.pdf [accessed 4 May 2011].

UNDP (2007), 'Human Development Report 2007/2008'. Available from http://hdr.undp.org/en/media/HDR_20072008_EN_complete.pdf [accessed 26 May 2009].

6

Contemporary Information and Knowledge Management

Impact on farming in India

R. Ajith Kumar, V. Balaji, G. Dileepkumar, T. V. Prabhakar & N. T. Yaduraju

Introduction

Farming is perhaps the most important sector of the Indian economy today, given the concerns over food price inflation. While dwelling on the spiralling impact of increased food prices on the national economy as a whole, commentators have pointed out that the continued neglect of agricultural extension, the process of linking farmers with institutionalized expertise, is one of the causes of emerging shortages in food production. This is where our story begins. (To emphasize smallholder farmers as key stakeholders in global and national food security, we will refer to agriculture as farming in this article.)

For generations, agricultural extension has been recognized as an essential mechanism for enabling information and knowledge transfers between experts and farmers (Jones 1997). It was not known when the first extension activities took place, but the birth of modern extension service has been attributed to the aftermath of Irish Famine (Jones & Garforth 1997). The role of agricultural extension was very significant in the advancement of food cereals production in the Green Revolution era in India in the 1960s and 1970s (AKM-India n.d.). However, the original paradigm, primarily one of top-down, technology transfer arrangement, is no longer considered to be adequate or effective. Today, many extension models are in use to support the information needs of farm communities. Each model has its own concepts and practices, and advantages and disadvantages.

According to Carl Eicher (2007), there are six extension models in use around the world. Among them, the national public extension model introduced by the US Land Grant College system is the dominant extension model that is premised on the coordination and management of three interlinked processes: agricultural research, extension and agricultural

higher education among the responsible institutions in the countries that have adopted this model. The transaction costs of the land grant model are considered to be low. Governments in Malaysia, Mali and other countries exporting cotton or palm oil use the community extension and research model that combines research and extension more directly. Turkey launched the training and visit (T&V) extension model in the early 1970s, which spread to other parts of the world under the World Bank sponsorship in the late 1970s and 1980s. Though the T&V model has proven to be financially unsustainable (Anderson, Feder & Ganguly 2006), some of the countries still use modified T&V extension programmes. Some other countries have tried out the farmer field school (FFS) model that emerged in South East Asia in the 1980s when extension workers offered advice to farmers on using IPM (Integrated Pest Management) to control pests in rice mono-cropping areas in the Philippines and Indonesia (Anderson *et al*. 2006; Feder *et al*. 2004). Though there is spirited debate among extension experts whether the FFS is an approach or a model, the model proved to be effective in reducing pesticide use by up to 80 per cent on farms in these two countries. The FFS model is now being used in around fifty developing countries (Carl 2007). In recent years, the private extension model was introduced with an expectation that the adoption of the user-pays principle will offset some of the cost of extension so that tax-based outlays on extension would be reduced (Anderson *et al*. 2006). However, there is little evidence to date that smallholder farmers can 'buy their way out of poverty' by paying for extension advice. When some of the NGOs realized that the private extension models are far from the reach of small-scale farmers in developing countries, they shifted gears from providers of food aid and humanitarian assistance, and this gave rise to the NGO extension model. They started recruiting extension workers (for instance, in Mozambique, in 2005, the NGOs employed 840 extension workers as compared with 770 public extension workers (Gemo, Carl & Teclemariam 2005)).

Apart from these, there are some other country-specific models that have become prominent in the recent years. An example is the Agriculture Technology Management Agency (ATMA) extension model initiated in late 1990s in India with World Bank support (Singh, Swanson & Singh 2006) when the extension specialists realized the need for decentralized public extension systems. The ATMA model combines decentralization with a focus on agricultural diversification and increasing farm incomes and employment, and it collects feedback from clients to extension specialists, researchers, policy makers and donors. Based on the feedback, the decisions on extension are made by a locally based governing board with equal representation between (1) the heads of the line departments (including agriculture, animal husbandry, horticulture etc.) and key people in the State Department of Agriculture, (2) research units within the districts and stakeholder representatives and (3) a

cross-section of farmers, women, disadvantaged groups and the private sector (Anderson & Feder 2007). Although no impact studies of this model have been published yet, it is known that this model has spread within India over agro-ecologically diverse regions.

Experts participating in the recent 'Global Consultation meeting on revitalizing extension and rural advisory services' held at the Iowa State University (12–13 October 2010) were of the view that extension today is in a state of decline in many countries. The public extension system especially is inadequate in terms of both human and infrastructural resources. Grinding poverty and chronic hunger remain partially or substantially unmitigated in many regions of the world while new challenges, including climate change, water scarcity and soil quality reduction, have emerged. The challenges to achieving food self-sufficiency, accessibility and affordability dominate the development agenda. The solutions must be knowledge intensive, with robust process design, scalability and monitoring, and built-in evaluation and assessment mechanisms (Global Extension Community Cafe n.d.). Many of the experts have come to believe that extension needs to be free from the narrow mindset of transferring technology packages. It should move towards a knowledge exchange mode that not only yields increases but also supports innovations and decision-support for the security and growth of income and livelihood among extension clients. The perspective for extension must be whole value chains or even value networks. Extension, as a paradigm, should evolve to become more effective in meeting the information needs of a much wider variety of clientele, including women farmers, agribusiness, rural youth and resource-poor farmers.

Farming, extension and Internet in India

In the early days of the Internet in India, much hope was raised about its potential to transform agricultural extension. For example, an international group of experts from both the developing and developed countries proposed a paradigm of Computer-Aided Extension (CAEx) along the lines of Computer-Aided Design or Manufacturing (CAD/CAM) (Swaminathan 1993). A combination of desktop multimedia and access to information networks, these experts surmised, would lead to an era where farmers could have access to key information on the 3 Ms, namely, materials (such as seeds, fertilizers and pest/insecticides), meteorology and markets, which will help them overcome the usual hurdles in adopting new technologies for production and in finding the right prices and markets.

