

The Contribution of Information and Communication Technologies for Development (ICT4D) Projects to Capabilities, Empowerment and Sustainability: A Case Study of iREACH in Cambodia

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Abstract

The purpose of the research underpinning this thesis is to develop and test a framework for understanding whether, how and under what circumstances information and communication technologies (ICT) can contribute to development. The framework consists of a model and a research framework. The model, the capabilities, empowerment and sustainability virtuous spiral, is informed by the capability approach and depicts reinforcing relationships between ICT and these three constructs. The research framework includes, but is not limited to participatory approaches, requires a forward-looking longitudinal perspective and consideration of the micro-, meso-, and macro-levels. This framework was applied in field studies at an ICT for development (ICT4D) project, iREACH, in Cambodia. A key finding from the fieldwork was that these constructs are interrelated and driven by knowledge, which facilitated the enhancement of capabilities in various domains, including education, health and farming. There were strong indications that this had been achieved in combination with greater equality, particularly through gender empowerment and by encouraging the more marginalised villagers to use iREACH's services. By promoting new agriculture techniques, including crop diversity and organic farm practices, iREACH contributed to sustainability. Although these outcomes were facilitated by ICT, they were not driven by the technology itself, but rather by the ways in which ICT had been implemented (i.e. in a community setting). These findings are significant, as policy makers and the donor community seem to be abandoning shared access facilities, pointing to the many failed implementations and the rapid take-up of individually owned mobile services. The main contribution of this study is its novel way of operationalising the capability approach in response to the many calls for a robust ICT4D evaluation framework.

Declaration

I, Helena Grunfeld, declare that the PhD thesis entitled *The Contribution of Information and Communication Technologies for Development (ICT4D) Projects to Capabilities, Empowerment and Sustainability: A Case Study of iREACH in Cambodia* is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Signature

Date

Acknowledgements

This acknowledgement section reflects that work on this thesis has been an exploration into new territory for me. The best part of the process of discovery has been the satisfaction of working with so many devoted people, in rural villages of India and Cambodia and being able to contribute something to the projects. The desire to do so was the attraction to start on this journey in the first place. In addition to mentioning the names of those who have assisted me along the way, I will also explain in what context they contributed, so this section becomes the story of how I got to this stage.

The story begins with my call to the Centre for Strategic Economic Studies (CSES) at Victoria University to enquire about the processes for enrolling in a PhD programme. I am grateful for the trust shown in me by the CSES Director, Professor Peter Sheehan, by accepting my application and for his offer to be my co-supervisor, for Professor John Houghton for accepting to be my principal supervisor. Professor Houghton has been the perfect principal supervisor, assisting when called upon, but encouraging me to find my own way in most aspects of this thesis. I want to express my sincere gratitude and appreciation for the valuable comments, suggestions, and other contributions made by both of my supervisors and for their encouragement throughout the process of preparing this work.

I also want to thank other staff at CSES for their assistance and support, particularly Margarita Kumnick and Michelle Motton. My transition from work in the corporate world to study and research was made easy by the friendly atmosphere at CSES and stimulating discussions with fellow PhD students, especially with Said al-Saqri and Syurkani Ishak-Kasim.

Embarking on a PhD thesis in a subject area, in which I had an interest, but no contacts, proved a frustrating beginning of this work, because the research question requires field research, at least at one ICT4D initiative to test the conceptual framework. After more than 12 months of fruitless searches for possible projects, my luck turned, with two potential projects. One came in the form of an email to an ICT4D list from Sriram Guddireddigari, asking an ICT4D related question on behalf of Engineers Without Borders Australia (EWB). When contacting Sriram, I found out that EWB was working with another Melbourne-based organisation, called The East West Overseas Aid Foundation (TEWOAF) on an ICT project, the Vicki Standish e-Education Centre (VSeEC) in India. Through Sriram, I was introduced to TEWOAF's founder Dr Natteri Chandran, whose support, together with the support of others in TEWOAF and several EWB staff and volunteers, I would like to gratefully acknowledge.

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When realising that two case studies were too many in terms of time allowed to complete a thesis and the word limit, several reasons, including the research setting with staff dedicated to research activities and the lack of studies of this nature in Cambodia, suggested a preference for iREACH. Laurent Elder, the Team Leader for Pan Asia Networking (PAN) Program at the International Development Research Centre, drew my attention to this project at the 2007 Communication Policy Research South (CPRsouth2) conference in Chennai, where I presented a paper outlining an earlier version of the framework used in this thesis (Grunfeld, 2007). I thank Laurent for introducing me to Maria Ng, Regional Senior Program Specialist on the PAN programme. Maria introduced me to the management and advisory team of iREACH, including Chea Sok Huor, iREACH project manager, Sean Ó Siochrú and Brian Unger, iREACH external advisors. Without the excellent teamwork with Maria, Huor, Sean and Brian, this research would not have got off the ground. We did not enter into a formal agreement prior to, during, or after the research reported in this thesis and it was conducted on the basis of an informal understanding. During my initial visit to iREACH in 2008, I was introduced to the pilot managers and other staff, many of whom later assisted with the research and here I will only acknowledge by name, staff directly involved in the research: Sokleap Hak, Dimanche Long, Pin Tara, Seng Dara, Bunthoeourn Mak and Chanda Pin. I am very grateful for their assistance with arranging the invitations to the focus groups, facilitating the sessions, conducting the surveys, simultaneous interpretation and comments on the draft reports I prepared after each research wave. I also want to gratefully acknowledge the many other staff members and volunteers who provided logistical support and focus group participants and survey respondents, who gave their time and valuable insights that provide the foundation for this research.

During the process of developing the conceptual framework, I have received valuable comments from anonymous reviewers of publications and from Alison Gillwald, Director,

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I also want to express my gratitude to the library staff at the City Flinders library at Victoria University for the support extended to me, particularly by John Tripotseris.

Above all, I acknowledge and thank my dear parents, who instilled in me the thirst for knowledge, but did not live long enough to experience my endeavours to combine acquisition of, with contribution to knowledge. Finally, I express my appreciation to my husband, who, as always, encouraged me to pursue my interests.

List of publications

Peer reviewed book chapters

- Grunfeld, H. with Guddireddigari, S., Marian, B., Peter, J. & Kumar, V. (2011). Analysing an ICT4D project in India using the capability approach and a virtuous spiral framework. In E. Adomi (Ed.), *Handbook of research on information communication technology: trends, issues and advancements* (pp. 50–75). Hershey: IGI Global.
- Grunfeld, H., Ó Siochrú, S., Unger, B. & Im, S. (2011). iREACH: lessons from a community owned ICT network in Cambodia. In J. Steyn, J-P. van Belle & E. Villeneuve (Eds.), *Development informatics and regional information technologies: theory, practice and the digital divide, Vol 2: ICTs and sustainable solutions for the digital divide: practical approaches* (pp. 302–328). Hershey: IGI Global
- Ashraf, M., Grunfeld, H., Afza, S. R. & Malik, B. T. (2011). Information communication technology (ICT) for rural women's life in Bangladeshi villages. In Y. K. Dwivedi (Ed.), *Adoption, usage, and global impact of broadband technologies: diffusion, practice and policy* (pp. 171–183). Hershey: IGI Global.

Peer reviewed journal papers

- Ashraf, M., Grunfeld H., Harris, R. & Alam, N. (2011). An explorative study of ICT for developmental impact in rural areas of Bangladesh. *Media Asia*, 38(1), 22-31.
- Grunfeld, H., Hak, S. & Pin, T. (2011). Understanding benefits realisation of iREACH from a capability approach perspective. *Ethics and Information Technology*, 13(2), 151–172.

Peer reviewed conference papers

- Guddireddigari, S., Grunfeld, H. & Johansen, G. (2011, May). 'The gift of God': exploring the role of a digital diaspora in ICT4D project implementation. Paper presented at the IFIP WG9.4 Conference, Kathmandu, Nepal.
- Ansari, N., Ashraf, M., Malik, T. & Grunfeld, H. (2010, June). Green IT awareness and practices: results from a field study on mobile phone related e-waste in Bangladesh. Paper presented at the 2010 IEEE International Symposium on Technology and Society, Social Implications of Emerging Technologies, University of Wollongong, Wollongong.
- Ashraf, M., Malik, B. T. & Grunfeld, H. (2009, December). Evaluating health behaviour outcomes of an ICT project: results from research in three villages in Bangladesh. Paper presented at the 11th International Conference on e-Health Networking, Applications and Services (Healthcom2009), University of New South Wales. Abstract published in *Journal of ehealth*, 7(2), 179.
- Grunfeld, H. with Hak, S. & Pin, T. (2009, November). How iREACH has contributed to local communities. Paper presented at the Community Informatics Research Network (CIRN)

2009: Empowering communities: learning from community informatics practice, Monash University, Prato. In L. Stillman, G. Johanson & T. Denison (Eds.), *Prato Community CIRN Conference 2009: Empowering communities: learning from community informatics practice* ISBN: [978-0-9581058-5-9]. Format: CD-ROM

Grunfeld, H. (2007, December). Framework for evaluating contributions of ICT to capabilities, empowerment and sustainability in disadvantaged communities. Paper presented at the CPRSouth2 (Communication Policy Research) Conference, 'Empowering rural communities through ICT policy and research', Indian Institute of Technology (IIT) – Madras, Chennai.

Other conference papers

Grunfeld, H., with Pin, T. & Seng, D. (2010, September). Challenges in operationalising the capability approach for evaluating the contribution of the Cambodian ICT4D project, iREACH, to capabilities, empowerment and sustainability. Paper presented at the 2010 annual conference of the Human Development and Capability Association, The University of Jordan, Amman.

Grunfeld, H. (2011, September). Exploring sustainability through innovative farm practices at an information and communication for development (ICT4D) initiative, iREACH, in Cambodia, from a capability approach perspective. Paper presented at the 2011 annual conference of the Human Development and Capability Association, The Hague.

Other articles

Unger, B., Huor, C. S. & Grunfeld, H. (2010). Project iREACH: informatics for rural empowerment and community health in Cambodia. *IEEE Communications Magazine, Global Communications Newsletter*, 48 (10), 2-4.

Grunfeld, H. & Hak, S. (2009). Gender empowerment through ICTs, iREACH, Cambodia: iREACHing the unreached. *Information for development (i4d)*, 7(7), 11–14.

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Chapter 1 - Overview

The purpose of the research underpinning this thesis is to develop and test a framework for understanding whether, how and under what circumstances information and communication technologies (ICT) can contribute to development. In this study, development is conceptualised as the expansion of people's capabilities (as per the capability approach), empowerment and sustainability, termed the CES constructs in this thesis. This framework, together with its application at iREACH, a rural ICT for development (ICT4D) initiative in Cambodia, is the original research contribution of this study. It consists of a model, depicting reinforcing relationships between ICT and the three constructs (the CES virtuous spiral), and a research framework for studying the linkages between them. The research methodology in the framework includes, but is not limited to participatory approaches. The research framework also requires a forward-looking longitudinal perspective and consideration of the micro-, meso-, and macro-levels.

In illustrating the research framework and the model, we conducted field research at iREACH's shared access facilities in 2009 and 2010. The empirical research serves as a practical demonstration of applying the approach and is not the main contribution of this thesis. While the scope of the research is insufficient to generalise about relationships between ICT and the CES constructs in general, we found the model and the framework useful for understanding the drivers and processes linking ICT with these constructs.

A key finding was that these constructs were interrelated and driven by knowledge. For example, knowledge derived from iREACH's activities expanded farming capabilities in iREACH's catchment areas. The application of these capabilities in the form of new on-farm practices had started showing results such as improved yields without additional chemical inputs (sustainability). By offering villagers greater choice, this process was empowering and encouraged farmers to seek more information. Another key finding was that it was not ICT per se that drove these processes, but rather the ways in which ICT had been implemented (e.g. in a community setting).

The reason for developing this framework is to contribute to the discourse on how to evaluate ICT4D projects, eventually leading to a better understanding of relationships between ICT and development. Despite the large volume of work in this field of study, we could not find a suitable framework that encompasses the broad range of issues we consider necessary for a comprehensive view of what role ICT can play in the service of development. The significance

of the research is that, with a model and research framework that can provide better understanding of the processes leading to specific outcomes, the framework has the potential to lead to improved targeting of development resources. But the usefulness of the approach would first have to be tested through additional research waves at iREACH and piloted in other ICT4D projects.

There are three main elements of this study:

- Setting the scene: this is done mainly in the introduction in the next chapter, the review of the literature in chapter 3, summary of conceptual frameworks in chapter 4 and methodologies used in ICT4D research in chapter 6.
- Original research contributions: the framework described in chapter 5 and the research conducted at iREACH, covered in chapters 7-10.
- Discussion of work: while the work is discussed together with descriptions of iREACH and other findings about ICT4D in general in chapters 7-10, the main discussion and reflections of the work are in chapter 11.

The chapter structure is as follows:

Chapter 2, introduction: the thesis starts with an overview of the field of ICT4D, followed by a brief overview of iREACH.

Chapter 3, a review of the literature: in setting the context, this chapter covers three fields of study that have influenced this work: literature related to ICT4D, with an emphasis on what is known about its impacts on development related issues, overviews of the development discourse and the field of evaluation. Following a discussion of evaluation of ICT4D initiatives, the chapter concludes with formulating the research questions underpinning this study: would research based on the conceptual model and the research framework developed for this thesis be of practical use for policy formulation and for defining future ICT4D projects?

Chapter 4, conceptual frameworks used in ICT4D research: this chapter looks for guidance from other ICT4D studies on suitable conceptual frameworks and concludes that, as no framework was found that would meet our requirements, it would be necessary to develop our own framework.

Chapter 5, conceptual framework used in this study: this is where the model and framework is presented, justifying the choice of constructs and research framework. It summarises relevant elements of the capability approach and outlines what we mean by empowerment and

sustainability. We also provide an overview of participatory approaches, longitudinal studies and discuss the importance of incorporating micro-, meso- and macro perspectives.

Chapter 6, methodologies and methods: we start this chapter by outlining methodologies and methods used in ICT4D research and then detail how we have conducted the study, concluding by assessing the rigour of the research and challenges associated with operationalising the capability approach.

Chapter 7, case study of iREACH: this is where we introduce iREACH in greater detail and present the macro- and meso- environments within which it operates and also present field research findings of a general nature. Findings in the context of the three constructs are analysed in chapters 8-10 and are summarised in Box 1.

Chapter 8, research findings related to capabilities: the key capabilities emerging from the research were associated with being educated and obtaining knowledge, being healthy, cultural and innovation capabilities. These capabilities were intertwined with findings related to the other two constructs of the model: empowerment and sustainability.

Chapter 9, research findings related to empowerment and social capital: in this chapter, we bring together findings that loosely fit under a social environment umbrella, denoted in the model by the term empowerment, which in this context includes governance, cultural aspects, equality, social capital and family relationships. Except for governance, an area in which iREACH's influence was minimal and mainly associated with governance of the project itself through the elected management committees, iREACH had made reasonable contributions, particularly in relation to gender empowerment.

Chapter 10, research findings related to sustainability and livelihood strategies: by far the greatest impact of iREACH pertaining to sustainability was linked to agriculture, and this topic constitutes the focus of this chapter. As far as we could tell from the research, iREACH contributed less to employment and other livelihood diversification strategies. Despite the creation of enterprises being a key objective, there was not much sign of this having been achieved.

Chapter 11, concluding remarks: starting with a reflection on the field study results, this chapter notes that the three constructs were interrelated and driven by knowledge, which facilitated the enhancement of capabilities in various domains, including education, health and farming. There were strong indications that this had been achieved in combination with greater equality, particularly through gender empowerment and by encouraging the more marginalised villagers to use iREACH's services. By promoting new agriculture techniques, including crop

diversity and organic farm practices, iREACH contributed to sustainability. Although these outcomes were facilitated by ICT, they were not driven by the technology itself, but rather by the ways in which ICT had been implemented (i.e. in a community setting).

This chapter also reports on limitations of the study, how the research questions have been addressed, contribution to knowledge and significance of the research. The main contribution is the novel way in which the study has operationalised the capability approach in response to the many calls for a robust ICT4D evaluation framework. Through this framework, this study has added a useful tool for holistic and systematic assessments of ICT4D initiatives. The framework and the research findings are significant, as policy makers and the donor community might question the value of shared access centres, pointing to the many failed implementations and the rapid market-led uptake of individually owned mobile services. The chapter and the study conclude with recommendations for a research agenda to progress knowledge in this important field.

Capabilities

- Capabilities of being educated and becoming knowledgeable, including ICT literacy
- Capabilities of engaging with the “outside world”
- Health related capabilities
- Capabilities related to culture
- Innovation capabilities

Empowerment and social capital

- Inclusion, participation, self-esteem and confidence
- Gender empowerment
- Community building and positive social capital
- Improved family relationships

Sustainability

- Considerable contributions to capabilities related to technical efficiency of agriculture, particularly organic farming methods
- Limited contributions to allocative efficiency in agriculture, livelihood diversification through entrepreneurial activities and employment

Box 1: Key findings related to iREACH’s contribution to capabilities, empowerment and sustainability

Chapter 2 - Introduction

The first part and main body of the introduction contains a brief history and overview of information and communication technologies for the development (ICT4D), the field of study within which this thesis is situated. The chapter ends with an introduction of iREACH, an ICT4D initiative in Cambodia. While the purpose of this thesis is to develop and test a model and framework for ICT4D evaluations, rather than undertaking an in-depth ethnographic study of iREACH, an overview of this ICT4D initiative is included in this chapter, as it is referred to in the text prior to a more detailed presentation of iREACH in section section 7.1.

2.1 Overview of information and communication technologies (ICT) for development

For the purpose of this thesis, ICT is used an umbrella term for

‘... information-handling tools - a varied set of goods, applications and services that are used to produce, store, process, distribute and exchange information. They include the "old" ICTs of radio, television and telephone and the "new" ICTs of computers, satellite and wireless technology and the Internet’ (UNDP, 2001a, p. 2).

Several features of ICT makes it potentially beneficial for development, primarily its enabling nature for applications in fields such as agriculture, health, education, governance, rural development and trade. “Official” recognition of the importance of ICT for development dates back to at least the time when United Nations Educational, Scientific and Cultural Organization (UNESCO) commissioned the report “Many Voices, One World” (UNESCO, 1980). This publication, more widely known as the “McBride Report” identified the need for more equitable resource allocation in the field of communication. The inadequate telecommunications infrastructure in developing countries was again raised in “The Missing Link: Report of The Independent Commission for World Wide Telecommunications Development”, also known as the “Maitland Report” (ITU, 1984), citing the lack of telephone infrastructure as a barrier to economic growth. Although several UN agencies, including the International Telecommunication Union (ITU), the Food and Agriculture Organization (FAO) and UNESCO had by then already used and argued for the benefits of ICT for development for several decades, this report marked a watershed, as it placed development more firmly on the agenda of ITU. Having previously dealt mainly with technical matters, it established a separate unit to deal with development issues. The Group of Eight (G8, 2000) officially recognised ICT as a tool for enabling social and economic development in the Okinawa Charter on Global

Information, which considered ICT to be ‘*one of the most potent forces in shaping the twenty-first century. Its revolutionary impact affects the way people live, learn and work and the way government interacts with civil society*’ (p.1). This led to the establishment of the Digital Opportunity Task Force, which in 2001 produced the “Digital Opportunities for All” report (DOTForce, 2001), encompassing four key areas: readiness, connectivity, human capacity and participation in e-commerce and other e-networks - through entrepreneurship for sustainable economic development, including poverty alleviation. Much of the 2001 Human Development Report (HDR) (UNDP, 2001b), “Making New Technologies Work for Human Development” was devoted to ICT.

In 2003, the importance of ICT for development was again given official recognition in the first phase of the World Summit on the Information Society (WSIS). Although initiated by ITU, it was also through interventions by development-focussed agencies that development issues attracted significant attention. The second phase of the summit, held in Tunis in 2005, produced the “Tunis Agenda for the Information Society”, which stressed the role of ICT as a development enabler, linking it to the Millennium Development Goals (MDGs):

‘We agree that the financing of ICT for development needs to be placed in the context of the growing importance of the role of ICTs, not only as a medium of communication, but also as a development enabler and as a tool for the achievement of the internationally agreed development goals and objectives, including the Millennium Development Goals’ (WSIS, 2005, point 12, p. 2).

Despite this statement about perceived benefits of ICTs, it has been argued that the summit did not push ‘...*the boundaries of thinking on the role of ICTs in development...*’ (Souter, 2007, p.40) and in its 2007 Annual Report, “Making Globalization Work for All”, UNDP noted the link between lack of integration, low foreign direct investments and low Internet access in the least developed countries (UNDP, 2007a).

According to Heeks (2009), the focus on ICT4D reflected the confluence of two streams: ‘*The digital technologies of the 1990s, then, were new tools in search of a purpose. Development goals were new targets in search of a delivery mechanism*’ (p.3). Consistent with this quest for more efficient delivery of development goals, agencies paid attention to mechanisms for combining these two streams, recognising that it was not only a matter of access to ICT, but also implementation aspects affecting how the benefits would flow. In the flurry of activities from the mid- 1990s, designed to extend ICT to developing countries, these aspects were gradually taken into account. The initial pre-occupation was with the “digital divide”, a term that embodies the perceived threat that the information society could widen,

rather than reduce divides between and within countries. But, as de Beer (2007) put it: *'identifying a divide, assumes that there is a need'* (p.201) and Parayil (2005) cautioned that the discourse on a digital divide was a mechanism that could be exploited by those with vested interests.

In an effort to hasten the deployment of ICTs, shared access facilities (e.g. telecentres) with an emphasis on Internet access, became a common mechanism for extending ICTs to underserved areas in the developing world from the 1990s. In this context, shared access refers to sharing the equipment through which users access ICT services, rather than the infrastructure, which in most parts of public communication systems is shared, more so in mobile than fixed networks. Pilot projects mushroomed, but often lacked funds to continue and scale, despite them being included in the WSIS (2003) Plan of action: *'to connect villages with ICTs and establish community access points'* (Point B.6.a). A multitude of national and international agencies invested significant resources in facilities of this nature (Menou, Poepsel & Stoll, 2004; Sein & Harindranath, 2004; Tiwari, 2008; UNCTAD, 2007), expecting them to be powerful tools for the poor in improving their livelihoods, by exploiting their potential role in economic and social development (e.g. through facilitating education, knowledge gathering and sharing, empowerment, social participation and providing economic opportunities (McConnell, 1999; Odame, 2005; Weigel & Waldburger, 2004; World Bank, 2009a)). The extent to which this potential has been realised is still a matter of contention.

However, the unsuccessful quest for long-term sustainability of these investments has tempered the enthusiasm for such projects (Kumar, 2004) and many donors have become disillusioned with the way many of them conducted their operations. Despite this, it is still possible to come across more recent references to the potential of such initiatives (e.g. to reduce costs of ICTs to individual users (UNCTAD, 2007; UNESCAP, 2008)). Combined with the explosive growth of cellular mobile services in many previously unserved rural areas, potential donors and some scholars have questioned the need for telecentres (Howard, 2008; Souter et al., 2010), on the grounds that mobiles offer a relatively affordable and accessible option, compared to other ICTs (Rashid & Elder, 2009). Many of the applications available via the short message service (SMS) are likely to extend in more useable forms on 3rd and 4th generation mobile. Mobile services seem to be taking the place of telecentres as the focus of most ICT4D initiatives with the realisation by operators that these can be profitable in rural areas, sometimes with the assistance of government subsidies. They are also more scalable.

A major difference between the deployment of individual mobile services and the shared access model is that, while the former operate on a commercial basis, usually planned and

managed centrally and used at an individual level, the latter has greater scope for being embedded within communities, engaging in training and other community activities. (In this thesis the term “community” is a way of describing people living in an area. It does not imply a homogenous social entity whose actors share common needs, interests, or practices), The question is whether such centres, through collaboration with a variety of sectors, including content providers, can more effectively and efficiently enhance the livelihoods of the rural poor, as suggested by some authors (McNamara, 2008; Peizer, 2003). Conversely, is the scope for such partnerships aimed at achieving development outcomes more limited where individuals purchase phones for individual, family and/or community use? It is important to understand how different models can contribute to development and how various technologies can serve complementary purposes. When arguing that ICT4D should not be about which technology is best, but rather how different deployment models may best meet development objectives, Heeks (2009) noted the absence of the mobile equivalent of DOTForce.