Since the late 1990s, a number of pilot experiments have been in progress in rural areas of India, using contemporary Information and Communication

Technologies (ICTs), especially the Internet, the web and its new platforms (Web 2.0 and social networking), and mobile telephony. A key arrangement in the delivery of services through such projects is the existence of tele-centres. The estimates of such connected rural centres vary between 11,000 and 14,000. How have they contributed to the advancement of prosperity through farming in the past fifteen years?

The following set of statements attributed to the Indian Minister for Agriculture, Mr Sharad Pawar, has an answer (http://www.indiatogether.org/2011/jan/agr-harvest.htm):

> *Despite so many agriculture universities and research centers, why are our farm yields so low?*
> It is not correct to say that Indian agricultural yields are universally very low. In fact, Indian yields for wheat and rice in several states are quite comparable to the best in the world. Similar is the case with yields for fruits and vegetables in many states. However, since a large part of the country is still rain-fed, average yields in many crops tend to be lower.
>
> *Why are our farmers so vulnerable?*
> This is on account of two primary factors. One relates to their small holdings that tie them in a low income trap, restraining any credible investment of their income or surplus in land productivity. Secondly, 60 per cent of agriculture is still dependent on the rains. If the rains fail or there are unfavorable variations in rain or other climatic factors, then crops suffer.

This is also the time when the spokespersons of the software industry in India forecast that in spite of continuing fiscal crisis in many OECD countries, over about 180,000 fresh hires would occur in 2011 in India. The disconnection between a thriving IT industry and the agrarian income and food production in the country has never been greater. The promise of ICT and contemporary information management for at least the average Indian farmer is yet to be realized. Is this part of a bigger challenge affecting more countries?

Farming, agriculture and the web: a generic analysis

Back in 2008, a group of scholars in International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) conducted an analysis of agriculture-related entries on the popular Wikipedia website and found that there were fewer than 6,000 entries in this very broad category out of a total of about 1.3 million entries. Later in 2009, an agriculture portal on Wikipedia was launched. As of January 2011, a comparison of this portal with another in a domain such as health shows that it is still under-populated. It is especially so when compared with a sub-portal in natural sciences such as biology! An entry on 'high-yielding variety', an important concept and practice in

contemporary agriculture, at 523 words, is classified as one that is in need of improvement whereas the one on the Boeing 787, just one type of airplane in a particular class of aircraft, has an intricate contribution. More such examples can be given.

On the very popular Facebook, the FarmVille game is considered to be the most widely used application, with an estimated 62 million active users. However, this popularity of farming does not translate into support for improved farming. FarmVille's designers consider it as a social gaming activity, built on the 'instinct' of people to nurture – in other words, it has got nothing to do with supporting advancement of food production or the income of the resource-poor farmer. The YouTube space, famous for its emerging role as a 'speaker's corner', has relatively fewer videos that directly relate to farming (a significant amount coming from KISSAN-Kerala, which is covered in this article later) and more that relate to recipes and cooking. It is significant that no agricultural faculty in a land grant university in the United States or any agricultural university elsewhere figures among the YouTube universities.

There are a number of intergovernmental and international organizations in the agriculture sector that have sector-specific programmes in information management, such as the UN Food and Agriculture Organization (FAO n.d.) and the consortium of agricultural research centres known as the Consultative Group on International Agricultural Research (CGIAR n.d.), of which ICRISAT is a member. There are also major networking organizations such as the Global Forum for Agricultural Research (GFAR n.d.) and their allied organizations in Africa, Asia and Latin America. The FAO, consistent with its character as a premier intergovernmental body in agriculture, has focused more on standards in agricultural information management and is in the process of building new online services in agricultural ontology (AGROVOC n.d.; FAO n.d.). The FAO and GFAR have recently started to promote the Coherence in Information in Agricultural Research and Development (CIARD n.d.), which also focuses on standards and training of relevant professionals. The CGIAR has a corporate programme that is a non-technical advocacy group focusing more on intra-institutional matters with little interest or demonstrated capability in agricultural content matters (ICTKM n.d.).

Globally, there is thus a serious gap in the presence or accessibility of digital information, especially on the Internet, relating to the farming/agricultural sector. This limitation is somewhat unique since other primary and development-oriented sectors, such as health and medicine, are known to have larger amounts of information on which web services can be built. An example here is the way an intergovernmental body such as the World Health Organization (WHO) used the Internet to track the spread of the Avian Flu pandemic using vast quantities of information and data available online

(IVTM n.d.). A corresponding effort to forecast adequately a major crop/animal disease or even a more easily noticed event such as large-scale drought cannot be easily cited yet (a micro-level exception is at http://vasat.icrisat.org/?q=node/70 – see also below). This inability is directly due to the relative paucity of content on agriculture and farming in the Internet space.

Digital information management and farming in India

That the vision of benefits from digitalization of information services in agriculture, first articulated by experts back in 1992, has remained unfulfilled for a long time is evident from the reports of the Indian National Commission on Farmers (NCF 2004). In its first report, the NCF stated its vision for a Digital Gateway for Agrarian Prosperity in India as follows:

> The support system for a rural knowledge revolution should be complemented, by establishing a National Digital Gateway for Rural Livelihood Security. There is need for investment in creating databases relevant to rural needs. For example, a decade ago, a National Agricultural Drought Assessment and Monitoring System was set up under the National Remote Sensing Agency (NRSA) to facilitate improved decision making by farmers in the kharif and rabi seasons. The potential of this system needs to be harnessed for giving proactive advice to farm families on land and water use planning. The architecture of such a gateway should be based on currently available digital content from diverse agencies, ranging from the ICAR to the NRSA and ICRISAT, with a focus on improving livelihood security in rural India. Every participant agency should be encouraged to create well-adapted and annotated digital content (maps, numeric data or documents etc.) in a manner accessible to non-specialists. (NCF 2004)

In its final report released in 2006, the NCF stated again:

> The help of ICT should be harnessed by establishing a Gyan Choupal [village knowledge centre] in every village. The Common Service Center (CSC) programme of the Department of Information Technology (DIT), Government of India, should aim at social inclusion in the use of this important technology. The structure of the ICT-based knowledge system will be as follows:
>
> - Block level: Village Resource Centre (VRC) established with the help of the Indian Space Research Organisation.
> - Village level: Gyan Choupals established with the help of the CSC Programme of the DIT.
> - Last mile and the last person connectivity: This can be accomplished through either Internet–community radio or Internet–mobile phone synergy.

During the past fifteen years, a large number of e-governance projects have been launched in different parts of the country, some receiving international

recognition in their initial stages. An earlier analysis (Bagga *et al*. 2005) showed that agricultural extension support had not been a priority in general in the e-governance projects.

A significant study that emerged at this time was the one by the National Sample Survey Organization (NSSO), which had conducted a well-organized survey covering over 50,000 farmer households across India, focusing on the information exchange habits and patterns among farmers of every type in nearly every agro-ecological region of India (NSSO 2005). This study offered numerous insights, showing clearly that the availability of Internet infrastructure in India from 1995 onwards had not made a difference to the typical farmer. Nearly half of all information transactions in relation to farm production remained informal, mostly from farmer to farmer; in the locality, the transactions reached the local input supplier/dealer and the money lender and with little exchange taking place trans-locally.

The exchanges of farmers with India's famed Farm Science Centers, the Krishi Vigyan Kendras (KVKs) (ICAR-KVK n.d.) were significantly limited, as revealed in this survey. (It is also significant that even as of close of 2010, fewer than 20 of these 600-odd centres had a presence on the web, while about a third of them have been connected digitally in a closed user group configuration.) The NSSO report confirms a trend noticed and reported from two different locations in India in 1999 and 2003 (Balaji *et al*. 2003; VASAT 2003). Both these previous surveys of information exchange patterns in rural Pondicherry and the Mahbubnagar region of Andhra Pradesh revealed that farmers were predominantly obtaining production-related information from other farmers who may have been in the same economic situation. There is evidently a serious gap between practicing farmers and the generators and custodians of formal agricultural knowledge and information, in spite of increasing access to the Internet. It has been the subject of scholarly discussions in different parts of the world (Baan & Samantha 2006; Carl 2007).

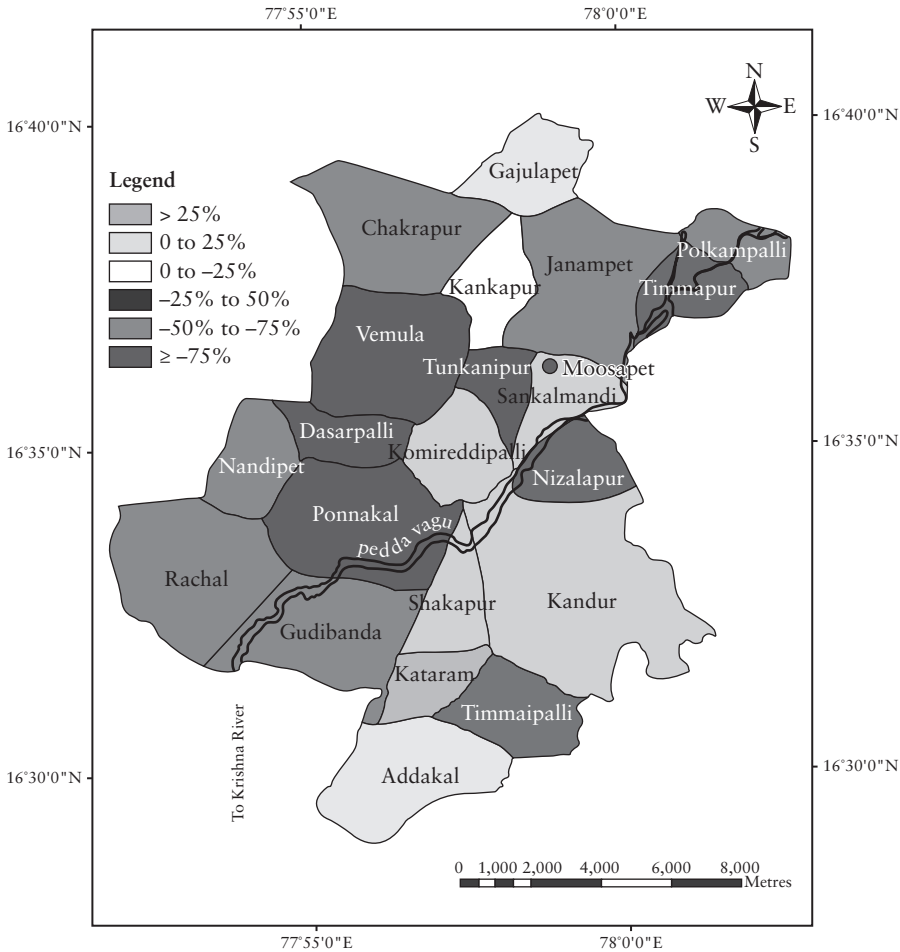
The twain shall meet? ICT in rural development and ICT for agriculture

The discussions that led to IT 'reaching the unreached' (Swaminathan 1993) also led to a series of initiatives that sought to bring the advantages of connectivity and IT in finding solutions to the challenges of rural development through a new set of approaches, later known collectively as ICT4D in international literature. Starting in the late1990s, this global trend had caught the imagination of many Indian thinkers, social activists, administrators as well as actors in the for-profit sector. An earlier set of reports and analysis revealed the range of activities in this area in India, and by early part of the

past decade, India probably had the largest number of ICT4D projects in a single country (Keniston & Kumar 2000). At the centre of this collective of approaches was the access arrangement at the village level, known variously as 'village knowledge centre', 'rural information kiosks' and so on. While access to government records of various types was the dominant theme in many projects, farming or production agriculture was not a major interest in many of the initiatives (Bagga *et al*. 2005). The really big exception to this trend was the famous e-Choupal programme of the ITC.