Although this study does not compare different implementation models, it develops a framework within which this could be done, thereby creating a foundation for research that can inform future investments in ICT4D initiatives.

2.2 Informatics for rural empowerment and community health (iREACH) - overview

This overview serves to provide sufficient background to make sense of references to iREACH, prior to the presentation of a more detailed picture of this project in section 7.1.

Established in 2006 and funded by the Canadian International Development Research Centre (IDRC) as a three-year project (subsequently extended until mid- 2012), iREACH is a “micro-telco” pilot project in Cambodia, based on the principle of a community-based organisation. In several ways iREACH fits within the broad shared use Internet access ICT4D project category, known under different names (e.g. telecentre) deployed since the mid 1990s. The pilot operates at two sites in rural areas, Kep and Kamchai Mear (KCM), both of which have higher than average Cambodian poverty rates and are located a few hours drive from the capital Phnom Penh (see map in Appendix A). In the early days of iREACH, when it pioneered computers and Internet access, there was an ICT access gap in the two pilot sit locations and iREACH was an example of how communities, rather than waiting for commercially provided services, can adopt alternative methods of gaining access to ICT, and at the same time use this process for strengthening community engagement.

The headquarters (HQ) of each pilot site, the only locations directly connected to the Internet, serve as nodes, linking nine village hubs and their local communities with each other and with the Internet via an iREACH wireless network. Until early 2011, when optical fibre based Internet access became available, access to the Internet was via satellite (VSAT) connections. All hubs are situated in publicly accessible buildings, such as commune council offices, pagodas and schools, within a radial distance of up to 20 kilometres from the HQs and were initially equipped with one computer and supervised by a community facilitator (CF). The number of computers was significantly increased in mid-2009, with the donation of 200 One Laptop Per Child (OLPC) devices, for use by children. The CFs assist those lacking sufficient literacy skills to use computers and access the Internet by themselves. With the exception of international calls, most services are provided free of charge. In addition to providing Internet access and international calls, iREACH offers training in ICT and topics such as agriculture and health and narrowcasts news and information of relevance to the daily lives of villagers. It also offers mobile video shows, screened at public events in villages and pagodas. Both sites have multi-media co-ordinators and content developers responsible for developing appropriate local content under the direction of elected management committees. As one of the initial tasks, iREACH arranged management committee elections, in which all villagers in the coverage areas were invited to stand as candidates and to vote. The election process was designed to achieve proportional representation of women.

In addition to providing ICT based services, iREACH also endeavoured to build capacity and evidence to influence ICT policy, particularly pertaining to rural areas.

Chapter 3 - A review of the literature

The first part of this review provides an overview of ICT4D literature. While some of this literature builds on the large body of work on ICT in developed countries, the latter is not addressed in this review. There is however scope for greater integration between the two fields of study, particularly on the influence of the Internet in the economic and social spheres. As the thesis also deals with the development discourse and the field of evaluation, this chapter includes sections on these disciplines. It concludes by identifying knowledge gaps guiding the formulation of the research questions and the study. Respective thematic chapters incorporate references from relevant literature (e.g. chapter 4 includes literature dealing with conceptual frameworks used in ICT4D studies).

3.1 Literature related to ICT4D

ICT4D is a rapidly changing multi-disciplinary and multi-dimensional applied field of research, situated at the intersection of technical, economic, social and political perspectives. It is heavily oriented towards the application of information systems in developing countries, among individuals, in communities, government and businesses. In this review, we summarise the current body of knowledge by providing general background and the context of the different types of publications pertaining to ICT4D, focussing on issues of relevance to the topics explored in this thesis. Lacking an enshrined research paradigm, researchers in this field have adopted different epistemological stances, a diverse range of conceptual frameworks and methodologies. A loose network of academics, other professionals and practitioners, competent in one or several aspects of this field, residing at universities, national and international agencies and consulting firms, make up the epistemic community producing ICT4D-related literature, but there is no consensus on what should drive the research agenda. The field contains a voluminous and dispersed body of literature in academic and other (non-peer reviewed) publications, including reports, websites and blogsites, examining the design, adoption, uses and impacts of ICT in the developing world. At least three journals have specific ICT4D focus: Information Technologies and International Development, Information Technology for Development and the Electronic Journal on Information Systems in Developing Countries. With only some of the literature published in high ranking journals (e.g. info, MIS Quarterly, Telecommunications Policy, The Quarterly Journal of Economics, Third World Quarterly and World Development), many of the publications are of varied quality. Nevertheless, the latter are still useful for constructing a picture of the potential of ICT to contribute to development. Hence, we do not

distinguish between the scholarly and non-scholarly literature in this review or when referring to literature throughout this thesis.

The interdisciplinary nature of this thesis and ICT4D in general, which straddles the disciplines of communication, engineering, developmental studies, economics (including regulatory economics), finance, evaluation, information systems, social and community informatics, media, political science and sociology, makes it difficult to draw boundaries around the literature review whilst keeping it within reasonable limits. Much of the ICT4D research can be classified into a few broad themes, including its role in economic development and its use for, and impact on, different aspects of development (De' & Ratan, 2009; Walsham & Sahay, 2006).

As in the general information systems literature, there are several ways to classify ICT4D literature. Smithson & Hirschheim (1998) developed a classification system in which literature was categorised according to fundamental assumptions of different evaluation approaches along a continuum from highly rational/objective (analytic perspective), political/subjective (interpretivist perspective) and efficiency, effectiveness and understanding. Jagun, Heeks & Whalley (2008) clustered the research into two sets, one of which takes an 'upstream' focus by exploring ICT related policies and strategies and the other focussing on 'downstream' issues, such as impacts. In their overview of the literature, Sein & Harindranath (2004) identified three conceptualisations of ICT4D: how it is used, viewed, and impacts.

Rather than using an existing structure, this review starts with theoretical and conceptual discussions. An overview of standalone literature reviews (i.e. some form of compendia available in this field) follows next, before exploring literature dealing with analyses of ICT4D initiatives, empirical studies on ICT use and specific themes addressed in this literature. A section trying to synthesise current knowledge on ICT4D from this literature precedes discussion on attempts at measuring various aspects of ICT4D and a summary on technological and cost aspects. The review concludes by giving voice to some researchers critiquing the ICT4D concept.

3.1.1 Theoretical and conceptual discussions

Theoretical discussions relating to ICT for development range from the role of ICT in a global society and its impact on the developing world, to exploring ICTs role at the individual level. At the global level, Castells (1996) argued that ICT has created a global network society with informationalism as the new mode of development. The individual level is concerned with access and use, for which van Dijk & Hacker (2003) presented a framework taking into account

the multifaceted dimensions, categorised as mental, material, skills and usage. Material access (e.g. to the Internet) is necessary, but not sufficient for usage, a theme echoed by others (e.g. Czerniewicz, 2004; Dalvit, et al., 2007). Imbalances of access and use within and between developed and developing countries are, according to this view linked to issues such as attitudes toward ICT, digital and other literacy skills and culture. Gurstein (2003) coined the phrase “effective use”, to emphasise the importance of ‘*the capacity and opportunity to successfully integrate ICTs into the accomplishment of self or collaboratively identified goals*’ (web document, no pagination).

Without the necessary ingredients for effective use, digital exclusion can give rise to social exclusion, in a “digital vicious cycle” (Warren, 2007), as has been the case for general ICT use as well as intentional ICT4D initiatives (see 3.1.5.3). Analytical discourse on these issues, supported by empirical evidence from the developing world is still in its infancy (Howard, 2007), and insufficiently incorporate past experiences, including those from the field of communication for development (Kleine & Unwin, 2009).

There is a lack of theoretical and conceptual underpinnings for much of the ICT4D related research. In calling for greater conceptualisation, particularly with respect to development theories, Heeks (2009) pointed to the capability approach and Sein & Harindranath (2004) to a conceptualisation that recognises different roles of ICT: as a commodity, tool for supporting development activities, a driver of the economy and its function in specific development activities. We will revisit this dearth of conceptual frameworks in the section on knowledge gaps (section 3.4), after providing further details on what knowledge is available, starting with standalone literature reviews in the next section.

3.1.2 Standalone literature reviews

There are a few publications aimed at summarising the state of knowledge in the field of ICT4D, sometimes with focus on specific aspects. The compendium by Heeks & Molla (2009) focussed on different approaches to ICT4D evaluation, covering intentional (initiatives funded as specific projects. For example, a telecentre funded as an aid project would be defined as “intentional”, whereas a privately operated centre would not) and “standard” use of ICT. A document by Sey & Fellows (2009) covered public access, addressing issues such as users, usage and impacts on health, education and other factors as well as the nature of current research and knowledge gaps. In their analysis of ICT4D literature from the year 2000, Walsham & Sahay (2006) categorised studies in terms of key challenges addressed and the methodological and theoretical approaches used. Chapman, Slaymaker & Young (2004)

summarised literature applying the sustainable livelihoods approach to ICT for rural poverty alleviation. A literature review by Adeya (2002) focussed on ICTs and poverty, exploring particularly their impact on agriculture, culture, governance, education, health and gender.

3.1.3 *Analysis of ICT4D initiatives*

Somewhat related to the standalone literature reviews are publications containing multiple case studies of intentional ICT4D initiatives, often with generalisations, conclusions and lessons learned (sometimes a euphemism for failure), underpinned by varying degrees of analysis and research, possibly from a particular perspective, such as poverty alleviation and enhancing livelihoods (e.g. Harris, 2004; McNamara, 2008). Such documents are usually commissioned by aid agencies or other institutes, (e.g. AusAID (Curtain, 2004), *infoDev* (a global development financing programme, hosted by the World Bank) (Batchelor, et al., 2003), One World South Asia (Garai & Shadrach, 2006), the Rockefeller Foundation (Dagron, 2001), UNDP (Dougherty, 2006) and UNESCO (Creech, et al. 2006; Slater & Tacchi, 2004)) or are of a more general nature (e.g. O'Neil, 2002; Gagliardone, 2005). There is considerable regurgitation, with several studies referring to the same cases, without adding additional information about any aspect of the initiative, let alone referring to previous literature on the same project. In later chapters, we return to and discuss anomalies in different publications covering the same projects (e.g. there are a few inconsistencies relating to use and users of the oft-cited studies dealing with Gyandoot in India, a project referred to several times in this thesis). Research on specific initiatives is rarely co-ordinated, leading to ad-hoc studies from which it is difficult to understand the dynamics leading to certain outcomes.

Some documents summarise projects funded under a specific scheme (e.g. Dougherty (2006) reporting on projects funded under the Pan-Asia ICT R&D Grants Programme). Others focus on specific themes, such as ICT for gender empowerment (KIT, 2005; Ramilo, 2003) or social change (Dagron, 2001).

Several studies incorporating multiple intentional projects deal with pilot shared access centres, focussing on a country or continent (e.g. De', 2006; Etta & Parvyn-Wamahiu, 2003; Harris & Rajora, 2006; Kuriyan & Toyama, 2007; Menou, Poepsel & Stoll, 2004; Parkinson, 2005). Many of these draw out key lessons, provide inventories of best practice, checklists, and/or recommendations (e.g. Amariles, et al., 2006; Batchelor, et al., 2003; Curtain, 2004; De', 2006; Phillip & Foote, 2007)

There is a large body of work on individual projects in the telecentre vein, dealing with monitoring and evaluation, a discipline of growing importance, further discussed in section 3.3.

Appendix B includes a summary of the main initiatives cited in this study. In-depth exploratory case studies tend to be in academic publications, whereas other studies are of a more descriptive nature, without much reference to research behind claims and conclusions. Shared access facilities in India have generated many case studies, through independent research and commissioned by respective project, including Akshaya (De', 2006; Kuriyan, Ray & Toyama, 2008; Madon, 2004), eChoupal (Annamalai & Rao, 2003; Kumar, 2004), SARI (Best & Kumar, 2008) and Gyandoot (Cecchini & Raina, 2004; CEG, 2002; Jafri, et al., 2002; Sreekumar, 2007; Tiwari, 2008). Studies from other countries include Sri Lanka (Harvey-Carter, 2009; Pringle & David, 2002), China (Soriano, 2007; Ulrich 2004), Nepal, (Pun, et al., 2006), Solomon Islands (Chand, et al., 2005), Peru and Venezuela (Gigler, 2008), Mexico (Huerta & Sandoval-Almazan, 2007), Chile (Kleine, 2009); Colombia (Parkinson & Lauzon, 2008; Parkinson & Ramirez, 2006) and Panama (Miller, 2004). Some studies have a specific focus, such as using telecentres to establish self-help projects or micro-businesses (Rhodes, 2009) or linking projects to wider policy issues, as Madon (2006) did in research on information technology (IT) based government reform in the Indian state of Gujarat.

Research on shared access facilities covers the spectrum from descriptive, narrative and anecdotal with doubtful substantiation, sometimes making assertions bordering on the promotional, to more interpretive, systematic and theoretically based, but most findings tend to be of a suggestive nature, whereas studies resulting in quantitative indicators are more common in surveys of private use of ICT.

Some studies endeavour to provide general measures of impact, such as statements about the percentage of people who obtained employment after completing a training programme. Attempts at measuring outcomes, such as increase in literacy, employment and/or consumer surplus, rarely have level statistical significance attached to findings or reference to what other factors might have contributed to actual or perceived changes (Sey & Fellows, 2009).

In concurrence with Heeks (2006), we found that theoretical frameworks from information and communication disciplines are more likely to inform material in academic publications than frameworks from development studies and that greater consistency in approaches to evaluating public access facilities would facilitate comparisons between different initiatives. This study responds to this gap, being informed primarily by the development discourse.

With individual ICT use of mobiles increasingly seen as an alternative to shared facilities with explicit development objectives (see section 2.1), research in this field is also relevant and is covered next.

3.1.4 Empirical studies – adoption and use by individuals and businesses

Themes in empirical studies of general (i.e. not associated with intentional projects) access and use among individuals and businesses include who has access, who uses what and level and purpose of use. Findings in those studies, some of which are summarised in section 3.1.5, improve understanding of demand drivers and are thus useful for operators (e.g. telcos and ISPs), as they extend their markets (McKemeey, et al., 2003; Zainudeen, Samarajiva & Abeysuriya, 2006) and as inputs to policy formulation.

Many of the early studies on economic and social issues on use of telephony in developing countries dealt with public call offices (PCOs) (Saunders, Warford & Wellenius, 1994). Later studies explored relationships between adoption of fixed or mobile telephony and socio-economic characteristics of households (e.g. Samarajiva & Zainudeen, 2008; Wang, 2006). Capturing user-based data in India, Mozambique and Tanzania to understand ICT needs, Souter, et al. (2005) is one of only a few multi-country, multi-technology studies assessing the impact of telecommunications on livelihoods of low-income communities.

Research trends have followed the growth of mobiles, for which there is a plethora of studies. In Africa, studies have dealt with characteristics influencing ownership among small enterprises in Nigeria (Adeoti & Adeoti, 2008), impact of mobiles among micro-businesses in the weaving sector in Nigeria (Jagun, Heeks & Whalley, 2008), mobile use among entrepreneurs in Rwanda (Donner, 2004, 2006), use of mobiles among traders in Ghana (Overå, 2006). In Asia, Zainudeen, Samarajiva & Abeysuriya (2006) illustrated strategic use of ICT among the poor and Donner (2007) explored the extent to which micro-entrepreneurs in Hyderabad used mobiles for customer acquisition. Studies of mobile use among micro-entrepreneurs in the fishing sector in Kerala have revealed how these have been used to overcome information asymmetries, reduce waste and improve safety at sea (Abrahams, 2007; Jensen, 2007).

There is also a reasonable volume of work dealing with different aspects and consequences of Internet use, primarily associated with privately operated telecentres, or Internet cafes (Akpan-Obong, 2010; Falch & Anyimadu, 2003; Griswold, McDonnell & McDonnell, 2006; Mwesige, 2004).

Research on e-government initiatives usually point to specific challenges faced when introduced in environments that are culturally and institutionally different to the settings for which the systems were designed, often in the developed world. Dealing with similar themes to those presented in the general IT literature (e.g. technology acceptance) this literature also

addresses specific difficulties faced in the developing world (Avgerou, 2009), such as tensions arising from the introduction of ICT in a resource constrained environment, with limited ICT literacy and insufficient attention to embedding local work practices in technologies (Mosse & Nielsen, 2004).

This concludes the presentation of categories into which we have segmented the literature relating to ICT4D and we now move on to describe salient findings from this literature with respect to impacts.

3.1.5 Key findings in the literature about ICT4D and its impacts

This section summarises what is actually known about ICT and its impacts, including from some of the studies cited in the preceding sections of this chapter. The term impact is often confused with output and outcome. With impact, we mean significant and preferably lasting changes, although the latter is impossible to verify without longitudinal studies, which, as addressed in section 5.2.1, are rare in the ICT4D field. One way of looking at impact studies is in the form of two interlinked streams, one of which focuses primarily on the relationships between ICT and a range of macro-economic indicators and the other on human development, dealing with issues related to ICT’s contribution to livelihood improvements, such as empowerment, disease prevention and better farming practices. The impact of these streams, can be static (i.e. non-recurring) and/or dynamic (Figure 1). Productivity improvements and reductions in transaction costs (e.g. associated with business-to-business e-commerce), would typically be static as savings tend to be one-off, only counting as an improvement after the initial implementation. Dynamic gains would emerge from the type of innovations that stimulate other innovations, through diffusion of knowledge. The dotted lines in Figure 1 indicate permeable boundaries and the shaded area is the focus of the conceptual framework for this study, but the literature review covers knowledge in all four cells.

	Economic development	Human development
Static	Savings in transaction costs Productivity improvements	Improvement in living standards
Dynamic	Economy stimulated by innovations, which in turn generate other innovations	Interactions along the CES virtuous spiral where the micro-meso-and macro environments adapt to support human development

Figure 1: ICT impact categories

We first summarise knowledge on ICT and economic factors, followed by its relationship with poverty and human development, consideration of relationships between ICT and inequality, unintended outcomes of ICT, factors affecting use and reasons for non-use of ICT. This leads to the section dealing with social and institutional context, before concluding with the concept of the infomediary.

3.1.5.1 ICT and economic development

Privatisation and deregulation saw the emergence of a wide body of macro-level literature on telecommunications and economic indicators, much of it demonstrating the benefits of these changes. This literature also deals with factors contributing to the diffusion of ICT. In addition to the general difficulty associated with attributing causality, one reason for the difficulty of disentangling causal relationships could be that the dramatic growth of the sector coincided with technological advances and widespread liberalisation, both of telecommunications regulation, transport and trade in general. In their review, predating the widespread use of mobiles and the Internet, Saunders, Warford & Wellenius (1994) argued that telecommunications could contribute to economic development in various ways: better market information, improved transport efficiency, more distributed economic development, reduction of isolation, increase in security and increased connectivity with international economic activity. More recently, Kim, Kelly & Raja (2010), pointed to sectoral studies suggesting positive relationships between ICT investments and gross domestic product (GDP) growth.

Several cross-country econometric analyses have posited positive relationships between diffusion of ICT and national economic development (Bedi, 1999; Canning & Pedroni, 1999; Forestier, Grace & Kenny, 2002; Röller & Waverman, 2001; Waverman, Meschi & Fuss, 2005). The World Bank (2009c) reported a 1.8% increase in economic growth for every 10% increase in broadband penetration in developing countries. A study of 27 developed and 66 developing countries (Clarke & Wallsten, 2006) found that a 1% increase in the number of Internet users correlated with an increase of 4.3% in exports in general and an increase in exports from low-income to high-income countries of 3.8%.

The direction of any causality, the lag involved, or the impacts on poverty reduction are not well understood (e.g. did economic conditions encourage the growth in ICT versus ICT being the driver). It is nevertheless widely recognised that the use of ICT is a requirement for economic and social development (Garai & Shadrach, 2006; McNamara, 2008; Proenza, Bastidas-Buch & Montero, 2001).

Using data on mobiles, some researchers have been more confident in declaring positive causality between use and economic growth. Drawing parallels between mobiles in developing economies and fixed telephony in developed economies in the 1970s and 1980s, Waverman, Meschi, & Fuss (2005) suggested the impact of mobiles on economic growth might be double in developing, compared with developed countries because of a “growth dividend” (p.11). For Bangladesh, Lane, et al. (2006), in a study commissioned by the GSM Association, estimated a 10% increase of mobile penetration to be associated with a 0.6% increase in the annual GDP growth rate, approximately double the effect on GDP growth compared to a developed economy. Balamoune-Lutz (2003) showed that increases in the use of mobile phones, the Internet and personal computers led to higher per capita income and found a positive relationship between mobiles and foreign direct investment (FDI). However, the causality direction of the association between ICT and FDI is not clear, with Gholami, Lee & Heshmati (2005) suggesting a causal relationship from ICT to FDI in developed countries in that a higher level of ICT investment leads to an increased inflow of FDI. Presenting partial evidence in developing countries of an opposite causality relationship (i.e. FDI causing further increases in ICT investment and production capacity), they suggested inflows of FDI generate new ICT investments that in turn facilitate improved production potential.

With respect to ICT and productivity, the “productivity paradox” (the inability of earlier studies to find a positive relationship between these factors in developed countries), was somewhat of an enigma. Later studies (e.g. Dedrick, Gurbaxani & Kraemer, 2003) refuted this paradox at both the firm and country level in developed countries. But studies have generally failed to refute it in the developing world (Dewan & Kraemer, 2000; Seo & Lee, 2006), possibly due to lack of advanced business practices, investments in human capital and infrastructure. Souter (2004) referred to the possibility that costs associated with adapting the workforce to new technologies may outweigh the returns likely to result from higher productivity. Esselaar, et al. (2007), however, found that ICTs are productive input factors that increase labour productivity for informal and formal small and medium enterprises (SMEs) in developing countries. This accords with the general thrust of those ICT4D studies pointing to considerable benefits associated with better market price information, reduction in downtime when equipment breaks down, timely delivery of products to markets and reductions in inventory (ADB, 2003; Whyte, 1999).

The issue of whether developing countries can use ICT to leapfrog economic development, as they did in moving from very low landline penetration levels to mobiles, is another issue subject to conflicting claims. While it has been argued that at least some of them may (Darley,

2003; Negroponte, 1998; UNICT, 2003; World Bank, 2000), Howard (2007) did not find much evidence supporting this phenomenon, possibly because technologies are moving rapidly in developed countries as well and it is difficult for poorer countries to keep pace. However, Souter (2004) argued that, due to economic structures, regulatory environments, low incomes and skill levels, developing nations may not be as well-equipped to take advantage of ICT's potential to stimulate growth, thereby falling further behind those countries, which are also benefiting more from rapid technological changes.

Some of the literature on cross-country studies has acted as signposts for deregulation and privatisation, with finger-pointing at regulatory environments and extolling the virtues of competition policy. These have been common themes in studies trying to explain country differences for various ICT indicators. Several studies in this genre conclude with policy recommendations, usually prescribing market liberalisation, even where other issues of greater importance might have emerged (Dasgupta, Lall & Wheeler, 2005; Liu & San, 2006; Quibria, et al., 2003).

The salient matter to note from the above is that while there are positive relationships between at least some economic factors and ICT at the macro-level, with a few exceptions (see 3.1.5.3), those studies do not explore impacts on social issues such as equality or regional and local implications at the meso- and micro-levels. Attention on the geographic meso-level (i.e. regions within a country), or urban and rural differences is scarce, with only limited research dealing with ICT at that level. Kenny (2001) pointed to evidence from Botswana and Zimbabwe showing that areas lacking telephone access had significantly less entrepreneurial activity than those with access.

It is at the micro-level, of greatest relevance for this study, one might best develop an understanding of the potential of ICT to improve business performance. Long before ICT became ubiquitous, Saunders, Warford & Wellenius (1994) found many businesses without their own access using PCOs for communication related to '*productive economic activity*' (p. 243). Reduction in transaction costs is often associated with ICT in developing countries (Norton, 1992), particularly among micro-enterprises (Duncombe, 2006; Duncombe & Heeks, 2002). Scattered evidence suggests ICT substitution for travel in the supply chain (Duncombe & Heeks, 2001), but other research found a mixed picture with only some journeys being substituted, as travel may fulfil other important functions (Souter et al., 2005; Overå, 2006). Reported benefits of mobiles include increase in trading speeds, cost reductions, geographic spread of micro-enterprise activity and reduction in information uncertainties when trading over larger geographic areas (Donner, 2004, Jagun, Heeks & Whalley, 2008).

There is no undisputed evidence on how ICT may affect supply chain structures (Bedi, 1999; Eggleston, Jensen & Zeckhauser, 2002), particularly changes in the role of intermediaries. It is argued that the erosion of information asymmetries benefiting intermediaries would increase the surplus, which farmers could invest in productive activities. While ICT has led to some disintermediation among farmers and micro-enterprises (Bayes, 2001; Bowonder, Gupta & Singh, 2003), there is also evidence pointing to ICTs fostering ongoing and even entrenchment of intermediation (Duncombe & Heeks, 2001; Overå, 2006; Jagun, Heeks & Whalley, 2008). Despite continued existence in the supply chain of intermediaries, the increased information symmetry may reduce the power of intermediaries, leading to better quality of decision-making (Bedi, 1999) and cost savings.

3.1.5.2 ICT, poverty reduction and human development

Despite the many studies undertaken in the ICT4D area since Ballantyne, Labelle & Rudgard (2000) noted the scarcity of documented examples showing how ICT can reduce poverty, there is still not much evidence to support that it has. Where ICTs are available, low-income communities use them, particularly where they can substitute for more expensive ways of performing certain tasks and they do not require significant new skills or resources, thereby potentially enhancing the delivery of mainstream development goals (e.g. Souter, 2004; LIRNEasia multi-year Teleuse@BOP studies). But the use in itself does not reduce poverty, despite the claim that ICT growth in general is pro-poor (Tiwari, 2008).

In the diversity of frameworks used in analysing the contribution of ICT to poverty reduction, findings indicate complex, rather than direct effects of ICTs. While there are claims and some evidence of ICT's constructive contribution to poverty reduction and livelihood enhancements (Chapman, Slaymaker & Young, 2002; Creech, et al., 2006; Dabla, 2004; Falch, 2004; Garai & Shadrach, 2006; Hongladarom, 2004; Hudson, 2006, Indjikian & Siegel, 2005; McNamara, 2003, 2008; Mwesige, 2004; Oyelaran-Oyeyinka & Lal, 2005; Papaioannou & Dimelis, 2007; Pitroda, 1993; Reilly & Gomez, 2001; Slater & Tacchi, 2004; Soriano, 2007; UNCTAD, 2003; UNDP, 2005; World Bank, 2006), there are also studies concluding that direct benefits of ICT for poverty reduction have been limited and disappointing (Duncombe, 2006; Chand, et al., 2005; Nielson & Heffernan, 2006). Many ICT4D projects and general ICT infrastructure have delivered improved communication, but this is more like an indirect contribution to development. The mixed results could reflect variations in implementation practices. Several governments that proclaim the benefits of using ICT to promote human development rarely translate such pronouncements into specific initiatives (UNDP, 2005). This is particularly the case when it comes to the deployment of infrastructure and provision of

appropriate applications, despite ambitious policies on universal access (Akpan, 2003; Bhuiyan, 2004; Gillwald, 2005).

From the perspective of human development and poverty reduction, it can nevertheless be concluded that ICT has in several ways been a useful instrument, but not everyone may have benefited, as discussed in the next section.

3.1.5.3 ICT and equality

Equality incorporates a multiplicity of variables reflecting human diversity (e.g. equality of income, opportunities and capabilities). Castells (1996) warned that because of the transformative effect of ICTs on society, the “information have-nots” risk being excluded from the information society. Others have echoed similar concerns (UNDP, 1999; Heeks, 2009), particularly for newer technologies, which may favour the more advantaged (Sciadas, 2005), thereby widening the “digital divide” a term denoting gaps between those with and without Internet access, whether due to differences in opportunity because of social, gender, age or other reasons (Dewan & Riggins, 2005; Rogers, 2001).

Like other infrastructures, ICT could exacerbate spatial inequalities (e.g. within and between countries, urban and rural areas and between different regions (Unwin, 2009)). Forestier, Grace & Kenny (2002) found that, telecommunication deployments had contributed to increasing inequality within countries, showing that those with high initial and high growth in teledensity had significantly higher income inequality increase. Contending this could be the result of deployments targeted at the wealthiest segments of society, they recommended concerted action to prevent the Internet becoming a force for income divergence. Uneven infrastructure deployments could particularly worsen inequalities and exclusion of rural communities (Chapman, Slaymaker & Young, 2004). Drawing attention to the uneven deployment of ICT4D initiatives in India, Garai & Shadrach (2006) noted a concentration of these in only ten states, with a strong bias towards the southern states.

Then there is the issue of relative benefits of ICT initiatives when available. Comparing two Chinese villages equipped with telecentres, Soriano (2007) found the average annual income had increased by almost 20% between 2000 and 2005 in the poorer and by 30% in the wealthier village. Only anecdotal evidence was provided to attribute this widening gap to ability to benefit from ICTs, but if true, this would illustrate an absolute improvement, but also an increase in inequality, resulting from deployment of ICT.

There is evidence suggesting those benefiting most from ICT — directly by adopting ICT and indirectly through its spillovers — are often relatively better-off, with higher education

levels (Alampay, 2006b; Cecchini & Scott, 2003; Dalvit, et al., 2007; Pigato, 2001; Wang, 2006). Noting that only the wealthier gained benefits from the use of ICT for income generation, Souter, et al. (2005) commented that use of telephones could contribute to greater economic disparity, as the economic value of the telephone disproportionately favoured the more educated and wealthier. While finding that benefits of mobiles associated with cost savings in comparison with alternatives such as postage and travel, were evenly distributed across socio-economic groups, they also noted that some respondents among the low-income earners considered the telephone to be more of an economic burden, despite their appreciation of its benefits. In Gujarat, the poorest group expressed a negative attitude toward the role of the phone in relation to economic activity.

Public access facilities may not be different in this respect, with many studies pointing to these being frequented mainly by younger male users, primarily those of higher socio-economic and educational status (Blattman, Jensen, & Roman, 2003; Cecchini, 2007; Gitta & Ikoja-Odongo, 2003; Khelladi, 2001; Jafri, et al., 2002; Kumar & Best, 2006a; Meera, Jhamtani, & Rao, 2004; Mwesige, 2004; Quibria, et al., 2003).

Structural constraints can limit the potentially beneficial influence of ICT projects, particularly for marginalised groups and ICT can become opportunities for the powerful to consolidate their power (Duncombe, 2006; Etta & Parvyn-Wamahiu, 2003; Gigler, 2008). One example is the oft-mentioned market price information, which mainly benefits those with access to credit, storage and transport to alternative markets (Best & Maclay, 2002; Curtain, 2004), an issue revisited in section 10.1.1.

There is not always consensus among researchers with respect to the impacts of a specific initiative. De' (2006) noted that the Bhoomi land registration system did not benefit tenant farmers, as it did not include records relevant for them. However, Garai & Shadrach (2006) had nothing but praise for this project, as they did for the eChoupal initiative, seeing only the positive side in the form of how it assisted farmers with merchandising their products. But, according to Annamalai & Rao (2003), eChoupal also had adverse effects, not only on intermediaries, but also for workers who had previously weighed and bagged produce. There were also segments of communities, particularly women, who did not have direct access to the benefits available through eChoupals.

Empirical studies have illustrated competitive advantages gained by micro-enterprises using mobiles (e.g. among the yam and onion traders in Ghana (Overå, 2006) and weavers of traditional garments in Nigeria (Jagun, Heeks & Whalley, 2008)). Weavers who did not have mobile access lost orders to those who had, as the authors put it: *'There were few signs, then, of*

mobile telephony levelling the playing field; and more signs that it had been a technology of inequality' (p.62). Inequality can thus increase as small businesses reduce their ability to compete if unable to afford the ICTs used by others in their sector. The question is whether advantages gained by early adopters are of a temporary nature on the route to more universal access, or whether they can use ICT to entrench their competitive position, rendering ICTs unaffordable for the others.

Other studies on mobiles, among them one sponsored by the GSM-Association (Lane, et al., 2006), drew different conclusions in finding that the poorest citizens in Bangladesh benefited most and that mobile services improved social cohesion and access to healthcare and could facilitate overall improvements in users' quality of life. An earlier study on Grameenphone in Bangladesh (Bayes, von Braun & Akhter, 1999) also found greater benefits for the poor, estimating their consumer surplus, derived from opportunity costs, to be 50% higher than for others, without explaining the reasons.

Similar to other tools and resources, ICTs can be appropriated by the powerful and well-resourced, sometimes at the expense of those who are deprived, but this does not in any way imply that ICT is inherently a zero-sum game. In the absence of sufficient empirical evidence on the circumstances under which ICTs lead to inequalities, this area, as suggested by van Dijk & Hacker (2003) would have to be subject to further research to improve understanding of inequalities, whether related to socio-economic status, gender, age, ethnicity or geographic location.

This section has not addressed inequality associated with ICT from a gender perspective, as this is dealt with in section 9.4, in the context of discussing findings from the iREACH field research. Further discussion on equality related to ICT4D projects in general and iREACH in particular is included in section 9.6. With this basic understanding of potentially negative impacts of ICT on equality, we now turn to the question of other unintended consequences of ICT.

3.1.5.4 Other unintended and unanticipated outcomes

Identifying ignorance and error as the two most common causes of unanticipated consequences, Merton (1936) defined the third as '*imperious immediacy of interest*' (p.901), the situation where the intended consequence of an action is so eagerly anticipated that potential unintended effects are ignored. When writing about the importance of anticipating predictable unintended consequences, Sen (2001) implied mainly negative consequences. The contextual nature of ICT may inhibit the anticipation of negative outcomes (Batchelor & Norrish, 2005; Sein &

Harindranath, 2004), as was the case with the Bhoomi system, used by land speculators to identify farmers unable to afford land taxes and then offered to buy their land cheaply. Noir & Walsham (2007) identified negative outcomes in an ICT project in India's public healthcare sector that could easily have led to the conclusion that it had been unsuccessful. They also noticed positive impacts, not directly linked to project objectives, including empowerment and social mobility of rural Indian women, generated by their computer literacy. With growing empirical evidence of unintended benefits positively impacting social and economic development, they argued that metrics for success should be extended to incorporate unintended outcomes. Another positive unanticipated innovation was a local entrepreneur in Botswana, who produced, bought and sold ring-tones for mobile phones, paying royalties to local musicians producing the tones (Urbach, 2007).

A project unable to proceed due to technology failure (Hudson, 1999) is an easily identifiable negative unintended consequence, posing challenges for impact evaluations. An even greater challenge may be to capture positive unanticipated outcomes, possibly because these may only emerge in evaluation frameworks that make room for them, which is often not the case (see section 3.3). iREACH experienced both positive and negative unintended outcomes, the former were the different ways in which it had contributed to the communities and the latter in the form of technical problems, which acted as barriers to use, a topic presented below from a more general perspective.

3.1.5.5 Barriers to ICT use

With ICT becoming a prerequisite for participating in society, understanding reasons behind and implications of non-use is important and this has been covered in the six-country longitudinal LIRNEasia "Teleuse@BOP" studies (2005-2011). Several studies have analysed users of Internet facilities with respect to socio-economic attributes, but less information is available on non-use and non-users among potential users.

Barriers to ICT use can stem from social and institutional structures (Gigler, 2008; Mansell, 2004), manifested in lack of affordability and relevant content, language issues, low functional literacy, attitudes, culture, lack of time and/or lack of interest (Chand, et al., 2005; Kuriyan & Kitner, 2009; Moyi, 2003; Parkinson & Lauzon, 2008; Tiwari, 2008; van Dijk & Hacker, 2003; Warren, 2007). For public access facilities, inappropriate design, content and services, lack of privacy, long waiting times and inadequate network quality can inhibit use (Ballantyne, 2004; McKemey, et al., 2003; Miller, 2004).

In exploring issues that marginalised populations faced at telecentres in Mexico, Huerta & Sandoval-Almazan (2007) found low skill levels in three related abilities: branching or navigation to find information, analysis and synthesis and quality assessment of the information. They also noted that the slow Internet speeds and lack of English language skills impeded efficient use. Bailey (2009) suggested men with low literacy skills were particularly deterred from using such centres, feeling stigmatised by not being able to read well.

Location of ICT facilities, whether related to distance, type of building (e.g. government office), or character of area (e.g. caste), has featured as a factor influencing the level of use (Chand et al., 2005; De', 2006; Jafri, et al., 2002; Kumar & Best, 2006a; Nnadi & Gurstein, 2007; Slater & Tacchi, 2004). Distance may particularly affect women, who, as pointed out by Hafkin (2003), are less mobile due to heavy workloads, access to transport and ability to leave their homes. Safety and security, especially when travelling after dark, are other concerns (Etta & Parvyn-Wamahiu, 2003; Huyer, et al., 2005). Regarding location types, Bayes, von Braun & Akhter (1999) discerned that, while better-off villagers would come to a poorer woman's house to use a Grameenphone, the reverse did not occur. This is how a woman expressed discomfort of entering a Philippine telecentre:

'... only prominent people in the community entered the Telecentre. Simple farmers, vendors, drivers would not feel at ease going inside the barangay hall. Much less in an airconditioned telecentre inside the barangay hall with computers and all the air of technological sophistication alien to the rural folks' (Ramilo, 2003, p.35).

A South African manager explained the reason for moving a telecentre from the local library to an independent location:

'...the library location was not appropriate because it appeared to the community as an official or government site. People were intimidated by the library and what it means; they think it is for "intellectual people' (Esme Modisane, telecentre manager, quote from Phillip & Foote, 2007, p.24. Originally from another source).

Some past users may cease using ICT4D facilities, e.g. due to unrealised expectations, as in the case of an indigenous Ashaninka telecentre in Peru, which community members wanted to use for selling their products in Lima, but this, according to Gigler (2008), did not eventuate. Unrealised expectations could also be the reason for the fall in usage by carpenters at a telecentre in a remote area of Chile (Kleine, 2009).

Our field research findings will contribute in a small way to additional knowledge about reasons for non-use, answering calls for greater understanding of this issue (Souter, et al., 2005;

Selwyn, 2003). As shown in section 7.4.7, iREACH faced similar issues to those covered in this section and they were in large part associated with the social and institutional context.

3.1.5.6 Social and institutional context

Communities interact in different ways with ICT4D initiatives, often reflecting cultural and social norms and assumptions relating to the underlying project design (Avgerou, 2000; Nnadi & Gurstein, 2007; Parkinson & Ramirez, 2006; Puri & Sahay, 2003). Unable to find a direct relationship between ICT and enhanced well-being, Gigler (2008) concluded this is '*shaped by a dynamic, multi-dimensional interrelationship between technology and social context*' (p.2464). Contrasting the success of an indigenous project built on traditional structures in Venezuela with the Ashaninka initiative, he noted that the latter bypassed these, giving rise to a range of problems. In a similar vein, Puri & Sahay (2003) attributed the relative success of the Anantapur geographic information system (GIS) in Andhra Pradesh to effective institutions that promoted decentralised decision-making and local practices. The eChoupal project, another initiative built around an institutional context, in this case an agriculture supply chain, created a system addressing what many considered exploitation of farmers. Its design took into account constraints in the physical and social environments, blending stakeholder value creation with social development through short-term Internet access and longer-term

development (Annamalai & Rao, 2003). Avgerou (2000) illustrated that it was the social environment, rather than any technological rationality that rendered unsuccessful an attempt in Cyprus at using ICT to emulate an Italian model for rationalising furniture production.

As a social environment is not static, disadvantage, such as low literacy, can at least partially be overcome through appropriate design, including the use of intermediaries, as was the case at iREACH. The ICT4D literature has recognised the value of intermediaries, sometimes referred to as infomediaries, the subject of the next section.

3.1.5.7 Infomediaries

When exploring variations in results from different studies, some commentators have identified the role of infomediaries, which have emerged as key players in some assessments of how ICT4D projects can be more effective (Cecchini & Scott, 2003; Gigler, 2008; Gurstein, 2003; Ramirez, 2001, Schilderman, 2002). Whereas well-informed residents typically have access to several key informants, others may find it easier to obtain information from an infomediary, who can gather relevant information from different sources to assist with the complex and multifaceted nature of poverty (Schilderman, 2002). Infomediaries can also be proactive,

identifying and facilitating access to appropriate services for local needs, support local content generation and training. Without discounting the vital role played by social linkages, Duncombe & Heeks (2001) considered commercial infomediaries to information to be more useful for small enterprises.

Infomediaries have been involved from the implementation into the operational phases (Aral, Escobari & Nishina, 2001; Best & Kumar, 2008; Meera, Jhamtani & Rao, 2004), as was the case with iREACH. UNDP (2001a) pointed to research showing the most effective intermediaries had links to communities they served, with infomediary functions often provided by staff and users at telecentres (Bailey, 2009; Soriano, 2007), encouraging use, finding information and advising community members on productive use of information. Children act as infomediaries when obtaining information for their parents (Ulrich, 2004). A closely related concept is a “champion”, someone who can get things done and this often requires intermediation between users and external organisations (Madon, 2006; Roman & Colle, 2002; Talyarkhan, Grimshaw & Lowe, 2005).

Acknowledging the importance of local intermediaries, Rajalekshmi (2007), suggested the literature on telecentres progress from this point to explore the construct of trust, particularly with respect to e-government services at the local level, focussing on the institutional membership of the intermediary, as issues such as credibility and accreditation are critical. For example, trust may be lacking where someone not associated with the health system provides health information.

The literature dealing with infomediaries has not sufficiently addressed the dependence these might create for users and associated impact on empowerment. This issue is of relevance to iREACH, where many users relied on community facilitators (CFs), but this was not raised as a concern during the field research.

This completes the components of the literature review dealing with attempts at understanding the impacts of ICT4D initiatives. A segment of the ICT4D literature dealing with knowledge of a more “objective” nature about ICT in developing nations is addressed next.

3.1.6 Measurements and indices relating to ICTs

A tool for unentangling complex issues, indicators are particularly useful for analysing direction and magnitude of change in longitudinal studies and much effort has gone into the development of ICT related indicators (Sciadas, 2005). The WSIS (2003) Geneva Plan of Action (para 28) called for qualitative and quantitative international performance evaluations through statistical

indicators for measuring its objectives. Cynically, Menou & Taylor (2006) recalled similar calls from the 1960s. While there has been much progress with national quantitative measures, it has been slower on the qualitative side.

Various UN agencies publish regular ICT-related indices: ITU's (2010a) ICT Development Index (IDI), UNDP's Technology Achievement Index (TAI), the ITU/UNCTAD (2007) Digital Opportunity Index (DOI) and the UN's (2008) e-Readiness index. These composite indices combine data in standardised ways, thereby providing historical statistical measures. The IDI incorporates indicators for ICT infrastructure, access, use (primarily by individuals) and ICT skills, whereas the UNDP's TAI captures how well a country creates and diffuses technology and builds human skills. Designed to reflect a country's capacity to participate in technological innovations, the TAI focuses on achievements (Desai, et al., 2002). Although it also incorporates some of the statistics included in other indices (e.g. statistics on fixed lines, cellular subscribers and Internet users), it extends beyond these by incorporating statistics on patents, royalties and licence fees, research and development expenditures and number of researchers. The World Economic Forum has also contributed in this area by publishing the Networked Readiness Index (NRI), which measures the extent to which developed and developing countries leverage ICT for enhanced competitiveness (WEF, 2010). The World Bank (2009c) also publishes key indicators on ICT.

While such country-level data are of significant value in painting a picture of the macro-environment, as we do with respect to iREACH's in section 7.2.2 they tend to lose detail in the aggregation. Despite a recognition of the importance of looking beyond country averages (UNDP, 2003), meso-level, or intra-country measurements are often not available, in the public domain anyway. This is also the case for the micro-level, making it difficult to gain insights into the impact of ICTs on individual communities (Hafkin, 2003). But indicators related to access and use provide only one side of the equation, with information on financial aspects constituting the other, and as indicated in the next section, knowledge on this aspect is in even shorter supply.

3.1.7 Technologies, financial and cost-benefit analyses

Turning now to the other side of the balance sheet, technologies and associated financial aspects, literature dealing with these is relevant to policy-makers and funders, but is thin on the ground, particularly costings, which is covered after a brief discussion on technologies, an important consideration in dealing with costs.

3.1.7.1 Infrastructure and technologies

Despite a tendency among development agencies to '*rush to the high end*' (Marker, McNamara & Wallace, 2002, p. 24), several studies, including LIRNEasia's Teleuse@BOP series, have shown that mature technologies have been very effective in meeting the needs of poor people. Sharing these views, Kenny (2002) contended that telephony and radio had higher benefit/cost ratios and lower overall costs compared to Internet and would therefore be more appropriate for poverty alleviation, pointing particularly to Internet's language barriers and rapid obsolescence. Radio, community radio (CR) in particular, is a well-established tool for development, with studies in diverse environments showing this to be a major source of information and communication for both genders (Beardon, et al., 2004; Dagon, 2001; Parkinson, 2005). CR has also performed important functions for early warning disaster prevention systems and for facilitating reconstruction after disasters (AMARC, 2007; Wattegama, 2007).

Against this stand the benefits of the Internet, with applications such as Voice over Internet Protocol (VoIP), audio and video-streaming and automated translations that can overcome some language barriers. These benefits also come with a high price tag, both in terms of costs and complexity, resulting in higher risks of failure.

Several ICT4D projects have suffered from infrastructure problems (e.g. power outages, obsolete computers, the cost and quality of Internet connectivity, lack of technical support, inadequate documentation (Ballantyne, 2004; Best & Kumar, 2008; Buré, 2006; Cecchini & Raina, 2004; CEG, 2002; Parkinson & Lauzon, 2008)) and theft of copper cabling (Batchelor, et al., 2003). Although with remote monitoring, it is easier to maintain complex systems (Cecchini, 2007).

Commercially provided cellular systems, deployed in many rural areas previously unserved, through innovative and flexible pricing and payment schemes, have become accessible even for poorer segments of society (Overå, 2006). Accessibility has increased through shared mobiles, as pioneered by Grameenphone. SMS has proved attractive, particularly applications accessible for those with low literacy levels (Beardon, 2009). As discussed in the introduction and the concluding remarks, mobiles are eclipsing investments in telecentre type ICT, with potential consequences beyond the technological sphere.

With technologies complementing each other in the dynamic environments created through technological convergence, it is no longer a matter of choosing between technologies, as exemplified in UNESCO's combination of Internet and CR (Creech, et al., 2006). Technological choices are often constrained by regulatory environments than technologies, as was the case for

iREACH with respect to CR. Obstacles to promoting infrastructure development can often be attributed to policies that do not adequately consider the scope of new technologies or limit them through artificial restrictions (e.g. on VoIP (UNCTAD, 2008)), as experienced by iREACH regarding its plans to offer offer VoIP. These restrictions impacted not only iREACH's ability to fulfil its role in offering services benefiting villagers, but also its financial sustainability, an issue addressed in the next section.

3.1.7.2 Costs and cost-benefit analyses

The dearth of literature dealing with financial analysis of ICT4D initiatives probably reflects the absence of such knowledge, even among those responsible for such projects (Creech, et al., 2006). The scant attention of research on costs is particularly problematic for operational and other recurring expenses, as these are the ones that affect sustainability (Unwin, 2009). The literature contains a few cost themes, including project financial analyses, approaches to costing, cost comparisons between different technologies and cost-benefit analyses for individuals and businesses of using ICT (CEG, 2002; Kumar, 2004; Richardson, Ramirez & Haq, 2000).

Some studies have examined financial sustainability of Indian telecentre projects (Kumar, 2004; Kuriyan, Ray & Toyama, 2008; Madon, 2005). Kumar's (2004) analysis of eChoupals in India is one of the more comprehensive, incorporating triangulation and validation of cost and benefit estimates, assumptions on discount rates and sensitivity analysis in estimating pay-back periods. Other studies have focussed on specific aspects (e.g. cost comparisons between rural and urban areas (Shakeel, et al., 2001), cost effectiveness of different telecentre size ranges (Khelladi, 2001) and lists of cost items and potential revenue sources for telecentres (Whyte, 1999)). Going a few steps further, Goussal (1998) and Lochner (2005) discussed methods for financial analysis of projects, the latter promoting use of total cost of ownership (TCO), as up front investments in telecentres tend to represent only 5-20% of TCO. It is surprising that so little attention has been paid to TCO when considering the inability of telecentres to allocate funds for equipment depreciation, let alone generate revenue to repay the initial capital (Caspary & O'Connor, 2003).