Participants in a collaborative research project carried out by the Indian Institute of Information Technology in Bangalore (IIITB) during 2005–6 covered ten such projects (many running for over three years) in considerable depth and used the internationally accepted practices of ethnographic action research to assess the impact of such efforts (IIITB 2005). The results showed that farming/production agriculture support through provision of information services via the 'kiosk' was either a non-premium concern or was absent altogether. Where provision of Internet access to rural users was the principal concern, little attention was paid to fulfilling the farming information needs of farmers, as reported in this study on a group of projects in south India. A subsequent analysis including more ICT4D projects from various other regions of India also revealed that farming/agricultural information support was not a priority in ICT4D projects (Guntuku 2010). A series of analytical reports and papers from the Technologies for Emerging Markets group (of Microsoft Research India) on the sustainability and profitability of ICT4D projects also shows that farming/production agriculture did not figure among the interests that the kiosks were expected to serve for their profits/income, and neither did providing a public service to the rural population (Microsoft Research 2010).

A series of experiments conducted by ICRISAT provided some solutions to the successful implementation of farming-related information services at typical rural kiosks. In 2004, with the support of ICRISAT, the Adarsha Mahila Samikya (AMS), a community-based, all-women, micro-finance organization working in Addakal region of Mahbub Nagar district in Andhra Pradesh, India, set up rural information kiosks (village knowledge centres with Internet access) in all the twenty-one villages where they were active. This region is known to suffer from recurrent, severe drought. AMS and ICRISAT have run the rural information kiosks on a cost-sharing basis. The principal goal in this partnership was to understand how knowledge of vulnerability to drought in an upcoming season, through the adoption of crop rotation and water conservation techniques, can lead to reduced economic and other losses in the region. Earlier work carried out in the Indian Institute of Technology, Bombay (IITB) on drought vulnerability assessment was adapted by ICRISAT to generate micro-level advisories that were exchanged using the Internet-connected kiosks. The results of vulnerability analysis were presented as colour-coded maps that were easy to interpret by the members of the AMS (Figure 6.1).



Note: The shaded areas show the status of surface water in meeting the village requirenents at an annual rainfall of 400 mm. The balance estimate is based on human, animal and irrigation requirements and run-off.

–75% of total water demand is not available or deficit.

+25% of total water demand is excess or surplus.

Source: ICRISAT.

Figure 6.1 Sample drought vulnerability prediction map at micro-regional level for 400-mm rainfall

AMS women volunteers were further trained in drought literacy matters and in information facilitation, to enable them to communicate farmers' perceptions, observations and concerns to scholars and scientists at ICRISAT. They were also trained in basic techniques such as accurate measurement of rainfall and in upload of measured data into a password-protected Wiki page. This process has been ongoing continuously since 2005, and the impact analysis shows that a number of farmers were able to cope with drought better as a result.

Many switched to drought-tolerant crops (avoiding crops such as paddy), and started to adopt conservation-oriented practices that led to saving of water for crops and animals (Dileepkumar *et al*. 2007).

A number of initiatives in this sector consider fulfilling farmer queries as a key service and deploy a variety of ICT-based methods ranging from interactive voice response systems to web-based interfaces to enable information exchange between farmer and expert. The role of women as skilled and knowledgeable intermediaries, who strengthened their knowledge and information through online interactions with experts and their learning materials, is evident in this effort. Significantly, most of the capability development effort was carried out using a blend of online and offline methods. Supplementing the work on the design of web interfaces or the creation of a massive techno-infrastructure for query–response needs to be supplemented by skill building for information facilitation among willing farmers.

ICRISAT scholars in Addakal, south central India, observed that the time to get satisfactory response from experts declined from about six days to less than twenty-four hours, going down to as low as eight hours where trained intermediaries were available. There is a noticeable difference in information facilitation capability before and after training. The trained women volunteers were able to refine farmers' queries before passing them on to the experts and were able to fine-tune answers from the experts before passing them on to the farmers (Dileepkumar, Dixit & Balaji 2005).

The other strand: ICT in agriculture

Institutions in the agricultural sector, especially those in education and R&D, have built and implemented projects and activities that use ICT extensively. A major initiative in this direction in India was the National Agricultural Technology Project (NATP) of the ICAR that was operational for seven years during 1997–2004. This project led to the creation of an essential ICT infrastructure and Internet access in a large number of State Agricultural Universities (SAUs) and in ICAR centres across the country. Although IT-related implementation slowed down after the first three years of this project, a fair amount of basic infrastructure had come into existence, even if slightly inadequate for the size of the challenges it was expected to handle. However, the capabilities necessary to build and maintain information and data services relevant to farmers had not been created adequately, with the result that the presence of institutionalized agriculture in India on the Internet was and has remained minimal.

The SAUs in India play a pivotal role in sustaining and advancing agricultural productivity and are responsible for the development of what are known as the 'packages of practices' documents for each crop that is cultivated in a state.

This document is an official one and has many levels of review and approval prior to release. The SAUs also manage a very large proportion of the KVKs (see above) to enable farmers to get information and training in important new production technologies and are expected to provide farm advisory and alert services. While many SAUs have created a minimal IT and connectivity infrastructure over the past about twelve years, the momentum to sustain and advance the infrastructure was not generated. Making the accumulated data on technology trials available online or building digitally enabled information and advisory services for farmers is not yet a priority or routine activity at the SAU level. The net result is that few of the packages of practices documents are available online. Few, if any, research projects in this system consider online publication of results as a serious output.

The national programme for farmers' call centres, called Kissan Call Centers, has operated in almost all states of India since 2004, but not all SAUs are active participants in it; the initiative itself is not seen as being particularly effective, and no impact assessment has been published yet. A few states, such as Andhra Pradesh, have their own farmers' call centre, whose operations are supported by the SAU.

A recently completed study at ICRISAT showed that most SAUs are not in a position to offer agro-meteorological alerts online within their own territories. A notable and large exception is the Tamil Nadu Agricultural University (TNAU), which since 2008 has placed on the web nearly all its extension material (AGRITECH n.d.). The TNAU has also placed on the web near real-time data from its weather stations from across the state of Tamil Nadu (about 224 stations), making it a true pioneer among agricultural universities in developing countries (TNAU n.d.).

The national research laboratories, centres and field stations under the ICAR are better networked compared to the SAUs and have a better presence on the web. Yet few of them have Web 2.0 features or have other arrangements to enable interactivity with the 'clients' (ICAR n.d.). The ICAR directorate of information and publications (DIPA) does not yet have significant presence on the web; as a result, critical documents, especially ones with historical value in terms of data, information and images are unavailable to build and sustain services. In the past two years, there have been ongoing efforts at the Indian Agricultural Research Institute (IARI) to build an open access repository of research publications, and a small number of professional research societies are also moving in this direction (CIARD n.d.; IARI n.d.). Key datasets and information on soil and water management, gathered, analysed and stored in a number of ICAR centres, are not available online yet. This gap and the non-availability of meteorological information has led to failures in forecasting key diseases, an example being the potato blight that affected production significantly in large parts of north-western part of the Gangetic plains in 2009 (ICRISAT n.d.).

India's National Informatics Center (NIC n.d.) has for long been an active player in making agricultural information available online and initiated the

Warana Wired Village (Warana n.d.) project in 1998 in Maharashtra, which was unique in the way it brought together agricultural information with 'kiosk' operations focusing on a single crop, namely, sugarcane. While that initiative could not be sustained, NIC has placed online market prices of key agricultural produce for most of the district headquarters (AGMARKNET n.d.); similarly, NIC has also been able to bring together nearly all the digitally published package of practices (POPs) of SAUs (ICAR n.d.), although the proportion of digitized POPs is still small. A lack of clarity of roles between NIC and the Union Ministry of Agriculture (Department of Agriculture and Cooperation, DAC) in such a publication process has been noticed for a long time, and addressing this would help make available a larger quantum of agricultural information online. The DAC's website is primarily a collection of static pages.

These are among the large or long-running activities that use the Internet as a medium to enable access to agricultural information and data for farmers and their organizations. The Digital Green (n.d.) non-profit initiative is a key emerging player. This initiative is premised on the idea that promoting farmer–farmer exchanges of information and building the facilitational capability of farmers using video is an effective way to improve production value and conservation of resources. The Indian Space Research Organization (ISRO), through its closed user group network of VRCs (http://www.isro.org/publications/pdf/VRCBrochure.pdf), has enabled direct interaction between experts in institutions and farmers in many parts of the country during 2005–10, although few SAUs were found to be partnering in this activity as of 2010. As we had noted earlier, the well-known e-Choupal programme makes more use of non-Internet networking to build an arrangement for sourcing of select farm produce while assuring better realization of value to farmers and consumers. This is a well-documented effort (Dileepkumar *et al*. 2006; Kumar 2004) and is not covered in detail here.

When it comes to commodity pricing, significantly larger number of efforts are found, and they operate on a reasonably large scale, using a blend of Internet access and closed user groups. The NIC AgMarkNet (AGMARKNET n.d.) is the longest running activity of this kind. The National Horticultural Board has set up a price information system on the web with limited analytical features. Best known is the effort of India's MCX (Multi-Commodity Exchange), which covers several traded agricultural commodities extensively, with fine-grained pricing available for a smaller number of crops covering some regions of Maharashtra (MCXINDIA n.d.). Similar efforts of India's NCDEX (National Commodity and Derivative Exchange) are also notable (NCDEX n.d.). A new effort involving a consortium of universities led by the TNAU focuses on prices forecast for select commodities in an accurate fashion, building on a widely tested simulation developed at TNAU. This much needed effort is still an experimental project. In general, market price

information, although not available easily at scales below that of a district in India, is better visible on the Internet, while the same cannot be said of 'material' (soil, water, seeds and other inputs) or meteorology. The original expectation, articulated in the early 1990s, that the Internet would help fill gaps in the availability of information on 'the three Ms' is still unfulfilled in India.

A different group of projects that combined elements of ICT4A with ICT4D has been developed mainly by expert IT resources. Three among them are the aAQUA (AAQUA n.d.) by IITB, DEAL (DEAL n.d.) at IIT-Kanpur and the KISSAN-Kerala (KISSAN n.d.) of IIITM-Kerala. Another notable one is the e-Sagu project of IIIT-Hyderabad (E-SAGU n.d.). Of these, KISSAN was the most deeply integrated with institutionalized agricultural expertise, and it had its own regular episodes on a popular TV network. The Agropedia has evolved from DEAL (see above) in partnership with a consortium of institutions comprising ICT resources (IIT-Kanpur, IIITM-Kerala, IIT-Bombay) along with leading institutions with agricultural domain expertise (http://www.akmindia.in). Agropedia has been envisioned and designed by a group at IIT-Kanpur as a semantically enabled platform for agricultural information management and is, in the present phase, enabled with features for information exchange via mobile telephones. These two initiatives provide a view of what synergies between leading ICT resource institutions and research and extension institutions in farming can achieve in drastically improving knowledge exchange between institutionalized expertise and farmers.

KISSAN-Kerala: exemplifying delivery of farm information services in multiple modes

Karshaka Information Systems Services and Networking (KISSAN) is an integrated, multi-modal delivery of agricultural information system, which provides several dynamic information and advisory services for the farming community across the state of Kerala. It is one of the citizen-centric e-governance projects of the state government. The project was conceptualized, designed, developed, implemented and managed by the Indian Institute of Information Technology and Management-Kerala (IIITM-K) (http://www.iiitmk.ac.in).