On the other side of the equation is revenue and other tangible and intangible benefits (e.g. consumer surplus). Some older studies (e.g. Saunders, Warford & Wellenius, 1994) summarised results from research mainly in the form of consumer surplus, measuring how much ICT users gain, compared to alternative means of performing similar functions, such as travel. Richardson, Ramirez & Haq (2000) took a similar approach in their study of Grameenphone. While more

recent literature contains frequent references to benefits, particularly in the form of reduced travel time and associated transaction costs (Jagun, Heeks & Whalley, 2008; Lobu & Balakrishnan, 2002; Obayelu & Ogunlade, 2006), it is rare for these or more intangible social benefits to be quantified. One exception is Ulrich's (2004) study of telecentres in China, in which he quantified the average annual benefit per household to be USD 38.

Studies of Bhoomi (Lobo & Balakrishnan, 2002; World Bank, 2009c) have incorporated a more unconventional element on the positive side of the balance sheet — savings resulting from reduced corruption. In some cases, non-users might also benefit from ICT4D systems, through some form of spillover effect, but it is even more difficult to quantify these benefits.

As many ICT4D initiatives tend to be some form of social enterprises with broader than financial objectives, the indicators relied on by commercial enterprises to assess performance (e.g. return on investment) would be inadequate for such initiatives. Social return on investment (SROI), would be more appropriate, requiring some form of estimate of the magnitude of benefits, but the literature does not offer much guidance in this direction (Sey & Fellows, 2009). Furthermore, the methodological diversity in estimating benefits displays signs of similar symptoms as the general ICT4D literature — lack of common frameworks that might enable comparisons across time and place.

While a cost/benefit analysis is beyond the scope of this study, this activity is so critical for justifying further investments in shared access facilities that one of the recommendations flowing from this study suggests a system, through which analyses of this nature could be conducted on a larger scale, using a common format (section 11.8.3). The greatest challenge would be to estimate intangible benefits from a human development perspective, but necessary for policy-makers, donors and for input into the discourse on the concept of ICT4D, which, as will be seen in the next and final sections in the ICT4D literature review, is questioned in some quarters.

3.1.8 Critique of ICT4D

Stepping away from what might appear an ICT hyperbole and those who extol only the benefits of ICT4D, voices critical about activities in this field found an unexpected ally in Bill Gates when he declared: *'the world's poorest two billion people desperately need healthcare, not laptops'* (Helmore & McKie, 2000). Unlike many others who have adopted a contrarian stand to the ICT4D enthusiasm, the Bill and Melinda Gates Foundation has supported initiatives incorporating an ICT element.

The contrarian view ranges from those questioning whether ICT4D should be a priority on the basis that there are more urgent and basic needs of the poor to the post-modernist development perspective, which after deconstructing ICT4D with fervour concluded that it brings more dangers than benefits (Escobar, 1995). Rather than treating it as just an innocent fad or a waste of resources, allegations have pointed to ICT4D as an attempt to revive the modernisation theory, with its focus on technology transfer and economic growth (Castells, 1996; Wade, 2002). Others see it as a way of strengthening developed countries (Sein & Harindranath, 2004) and promoting the interests of donors, service providers, hardware and software vendors (Kleine & Unwin, 2009). While there is near-consensus among practitioners in the development field about the potential benefits of ICT4D (Souter, 2007), the critique of it as a phenomenon, rather than specific practices, has emanated primarily from academia, probably in response to active involvement by organisations with vested interests (e.g. equipment vendors). Some organisations have promoted ICT4D in ways that could be interpreted as self-interest. For example, in formulating its strategy for entering this area, the Asia Development Bank (ADB, 2003) pondered how to ‘*move quickly and credibly in developing ICT applications and promoting their extensive use*’ (p.5), a not-too-subtle hint of top-down technology transfer, suggesting it could initiate ICT applications for the development of rural and disadvantaged areas: ‘*in partnership with the private sector and/or other funding agencies*’(p.27). Did this enthusiasm for ICT4D, which made no reference to engagement with communities or other demand side considerations, reflect self-interest, or the more innocent ‘*extension of the institutional myth of technology*’ (Noir & Walsham, 2007, p. 14)? Or, perhaps, a bit of both?

Similarly, it was the G8, rather than developing countries, that formulated the Okinawa Charter, stressing the importance of ICT use to facilitate social development, good governance and pro-poor growth. Such bias in favour of the supply side, with insufficient balance toward the demand side, could, at least partially, explain the many ICT4D failures (Sreekumar & Rivera-Sánchez, 2008; Unwin, 2009). Without advocating modernisation theory from a philosophical angle, many ICT4D enthusiasts, often with a technical and/or industry background, have tended to over-estimate ICT’s potential (Heeks, 2009) in literature produced or co-produced with industry players and published in academic journals by employees of corporations and other organisations and through other channels (e.g. Lane, et al., 2006; Intel, 2009). The often self-congratulatory and promotional nature of material produced by the aid sector has also contributed to the cynicism.

Without ignoring the potential of ICT to be the harbinger of undesirable social outcomes, others (Obijiofor, 2009; Schech, 2002) have suggested that such unintended negative

consequences be balanced against ICTs potential as a tool for positive development, including protection and promotion of local cultures.

ICT4D sceptics can point to many inadequately conceived and implemented projects, questioning what sense they have made to the local population (Arunachalam, 2002; Caspary & O'Connor, 2003; Wade, 2002). Analysing telecentres from a post-colonial perspective, Bailur (2008a) expressed similar sentiments, referring to them as an imposition from the centre on the periphery, including a top-down imposition of participation, leading her to question whether it is possible for the “beneficiaries” to speak of the benefits of a telecentre and by implication, whether it is therefore possible for others to know the impacts of these. The research results in this study indicate that it is possible to understand at least contributions made by such centres.

This discourse is reminiscent of the utopian and dystopian images of computers in their early days and debates contrasting the ability of ICT to enrich lives against the potentially oppressive use of personal data. This conversation about ICT continues (Feenberg, 2009), and whatever the verdict, if any, both views are beneficial in the search for real possibilities, balancing the enthusiasm for ICT4D with critical reflection. Useful as the critique of the ICT4D in general might be, it is not convincing as a corrective to the exuberance of the other extreme, particularly as it has not examined closely empirical studies to understand nuances.

Unlike those strident critics of ICT4D, who see activities in this area as an imposed exogenous force, we view ICT4D as a tool, but learn from constructive insights in the critique. It is in the search for possibilities that our research is situated, with emphasis on *‘equity, social development, and the need for a broader conception of the potential of the new media’* (Mansell, 2002, p.417), implying more concentration on overcoming obstacles related to physical infrastructure, education, literacy, content and language (Warschauer, 2002). This would require greater attention to the “D” in ICT4D studies (Hedström & Grönlund, 2008; Heeks, 2006) and we start this process with a brief overview of the development discourse.

3.2. Development Discourse

This section outlines some of the salient debates that have featured in the development literature to trace the evolution towards the capability approach, the conceptual framework informing this research.

A contested concept, development is often associated with the imposition of western cultural values, economic structures and institutions, whether in mainstream practice or in the critical discourse. There have been several stages, most emanating from the developed world, in the tortuous path of development practice and its associated aid disbursement policies and in the

theoretical discourse attempting to understand the concept of development (Unwin, 2004). Some of these overlapped in focus, theme and time, so any summary represents a simplification. Heeks (2005) identified three stages: focus on the state until the 1970s, on the private sector in the following two decades and then on civil society from the 2000s. During most of this time, the mainstream development community measured progress in terms of macro-economic indicators, such as GDP.

Making western '*scientific advances and industrial progress available for the improvement and growth of underdeveloped areas*', as proclaimed by President Truman (1949) in his inaugural address, became a hallmark for development. This mindset, sometimes known as the modernisation theory, spawned a new branch of economics, the field of "development economics", concerned with questions of economic growth (Escobar, 1995). Rostow's (1971) stages of growth model, starting from "traditional" societies transiting through pre-condition for take-off, take-off and maturity before landing in the age of high mass-consumption, is a good illustration of this way of thinking about how poor economies could develop, using experiences of industrialised countries as a blueprint. The difference between what Rostow termed traditional and modern societies was reduced to a question of the relationship between investment rate and population increase. During the take-off period, economies would use the surplus from export of natural resources to finance the import of capital equipment and service foreign debt. With its focus on economic development, the modernisation theory did not devote much attention to human development (Clark, 2002). Neither did it entail much hope for the subsistence sector, which because of its perceived inability to improve productivity, was considered only to passively contribute to economic development by supplying resources until the agriculture sector was overtaken by more efficient operators (Ellis & Biggs, 2001).

Criticisms of the modernisation theory started surfacing from the late 1960s. A major source of opposition was the dependency theorists, who considered this theory '*a purely mechanical, automatic, and manipulating type*' with '*the center of decision for change not in the area undergoing transformation but outside it*' (Freire, 1974, p.129). To remedy the stagnation at the periphery (i.e. formerly colonised countries), which according to the dependency theorists was caused by their integration into global capitalism, several developing countries adopted import-substitution policies (Escobar, 1995). The influence of this movement continued until the early 1980s, when it was realised that these policies did not necessarily benefit the poor (e.g. a 1978 evaluation of the Indian Council of Scientific and Industrial Research found that it had not designed technologies to meet actual needs (Pulamte & Abrol, 2003)). Similar to the

modernisation approach, the elites could benefit from programmes informed by dependency theory.

From the early 1970s, there was widespread acknowledgement, even from the World Bank (McNamara, 1973), that economic growth could hide income disparities and calls grew louder for more attention to reduction in unemployment and increasing the income of the poor. Realising that modernisation policies had not reduced poverty, attention turned to other paradigms, including “basic needs” and “poverty-focussed aid”, as illustrated by the adoption in 1976 by the International Labour Organization of the Declaration of Principles and Program of Action for a Basic Needs Strategy of Development (Akpan, 2003, p. 265).

Community participation in addressing issues and setting objectives holistically, replaced some of the conventional top-down approaches (Gardner & Lewis, 1996). Also reflecting a more holistic approach, were the national food strategies developed from the 1970s and into the 1980s, covering a range of areas associated with health and nutrition (Escobar, 1995).

From the 1980s, approaches based on classical and neo-classical economic theories of growth, as prescribed by the Chicago School of economics (Standing, 2000), became dominant in influencing policies in the developed and developing worlds alike. The role of the state was relegated to the creation of enabling environments for competitive markets, rather than intervention in the production process directly. Regulatory frameworks, combined with privatisation of state-owned enterprises became the focus of attention under the assumption that such restructuring would promote growth through increased efficiencies and liberate countries from what neo-classical adherents considered distortions from inefficient state bureaucracies. The World Bank, regional development banks and the International Monetary Fund (IMF), became major players in this evolution (Escobar, 1995), known as the Washington Consensus (Gore, 2000) and which assumed that consumers would be able to effect change through “consumer choice”, but without guidance on governance procedures to achieve this (Tandler, 1997). In this process, the telecommunications sector, which until then in many countries operated as a monopoly consisting mainly of state-owned operators, became subject to competition and privatisation.

Parallel with this neo-classical paradigm, there was a stream promoting a move from top-down approaches to participation and empowerment through involvement at the local level (Chambers, 1983; Gardner & Lewis, 1996; Kumar & Corbridge, 2002). Proponents of the neo-liberal school soon realised efficiencies arising from participation by local people in development projects (Bhatnagar & Williams, 1992; Fine, 1999) and terms such as

empowerment and social capital came to the fore even in Washington Consensus circles, such as the World Bank's "Voices of the Poor" reports (Narayan, et al., 2000).

This local involvement was often through stakeholder participation, of which civil society played a vital part (Puri & Sahay, 2007). The conception of people as passive recipients, or beneficiaries, gave way to terms such as partners. Numerous overlapping and interrelated approaches, strategies and theories of development made inroads (Boateng, et al., 2008), among them the sustainable livelihoods framework (DFID, 1999); the theme of sustainability having been introduced into the mainstream development discourse through the Brundtland report (WCED, 1987). The rights-to-development approach (UN, 1986) promotes human rights by analysing inequalities and redressing discriminatory practices (UN, 2006) and also links participation with human rights, by endorsing:

'the right to development is an inalienable human right, of which every human being and all peoples are entitled to participate in, contribute to and enjoy economic, social, cultural and political development in which all human rights and freedoms can be fully realized' (UN, 1986, Article 1, paragraph 1).

As part of this process, poverty alleviation, previously espoused by many NGOs, captured the interest of mainstream development agencies and schemes such as micro-finance and integrated development programmes were implemented in addressing concerns that aid should be directed at those most in need. This gave rise to a new vocabulary, with words such as "pro-poor" (Pernia, 2003; Sumner, 2004), where "poor" extends beyond a focus on incomes to incorporate other forms of deprivation (Chambers, 1995).

The increasing evidence that economic growth does not necessarily lead to poverty reduction stimulated the development of indicators of a more multi-dimensional nature that could act as proxies for human well-being, the most well-known of which is the Human Development Index (HDI) and other indicators contained in UNDP's annual Human Development Reports (HDRs), published since 1990, most recently the Multi-dimensional Poverty Index (UNDP, 2010). Drawing on the work of Amartya Sen, these indicators and the reports marked a shift in focus from the economy to people. Initially part of the counter-discourse against the Washington Consensus, human development took a leading role in promoting alternatives, but was joined later by this "consensus" (Clark, 2002; McNeill, 2007), whether for real is an open question.

The Millennium Development Goals (MDGs), adopted by the United Nations in 2000 as the key development targets for the first part of the 21st century, which address deprivation in several domains: income, food security, literacy, life expectancy, health, water quality, gender

equality and environmental sustainability, also reflect a multi-dimensional perspective. A core message of this compact is that many of the poorest countries and regions face structural impediments, making it difficult for them to achieve sustained economic growth (UNDP, 2003). Post 2001, security became another ingredient in some development aid programmes, as epitomised in the Australian White paper on aid: *‘And at the same time, we will advance our neighbours’ and our own national interest by promoting a secure and prosperous region’* (AusAID, 2006, p.vii). The Australian government defined the key challenges facing Asia as sustaining growth and managing threats, emphasising the importance of basic infrastructure assets, but in the context of improved market access rather than human development (AusAID, 2006). Governance and accountability have become other catchphrases in the development discourse.

Different development paradigms have been subject to more extreme forms of critique by deconstructionist and post-development theorists, at the margin of the development discourse. Conceptualising poverty and deprivation as a western construct, development is considered a mechanism through which the economic rationality of the west is extended to the Third World. As an alternative, they often glamorise “the local”, while ignoring inequalities and oppression taking place at that level and the critical role played by other levels in society both in contributing to and alleviating poverty. Unlike critique of specific development models, the post-development discourse has not really influenced development policy or practice.

We situate this study in the discourse of constructive critique of development policies, among those considering that too high a price was paid for uncritical acceptance of neo-classical theory (North, 1990; Unwin, 2007) and those calling for greater emphasis on distributive justice (Standing, 2000). Such constructive critique and the CA have informed this thesis. A philosophy for thinking about development and designing policies, the CA can also provide frameworks for evaluations, to the last topic in the literature review.

3.3 Project evaluation

Evaluations are tools for understanding how interventions can construct pathways out of poverty, inform decision-makers and hold organisations to account. Following an overview of the evaluation discipline, this section summarises ICT4D project evaluations and concludes with defining knowledge gaps.

3.3.1 *The field of evaluation*

‘Not everything that can be counted counts, and not everything that counts can be counted’ (attributed to Albert Einstein).

This quote illustrates tensions that often arise between quantitative and qualitative evaluations, similar to frictions between these approaches in general social science research. Early discussions on evaluation research, driven by methodological concerns about how to measure impacts, later gave way to more fundamental questions of a theoretical nature (Stame, 2004). The consensus view seems to be that the appropriate methodology is informed by what is being evaluated, which in turn is a function of its purpose.

Evaluations are complex operations, often requiring consideration of several quantifiable and non-quantifiable factors. Quantitative evaluations founded in the epistemological tradition of positivism have firm rules of evidence, providing what is considered objective facts. There are no equivalent rules in non-positivist approaches, such as the constructivist, interpretive and critical perspectives. Knowledge produced from these paradigms is not defined as facts, but rather as understanding *‘created through an interactive process that includes the evaluator (so much for objectivity) and the many stakeholders that are put at some risk by the evaluation’* (Guba & Lincoln, 1989. p.8).

Evaluations can serve several purposes, e.g. recognise benefits, appraise value and measure success (Guba & Lincoln, 1989; Stockdale & Standing, 2006). A common reason for undertaking evaluations is to learn from the past to improve the future. Often conducted by external parties, evaluations can bring different perspectives to policy-makers and practitioners, facilitating their decision-making through improved understanding of possible implications (Sampson, 2007). With sufficient rigour and consistency, evaluations can support stakeholders with *‘local learning’* (Clements, Chianca & Sasaki, 2008, p. 207), creating value by enhancing the effectiveness of various initiatives. An interesting and unusual perspective on evaluations was offered by Nagao (1997) who considered them useful for promoting *‘diversity of views in the society’* (p.167).

There is a plethora of approaches to and categories of evaluation, which can be primarily intended for stakeholder use, or more like audits (Patton, 1997). A relevant classification pertains to formative and summative; the former also known as conventional or traditional evaluations (Rodríguez-Carmona, 2004), monitoring project details against objectives. Focussing on output and outcome, they typically measure operational achievements, such as how well an organisation performed what it was supposed to do and how effectively resources

were deployed. Examples of factors monitored include: timely completion within budget, cost and quality of service, number of people using a service, number of complaints, number of computers repaired within target restoration times and amount of training delivered (Chowdhury & Bhuiya, 2004; Collins, Joseph & Bielaczyc, 2004; Hudson, 2006; Navas-Sabater, Dymond & Juntunen, 2002). Formative evaluations are usually commissioned by funding agencies wanting to know whether their funds were spent in accordance with contracts, which do not always specify wider impacts, and where they do, may lack details on how to monitor this aspect.

One of the most well-known formative evaluation practices is embedded in the logical framework analysis (LFA), often incorporated into project designs. The pre-defined objectives and progress indicators of this approach entail the risk of not addressing unexpected outcomes, which sometimes can be the most valuable (Karl, 2000; Sen, 2001). Critiquing the LFA, Chambers (2005) articulated that ‘... *it embodies a linear logic associated with things (such as constructing a bridge) rather than people (such as capacity development, institutional learning and change, or influencing policy)*’ (p.67). Instead, he suggested participatory evaluation approaches, in which participants and other stakeholders contribute to the definition of success. The more recent frequent use of participatory evaluation approaches, acknowledges that evaluation is not necessarily a top-down tool, but can also be undertaken by those targeted by a specific initiative (Chelimsky, 1997).

Summative, evaluations focus on impact (Hudson, 2006). Issues typically addressed in such evaluations of ICT4D initiatives include: who benefited directly or indirectly, what were the benefits of the project, what difference did it make to people’s livelihoods, did a project empower a particular group and what was learnt about the contributions of ICTs to social and economic development. Unlike formative evaluations, where it may be relatively easy to understand what may have gone wrong and why, summative evaluations pose more difficult problems (Guba & Lincoln, 1981), in that isolating the impact of one initiative from other factors is often a challenge (Ahmed, 2007; Ramirez, 2007). This is particularly so where the macro-economic environment and multiple projects undertaken by several organisations operate in the same area simultaneously, as was the case at iREACH. As funding agencies want to know whether their investments have made a difference, it is necessary to find ways to explore, at least, the contribution of projects. The knowledge generated by addressing such issues is also important for wider policies in the macro-sphere (e.g. universal access policies for ICT).

While we have contrasted formative and summative approaches to development, the distinction between them is in reality somewhat blurred. For example, summative evaluations,

normally undertaken at the end of a project are also useful for learning how projects can contribute to livelihoods during their operational phase, the approach adopted in this study through a forward-looking longitudinal framework.

Evaluations of poverty alleviation programmes have traditionally explored success from the perspective of income levels, rather than wider goals of human well-being (Chowdhury & Bhuiya, 2004), but there is a growing interest in taking a wider perspective. One illustration is Zohir & Martin's (2004) study of the impact of microfinance institutions in Bangladesh, which included four domains of wider impacts: cultural, economic, social and political, in assessments at the local, regional and national levels, incorporating institutional performance. DFID's (2009) evaluation guidelines represent another example of a multidimensional evaluation framework, covering both formative and summative issues: relevance, effectiveness, efficiency, impact, sustainability, coverage, coherence and coordination. Recognising it would not be appropriate to investigate every aspect, DFID expects evaluators to explain why they opt for specific issues.

Without dismissing the importance of statistical analysis, Osmani (2002) noted that when the poor inform authorities of the impact of budgets on their lives (i.e. when they are able to '*voice their own evaluation*' (p.237)) the understanding can be more illustrative than statistics provided by expert evaluations. Evaluations based only on these voices are subjective, but subjectivity is also difficult to avoid in more traditional evaluation methods (van Belle & Trusler, 2005; Heeks, 2002), where evaluators are detached from programme participants (Kum, Duncan & Stewart, 2009). Before proceeding to evaluation of ICT4D initiatives, this section concludes with a few words about the distinction between research and evaluation. Although the research presented in this thesis is a form of evaluation, it goes beyond the normal objectives of evaluation, which tends to be atheoretical and in general not conducted within conceptual frameworks (Stockdale & Standing, 2006). This study aims at advancing theory, rather than just evaluating an initiative.

3.3.2 *Evaluation of ICT4D initiatives*

Drawing attention to the complexity of measuring impacts of something as intrinsically intangible as ICT, ITU (2006) likened the exercise to imagining the impact of electricity. The impacts of such a general-purpose transformative technology as ICT are difficult to assess (Souter, 2004), mainly because of its indirect and iterative nature, (i.e. it is how the technology can change what and how things are done that will eventually be reflected in impacts).

Despite such impediments, there is in fact a long tradition of evaluating the contribution of ICT in different spheres. The main focus of evaluations in the telecommunications field prior to the 1990s was on developing cost-benefit analyses to justify investments in telecommunications,

with benefits estimated from information on business and social use through questionnaires and surveys (Saunders, Warford & Wellenius, 1994).

Unlike most other sectors where it may be reasonably easy to identify tangible outcomes and impacts, this is not the case with ICT4D projects, which may, at least partially, explain the lack of understanding of how the many ICT4D initiatives have influenced development outcomes, despite an early awareness of the importance of and endeavours to develop evaluation frameworks for ICT4D. Researchers have wrestled with the evaluation of benefits and impacts of ICT projects for quite some time (Ballantyne, Labelle & Rudgard, 2000; Heeks & Molla, 2009).

An early activity in this field was a 1998 conference, where Ernberg (1998) presented a model, combining participatory case studies, focus groups and data collection across projects, incorporating base-line studies, and studies before and after pilot projects. Importantly, he mentioned that ITU had initiated discussions on a common framework, incorporating formative and summative characteristics, for evaluating telecentres it had been involved with. In 1999, IDRC held an international meeting on evaluation of telecentres. Among the papers in the meeting report (Gomez & Hunt, 1999), was one by Menou (1999), who commented: '*Literature on the subject is already proliferating at a pace comparable to the one of the Internet growth*' (p.214). There does not seem to have been any follow up to synthesise the approaches presented at either meeting.

Since then, many funding agencies have emphasised the importance of evaluating ICT4D initiatives for their impact on poverty. In an effort to streamline evaluations of its funded projects, *infoDev* (Batchelor & Norrish, 2005) developed a framework, where evaluations be considered applied research, designed to address specific hypotheses and generating appropriate data, particularly for gathering evidence to assess whether a particular project would be suitable for mainstreaming. The framework includes requirements for understanding processes leading to specific outcomes. This framework is used in the evaluation of *infoDev*'s network of business incubators and other initiatives. Other organisations have developed separate methodologies (e.g. UNESCO applied rapid results evaluation of its telecentres (Creech, et al., 2006)). The International Institute for Communication and Development (IICD) and partner organisations have evaluated its ICT projects, with a methodology based on the "project scorecard evaluation tool", developed by the International Finance Corporation (McNamara, 2008). In its 2006 Information Economy Report, UNCTAD (2007) proposed a pro-poor ICT framework to evaluate to what extent policies and programmes support people living in poverty.

Despite the many calls for streamlined approaches, researchers have used a plethora of conceptual frameworks, methodologies and methods in fragmented evaluation efforts. “Conventional” approaches have tried to infer causality, while other studies have questioned the quest for causality (Mansell, 2006; Ramirez, 2007; Ramirez & Richardson, 2005), suggesting that at most, it might be possible to identify contributions. In cautioning against implying causality, Noir & Walsham (2007) suggested ‘*tempered indeterminism*’ (p.327) to convey the absence of a direct cause/effect relationship between ICT and impacts. Heeding the warning not to search for causality, this study reflects an emphasis on contribution, rather than attribution.

3.4 Knowledge gaps and research questions

This, the last section of the literature review, starts by citing many sources, which, in calling for more research on the link between ICT and development outcomes, have pointed to knowledge gaps. The section then concludes with the research questions guiding this study.

The literature abounds with references to the still poorly understood impacts of ICT on development. Here are two samples:

‘The lack of hard evidence on the relationship between ICT access and rural livelihoods inhibits effective decision-making on both ICT and livelihoods initiatives and programmes by development planners and the ICT sector, and means that scarce development resources may be ineffectively deployed or opportunities for effective pro-poor initiatives are being missed’ (Souter et al., 2005, p.41).

In the foreword to *infoDev*’s guidelines for conducting evaluations of ICT4D projects (Batchelor & Norrish, 2005), it was noted that despite the proliferation of ICT4D initiatives:

‘... rigorous field-tested knowledge about “what works and why” in ICT for development and a deeper understanding of the enabling conditions and success factors in ICT for development initiatives, have been relatively scarce’ (Quote by Terrab, p.3).

Inherent, if not always explicit, in these laments over the dearth of knowledge is the call for more rigorous analysis of economic, social and cultural dimensions of ICT in order to harness ICT4D to benefit livelihoods, at least to go beyond the anecdotal narratives. Such calls have echoed repeatedly, to such an extent that a large part of this thesis could be filled with quotes and references on this topic (e.g. Accascina, 2000; Adeya, 2002; Akpan, 2003; Alampay, 2006a; Batchelor & Scott, 2005; Boas, Dunning & Bussell, 2005; Checchi, Po-An Hsieh & Straub, 2003; Etta & Parvyn-Wamahiu, 2003; FAO, 2006; Gagliardone, 2005; Heeks, 2009, 2010a;

Heeks & Molla, 2009; Hudson, 2006; James, 2006; Khalil, Dongier & Qiang, 2009; Mansell & Wehn, 1998; Mchombu, 1996; McNamara, 2003, 2008; Morales-Gomez & Melesse, 1998; Nielsen & Heffernan, 2006; Parkinson, 2005; Parmar, 2009; Pimienta, 2007; Roman & Colle, 2002, Sciadas, 2005; Souter, 2007; Souter, et al., 2005; Sreekumar & Rivera-Sánchez, 2008; Torero & von Braun, 2006; Unwin, 2008, 2009; Wade, 2002; Warschauer, 2003).

While it has been argued that there is sufficient empirical evidence to support claims of overall positive impact on the poor of ICT (UNDP, 2005), there is also the view that research has not moved beyond repeated anecdotal narratives, often based on intuition rather than analysis (Batchelor & Scott, 2005; Phillip & Foote, 2007). Claiming that the literature is *'journalistic or short-term business studies rather than in-depth conceptual and empirical research on the impact of ICT at the household or community level'* (p.6), Torero & von Braun (2006) recommended investigations of the conditions required for ICT to contribute positively to sustainable development.

When commenting on the lack of established conceptual frameworks and models, Menou (1999) considered that the looseness of definitions and inconsistent use, the variety of methods used, and the lack of longitudinal studies had resulted in dispersed knowledge. A decade later, the situation was not much better, with Avgerou (2010) voicing concern that ICT4D research *'remains weak in forming convincing arguments about IT-enabled socioeconomic development'* (p.1).

The dissemination of knowledge has been somewhat unstructured and erratic and its effectiveness is questionable when considering similar lessons appearing repetitively, together with problems that could have been averted had the lessons been heeded.

Despite greater maturity in research, more needs to be known about the link between ICT and development (Walsham & Sahay, 2006), particularly about differences between public and private access (McNamara, 2008; Sey & Fellows, 2009). This distinction is important in light of the move away from support of public access in favour of private use of mobiles, with donors withdrawing from rural ICT projects (Howard, 2008; Souter, et al., 2010). An evolution of this nature could have implications for equality, empowerment and other quality of life indicators, which have been particularly absent from the research agenda (Gaved & Anderson, 2006).

Most projects studied have been of a pilot nature, so there is limited knowledge of what their contribution might have been in the longer term and on a larger scale. Gagliardone (2005) argued that problems arise when localised experiences are scaled, and identified the absence of an innovative culture, capabilities and links between ICT enclaves and the rest of society as

factors impeding the use of ICT as an empowerment tool by rural communities. In calling for further evaluation, Obayelu & Ogunlade (2006) suggested these be conducted for successful and unsuccessful applications of ICTs for poverty alleviation. Heeks (2009) identified three generic research priorities: defining the vision of development ICTs can facilitate, “standing back” and taking a longitudinal approach with a less self-interested view on projects and moving from formative to summative evaluations. The reference to self-interest relates to the fact that evaluations are sometimes used to appeal for continued donor funding and may be based upon uncorroborated anecdotes used as surrogates for evaluations. Opinions on the effectiveness of ICT4D initiatives are divided and this could be addressed by valid models through which the sector could better understand their socio-economic contributions. This knowledge could guide the design of projects to be more useful to the most marginalised and inform decision-makers whether and how their resources have borne fruit.

3.4.1 Research questions

It would not be possible to address all of the under-researched areas discussed above in one thesis, but in endeavouring to respond to the many calls to narrow the knowledge gaps, we have developed and tested a conceptual model and a research framework for assessing the contribution of ICT4D interventions from the perspective of those who should benefit from them. The research questions we aim to answer are:

1. Is a conceptual model exploring how an ICT4D initiative contributes to capabilities, empowerment and sustainability of practical use for the project being evaluated, for policy formulation and for designing future ICT4D projects?
2. What are the characteristics of a research framework that could answer the first research question?

The epistemological goal of these questions is to advance the discourse on frameworks for evaluating ICT4D projects, rather than evaluating a particular project. The case study in this thesis serves as an illustration only. While answering these questions may go some way in addressing the many calls for additional research, it would be presumptuous for a single PhD candidate to try to do more, considering the achievements by the many proponents of ICT4D evaluations for over a decade.

As the knowledge gained from the many ICT4D implementations, whether pilots or proper implementations, is fragmented and poorly shared, this thesis also contains a meta-analysis of research conducted by others to answer the question:

3. Can structuring a meta-analysis of existing ICT4D research into capabilities, empowerment and sustainability be useful in advancing knowledge about impacts of ICT4D initiatives?

The significance of this research lies in its policy relevance, as systematic evaluation of ICT4D projects is pivotal for scaling up such initiatives. With a better understanding of the contributions made by various forms of ICTs, policy-makers can formulate realistic goals for resources deployed in support of projects of this nature.

Chapter 4 - Conceptual frameworks used in ICT4D research

With no “officially” recognised conceptual approaches in the field of ICT4D, the frameworks applied are almost as numerous as the number of studies, derived from the academic domains of business, communications, development, economics, information technology, psychology and sociology. There are no clearly defined boundaries between these fields in their application to ICT4D, as is the case with the interface between ICT4D research and the field of community informatics (CI), social informatics and the study of ICT as a socio-technical system (Davenport, 2008). There are overlaps, particularly with CI, which studies relationships between the design and implementation of ICT for community development and social justice (Stillman & Linger, 2009; Stoecker, 2005), in developed and developing nations. Similar to ICT4D, CI has adopted conceptual frameworks from diverse disciplines, depending on the research purpose, but none of the numerous approaches used is dominant.

This chapter summarises some ICT4D research approaches, classified into those with roots in or closest to development studies and those in the more general ICT domain and from other frameworks. As with most attempts to classify past research into categories, this taxonomy and associated placement of different frameworks is somewhat arbitrary, e.g. Mason & Hacker (2003) included diffusion of information, knowledge gap and structuration theories under the umbrella of communication theories. There are also cases of different frameworks used in the same study. Serving as an illustration of the diversity of models applied, this chapter makes no pretence of being comprehensive. An overview of this nature is useful in explaining reasons for favouring the CA as the guiding framework and how other frameworks might intersect with this preferred approach. Except for section 4.3.5, which includes frameworks from the enterprise field, the focus is on frameworks either at the individual or the community level, as this is where the CESVS model is designed to operate, even where benefits at those levels flow through businesses.

While many of the frameworks presented are useful for their intended purpose, none of them would on its own be sufficient to answer our research questions, the criterion against which they are assessed. Just as the frameworks could complement our approach, they can also complement each other in the sense they do not in general negate each other.

4.1 Frameworks from development studies

There has been insufficient focus on the “D” in ICT4D studies, despite the potential of a development studies perspective to guide research at both the micro- and meso-levels (Heeks, 2006, 2009).

4.1.1 *The capability approach*

As the conceptual framework informing much of this study, the CA is briefly described here, with further details in section 5.1.1, which also elaborates on how it has been applied in the area of ICT4D research.

Grounded in human development, the CA offers an alternative to the strong focus on economic growth, as the key avenue for poverty alleviation, still dominating mainstream development thinking. In contrast to the attention to income and/or consumption in utilitarian approaches, the central question in the CA is ‘*what they are actually able to do or to be*’ (Nussbaum, 2000, p.12) (i.e. capabilities to lead the lives people have reason to value). Embraced by the UNDP, as reflected in its annual HDRs and associated HDI, the CA has exerted considerable influence on development economics (Sen, 2000a). In practice, this means more attention to issues promoting human well-being, directing policy efforts towards health, education and sustainability in addition to economics (Saito, 2003).

Recognising the importance of ICT, Sen (2005) extended it to include capabilities, such as computer literacy, as implied when writing that: ‘... *access to the web and the freedom of general communication has become a very important capability that is of interest and relevance to all Indians*’ (p.160).

Considering the diverse contributions ICT can make to the aspirations of individuals and communities, it is understandable that it lends itself to be analysed through the CA. The increasing popularity of the CA in ICT4D studies is a testimony to its utility, as is the suggestion by Heeks (2009) that the CA could provide the foundation for future studies in this area.

4.1.2 *Sustainable livelihoods approach (SLA)*

Partially informed by Sen’s concept of entitlements, primarily his work on food-security and analysis of famines (Dorward, et al., 2003; Ellis & Biggs, 2001), the SLA ‘*is a way of thinking about the objectives, scope and priorities for development... In essence it is a way of putting people at the centre of development, thereby increasing the effectiveness of development*

assistance' (DFID, 1999, p.1). The SLA explores livelihood resources and strategies that enable or constrain the achievement of sustainable livelihoods for different groups and institutional processes. At the core of this normative concept are the tangible and intangible assets (physical, natural, financial, human, and social) of firms, communities and individuals and their ability to withstand shocks in environments that make them vulnerable (Carney, 2002; Scoones, 1998). When used for interventions, it seeks to identify holistic, rather than sectoral opportunities (Farrington, 2001).

Critiques of the SLA include insufficient attention to the macro-level, private and economic institutions and its overemphasis on self-help, assumptions that those living in poverty always make 'rational' choices and difficulties in defining and measuring the capital types and sustainability (Albu, 2008; Toner & Franks, 2006). Furthermore, Scoones (1998) called for disaggregation of the unit of analysis with more attention on individuals through analysis of dimensions such as wealth, gender, age and the distribution of control over resources.

When applied to ICT, the SLA has been used for identifying gaps in knowledge required for sustainable livelihoods (Schilderman, 2002; Sigauke, 2002) and for impact evaluations, the latter mainly in the form of case studies. Chapman, Slaymaker & Young (2002, 2004) summarised studies informed by this approach and McNamara (2008) used it in a "knowledge map" on enhancing the livelihoods of rural poor through ICT. Analyses of individual projects based on the SLA include the Kudumbashree social outsourcing project in Kerala (Heeks & Arun, 2010), Soriano's (2007) study of community telecentres in the Wu'an Province of China and research on the Aguablanca telecentre in Colombia (Parkinson & Lauzon, 2008; Parkinson & Ramirez, 2006). Aguablanca, unlike most studies based in rural areas, is in a densely populated urban area and, from a social equity perspective, both studies traced the extent to which the centres had led to improved livelihood outcomes, particularly for those with least options. A common livelihood strategy was to first transform physical, human, or social assets into money and then convert the financial assets into more appropriate human and physical assets. The SLA also lends itself to analysis of regular ICT use, as demonstrated in Duncombe's (2006) study on use of ICT by micro-enterprises for poverty-reduction in Botswana.

The philosophical compatibility between the SLA and the CA attracted Gigler (2008) to combine the two in an "alternative evaluation framework", applied to projects in indigenous communities in Peru and Venezuela.

Despite containing several attributes of relevance to this study, the SLA would not adequately answer the research questions. However, by including sustainability as one of the

constructs in the research, the thesis could contribute to the debate on the SLA (e.g. by exploring whether and how ICT can reduce vulnerabilities).

4.1.3 *Social capital framework*

Used broadly in a plethora of social science disciplines (Dutta-Bergman, 2005) in the context of the ‘*ability to secure benefits through membership in networks or other social structures*’ (Portes, 1998, p.6), social capital is one of the five capital asset types in the asset pentagon of the SLA. The large body of work dealing with ICT and social capital, most of which is in the context of the developed world, deals with social capital as a standalone issue (i.e. unrelated to the SLA).

Researchers have explored the relationship between ICT and social capital from different perspectives, without necessarily defining this construct. Mignone & Henley’s (2009) research in indigenous communities in Canada dealt with it in some detail, by extending Putnam’s (2000) work on social capital. Social capital theory has been employed to understand economic, social and political developments (e.g. Rideout & Reddick, 2005) and with respect to knowledge sharing (Huysman & Wulf, 2005; Nahapiet & Ghoshal, 1998).

In this study, we are interested in understanding whether and how social capital can trigger and sustain ICTs, while at the same time strengthening communities involved in ICT-related projects through some form of community engagement, as expressed by Ramirez, et al. (2002):

‘The outcomes of Community Engagement are sometimes surprising, since by bringing together community members for a common purpose — people and organizations who are not in the habit of working together — new relationships are formed within the community, as community members learn how to collaborate. The legacy of the community engagement becomes more than the installation and application of information and communication technologies (ICTs)’ (p.2).

There are contradictory views about the relationship between ICT and social capital. At one extreme is the suggestion that the relationship-building function of the Internet may be more essential than its information function (Gaved & Anderson, 2006; Pigg & Crank, 2004). At the other extreme is the view that increasing use of ICT could lead to localities becoming ‘*globally connected and locally disconnected, physically and socially*’ Castells (1996, p.404). The latter scenario has not been borne out in empirical studies (Kavanaugh, 1999; O’Neil, 2002; Sey & Fellows, 2009), but the conflicting views may arise from decontextualising ICT (i.e. how ICT is

implemented matters). Positive social capital is more likely to emerge in a community setting, as was the case at iREACH (section 9.5).

4.1.4 Millennium Development Goals

Several of the international targets in the Geneva Plan of Action (WSIS, 2003, Section B, §§ 4-7) were based on the MDGs and ITU (2010b) reported on progress towards achieving these targets. The MDGs have informed some ICT4D studies, e. g. the *infoDev* evaluation framework (Batchelor & Norrish, 2005), mentioned in section 3.3.2 focussed on gathering evidence that would help answering questions related to relationships between poverty and ICTs, particularly referring to the MDGs. The most prominent MDGs relate to poverty reduction, improved health and basic education. The deeper changes required for the achievement of these depend to a large extent on actions that are not directly associated with any one MDG, but rather on actions that enable the goals to be achieved (e.g. improving government capacity and reducing vulnerabilities (McNamara, 2003)). This is where ICT can become important and Curtin (2004) suggested steps on how to mainstream ICT into development projects to facilitate achievement of the MDGs.

The only explicit reference to ICT in the MDGs occurs in Goal 8, Target 18: *'In co-operation with the private sector make available the benefits of new technologies, specifically information and communications'* (UN, 2001, p.58). ICT related indicators for Target 18, number 47 and 48 - telephone lines per 1,000 people and personal computer per 1,000 people, respectively, do not however reflect the importance of making available the benefits of new technologies to the most vulnerable in developing countries. Rather than conveying information on who can use ICT for what purpose, they only give quantitative measures of some technologies. ITU (2006) has progressed this somewhat, by defining indicators for measuring inputs, outputs and outcomes associated with MDG achievements, but it is not clear whether these have been implemented anywhere.

Recognising that poverty reduction requires action only marginally related to ICT, many in the development community nevertheless believe ICT merits attention in pursuit of the MDGs, as a tool for creating an enabling environment (UNDP, 2005). Batchelor, et al. (2003) illustrated the contribution of ICT to MDGs by mapping 17 *infoDev* funded projects against these, exploring impacts and lessons learned. The United Nations ICT Task Force (UNICT, 2003) established a framework for mapping each MDG into a three tier structure to demonstrate the relevance of ICTs for that particular goal: macro level for national and global issues, system

level to capture impacts on service delivery institutions, such as schools and hospitals, and at an individual level, focussing on the poor.

Despite the importance of the MDGs, the framework surrounding it lacks sufficient theoretical depth to further the understanding of processes behind possible contributions of ICTs. Furthermore, it would require a system of indicator measurements and the establishment of control groups, both of which were beyond the scope of this thesis.

4.1.5 *Logframe analysis (LFA)*

While not confined to developing countries, the LFA, is a popular method for project evaluation in the developing world, used by several agencies, including an evaluation of the Swedish aid agency, SIDA, funded Namibian SchoolNet. While questioning the relevance of some of the indicators established for the objectives of this project, Ballantyne (2004) nevertheless used them. For example, a key indicator for the objective of reaching a high level of Internet usage by learners and teachers was how many days per month the local school servers were connected to the Internet. Enhancing basic computer skills was measured by how often students and teachers used their e-mail accounts.

Dealing primarily with formative evaluation, the LFA has some deficiencies, as articulated by Chambers (2005) (see section 3.3). With respect to the research questions, it does not easily lend itself to learning about longer-term contributions, particularly of an abstract nature, such as empowerment and its predetermined focus may fail to capture unintended benefits or problems.

4.1.6 *Bottom of the pyramid (BOP)*

The key proposition of the bottom (or base) of the pyramid (BOP) concept is that, rather than thinking about the poor as victims, the market should recognise them as '*resilient and creative entrepreneurs and value-conscious consumers*' (Prahalad, 2005, p.1), transforming them into active market participants. Following this advice and combining their corporate social responsibilities with the potential profits from emerging markets, many companies operating in developing countries have modified their products (e.g. in the form of smaller packaging, such as lower value calling cards) to cater to this market. Treating information poverty as a roadblock to development (Prahalad & Hart, 2002), BOP adherents expect the market to provide adequate access. Operators may be aided by research, informed by this framework (e.g. by LIRNEasia) on topics such as analysis of BOP customer behaviour, in ways that could provide useful marketing information (Samarajiva & Zainudeen, 2008).

Critiquing the BOP paradigm for its emphasis on consumption, Karnani (2006), suggested policy-makers pay more attention to the disadvantaged as producers, rather than consumers. This debate is of great relevance to ICT4D in that operators target the BOP market, where profitable, without considering the affordability for poor people and their opportunity costs (i.e. they could invest those funds in productive capacity).

Implicit in the BOP concept is that the market, rather than intentional ICT4D projects, is the best avenue through which to harness the benefits of ICT, as suggested by Abraham (2007): *‘investments made with the aim of reducing transactions costs are more likely to succeed than amorphous, ill-defined attempts to bridge the “digital divide”’* (p.15). Kuriyan, Ray & Toyama (2008) were more circumspect about this framework when analysing Akshaya, pointing to the lack of research relating to how the BOP concept would work in practice, calling for more research on how services offered by Akshaya could be useful for meaningful development. Many of the questions raised in discussions about BOP are relevant for this study and by better understanding the pathways from ICTs to development outcomes, our findings might contribute to the discussion of the relevance of the BOP concept versus more interventionist approaches.

4.1.7 Needs analysis

Several researchers have stressed the importance of needs-analysis, whether from a community perspective or something more akin to commercially based market research, prior to embarking on ICT4D initiatives (Beardon, et al., 2004; Mchombu, 1996; Saunders, Warford & Wellenius, 1994; Schilderman, 2002; Sigauke, 2002). In a similar vein are baseline studies for establishing the basis against which to measure progress toward achieving the objectives of an intervention. Based on the philosophy that community members, through participation in defining indicators for success, would orient projects towards their needs and interests, Action Aid (Beardon, et al., 2004) conducted what they referred to as Reflect circles in planned ICT4D projects, but it has not been possible to find out whether and how the indicators developed through this process were measured. The participatory process of K-Net also formulated indicators (Ramirez, 2001), which may not have been implemented.

Knowledge information system (KIS) is another framework for information needs analysis (Schilderman, 2002). Applying this approach in Zimbabwe, Sigauke (2002) noted that factors promoting knowledge and information acquisition and dissemination operated at three levels: the individual, the community and the local board and government. Interpreting how different actors and perspectives interrelate in a telecentre environment, Parkinson & Lauzon (2008) also used this approach.

iREACH conducted baseline studies in the form of needs analyses at both pilot sites as one of its initial activities, but did not incorporate indicators that could be used for monitoring progress. While the question framework for our study included a participatory approach to developing indicators that could, at least partially, indicate iREACH's contribution, these did not form part of a formal monitoring system.

4.1.8 Multi-order effects

De' (2006) used a framework of multi-order effects to analyse e-government projects, with first-order referring to immediate outcomes (e.g. quicker processing). Second-order effects would result from continued use of a system over a longer period and reflect livelihood changes (e.g. easier access to land records may enable quicker processing of loans in rural credit institutions). These would eventually lead to third order effects, which could be along dimensions of the five instrumental freedoms, identified by Sen (2001). Not always obvious or positive, such higher order effects can also be unintended. According to Sein & Harindranath (2004), due to competing developmental and economic priorities, progression to higher orders is not automatic and may require policy intervention.

While the intention of this thesis is to focus on higher-level effects, it emerged early in the research that focus group participants were still very concerned about first and second order effects, such as learning to use computers and easy access to information.

4.1.9 Post-colonial and critical theories

One example of analysis from a post-colonial perspective is Bailur's (2008a) re-conceptualisation of telecentres as an '*imposition of the centre on the periphery*' (p.1). Focussing on power relations between what was referred to as "developers" (development agencies, experts, governments) and "developees" (marginalised communities), Granqvist (2005) claimed the latter are often neglected in assessment models.

While critical theories, i.e. those that examine and critique society and culture, raise salient issues of relevance to ICT4D, but where they only concentrate on critique, rather than on the pursuit of constructive endeavours, they are unsuitable to answer the research questions. Insofar as the issues raised in these critiques are useful in explaining factors that may inhibit the achievement of positive outcomes of iREACH, they were considered, but without adopting the normative philosophy underpinning the approach. This does not mean that the study uncritically supports the "mainstream" thinking that ICT will necessarily be positive for development.

4.2 Frameworks from ICT studies

Frameworks used in ICT studies originate from a diversity of disciplines (e.g. psychology and sociology), some of which derive from organisational settings, whereas others are more community based.

4.2.1 *Psychological theories*

Useful for understanding motives for ICT adoption and use and predominantly applied in studies of ICT acceptance that focus on user needs and social norms, theories such as the technology acceptance model (TAM), the theory of reasoned action (TRA), the theory of planned behaviour and the use and gratification theory have been applied in a variety of environments (Hsieh, Rai & Keil, 2008). They are useful for understanding motives for ICT use and can assist in explaining drivers and impediments to adoption and variations in usage patterns between contexts and individuals.

TAM, originally developed by Davis (1989), is probably one of the best-known of these frameworks in ICT research. It deals with perceived usefulness and perceived ease of use, defined as: *'the degree to which a person believes that using a particular system would enhance his or her job performance'* (p.320) and *'the degree to which a person believes that using a particular system would be free of effort'* (p.320), respectively. Adapting this model for the developing world, Musa (2006) incorporated socio-economic and human development factors that may impede ICT access and adoption. Combining the TAM with the diffusion of innovation theory (DOI, see section 4.2.2), Sang, Lee & Lee (2009) built a model to explain acceptance of e-government applications in Cambodia.

Exploring how expectations, evaluations and the perceptions of others influence behaviour, McKemey, et al. (2003) applied the TRA for an ICT forecasting model, according to which intentions, supported by attitudes represent the most reliable indicator of potential future behaviour.