The basic objective of this project is to provide contextualized information to the farming communities dynamically using a combination of web interfaces, television-based mass media programmes, telephone and mobile (text/voice/video) based advisory and broadcast services and a dedicated branded Internet video channel on agriculture. It involves collaboration of experts from key organizations for effective information delivery on demand seamlessly to all farmers in a seamless manner.

The key feature of KISSAN is its integrated service delivery model. The major services are as follows:

- Online agri advisory service: The dynamic portal-based online advisory service (http://www.kissankerala.net) is a major output of the project. The portal provides an online platform for farmers to interact with expert research scientists and agricultural extension officers in an interactive way. The portal also provides several dynamic advisory services, including market information, weather and crop advice, and an expert system on fertilizer recommendation. Through an online query management system, the experts involved in the project have answered more than 18,000 queries from farmers in the past five years. Through the online fertilizer recommendation system, the farmers have generated or received more than 35,000 online fertilizer recommendations (in the local language, Malayalam) for their preferred crops.

  Development of a web-GIS-based dynamic weather information and forecasting system for the entire state of Kerala is a major feature of this portal. The system currently gives more than 300 weather locations across all districts of Kerala. It gives three basic weather parameters, namely, temperature, cloud cover and precipitation (rainfall) for each location with weekly prediction.

- KISSAN Krishideepam: It is a weekly agriculture television programme – in Malayalam – that provides select information on best practices, success stories, departmental news, news on various farming-related public programmes, market analysis, cultivation methods, analysis of current issues and so on. Care has been taken to ensure that KISSAN Krishideepam is authentic. It is produced in-house at IIITMK by agricultural and media experts. The project produces and telecasts a weekly television programme (of thirty minutes duration) over a leading satellite channel (Asianet) in Kerala. The programme now reaches more than five million regular viewers across the state and beyond. The project has completed the production and telecast of 370 unbroken weekly episodes during the past eight years.

- Online agri video channel: India's first branded online video channel in agriculture, launched in collaboration with YouTube. More than 150 selected videos (telecast quality) are available through this channel (http://www.youtube.com/kissankerala).

- Tele advisory services: The project also provides telephone-based Agri advisory services through a dedicated telephone number for farmers. The farmers can ask any questions to the agricultural scientists and seek expert advice for their crops. As part of this service, the project

has developed an extensive crop database across the state to provide location-specific advisory services.

- KISSAN mobile-based advice: Kerala is considered to be one of the states where mobile penetration is very high. KISSAN has launched several mobile-based services via SMS (PUSH and PULL), voice and video-based services to the farming community (http://www.kissankerala.net/mobile).

Some of the mobile-based services are as follows:

- Information on the availability of planting materials. This service helps farmers locate and purchase quality planting materials from the nearest farm/nursery.
- Weather information and advice for farmers. This helps famers obtain weather information for the locality and covers six parameters that are important in farming.
- Two-way query answering system (Ask our Experts through mobile).
- Information on soil health. Through this service, farmers can easily procure test results in the least possible time; it normally takes weeks to get a soil test done.
- Voice-based monthly crop management advice. Through this service farmers will get an automated voice call depicting the different operations for the particular crop in the given month.

The key feature of KISSAN is the services delivery model, which allows experts from any agriculture-related organization to reach farmers anywhere in the state through any mix or all of the above modes of communication. This is a new Internet-driven service delivery and knowledge system that enables the coming together of multiple stakeholders to enhance the services provided to farmers more effectively than before. This has been made possible by the coming together of institutions as well as the deployment of an integrated services delivery model.

Agropedia: multiple strands coming together

During the past three years, a consortium of IT resource institutions and agricultural universities and research institutes have come together with the support of the National Agricultural Innovation Project (NAIP) (AKM-India n.d.) and developed a series of prototypes modelled after KISSAN-Kerala. The content organization was built completely anew. Called Agropedia (Agropedia

n.d.), this platform involves the use of semantic web practices, especially of knowledge models, with FAO's Agrovoc (AGROVOC n.d.) serving as the basis of an ontology for crop information. Agropedia was conceived of and designed by a team at IIT-Kanpur (n.d.), and the validation of crop knowledge models for nine crops was carried out by a number of agricultural subject matter experts from all over India, especially those at the partner institutes, namely, ICRISAT, University of Agricultural Sciences, Raichur and the GB Pant University of Agriculture and Technology.

The architecture of Agropedia is based on the idea that the semantic enablement of information management via a web interface would significantly contribute to addressing the language diversity in Indian farming. It is also enabled with what are now accepted as typical Web 2.0 interfaces, namely, wikis and blogs. To allow for the participation of experts and practitioners outside the milieu of institutions, Agropedia allows for two tracks for contributing information: one, termed Gyandhara (the Hindi equivalent for formal knowledge), is available for use by institution-affiliated experts; the other, called Jandhara (the Hindi equivalent for popular knowledge), is open to anyone. All contributions are available for browsing and commentary by anyone. This satisfies the institutional view that all farming information has a prescriptive element and needs to rise through a validation process (that is, Gyandhara).

The semantic aspect is in the way contributions and commentaries are tagged, using a knowledge model for the topic. In the current phase, a crop is identified as a topic and a knowledge model is built for each crop. This is arrived at through a series of workshops where experts from the agricultural research and education institutions come together and validate the model through reaching a consensus on the placement of concepts and their relationships. This approach has enabled searches for information in four different languages (English, Hindi, Kannada and Telugu). As of now, nine crop knowledge models have been developed and content in all the four languages mentioned is available on these crops.

In the ongoing phase, Agropedia's designers have also created tags for research information and have further built an automatic tagger for research publications in agriculture (Agrotagger, http://agropedialabs.iitk.ac.in). They have also added features that allow the delivery of crop advice by a field-based extension worker to a select group of farmers. Depending upon the level of access to networks, such advice can be received by email, voice or text. The integration of such features in Agropedia makes its architecture scalable for both content aggregation and integrated, multi-modal delivery.

The IIITM-Kerala, host of the KISSAN-Kerala project, has designed and built open web GIS interfaces that enable a user to overlay weather information and soil micro-nutrient deficiency to enable better recommendations on fertilizer input management for farmers at a local level (http://www.akmindia.in/agrogis/dhwd1/index.php).

With these two significant crop or animal topics, specific services for a wide variety of farming conditions can be created.

ICT contributing to agrarian prosperity in India: the twain must meet

We have pointed out that there is a significant gap in the availability of farming/agricultural information and data on the Internet, and it is a global phenomenon. It is more acute in India. The non-priority status for farming information in the rural 'kiosks' and e-governance projects in India has given rise to a divergence between investments and interests that drive applications of ICT in agriculture and in rural development. This needs to change.

A significant part of the responsibility in changing this is actually with the institutionalized expertise in agriculture, whether in public or private, in the for- or non-profit sectors. The absence of a digital content infrastructure for India as a whole is the biggest impediment to launching meaningful, large-scale information and advisory support for the farmers of India. Similar to the investments made by various public agencies in improving network connectivity, the key stakeholders in India's vast agricultural sector must consider this a priority area for policy attention and investment. Considerable synergies need to be built as well. Given the history of good intentions and foresight that are coupled with a lack of capabilities and motivation, this large task will require the participation of a number of non-standard actors. The recent success in bringing together leading ICT resources and agricultural domain expertise shows that the role of non-traditional, emerging stakeholders is important. The older and continuing attitude of favouring verticality of processes where agricultural sector would build an end-to-end solution in IT matters should be given up.

The IT researchers in the public sector and in the software industry need to carefully assess if all the technological solutions needed are readily available to meet the complex and multidimensional challenges of information and data management in Indian farming. There is no pre-built, readily accessible data and content organization by which services can be created for the various stakeholders in Indian agriculture – whose diversity is immense. A lack of appreciation of this, in our view, has led to many fragmented efforts in recent times. The digital content infrastructure for farming in India does not exist and needs to be built as a mandate. The rapid and extensive spread of mobile telephony is leading to the launch of new initiatives for rural areas. All such initiatives in the deployment of mobile telephony as the delivery mode of choice (e.g. the AIRTEL-IFFCO IKSL project – http://www.iffco.nic.in/iksl/ikslweb.nsf) will also require the availability of an advanced

content organization on the Internet for sustenance. Internationally, the access of farmers to institutional expertise and information in agriculture has not been a serious challenge in countries with industrialized agriculture, and as such they can offer no models for India, which needs to build its own, possibly pluralistic model. Significant investments and synergies are essential, and they need to come from a variety of stakeholders, including non-traditional ones.

References

AAQUA (n.d.), Available at http://www.aaqua.org [accessed 28 May 2011].
AGMARKNET (n.d.), Available at http://agmarknet.nic.in [accessed 28 May 2011].
Agricoop (n.d.), Available at http://agricoop.nic.in [accessed 28 May 2011].
AGRITECH (n.d.), Available at http://agritech.tnau.ac.in [accessed 28 May 2011].
Agropages (n.d.), 'Late blight attacked potato in Maharashtra, India', Available at http://news.agropages.com/Feature/FeatureDetail—122.htm [accessed 28 May 2011].
Agropedia (n.d.), Available at http://www.agropedia.net [accessed 28 May 2011].
AGROVOC (n.d.), Available at http://www.fao.org/agrovoc [accessed 28 May 2011].
AKM-India (n.d.), Available at http://www.akmindia.in/ [accessed 28 May 2011].
Anderson, J. R. and Feder, G. (2007), 'Agricultural Extension', in E. E. Robert and P. Pingali (eds), *Handbook of Agricultural Economics*, Amsterdam: Elsevier, pp. 2343–78.
Anderson, J. R., Feder, G. and Ganguly, S. (2006), 'The Rise and Fall of Training and Visit Extension: An Asian Mini-Drama with an African Epilogue?' in A. W. V. d. Ban and R. K. Samanta (eds), *Changing Roles of Agricultural Economics*, New Delhi: B. R. Publishing Company, pp. 149–72.
Baan, V. d. and Samanta, R. K. (2006), *Changing Roles of Agricultural Extension in Asian Nations*, Available at http://www.scribd.com/doc/36193789/Changing-Roles-of-Agricultural-Extension-in-Asia-Nations [accessed 28 May 2011].
Bagga, R. K., Keniston, K. and Mathur, R. R. (2005), *The State, IT and Development*, India: SAGE Publications.
Balaji, V., Rajamohan, K. G., Rajasekara, P. and Senthilkumaran, S. (2003), 'Toward a Knowledge System for Sustainable Food Security'. Available at http://www.isoc.org/oti/articles/0401/balaji.html [accessed 28 May 2011].
CGIAR (n.d.), Available at http://www.cgiar.org [accessed 28 May 2011].
CIARD (n.d.), Available at http://www.ciard.net [accessed 28 May 2011].
DEAL (n.d.), Available at http://www.deal.org [accessed 28 May 2011].
Digital Green (n.d.), Available at http://www.digitalgreen.org [accessed 28 May 2011].
Dileepkumar, G. (2010). 'Micro-Level Drought Preparedness with Information Management and Rural Knowledge Centres: A Framework to Support Rural Farm Families', Available at http://intranet.da-iict.org/~sanjay/docs/Micro-level%20Drought%20Preparedness%20with%20Info%20Mgt%20and%20Rural%20Knowledge%20Centres%20A%20Framework.pdf [accessed 28 May 2011].
Dileepkumar, G., Dixit, S. and Balaji, V. (2005), *Agricultural Extension with Information and Communication Technology (ICT) Mediated Open Distance Learning (ODL) Methods: A Case Study from Rural South India*. Proceedings of the Community Informatics Research Network Conference, South Africa.
Dileepkumar, G., Kuna, A. S., Diwakar, B. & and Balaji, V. (2006)., *ITC Aqua Choupal Model: An ICT- Based Traceability Mechanism for Solving Indian Shrimp*