Zhu & He (2002) turned to the gratifications theory when researching adoption and use of the Internet in China. This user-focussed theory, suitable for examining how individuals used ICTs to satisfy their social and psychological needs, was also used by Donner (2004) and Leung & Wei (2000).

By changing the last two words in Davis' (1989) definition of perceived usefulness from "job performance" to "capabilities to lead the life he or she has reason to value", some elements of the TAM would be useful in our exploration. But as ICT adoption per se would be akin to

commodities without considering what benefits they can accrue, it would first be necessary to answer the question: adoption for what purpose? Furthermore, we are not only interested in whether persons “believe” the ICT is useful, also want to understand the processes through which it actually is useful. Thus the TAM would be relevant if and when benefits of a project have been established.

Other user-based theories could be applicable for explanatory purposes, particularly in understanding use and non-use of iREACH. However, they tend to probe too deeply into intentions to fit within the scope of this research.

4.2.2 Adoption and diffusion of new technologies (DOI)

There is a relationship between the concept of acceptance and DOI, in that an innovation must be accepted and adopted prior to its diffusion. Initially formulated by Rogers (2003), the DOI has provided the framework for a diverse range of ICT4D studies, (e.g. Roman’s (2003) study relating to planning and evaluating of telecentres, Kumar & Best’s (2006a) analysis of the characteristics of SARI users and Richardson’s (2009) examination of teacher ICT training in Cambodia). Taking into account the warning by Rogers, that diffusion is likely to widen existing socio-economic inequalities, Roman identified three principal innovation attributes to address this issue in telecentre research: relative advantage, compatibility and complexity. Similar to Kumar & Best who focussed on characteristics of users and drawing from the literature on the adoption and diffusion of new technologies and small enterprise development, Adeoti & Adeoti (2008) identified qualities of small scale entrepreneurs influencing adoption of mobile services among small enterprises in Nigeria.

As with the question related to TAM - acceptance of what - we can ask diffusion of what, about the application of the DOI in this thesis. Once established that iREACH has something useful to diffuse, the DOI could be a suitable framework for planning and evaluating its diffusion effectiveness, but that is beyond the scope of this study.

4.2.3 Actor network theory (ANT)

ANT aims at explaining occurrences in complex social contexts by bringing a sociological perspective to understanding how technology is embedded in organisations and communities. In the ICT4D context, two studies of South African telecentres used this approach to understand implementation issues and barriers to achieving development objectives (Rhodes, 2009; van Belle & Trusler, 2005). Exploring the OLPC initiative, Luyt (2009) applied ANT to explore the

relationships between various features of this undertaking – its intended scale, involvement of governments, the role of children and the open source software community.

As an analytic device for dealing with the complexity of human and non-human processes of ICT projects, ANT is not suitable for understanding contributions to development, despite its ability to give insights into dysfunctions that may affect developmental outcomes.

4.2.4 Information chains and resource movement impact

Resource movement impact concerns itself with positive and negative resources brought in and out of communities through different channels (e.g. via roads and ICTs). Applying this framework to remote mountain communities, Heeks & Kanashiro (2009) compared the impact on remote mountain communities of road and ICT resources, modelling these to analyse exclusion.

Dealing with impacts and exclusion, some aspects of this model would be relevant to this research, which implicitly addresses both resource flows and exclusion by studying what applications villagers used at iREACH, what resources were required to benefit and impacts on equality. Resources in the form of information on market price and new farm practices were brought in, but only circumstantial evidence emerged on resources taken out (e.g. possibly agricultural produce, surplus to subsistence level requirements, and employment opportunities found on the Internet and located outside the villages).

4.2.5 Gender analysis – gender and evaluation methodology for ICT (GEM)

In a gender analysis of 95 *infoDev* funded projects, Hafkin & Huyer (2002) found that only 20% of projects took into account potential differences in impact on men and women. Subsequent to this study there was a flurry of activities relating to various forms of ICT gender analysis, a field seeking to explain reasons for different experiences of men and women in their use and benefit of ICT. Typical areas of study include potential discrimination against women in terms of access to ICT and research on the impact of ICT use by women on their work time. The gendered “technology as culture” approach (Gurumurthy, 2004; Ramilo & Cinco, 2005), which argues that technology depends on culture, is widely used in ICT gender analysis. It explores gender as a socio-economic variable in the evaluation of roles, responsibilities, constraints, opportunities and needs of men and women in a given context.

Developed by the Women’s Networking Support Programme of the Association for Progressive Communications, the gender evaluation methodology (GEM) is a toolkit consisting

of several approaches that can be customised for incorporation into ICT gender evaluations (Buré, 2006; Heeks, Arun & Morgan, 2005; Ramilo, 2003). Evaluations are dynamic learning processes, examining how ICT interventions have affected changes in individuals, organisations and communities from a gender and broader social perspective. The approach is normative in that evaluation results should lead to recommendations that strengthen gender equality practices (Ramilo & Cinco, 2005). The GEM process, typically entailing questionnaires and interviews with different project stakeholders, does not have to be a standalone process, but can form part of other evaluations. An important aspect is that GEM does not deal exclusively with issues relating to women. As suggested by Rowbotham (1995), ‘... a gender lens alone becomes insufficient: other forms of social exclusions, other groups’ subordinated experience, have to be considered...’ (p.65), this thesis incorporates a gender perspective, but consistent with GEM, this is only one of several considerations.

4.2.6 Knowledge gap hypothesis

According to the knowledge-gap hypothesis (Tichenor, Donohue & Olien, 1970), innovations in ICT tend to result in widening information inequalities. Parayil (2005) argued that because skills in the information society are more expensive to acquire than skills for older types of technologies, there is a risk that the gap may widen. Although the gap is not necessarily the result of socio-economic factors, there is usually an association, as noted by Kumar & Best (2006a) in their findings about SARI kiosks, used mainly by those with higher socio-economic status.

While impact on equality is a consideration in this research, it is not the main emphasis and findings relating to this aspect rely primarily on perceptions gathered during the research. As discussed in section 9.6, these perceptions showed a more complex view of the relationship between poverty and use of iREACH.

4.3 Frameworks from other fields

This section presents a range of other frameworks that are difficult to classify into specific ICT categories.

4.3.1 Structuration theory

Structuration theory (Giddens, 1984) is concerned with the dynamic relationships between human agency and societal structures in the form of institutions. Structural analysis in accordance with this approach highlights ‘... the processes through which ICTs are shaped

under the influence and at the same time contribute to the shaping of the social relations of the organizations within which they are introduced' (Avgerou, 2001, p.47). It identifies practices that might lead to new forms of structure, elaborating ways in which this occurs, thereby bridging between human agency and structure. This theory is thus useful for understanding complex phenomena related to ICT4D interventions, as demonstrated by De' & Ratan (2009) in exploring the use of ICT in India's microfinance sector and Akpan-Obong (2010) in studying unintended outcomes in ICT adoption at cybercafes in Nigeria.

While the iREACH research findings touch on both agency and structure, we do not explicitly refer to the structuration theory.

4.3.2 Institutional theory and sociology of governance

Drawing on Meyer & Rowan's (1977) contributions to new institutional theory, Noir & Walsham (2007) explored whether those involved in some ICT projects in the Indian public healthcare sector sponsored by international aid organisations, aligned their conduct with their perceptions of what was expected of them, rather than with the demands of their work responsibilities. Similar to Akpan-Obong (2010), they pointed to unintended positive outcomes, contending that ICT4D success measurements be expanded to include more than assessment of intended outcomes, arguing that the use of institutional theory enabled them to take this wider perspective of ICT.

Also taking an institutionalist perspective, but drawing on the theoretical framework of the sociology of governance, Rajalekshmi (2007) in a study of Akshaya, highlighted how the institutional membership of intermediaries was critical for effective e-governance service delivery. Trust was central in these relationships, and this was facilitated by the private franchise intermediaries having been selected by local governments, based on a set of criteria, including their previous involvement with community affairs (Garai & Shadrach, 2006).

iREACH's structure and relationship with authorities are considered in the analysis of its meso- and micro-environments, but too much attention on this from a conceptual perspective would have detracted from the focus of this thesis.

4.3.3 Soft system theory and methodology (SSM)

Based on learning and enquiry cycles, SSM is suitable for managing poorly structured problem situations (e.g. as in as study by Gunawardena & Brown (2007) on the use of IT in the vocational education sector), in contrast to project management theory that deals with well

structured problems. Andrew & Petkov (2003) and Ramirez (2003) made reference to soft system thinking in the context of rural ICT services, suggesting it would be appropriate for implementation of technologies, where the issues are not only of a technical nature.

In so far as the SSM draws attention to relationships between technologies and people, it would have been a useful framework to consider in situations where the infrastructure does not always work as intended at iREACH, but that is not a focal point of this study.

4.3.4 Habermasian ideal speech situation (IDS)

Identifying the need for integrating disparate knowledge systems around GIS-based applications to mitigate land degradation, Puri & Sahay (2003) turned to the Habermas (1984) theory of communicative action, more particularly to the ideal speech situation (IDS) as a normative framework against which to evaluate the use of a GIS system. Highlighting the importance of critical partnerships between scientists, district staff and community members, they analysed these in terms of conditions formulated by Hirschheim & Klein (1994) and aimed at diffusing power relationships with respect to communicative activities. Unwin (2009) suggested the theory of communicative action would be useful for informing ICT4D practice because of its emphasis on ‘... *human emancipation and a moral framework based on universal pragmatics*’ (p. 63).

As a general-purpose model for understanding collaboration between users, staff and the many parties involved in iREACH, many aspects of this framework would be relevant, but because of a different focus in this thesis, it has not been applied.

4.3.5 Enterprise value chain, including supply chain analysis

In new institutional economics, micro-enterprise supply chain relations represent a chain of trading activities that rely on information prior to, during and after the trading process (Norton, 1992). In their paper on eChoupal, Annamalai & Rao (2003) implicitly used an agro-business value chain to describe the benefits enjoyed by various players. They considered financial costs, time, quality, trust and dependability factors. Compared to prior treatment of farmers when bringing their produce to market, they found eChoupal had an empowering influence. Jagun, Heeks & Whalley (2008) also focussed on the intermediation process in their value chain approach when exploring the impact of mobiles on different segments of the traditional weaving sector in Nigeria.

With market information on farm produce being one of the applications introduced by iREACH, supply chain analysis is of interest in understanding whether this information led to intermediation changes. When analysing the research results, we consider the role of market price in the context of other supply chain factors required to realise benefits from this initial step, without specific reference to a theoretical framework relating to supply chains.

4.4 Consideration of conceptual frameworks presented in this section

Despite the usefulness of many of the frameworks presented in this section, none of them could, on their own be sufficient as a tool for answering our overarching research questions. As indicated in this chapter, several aspects of different approaches can shed light on specific parts of the research, and where this is the case they have been implicitly absorbed. However, in terms of understanding the overall contribution made by a project to capabilities, empowerment and sustainability, the CA provides the best foundation on which to build the necessary knowledge base. The next section explains why this is the case.

Chapter 5 - Conceptual framework guiding this study

The conceptual framework guiding this study emerged in response to knowledge gaps identified in the literature review, specifically taking on board suggestions for further research made in the ICT4D evaluation literature. Similar to the CA, which is normative in that it considers development should focus on the protection and expansion of a set of values and norms (Frediani, 2010), the framework informing this thesis is normative, as it establishes a priori the desirability of expanding capabilities, empowerment, and sustainability. It is thus appropriate for the study to be positioned mainly as deductive research (Miles & Huberman, 1994). The purpose of the conceptual framework was to guide the formulation of the field research instrument and approaches for analysing and presenting the findings.

The framework consists of two integrated elements: an explanatory model designed to conceptualise the relationships between its constructs and a framework for studying these constructs. The model views ICT as a tool for capability development, empowerment and sustainability (CES). Just as a tool-maker might use machinery to produce tools for other goods and services, which could be inputs into building better machinery, so the model posits that individuals and communities could use ICT to build and extend CES, which in turn might improve their ICT infrastructure. This infrastructure, consisting of technologies and skills, would in turn further enhance their CES. Such mutually reinforcing relationships would, according to the model, continue in a virtuous spiral, a metaphor lending itself to conveying the potential dynamic nature of ICT deployments in previously underserved geographic locations. This concurs with Hill & Dhanda's (2003) conclusion that there is a reciprocal relationship between technological achievements and human development in that technology contributes to human capabilities, while improvements in these enhance knowledge creation necessary for technological changes.

The framework within which to understand these processes is informed by the CA, with capabilities being one of the three constructs in the model. Empowerment has featured considerably in literature surrounding the CA and in the development discourse in general. The CA has not dealt extensively with sustainability, which is included as a key construct in the model because of its prominent role on the development agenda and the potential of ICT to affect sustainability positively and negatively. By incorporating this aspect, the study can contribute to the more recent body of work on the relationship between ICT and the environment.

The second element of the framework, the research approach, applies a forward-looking, longitudinal perspective to the micro- meso- and macro-levels, using participatory methodologies for field research. We start by elaborating on the model constructs and then proceed with explaining the elements of the research framework. The “model” refers to the way in which ICT interacts with CES, whereas the “framework” refers to the research methodology adopted to understand how this interaction operates.

The CES virtuous spiral model (CESVS) assumes that individuals and communities require a minimum set of capabilities, depending on the type of ICT, to gain access to and make effective use of ICT. Alternatively, a mediating organisation could facilitate this stage, aligning the complexity level of ICT to existing capabilities and encouraging adoption and use. In the case of iREACH, an external organisation, IDRC, in combination with a government department and local organisations established iREACH, which quickly gained public support. The model posits that a basic level of IT awareness and skills would strengthen confidence to enable individuals to take greater control over their lives, hence the importance of empowerment. Empowerment would then be one of the drivers for improving the ICT infrastructure and/or its effective use. Each twist of this spiral, illustrated in Figure 2, would bring new insights and improved capabilities, thereby strengthening communities, by enabling their members to improve knowledge in areas such as health, agriculture and governance.

The infrastructure in combination with capabilities could extend the field of contacts locally and globally, with both the “I” and the “C” in ICT contributing to capabilities of people to do and to be what they value and have reason to value. With substantial areas of commonality in the definition of “well-being” and “ill-being” across cultures (Narayan, et al., 2000), it is likely that there would be common basic capabilities in diverse places (e.g. being healthy and educated (Sen, 2001, p. 144)) and capabilities, specific to particular environments, such as the capability of learning sustainable agriculture practices.

We first present details on the CESVS model constructs and then elements of the research framework.

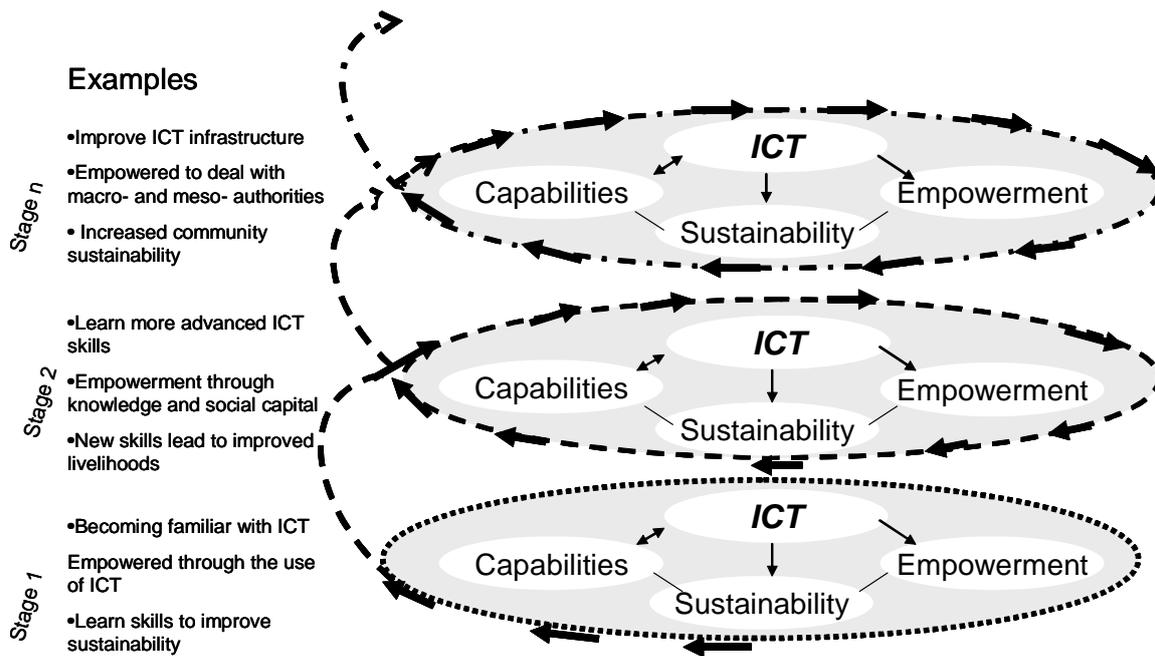


Figure 2: The capability, empowerment and sustainability virtuous spiral

Author's analysis. Previously published in Grunfeld, Hak & Pin (2011).

5.1 Model constructs

The intersection of the CA with empowerment and sustainability draws together themes that inform the CES model. Following an introduction of the CA as the main philosophical approach underpinning this work, we introduce the empowerment and sustainability constructs.

The focus on these three constructs does not mean that other relevant constructs or findings from the research are left aside, but those are, as far as reasonably possible, slotted under the CES. Where this is not possible, they are nevertheless addressed in other ways.

5.1.1 Capabilities – the capability approach (CA)

The centrality of the CA is the ‘*expansion of freedom ... both as the primary end and as the principal means of development*’ (Sen, 2001, p. xii). Development is an extension of freedom and freedoms constitute the basic building blocks for development, together with ‘*the expansion of “capabilities” of persons to lead the kinds of lives they value - and have reason to value*’ (Sen, 2001, p.18). Capabilities refer to ‘a person’s or group’s freedom to promote or achieve valuable functionings’ (Alkire, 2002, p. 184) and provide real opportunities to function through

a set of available alternatives (Garnham, 1999). Functionings describe the results of applying capabilities (i.e. the actual achievements (Sen 1992)).

The informational base of the CA for evaluating outcomes of development initiatives is based on capabilities that enable individuals to lead the lives they have reason to value and substantive human freedoms (Hill, 2003).

The seminal literature on the CA is “Development as Freedom” (‘DAF’), first published in 1999, by the 1998 Nobel Laureate, Amartya Sen (2001). Several other authors from different disciplines (e.g. Alkire, 2005; Comin, 2001; Corbridge, 2002; Deneulin & Shahani, 2009); Gasper, 1997; Giri, 2000; Nussbaum, 2000, 2006; Robeyns, 2001; Stewart, 2005; Stewart & Deneulin, 2002) have contributed to the development and clarification of this framework. The CA’s versatility lends itself to application in diverse fields, such as a philosophical analysis of social justice and human rights (Nussbaum, 2003), definition by children of their capabilities in an endeavour to understand appropriate dimensions of children’s well-being (Biggeri, et al., 2006), analysis of poverty alleviation programmes in New Zealand and Samoa (Schischka, Dalziel, & Saunders, 2008) and addressing a river water dispute between different Indian states (Anand, 2007).

One manifestation of the considerable influence of the CA is UNDP’s work on its HDRs and associated HDI (Sen, 2000a), with the very definition of human development bearing much resemblance to the definition of capabilities:

‘... a process of enlarging people’s choices. In principle, these choices can be infinite, and change over time. But at all levels of development, the three essential ones are for people to lead a long and healthy life, to acquire knowledge and to have access to resources needed for a decent standard of living. If these essential choices are not available, many other opportunities remain inaccessible’ (UNDP, 1990, p. 10).

A UNDP (2005) definition in the context of using ICT for human development in Asia read: *‘the process of enhancing the capabilities of individuals so as to expand their choices to live the kind of lives they value’* (p. 9).

Equipped with capabilities and subject to external constraints, it is up to individuals to translate these into functionings (i.e. applying agency in choosing whether and how to convert capabilities into functionings). Using the case of Mahatma Gandhi’s fasting, Sen (2005) illustrated the difference between capabilities and functionings. Having the capability of being well-fed, Gandhi used his agency when fasting, but the functioning (i.e. of not eating) was the same as that of a starving famine victim without access to food.

In the above case, access to commodities (food) influenced capabilities, but access is not always sufficient for the exercise of capabilities, as can be illustrated with respect to ICT. Two individuals may have access to the same commodity, say a telecentre where services are provided free of charge and therefore affordable for all from a monetary perspective, but one of them may lack capability to benefit from it due to insufficient literacy skills. The differences in capability would result in different achieved functionings, should the ICT-literate person apply his or her literacy skills. Having access to ICT is a commodity, knowing how to use it, represents a capability and applying agency to use it; say to send an e-mail, is a functioning.

From this discussion it follows that, while economic conditions may influence whether there is a telecentre and the extent of ICT literacy, economic indicators are in themselves inadequate for measuring quality of life and livelihoods and play no direct role in the above definitions. They may however be inputs into the process of converting commodities into capabilities and/or functionings (e.g. acquiring certain skills may cost money). There is thus a place in the CA for economic factors, but they are neither central, nor ends justifying means, but rather means to achieving what is valued. Economic freedom, defined as opportunities to use economic resources in the context of distributional arrangements of wealth, is one of the five rights and opportunities identified by Sen (2001, p. 10) as characterising human freedom. The others are political freedom, social opportunities, transparency guarantees and protective security. Freedoms are relevant whether or not they contribute to economic development (i.e. they are constitutive of development). There is a reciprocal link between freedom and capabilities in that certain capabilities are required to achieve and enjoy freedom, while freedoms in turn facilitate the expansion of valued capabilities.

From a political perspective, people's rights to capabilities, rather than achieved functionings would be appropriate societal goals (Robeyns, 2005; Sen 1982). Individuals can then use their agency to decide whether they value specific functionings. Explaining the importance of capabilities over functionings, despite the latter being more directly related to living conditions, Sen (2001) referred to slaves who could conceivably live in better material conditions than free persons, but would lack capabilities.

When considering goals of societies, Sen (1985) distinguished between well-being freedom and agency freedom, with the former being freedom to have a good life and the latter freedom to achieve what one has reason to value (capability). In contrast to passive beneficiaries, who may enjoy well-being freedom from an aid project without exercising agency, agents are actively pursuing agency freedom. The question of who should decide what capabilities to prioritise and how to translate these into functionings has been debated extensively. Insisting that individuals

and communities should decide, consistent with the capacity of everyone to define their own development priorities and goals, Sen has not been receptive to calls for him to define even a minimum set of basic capabilities. This does not appear compatible with his views on adaptive preferences (i.e. that deprived people may adapt to their relative deprivation):

‘deprived people tend to come to terms with their deprivation because of the sheer necessity of survival, and they may, as a result, lack the courage to demand any radical change, and may even adjust their desires and expectations to what they unambitiously see as feasible’ (Sen, 2001, p. 63).

If people adapt, they might lack aspirations to acquire capabilities that would end deprivations where such capabilities appear unattainable. However, in our field studies, rather than finding signs of repressed preferences, aspirations for better lives, particularly for children, were in abundance.

As a vocal advocate of basic capability lists, Nussbaum (2000, 2003) has proposed a tentative list of ten central minimum universal, normative human capabilities required to respect human dignity, as a basis for *‘constitutional principles that should be respected and implemented by the governments of all nations...’* (2000, p. 5), while acknowledging they must be reviewed over time and in different contexts. The idea is that governments would have constitutional obligations to provide for a threshold level of capabilities (Nussbaum, 2000). Despite insisting that capabilities be formulated through democratic processes, in his practical work, Sen has assumed that there would always be democratic support for capabilities such as being healthy, well nourished, educated and having secure employment: *‘Expansion of health care, education, social security, etc., contributes directly to the quality of life and to its flourishing’* (Sen, 2001, p. 144). These are *‘important not only in their own right, but also for the role they can play in giving people opportunity to approach the world with courage and freedom’* (Sen, 2001, p. 63). Sen (2005) has recognised the role ICT can play in contributing to these basic capabilities.

The issue of individuals vs. communities has also been hotly debated, with claims that there is excessive focus on the individual in the CA at the expense of firms and communities. As many who have tried to effect change in a community could attest, there are many barriers, of an institutional nature, between somebody’s freedom to act and ability to achieve (i.e. conversion from capabilities to functionings) - the latter often requiring the capability of forming groups. Considering that the CA focuses excessively on individualism, Stewart & Deneulin (2002) suggested an extension of the concept to include *‘valuable structures of living together’* (p. 68), arguing that the inclusion of *‘functional families, cooperative and high-trust*

societies and social contexts', deserve more attention in terms of how they facilitate and inhibit development. Corbridge (2002) also considered that the CA has paid insufficient attention to the social environment, in particular with respect to unequal power levels in the economic, political and cultural domains. But, in refuting this claim, Robeyns (2005) listed a number of studies that have compared average capabilities between different groups. Acknowledging influences of external constraints, including institutional, on the ability to acquire and use capabilities, the CA also recognises reciprocity between individuals and institutions in that a person's capabilities depend on social arrangements and institutions and in turn influence others, as described by Sen (1985):

'Given the intrinsic importance of well-being, and indeed of agency, it is not credible that a person can morally evaluate his or her actions without taking note of their effects on the well-being and agency aspects of others' (p. 216).

However, the principle of ethical individualism in the CA means that the unit for evaluations must include the individual. The practical implication of the collective vs. individual discourse for this study is that, while appreciating the importance of communities for the well-being of individuals (e.g. as reflected in our interest in social capital), it is ultimately for the individual that freedom and capabilities matter. For example, a project could create new community capabilities benefiting some, while disadvantaging others. It is thus not sufficient to consider the total or the average, but to also pay attention to the most marginalised.

For evaluations, the CA emphasises the primacy of capabilities, agency and freedom, with choice and factors affecting it, of paramount importance (Nussbaum, 2006, p. 45). Comin (2001) described the CA as *'a framework for evaluating and assessing social arrangements, standards of living, inequality, poverty, justice, quality of life or well-being'* (p. 4), arguing that it is at the micro-level where the CA is most relevant as an evaluation tool. Translating the ideas of the CA into practice is, however, far from straightforward, particularly on a de-averaged basis, due to difficulties in obtaining relevant data and general inexperience in operationalising the CA (Alampay, 2006a; Comin, 2001; Gasper, 2002).

This thesis is intended to be a contribution to operationalising the CA, by empirically applying aspects of it at the micro-level, whilst paying attention to the wider institutional factors at the meso- and macro-levels. We are interested in how these levels have affected iREACH, its users and others in terms of facilitating or inhibiting capability expansion and conversion of capabilities to functionings. In doing this, we build on previous work applying the CA in the context of ICT4D, discussed next.

5.1.1.1 ICT4D and the capability approach

‘... access to the web and the freedom of general communication has become a very important capability that is of interest and relevance to all Indians’ (Sen, 2005, p.160).

From a CA perspective, access to ICT is not an end in itself, but rather a commodity, or the means through which someone could achieve valued capabilities and functionings. The concept of access includes capabilities (e.g. computer literacy) to use the infrastructure, similar to Gurstein’s (2003) term “effective use” (see section 3.1.1). In the CESVS model, there is a reciprocal relationship between ICT and capabilities, in that individuals require certain capabilities to benefit from ICT, the use of which in turn facilitates communication and the free flow of information, salient factors for developing and sustaining capabilities.

There is a reasonable volume of work linking ICT and the CA in some way (e.g. Alampay 2006a, 2006b; Banerjee & Loo, 2002; Barja & Gigler, 2005; Byrne & Sahay, 2007; De’, 2006; Garai & Shadrach, 2006; Garnham, 1999; Gigler, 2004, 2008; Heeks, 2009; James, 2006; Kleine, 2010; Macueve, 2008; Madon, 2004; Mansell, 2006, 2010; Musa, 2006; Oosterlaken, 2009; Olatokun, 2009; Thomas & Parayil, 2008; Walsham, 2010; Walsham & Sahay, 2006; Wresch, 2009; Zheng, 2007; Zheng & Walsham, 2008). Appendix C summarises the focus and methodologies in some of these documents. A common thread in much of the literature linking the CA and ICT is the attention on capabilities of users to benefit from the technology in ways that will achieve desired functionings. The CA can be useful for both shaping the design of and for evaluating ICT initiatives. In modifying the technology acceptance model (TAM) to make it more applicable to developing countries, Musa (2006) referred to the relevance the CA and its focus on the intrinsic value to individuals of ICT, emphasising the importance of understanding how interactions between socioeconomic and human-development needs may impede adoption of ICT in the developing world.

Garnham (1999) analysed the contribution made by media to enhance a range of functionings, incorporating views from the CA when suggesting that those who evaluate impacts of ICT on human development should take into account the ability of people to use various forms of infrastructure, similar to “effective use”, referred to above. Thinking about ICT in terms of functionings and capabilities would move the discourse beyond what he considered superficial indices, such as commonly used access and usage statistics, toward greater awareness of the impact of inequalities in the marketplace to guide policy formulation for greater equality. Using the number of web sites as an indication of progress towards closing the digital divide, Wresch (2009) found that while there had been some progress in some of the poorest countries, there was still a significant gap in terms of websites accessible for people in

the developing world. He then went on to question whether the gap was linked with capabilities, concluding that these appeared to be expanding because of greater access to information. But this macro-perspective does not adequately reflect that access to information does not necessarily translate in its effective use.

Setting out to apply the CA in an analysis of two separate initiatives in indigenous communities in Latin America, Gigler (2004, 2008) focussed on interpreting reasons for different outcomes. Garai & Shadrach (2006) turned to a broad set of qualitative indicators derived from the CA in constructing their analysis of grassroots ICT interventions in India. On the theme of indicators, Barja & Gigler (2005) developed a conceptual framework, informed by the CA, for measuring information poverty in Latin America. Drawing attention to the requirement for new capabilities for the exchange of information about the economy, politics and society, they suggested that the significant role of ICTs in the advancement of human freedoms be incorporated.

Other researchers with an interest in the CA have gone a few steps further and applied the framework to specific countries or projects. Using the CA in an investigation of ICT ownership and access at two locations in the Philippines, Alampay (2006b) concluded that in order to contribute to human development, those who are marginalised must first be made aware of opportunities inherent in new ICTs. In their case study of a South African community health information system, Byrne & Sahay (2007) argued that the capability of community members to use the information collected be a central consideration.

Some researchers have applied the CA in analysing e-government applications in the context of development, most of them in India, but at least one from Mozambique (Macueve, 2008). In assessing whether and how the Kerala FRIENDS and Akshaya projects had improved well-being, Madon's (2004) informational base explored what functionings the projects had enabled, what users did with their new opportunities and barriers to achieving functionings. Administrative and governance reforms were included in the study to enhance understanding of how institutions shaped projects to achieve human capabilities. As discussed in the research findings, there were some similarities in outcomes between iREACH and Akshaya, particularly in providing physical spaces for women. Also interested in functionings, James (2006) explored the relationships between the Internet and poverty, concentrating on what occurs after the 'point of purchase' (i.e. usage, contrasting this with traditional welfare economics, with its emphasis on access, without consideration to the use of goods and service acquired). Many universal access policies, with their emphasis on access as a goal in itself, rather than capability of using and functionings enabled by ICT, reflect this welfarist approach. The focus of the iREACH

research is also on outcomes following the installation of ICT infrastructure, exploring how it has been used and resulting benefits.

Analysing Indian e-government initiatives from a CA perspective, De' (2006) focussed on the five freedoms identified by Sen (2001). Also using these in summarising how ICTs had contributed to the broader development of India, Walsham (2010) mentioned computerised land records and e-government services under freedoms associated with transparency guarantees, the contribution to economic facilities through initiatives such as telecentres, the use of mobile phones for primary producers, better agricultural supply chains and banking services, noting that these facilities had also contributed to social opportunities. While there were no examples of ICT's contribution to protective security, a project in which slum dwellers were more empowered by using information provided by an NGO illustrated political freedoms associated with ICT.

Informed by Alsop & Heinsohn's (2005) operationalisation of Sen's ideas and incorporating elements from the SLA, Kleine (2010) developed the "choice framework", applying it in exploring the use of ICT by micro-entrepreneurs in Chile. According to her interpretation of the CA as applied in this framework, individuals, rather than groups, would define their own meaning of development, based on what they value. Such a time-consuming exercise could be seen as a weakness of the CA, particularly where aspirations of individuals might be at odds with the expectations of funding agencies. This could have been the case in an example used to illustrate the framework: a female micro-entrepreneur who valued the ability to make an online "visit" to a German city, where she once had a pen friend.

Comparing villages in Kerala and Andhra Pradesh, Thomas & Parayil (2008) discovered better capabilities to use ICTs and convert information to useful knowledge in Kerala, attributing this to the more equitable socio-economic environment there, consistent with Niles & Hanson (2003) that conditions existing prior to the deployment of ICTs shape capabilities to use these. They concluded that ICTs, without social and political intervention, are not sufficient to promote development.

In concluding this summary of ICT4D studies, a word of caution related to use of the term capabilities and functionings. While, using "functionings" as a proxy for "capabilities", might strictly be what Bérenger & Verdier-Chouchane (2007) considered flaws in many studies using the CA, this study takes a more tolerant view, notwithstanding the importance we attach to agency and freedom. It is not always easy to distinguish between them and both are important concepts compared to prevailing utilitarian approaches.

The above discussion about diverse applications of the CA to ICT4D research highlights that, despite addressing many interesting aspects, a main question remains unresolved — how to apply the CA in a systematic manner to understand the contribution of ICT4D initiatives.

Literature relating to participatory evaluation of ICT4D initiatives within a CA conceptual framework is sparse, despite the reasonable body of work related to ICT and CA. Alluding to this sparsity, Mansell (2006) suggested that *‘one way of ensuring greater participation of the poor in ICT4D initiatives could be an evaluation of priorities in the light of entitlements as outlined in DAF ...’* (p. 903). Embracing the challenge presented by Mansell, this thesis represents an attempt to do this, using the CESVS framework, an innovative approach compared with other ICT4D research informed by the CA. What makes this approach unique is the combination of three constructs, in the CES model, in combination with an overall research framework. We now proceed to introduce the other two constructs of the model before presenting the research framework.

5.1.2 Empowerment

‘Yet it is only when new information and communication technologies empower humankind with the ability incessantly to feed knowledge back into knowledge, experience into experience, that there is, at the same time, unprecedented productivity potential, and an especially close link between the activity of the mind, on the one hand, and material production, be it of goods or services, on the other’ (Castells, 1999, p. 11).

One way of thinking about empowerment is as capacity for self-reliance (i.e. the opposite of dependency): *‘Dependence on others is not only ethically problematic, it is also practically defeatist in sapping individual initiative and effort, and even self-respect. Who better to rely on than oneself to look after one’s interests and problems?’* (Sen, 2001, p. 283).

Although the name of the field research site for this project includes the word empowerment, this was not the reason for incorporating empowerment as a key construct and the model’s development pre-dated the identification of the site.

There is a vast and complex body of literature on empowerment, but the modest purpose of this section is just to introduce this concept in sufficient detail to share a common understanding of what this concept means when considering its interdependencies with ICT in the conceptual model and the research findings. References to empowerment in the ICT4D literature abound, often with assertions that ICT has the potential to empower in general, or that a particular initiative has empowered people, but without properly defining the term.

There are several definitions of the multidimensional and interlinked process of empowerment, all of which imply some form of change in power relationships arising from a critical understanding of the political and social environments (Alsop & Heinsohn, 2005; Perkins & Zimmerman, 1995; Ramilo & Cinco, 2005). One such change, identified in the World Bank's "Voices of the Poor" reports (Narayan, et al., 2000), is the ability of having a say in decisions affecting one's life and freedom from humiliation and harassments in dealings with state institutions. Central to the understanding of empowerment is that it is a process that expands a person's choices and control over his or her life (Beteta, 2006), rather than an outcome. As a process, enabled or impeded by different factors, its nature is ongoing, with inputs and outputs, where the inputs serve as an 'enabling ingredient' (O'Bryant, 2003, p.77), required to start the process and include capabilities of considering options, taking control of decisions. The outputs involve a sense of control and critical awareness (Zimmerman, 2000), enabling individuals to set realistic goals they are capable of accomplishing. It is a process through which marginalised individuals or groups can exercise their agency (Friedmann, 1992), freeing themselves from domination, whether imposed by structures or relationships.

As implied in the above, individual empowerment is not sufficient, but the concept requires a broader view that encompasses groups, organisations and communities as central for conceptualising empowerment for the purpose of understanding the contribution ICT can make, particularly with respect to shared facilities, such as iREACH.

From the CA perspective, empowerment is a capability, representing the expansion of somebody's freedom in a manner enabling that person to lead a life he or she values and has reason to value. It can also be a functioning (i.e. an achievement of a capability) once someone has grasped the opportunity for empowerment. The recognition of empowerment as a central factor in the development discourse has in part inspired its inclusion as a key construct in this thesis.

In articulating the CA's association with empowerment, Robeyns suggested: '*In several instances the enlargement of people's capability sets will require practices of empowerment...*' (2001, p.26) (i.e. empowerment can provide opportunities for individuals and communities to expand relevant capabilities). These can in turn be empowering (e.g. the capability of empowering oneself). The reality of those who lack one or several basic capabilities, such as education, can illustrate the primacy of these for empowerment. They often find themselves in a process of deprivation, which may lead to impairment of their agency and functioning (du Toit, 2005). From a positive perspective, Madon (2004) noted that entrepreneurs who had taken the opportunity offered through the Akshaya project had achieved the functioning of being

empowered by becoming self-starters. The frequent use of the verb “empower” in the transitive form, with the subject being different from the object (i.e. x empowered y) is problematic, as the subject and object would have to be embodied in the same person (i.e. individuals empower themselves (Fetterman & Wandersman, 2007; Masschelein & Quaghebeur, 2006)).

This might create a dilemma for NGOs when attempting to facilitate empowerment in that they may exert their power to prescribe what they consider empowering, leading to disempowering “dependency”, despite the process of interaction and the outcomes being empowering at some level (Kilby, 2006). One way of overcoming this would be for institutions, including NGOs, to support processes that increase empowerment by creating an enabling environment (e.g. by removing roadblocks), rather than trying to empower individuals. Outside organisations conceptualising empowerment and its introduction as a key issue in development, as was done at iREACH, do not detract from this fundamental in the empowerment process. Such initiatives can provide the conditions enabling poor people, who may be too busy surviving to initiate action to overcome disempowerment, to engage in activities beyond their immediate needs (White, 1996) and participating in iREACH was for many an experience of this nature.

Empowerment is an oft-stated objective of development projects, as in iREACH, sometimes in combination with reducing inequality (e.g. BRAC’s (a major Bangladesh NGO) objectives include the *‘alleviation of poverty and empowerment of the poor, so as to reduce inequities between the rich and the poor, and between men and women’* (Chowdhury & Bhuiya, 2004, p. 381)). Although reduction in inequality was not an explicit objective of iREACH, equality considerations are nevertheless incorporated in the study.

Some of the empowerment building schemes that have emerged to address this issue, tend erroneously (Chambers, 2005; Friedmann, 1992) to focus on local autonomy, ignoring the difficulty of people empowering themselves at this level, where local elites often appropriate resources and dominate formal and informal institutions. While conscious of this issue, as mentioned in section 9.3, dealing with iREACH’s impact on governance and institutions, we avoided probing too deeply into this area so as not to endanger any of the participants.

As evidenced by the title of the chapter on research findings dealing with empowerment, which includes the term social capital (chapter 9), this study takes a broad view of issues incorporated under this umbrella, as in dealing with sustainability, the topic of the next section.

5.1.3 Sustainability

‘It can not be doubted that the concept of sustainable development, pioneered by Brundtland, has served as an illuminating and powerful starting point for simultaneously considering the future and the present’ (Sen, 2002).

The concept of sustainable development is commonly attributed to the Brundtland Report, where it is defined as *‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’* (WCED, 1987, p. 43). This definition does not refer to distributional equity issues. In “Agenda 21” at the 1992 Rio “Earth Summit”, the UN Conference on Environment and Development, four dimensions of sustainability were combined into a more comprehensive approach: ecological, social, economic and cultural (Bichler, Bradley & Hofkirchner, 2010). The SLA (section 4.1.2) also operationalises factors beyond the natural environment in sustainability.

Despite Sen’s references to sustainability, the CA community has only engaged to a limited extent with this issue, possibly stemming from Sen’s view that the sustainability literature has paid insufficient attention to the need for guaranteed protective security, one of the five instrumental freedoms he considered essential for contributing to the capability of a person to live more freely:

‘It is worth noting here that even the highly illuminating literature on “sustainable development” often misses out the fact that what people need for their security is not only the sustainability of overall development, but also the need for guaranteed social protection when people’s predicaments diverge and some groups are thrown brutally to the wall while other groups experience little adversity’ (Sen, 2000b, p. 37).

For example, the positive environmental benefits of crop diversity may provide protective security for farmers controlling their own land, but this option is not available for landless people, highlighting that the link between environmental conditions and people’s opportunities to realise what they have reason to value may not be available to all (Scholtes, 2010).

Notwithstanding the limited connection between sustainability and the CA, there is a thematic group dealing with sustainable human development within the Human Development and Capability Association, an organisation promoting research from many disciplines on key issues of the CA. Another initiative is a German research project, GeNECA, aimed at conceptualising sustainable development from the CA perspective, combining the issues of inter- and intra-generational justice by drawing on an integrated understanding of social,

economic and environmental development. There are no direct links between either of these two initiatives and ICT.

Beyond the CA community, there has been considerable exploration of the use of ICT in the context of the environment, natural resource management, livelihoods (Spence, 2003) and for mitigation against natural disasters, as in the Geneva Plan of Action (WSIS, 2003), subheading 20, “e-Government”:

1. *‘Governments, in cooperation with other stakeholders are encouraged to use and promote ICTs as an instrument for environmental protection and the sustainable use of natural resources.*
2. *Government, civil society and the private sector are encouraged to initiate actions and implement projects and programmes for sustainable production and consumption and the environmentally safe disposal and recycling of discarded hardware and components used in ICTs.*
3. *Establish monitoring systems, using ICTs, to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, LDCs and small economies.’*

Referring to MDG #7, “ensure environmental sustainability”, UNICT (2003) pointed to the valuable contribution ICT could make to environmental management by improving monitoring and response systems, facilitating environmental activism and enabling more efficient resource use. More recently, with the increasing awareness that: *‘The fights against poverty and climate change must go hand in hand, or we will lose them both’* (Solheim, 2010, p. 100), there has been a tidal wave of publications and activities related to ICT and sustainability in general and with respect to developing countries in particular. In one, Souter, et al. (2010, p. 4) introduced this topic: *‘Two issues of profound importance lie at the heart of current thinking about the development of global economies and societies: the challenge of environmental sustainability, and the potential of information and communications technology’*.

The Swedish Program for Information and Communication Technology in Developing Regions (SPIDER) held a workshop in April 2008 where researchers and professionals could share insights and experiences in the application of ICT to sustainable development (Larsen, et al., 2010). The 2009-10 World Economic Forum’s Global Information Technology Report, subtitled “ICT for Sustainability”, contains several chapters related to that topic (WEF, 2010). A 2009 workshop arranged by the Organisation for Economic Co-operation and Development (OECD), *infoDev* and the World Bank incorporated a separate session on “ICT and the

environment in developing countries: opportunities and developments”, exploring the role of ICT in adaptation and mitigation of climate change and other environmental pressures and international co-operation (e.g. through sustainable ICT value chains) (Houghton, 2009). IDRC commissioned research aimed at strengthening knowledge exchange on links between ICTs and climate change in developing countries (Ospina & Heeks, 2010). The journal *Information, Communication & Society* devoted its first 2010 issue to sustainable development and ICTs. In one of the papers, Hilty & Ruddy (2010) concluded that ICT can only support sustainable development as enablers of de-materialised production and consumption. Plepys (2002) had previously noted that there is no direct relationship between ICT and the environment and, depending on how it is used, it can be positive, negative or neutral, and considerably larger than direct impacts of increased consumption of ICT products and services. From the perspective of ICT profoundly affecting all sectors of the economy, and in addition to focussing on de-materialisation, Plepys articulated a broader view, consistent with the Rio Summit:

‘...it is necessary to look at both ecological and social dimensions. The positive ecological dimension rests on ICTs potential to deliver greener products, optimise the ways of their delivery, and increase consumption efficiency through dematerialisation, e-substitution, green marketing, ecological product life optimisation, etc. The environmental potential offered by the ecological dimension will be fully utilised only under an optimised social dimension, which deals with the behavioural issues of consumption’ (p. 518).

Dematerialisation was also implied in the suggestion by Sheehan (2008) that:

‘a central challenge for development theory and practice now is to understand and implement rapid growth based on services, and on a closer link between services and the rural sector. Little is understood about how to stimulate service growth in a developing country...’ (p. 17).

It is this broader view of sustainability that informs the CESVS model, rather than a narrower focus on the natural ecological environment. The term sustainability in the ICT4D literature is often used in the context of externally funded initiatives, such as iREACH, being able to continue beyond the external funding period. This form of sustainability is termed “viability” in this thesis.

5.2 Research framework elements

5.2.1 Longitudinal perspective

The Sydney Opera House ‘got an ambivalent response when it was announced, was considered a debacle during construction as the budget blew out, but is now seen as a triumph’ Edwards (2009). The CESVS framework recognises the importance of timing in assessing impacts, which are often indirect, similar to spillovers in economics (i.e. the impact may extend in unpredictable ways over an unknown period). But, ‘static, one-shot, cross-sectional studies’, characterising general information systems research (Orlikowski & Baroudi, 2002, p.54), have also been predominant in ICT4D. Most evaluations take place upon the “completion” of projects, when they can mainly offer benefits of hindsight, without making constructive contributions. Snapshot evaluations may not be appropriate for ICT4D, because of their innovative nature (Rogers, 2003). Heeks (2002) conveyed the importance of a longitudinal perspective because ‘today’s IS success may be tomorrow’s IS failure’ (p.101). Benefits enjoyed during the early, often euphoric, phase of a project can easily evaporate, particularly at the expiry of an external funding period. As most projects are dynamic — developing over time, with impacts likely to take a long time and be indirect, Hudson (1999) suggested that collecting data on telecentres at several points after the installation would provide better insights than a single evaluation at the “end” of a project. A longer-term perspective in evaluation recognises that acceptance, adoption and noticeable impacts of new forms of technologies may require exposure over a longer period (Hudson, 2006). This is particularly so where historical, cultural and/or socioeconomic conditions differ from the environments where technologies were invented, and as the contributions are likely to be less perceptible than acceptance and adoption, longitudinal approaches are more appropriate where the focus is on livelihood outcomes (McNamara, 2008; Musa, 2006). Another benefit of longitudinal approaches of relevance for participatory evaluations is that evaluations over time would be more conducive to capacity development.

Benefits of a longitudinal approach can accrue whether or not impacts are intended and expected. An unfavourable report shortly after project completion may have negative outcomes on the future of an initiative that might be successful in the longer term. Sometimes an evaluation can be useful in guiding its future development, another beneficial function of longitudinal studies (Parmar, 2009). The opposite may also hold, with positive outcomes fading away, as happened with an experimental mushroom growing plot at an iREACH hub, an activity noted as an example of innovation and social capital in a 2009 evaluation. In the 2010 study this

experiment had ceased. This validates the view of Gaved & Anderson (2006) that the points in the lifecycle where data is gathered will also determine how successful it appears.

Longitudinal studies can also be useful in understanding behaviour trends, as impacts change over time, pointed out by several authors in Wagner, et al. (2005). As noted by Whyte (1999, p. 288): *'the best data on impacts will come from longitudinal studies which can measure changes...'*. Having tried to understand trends by relating to perceptions of change, Souter, et al. (2005) acknowledged that data on actual behavioural trends would require a longitudinal panel study. One advantage of a forward-looking longitudinal perspective over a historical, retrospective analysis is that people's recall over a longer period becomes less accurate (Weisberg & Bowden, 1977), thereby improving construct validity (Franz & Robey, 1984), as events may be described in a more valid manner when analysed closer to their occurrence. According to them, it would also be easier to consider alternative interpretations at that stage, as the risk of rationalisation may increase with the duration between an event and its recording.

Without forward looking longitudinal evaluations exploring social aspects, statements about impacts *'take on a speculative nature'* (Huysman & Wulf, 2004, p. 12) and the foundation on which to build new ICT projects is less solid than it need be.

Despite the many benefits of a longitudinal perspective there is a paucity of impact assessments of this nature (Gaved & Anderson, 2006; Hedström & Grönlund, 2008; Menou, 1999; Sey & Fellows, 2009), most likely due to costs. Journal articles rarely adopt that perspective and where several researchers have studied the same project at different points in time, there seems to be a surprising lack of reference to previous studies, so there is seldom an explanation of diverse findings, or acknowledgement of compatible findings. Taking Gyandoot as an example, of the many researchers covering this project, only a few have referred to findings in previous studies.