Export-Oriented Problems. In Computers in Agriculture and Natural Resources, 4th World Congress Conference Proceedings. Orlando, Florida, 2006.
Dileepkumar, G., Kesavarao, A. V. R., Nagarajan, R. and Balaji, V. (2007), *Village Knowledge Centers and the Use of GIS-Derived Products*. Proceeding of IEEE/ACM International Conference on ICT in Development, Bangalore, India.
Eicher, C. K. (2007), *Agricultural Extension in Africa and Asia*. Literature review prepared for World AgInfo Project, Cornell University. East Lansing, MI: Department of Agricultural Economics, MSU.
E-SAGU (n.d.), Available at http://www.esagu.org [accessed 28 May 2011].
FAO (n.d.), Available at http://www.aims.fao.org [accessed 28 May 2011].
Feder, G., Murgai, R. and Quizon, J. B. (2004), 'The Acquisition and Diffusion of Knowledge: The Case of Pest Management Training in Farmer Field Schools, Indonesia', *Journal of Agricultural Economics*, 55(2): 217–39.
Gemo, H., Carl, K. and Teclemariam, S. (2005), *Mozambique's Experience in Building a National Extension System*, East Lansing, MI: Michigan State University Press.
GFAR (n.d.), Available at http://www.gfar.org [accessed 28 May 2011].
Global Extension Community Cafe (2010), 'Global Consultation: Video Documentation'. Available at http://blogs.extension.iastate.edu/global/2010/12/22/global-consultation-video-documentation/ [accessed 28 May 2011].
IARI (n.d.), Available at http://eprints.iari.res.in [accessed 28 May 2011].
ICAR (n.d.), Available at http://www.icar.org.in [accessed 28 May 2011].
ICAR-KVK (n.d.), 'Krishi Vigyan Kendras (KVKs)', Available at http://www.icar.org.in/en/krishi-vigyan-kendra.htm [accessed 28 May 2011].
ICRISAT (n.d.), Available at http://www.icrisat.org/
ICTKM (n.d.), Available at http://www.ictkm.cgiar.org [accessed 28 May 2011].
IIITB (2005), 'Information and Communications Technologies for Development: A Comparative Analysis of Impacts and Costs from India'. Available at http://www.iiitb.ac.in/uploads/Complete%20report.pdf [accessed 28 May 2011].
IIT-Kanpur (n.d.), Available at http://www.cse.iitk.ac.in/users/tvp/ [accessed 28 May 2011].
Iowa State University Global Extension (n.d.), 'Global Consultation on ICTs in Support of Revitalizing Extension and Advisory Services: Opportunities and Challenges'. Available at http://www.ucs.iastate.edu/mnet/ict/about.html [accessed 28 May 2011].
IVTM (n.d.), Available at https://extranet.who.int/ivtm/ [accessed 28 May 2011].
Jones, G. E. (1997), 'The History, Development and the Future of Agricultural Extension', in B. E. Swanson, R. P. Bentz and A. J. Sofranko (eds), *Improving Agricultural Extension – A Reference Manual*, Rome: FAO.
Jones, G. E. and Garforth, C. (1997), 'The History, Development, and Future of Agricultural Extension', in B. Swanson (ed.), *Improving Agricultural Extension: A Reference Manual (3rd Edition)*. Rome: FAO.
Keniston, K. and Kumar, D. (2000), *IT Experience in India*, India: SAGE Publication.
KISSAN-Kerala (n.d.), Available at http://www.kissankerala.net [accessed 28 May 2011].
Kumar, R. (2004), 'e-Choupals: A Study on the Financial Sustainability of Village Internet Centers in Rural Madhya Pradesh', *Information Technologies and International Development*, 2(1): 45–73.
MCXINDIA (n.d.), Available at http://www.mcxindia.com [accessed 28 May 2011].
Microsoft Research (2010), 'Microsoft Technology Emerging Markets', Available at http://research.microsoft.com/en-us/groups/tem/all_papers.aspx [accessed 28 May 2011].
NAIP (n.d.), Available at http://www.icar.org.in/naip [accessed 28 May 2011].
NCDEX (n.d.), Available at http://www.ncdex.com [accessed 28 May 2011].
NCF (2004), 'Serving Farmers and Saving Farming'. Available at http://krishakayog.gov.in/report1.pdf [accessed 28 May 2011].
NHB (n.d.), Available at http://nhb.gov.in [accessed 28 May 2011].

NIC (n.d.), Available at http://nic.in [accessed 28 May 2011].
NSSO (2005), Available at http://www.mospi.gov.in/mospi_nsso_rept_pubn.htm [accessed 28 May 2011].
Singh, J. P., Swanson, B. E. and Singh, M. (2006), 'Developing a Decentralized, Market-Driven Extension System in India: The ATMA Model', in A. W. V. d. Ban and R. K. Samanta (eds), *Changing Roles of Agricultural Extension in Asian Nations*, Delhi: B. R. Publishing Corporation.
Swaminathan, M. S. (1993), *Information Technology: Reaching the Unreached*, Chennai: Macmillan.
TNAU (n.d.), Available at http://tawn.tnau.ac.in [accessed 28 May 2011].
Trager, J. (1996), *The Food Chronology*, London: Aurum Press.
VASAT (2003), Available at http://vasat.icrisat.ac.in/?q=node/48 [accessed 28 May 2011].
Warana (n.d.), Available at http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN019006.pdf [accessed 15 June 2011].

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