Longitudinal studies of ICT4D at both the macro- and micro-levels tend to be backward looking, the former often in the form of time-series correlation analyses, as described in section 3.1.5.1, with the study focus often influenced by available official data. At the micro-level, studies tend to explain what occurred through analysing whatever documentation and log data might be available, in combination with interviews. Examples include Best & Kumar's (2008) analysis of historical log data to understand why some of the SARI kiosks survived longer than others, with further light shed through interviews and Ballantyne's (2004) evaluation of Namibia's Schoolnet project, which used some historical data.

Notwithstanding the aforementioned claim about a paucity of forward-looking longitudinal research, there are several studies of this nature, among them another study of SARI by the same authors (Kumar & Best, 2006b), on e-government applications at SARI, starting in mid-2003, with a follow-up study in 2005 to validate the findings. Other studies include Warschauer's (2003) case study in Egypt, conducted between 1998-2001, a study by Ramirez (2001) on community-based networks in Canada and longitudinal participatory action research in South Africa (Rhodes, 2009). Madon (2006) adopted a longitudinal approach to the study of IT-based government reform initiatives in India, as did Prakash & De' (2007). Examining the implementation process of GIS projects in India, Puri & Sahay (2003) also took a longitudinal perspective.

There are longitudinal studies of non-intentional projects (e.g. Overå's (2006) study of mobile use among onion and yams traders in Ghana, with interviews over a period of almost three years). Focussing on how ICT had affected trust among businesses in Tanzania, Moloney's (2006) fieldwork traced ICT in Tanzanian businesses over 15 months. Jensen & Oster (2009) used a household panel survey over three consecutive years to study the relationship between cable television and women's power in four states of India.

So, how long is longitudinal? There is not much guidance, even from IICD, which has adopted a longitudinal approach to evaluation of its ICT livelihoods projects for in-depth analysis to better understand linkages with poverty alleviation (McNamara, 2008). Views on what may be a suitable timeframe vary. Gaved & Anderson (2006) recommend data collection over a minimum of five years, also suggesting systematic assessment of social impacts through research on existing or recent initiatives. Menou (1999) referred to a timeframe of approximately ten years when writing: *'It is the process of change by which stakeholders moved from one to the other situation which one needs to understand in order to learn from this endeavour and take more effective action in the future'* (p. 203).

Given the benefits of a longitudinal perspective and viewing evaluations as a process, this approach is one of the three elements of the CESVS research framework, which is designed to capture short-term outcomes as well as impacts that may be longer lasting. While enough time has elapsed from the start of iREACH to gain some meaningful insights, it was not possible to conduct the study for this thesis to an extent necessary to give an indication of the timeframe within which impacts of iREACH could emerge sufficiently to populate the CESVS model as much as would be desirable. The two research waves offered a *'richer patterns for theorizing'* (Grover, et al., 2008, p. 46) than would be possible with only one wave. The main point is the inclusion of and justification for a longitudinal approach in the framework, as elaborated above.

The two waves also offered training for iREACH staff to enable them to conduct their own research in the future, consistent with Menou's (1999) view that self-observation, combined with third party involvement may be required to facilitate the process, while at the same time providing some form of non-partisan influence.

5.2.2 Micro-, meso- and macro-levels

Gagliardone (2005) used Ethiopia's Schoolnet program to illustrate a project not contextualised at an appropriate level. The decision to install a plasma TV set in every secondary school was intended as a way to compensate for the lack of qualified English language teachers, but the lack of reliable power supply and maintenance facilities was not taken into account. Designed from a central location, this initiative demonstrates problems that can occur when experiences from one area, are copied or scaled without adequate contextualisation. Projects designed at the other extreme (i.e. the village or local level) would most likely take relevant issues into account, but also suffer from deficiencies. With every village deciding its own methods for education, health, ICT and other infrastructure deployments, economy of scale benefits would be foregone, efforts in design and other functions duplicated and there would be no structures through which scalability could be achieved. A structure that contains a middle-tier, the meso-level, might avoid the pitfalls often inherent in either macro- or micro-perspectives.

Insufficient attention to the meso-level was one of the reasons for problems with an ICT project among the Ashaninka in Peru. This initiative was implemented at the community-level without coordination with the traditional organisational structure of the indigenous movement in Peru, a meso-level structure (Gigler, 2004).

From their experience of an Indian health programme, Madon, Sahay & Sudan (2007) noted that macro-level policy priorities and micro-level implementation of health projects were often disjointed. Also drawing on experiences from health information systems in India, Sahay and Walsham (2006) explored how to build scalable health information systems that could connect macro and micro levels.

These examples illustrate that analytical levels other than the national and the local could achieve closer orientation of macro-policies towards requirements articulated at the micro-level. A more realistic understanding of an ICT system could emerge between these two levels, defined as the meso-level. It is at this level that processes for interaction between other levels could be facilitated in ways that would enable local contexts to be taken into account, without jeopardising the benefits of scale and scope. ICT4D research at the micro-level is mainly in the form of evaluating individual projects, usually without explicit reference to macro- or meso-

levels, which may be critical in facilitating or impeding achievement of objectives. Macro-level research commonly deals with national policies or macro-economic factors, often without considering impacts on individuals. In addition to middle-tier government authorities, intermediary organisations, such as NGOs, partnerships and franchises operate at the meso-level, as do businesses that can be involved in different aspects of service provision, from equipment to content. The latter is particularly important in understanding the role of ICT in supply chains. Organisations placed at the meso-level in this definition, can be multi-tiered global organisations, in turn operating at the three levels.

The micro-, meso- and macro-levels in this study refer to geographic and conceptual dimensions. The micro-level is the lowest tier under consideration and in the case of iREACH it comprises individuals, the iREACH pilot areas (i.e. the villages equipped with iREACH hubs), with the commune governance structure operating at the meso-level. The Cambodian government, with its provincial governance structures, policies and practices is at the macro-level. The boundaries between all three layers are blurred, illustrated by the dotted lines in Figure 3, which shows the CESVS model operating at the micro-level.

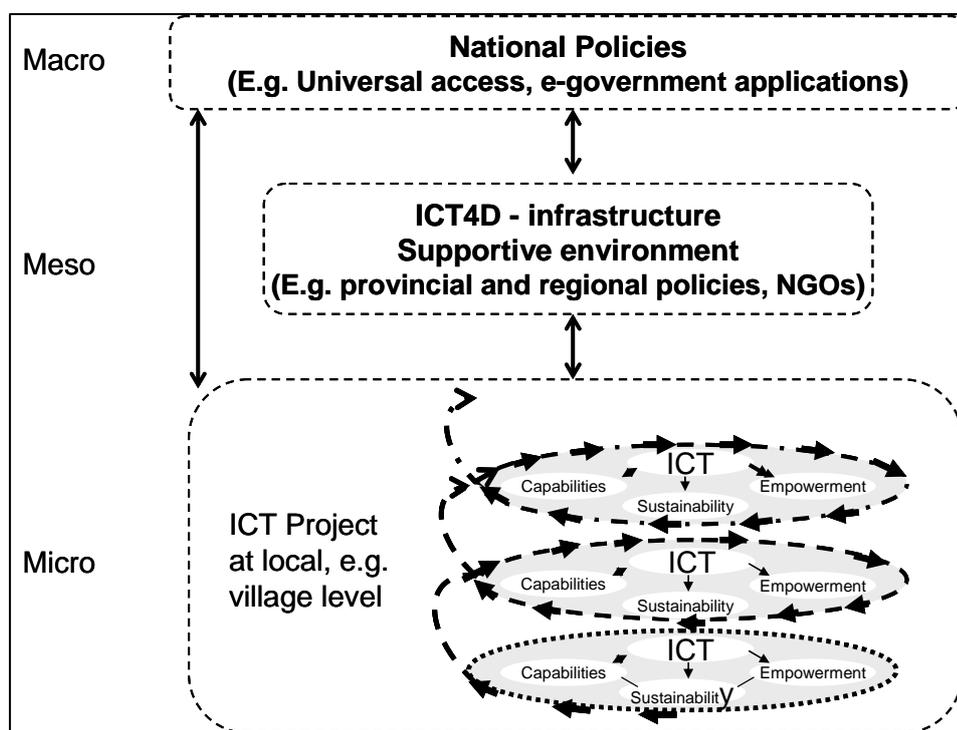


Figure 3: Schematic of the micro, meso- and macro- layers
 Author's analysis. Previously published in Grunfeld, Hak & Pin (2011).

While the model is primarily operationalised at that level, the arrows indicate interdependencies with the other levels, with several nested hierarchies within this somewhat simplified 3-tier scale. It is the understanding of the information flows and interdependencies that is relevant, rather than their exact definition. The relationship between the tiers is of a bi-directional nature. Policies, developed at the macro-level affect services at the meso- and micro-levels. Feed-back on micro-level outcomes of policies and initiatives should find their way to the macro-level, for the purpose of policy review (Rakodi, 1999). Layers form subsystems as part of wider systems, as in systems theory, an approach advocated by Andrew & Petkov (2003) and Ramirez (2003) for analysing the social context of ICT in rural environments. This interplay between the different tiers tends to be ignored in CA applications, dealing with either the macro- or micro-levels (Comin, 2001; Alkire & Deneulin, 2009). Expanding Sen's views on capabilities to encompass communities, referred to as the meso-level, Stewart (2005) suggested groups receive a more prominent role in the CA.

The three tiers also have a role to play in a conceptual dimension, in which they can denote any form of intermediate, or mid-point (e.g. different levels of generalisation). In this dimension, the meso-level defines a medium level of generalisation, *'less sweeping than macro concepts, without claiming that everything is different'* (Bebbington, 2004, p. 348). Similarly, Mohan & Hickey (2004) called for a *'path between the failed explanandums of meta-narratives and the methodological individualism of the more voluntaristic actor-oriented approaches, and also between the political and the cultural'* (p. 70) and Stockdale & Standing (2006) for frameworks that are *'sufficiently generic to be applicable to a wide range of applications, but also sufficiently detailed to provide effective guidance'* (p. 1091).

In the time dimension, the meso-level lies between short-term priorities and longer-term sustainability. Immediate challenges may require a short-term perspective, but this focus alone places sustainability at risk. Longer-term goals may appear too distant, whereas intermediate objectives, the meso-level, can render the longer term more realistic. The three-level concept is relevant for sustainable development, in that local communities that normally play a central role in natural resource management are not necessarily linked across institutional and structural boundaries (Jagger, Pender & Gebremedhin, 2005). These usually go via the meso-level, which is often overlooked in favour of emphasis on local and global levels (Khagram, Clark & Raad 2003), an unfortunate omission, they argued, as threats and opportunities for sustainable development tend to emerge at intermediate levels (i.e. at the meeting place for broader trends and the specificity of individual locations). Just as the issues can more easily be identified at this meeting place, so it is at this level that the potential for resolution is the greatest.

Most ICTD research overlooks the meso-level and interactions between different levels in favour of focussing on either the macro- or micro-level, thereby missing potential opportunities available at the middle tier, where service provision could be the most responsive (Goldman, 2000). At this level, it may be easier to cooperate with government authorities, infomediaries, NGOs and other organisations that can facilitate effective use of ICT (Duncombe, 2006; Ramirez, 2001). Suggesting that the meso-level is where '*normative changes occur and policy interventions often operate*' (Malhotra, Schuler & Boender, 2002, p.15), they noted a lack of empirical studies. This accords with Mansell's (2002) view that there is not much knowledge about how those at the meso-level view ICT and its relationship with society.

Just as both macro- and micro- perspectives are important to the understanding of ICT in broad economic development (Best & Kenny, 2009), so they are in comprehending its role in the social domain. It is rare to find reference to the impact of the macro environment on the micro-level. For example, when carriers fail in their obligations to deploy infrastructure in rural areas, preferring instead to pay penalties for breaching their supply obligations, there will be impacts on the micro-level (Bhuiyan, 2004; Malik & de Silva, 2005).

Except for analysis of firms, especially small and medium enterprises (SMEs), attention to the meso-level is also insignificant in ICT4D research, despite the benefits discussed above. There are some cases where researchers have referred to analysis at three levels, but not in terms of macro-, meso-, or micro. For example, Whyte (1999) emphasised the importance of taking into account perspectives at the local community, the national and the international levels. Dougherty (2006) noted that projects that had networked and built alliances between the local, regional and global levels were the most successful.

Several studies have incorporated at least two levels, but only a few have incorporated a meso-level perspective and even fewer have actually referred to this critical tier. Ballantyne's (2004) evaluation of SchoolNet took a macro perspective in its coverage of policies, while at the same time being a micro-level study, incorporating individual schools in the assessment. A paper by Harris, et al. (2003) on ICT and rural development in Nepal, suggested a link between macro and micro, presenting a methodology called infomobilisation designed to scale up telecentre operations to achieve development objectives. Linking the impacts of individual e-government centres with policies at the government level was a feature of De's (2006) study of Bhoomi. In their case study of Grameenphone, Richardson, Ramirez & Haq (2000) addressed the micro-environment by exploring the impact on individuals of policies at the macro- and meso-environments that enabled this initiative to occur. A key reason for its success is likely to have been co-ordination at three levels: telecommunications policy at the macro-level, the

Grameen multi-stakeholder structure at the meso-level and individual operators at the village level. Combining the expertise of Grameen Bank, Grameenphone and Grameen Telecom, all of which are meso-level operators, it was possible to provide services profitably to previously underserved rural poor.

In contrast, the lack of commitment by political leaders and public managers noted by Best & Kumar (2008) was a key factor in the failure of many SARI kiosks. That those kiosks owned and managed by the Dhan Foundation (a local NGO) were more successful, supports the contention that a supportive meso-level is essential. This was also noted in a study of Akshaya by Gurumurthy, Singh & Kasinathan (2005), who identified the state-wide implementation design managed by the state government and the participation of local governments as the most significant features of this initiative. They also attributed some problems to the telecommunication policies at the national level. But, despite support from some macro- and meso-levels, some individual kiosk operators were still unsuccessful (Kuriyan, Ray & Toyama, 2008). Without reference to any explicit layers in her study of telecentres in Jamaica, Bailey (2009) hinted at their importance by referring to the potential of the telecentres to establish linkages between ICTs, education and healthcare, functions normally the responsibility of the meso- and macro-levels.

Several ICT4D initiatives, including iREACH, are structured around three-tiers. The Informatics unit of the M.S. Swaminathan Research Foundation (MSSRF), with its headquarters, village resource centres and village knowledge centres (VKCs) is another example of a three-tier structure — a structure that is no guarantee for success. This was the case with community information centres in Nagaland, involving central, state and local authorities, but the central maintenance from Delhi created operational bottlenecks (Jain & Raghuram, 2005). The non-profit Infocentre project in El Salvador linked into macro- and meso-levels through content development agreements with government departments and culture and art programming for a regional cooperation agency. It also followed a three-tier structure, with a central operation, nodes, and ‘virtual’ telecentres with networked computers hosted within the facilities of partner associations under special operating agreements (Khelladi, 2001).

Smith & Madon (2007) suggested that multi-level and longitudinal approaches would strengthen the theoretical foundation in ICT4D research, but only a small number of studies have combined these two perspectives, one of which deals with a government reform initiative in the Indian state of Gujarat (Madon, 2006). There is nevertheless an increasing awareness that frameworks linking the three levels provide insights into vital contextual and policy issues, thereby improving awareness of social, political and technical aspects of ICT4D (Duncombe,

2006; McNamara, 2008). In its checklist of what to consider for telecentre networks to support livelihoods, UNCTAD (2007) classified factors into these three levels and acknowledged the importance of links between them. The macro-level included policies and programmes supporting economic activities and the meso-level consisted of issues associated with telecentre networks as institutions. Its focus at the micro-level was on exploring how telecentres can support local livelihoods, taking into account factors such as assets, capabilities, vulnerabilities and social relations. This approach, together with other arguments presented in this section suggests a multi-tier research perspective, paying attention to several levels of analysis to unlock understanding of how ICT4D initiatives can enable certain outcomes.

5.2.3 Participatory approach

Since emerging from development activities in the late 1980s, “participation” has been widely used in the development discourse (Alkire, 2006; Baruah, 2009; Gaventa, 2004). Embracing participatory approaches as a way of improving the effectiveness of its projects, the World Bank initiated the Participation Learning Group, a cross-organisational unit established in 1990 (McGee, 2002). This group found that, although more time was required for the preparatory stages, the costs may be no higher for participatory than for other approaches (Bhatnagar & Williams, 1992), particularly when taking into account that there may also be costs associated with ignoring participation (Becker, 2007). Additional costs in terms of time may be incurred with adequate representation in participatory research processes, but again, these costs would have to be balanced against the risks to certain groups if they are not adequately represented (McAllister, 1999).

Monitoring and evaluation is only one of several functions in a process through which people, particularly the disadvantaged, might exercise power, or at least influence, throughout a project and some researchers advocate an all or nothing approach to participation (Khagram, Clark & Raad, 2003; Masaki, 2004). But even where participation is all-encompassing, there is still no guarantee that this would be sufficient for social change (Alkire, 2006).

The relationship between participation on one hand and empowerment, accountability and/or equity on the other is unlikely to have been the motive for the World Bank’s interest in participation, even if its participation was designed to make projects more relevant and sustainable for the most marginalised people (Chambers, 2005). For example, empowerment was not included among the six benefits of participatory approaches in a World Bank publication on participation (Bhatnagar & Williams, 1992, p. 4). When used for the purpose of improving efficiencies in development outcomes, participatory processes do not necessarily

question power relations and might not contribute to empowerment. At worst, they may disempower the most vulnerable (Kelly, 2004). They can also enrich the learning process and contribute instrumentally to objectives, as measures of success tend to be more realistic and relevant when developed by those targeted by a specific intervention (Karl, 2000).

While there is an argument for a trade-off between participation as a tool of empowerment and as a means to attain project objectives (Parfitt, 2004), there is also support for the idea that the two aspects are compatible (Chambers, 1997). In Arnstein's (1969) "ladder of citizen participation" only the type that changes power relationships would occupy the top rungs, where she placed partnership, delegated power, or citizen control. Objectives of more extreme forms of participation, include the "*transformation of existing development practice and, more radically, the social relations, institutional practices, even social relations, institutional practices and capacity gaps which cause social exclusion*" (Hickey & Mohan, 2004, p.13). This would include Gaventa's (2004) suggestion that participation extends to, '*the right to define and to shape that space*' (p.34).

A more moderate view accepts the use of participation as a means as well as an end (McAllister, 1999; Parfitt, 2004), where the former, unlike the latter, is politically neutral in that it does not deal with any power relationships – e.g. as in DFID's (2000) definition of participation in its manifesto on human rights, as: '*...enabling people to realise their rights to participate in, and access information relating to, the decision-making processes which affect their lives*' (p.10).

The adoption by the World Bank of participatory approaches, as a technical method for project work, rather than as a methodology for empowerment has in the opinion of the more extreme adherents of participation, discredited this method. Others have proposed the participatory orientation be revisited, rather than discarded.

Some participatory methodologies have been formalised; the most well known of which probably is "participatory rural appraisal" (PRA), which, drawing on insights from anthropology (Gardner & Lewis, 1996), was introduced in the late 1980s and later modified several times (e.g. participatory learning and action (PLA) and combined PRA/PLA). Introduced at a time of increasing focus on empowerment, the decentralised nature of PRA has the potential of changing patterns of hierarchical power and is thus akin to participation from a CA perspective, which is democratic and empowering, giving people a voice in influencing decisions that will shape the future of participants (Alkire, 2006).

The empowerment evaluation paradigm considers participant empowerment through the evaluation process to be just as important as the evaluation itself (Diaz-Puente, Montero & Carmenado, 2009; Fetterman & Wandersman, 2007). While participatory evaluation could well lead to empowerment and the shaping of a particular space, this has not necessarily been the intention of the many researchers, who have used participatory forms of evaluation in a wide range of education and community development projects, including ICT projects (Hudson 2001; Lennie, et al., 2005). Unwin (2005a) supported the concept of evaluations as a shared activity, to maximise the learning generated from the process of evaluation and to ensure that those who are supposed to benefit from a project can have some influence.

There are also potential dangers and risks of participation. As it can be tedious and time consuming, there is a risk that the voices of those who are most busy, women in particular, might not be heard, making them even more marginalised (Warren, 2007). Local elites, who can capture the process, could limit participation of those likely to express negative views of the results of a certain project (Gordillo & Andersson, 2004; Kumar & Corbridge, 2002). The reverse is also possible, in that participation may enable individuals to renegotiate power dynamics, thereby creating discord, which can be quite detrimental in smaller communities where interpersonal conflicts can be more prone to undermining the social fabric than in larger settings (Platteau & Abraham, 2002). Other risks include raising expectations that cannot be met and hostility from participants, who can also become defensive (Gardener & Lewis, 1996).

While active participation by different social groups may be compatible with the prevailing culture, this may not be the case where social relations could constrain the exercise of agency required in the participatory paradigm (e.g. some cultures place high value on avoiding conflict and/or doing things the “right way”). A key issue is also what returns, tangible and intangible, people receive from participation. It is, according to White (1996), insufficient for these to be nebulous, such as participation transforming people’s reality and their perception of it, as there should ultimately be some noticeable benefit to avoid participants feeling obliged to participate because of power relationships that may not be visible to the researcher.

While iREACH, through its elected management committees, opened a space for community involvement, observing changes in power relationships was not a direct objective of this study. iREACH arranged a PRA exercise at the beginning of the project, mainly in the form of a needs analysis, but the participatory research in this thesis did not flow from that PRA, nor was it based on the PRA methodology or any of its derivatives. Empowerment was not the main purpose of opting for a participatory research approach. Though not designed to transfer any power, neither was there any cynical intent behind this approach, as in the middle rung —

“tokenism” — of Arnstein’s (1969) ladder. While the objective of the research was learning and understanding, the participatory research process could well have contributed to empowerment. The reason for using a participatory approach is that, in addition to being appropriate for operationalising the CA, although the CA also embraces other research approaches, it enabled staff and participants to learn from the process, thereby strengthening their capacity. There was no indication that participants were restrained from expressing their views or felt obliged to participate. On the contrary they seemed to enjoy the opportunity to convey their opinions and often did so with much humour and laughter.

5.3 Summary of conceptual framework informing this thesis

Drawing from work on the CA, we developed a conceptual model for understanding the dynamics between ICT, capabilities, empowerment and sustainability. Rather than applying the CA directly, which would be difficult in any case due to its inadequate operationalisation, it is used as a meta-framework to guide the evolution of the framework. This process has potential to contribute to the operationalisation of the CA.

Capabilities emerged as a construct on which to focus, because of its centrality in the CA. Empowerment is another central theme in the CA and for this reason, together with its prominent position in mainstream and alternative development discourses, we incorporated it as a key construct in the model. Although sustainability has not featured prominently in the CA literature, it is included as a third key construct because of its links with livelihoods. This attention to sustainability could, potentially, contribute to the discourse on ICT and sustainability in the climate change debate. Many other aspects of life, to which ICT could potentially contribute significantly (e.g. social capital, governance, security and culture) have not been ignored, but have been slotted in under the three key categories in the analysis of the field research results.

The three elements of the research framework emerged as extensions from the conceptual model. As the model constructs are processes, rather than outputs that can be studied at any point in time, a longitudinal perspective emerged as the most suitable. The consideration, as recognised in the CA, that institutions play a key role in affecting the lives of people, pointed to the necessity of looking beyond a project — towards its meso- and macro-environments. The CA’s view on the importance of people articulating their own aspirations for development, suggested the use of a participatory approach, at least as one component of the methodology.

We believe the combination of the CESVS model and the research framework lends itself to empirical study and can therefore contribute to strengthening the theoretical foundation of ICT4D research as well as empirical knowledge of ICT interventions.

Chapter 6 - Methodologies and methods

This chapter first summarises the breadth of methodologies and methods used in ICT4D research in general and comments on their suitability for the research questions. In section 6.2 we present methodologies and the research design used in the iREACH field research. The terminology surrounding methodologies and methods is imprecise, with methodologies in general referring to an overall approach (e.g. qualitative or quantitative) and the methods to the instruments used in conducting the research (e.g. focus groups or individual questionnaires).

6.1 Methodologies and methods in ICT4D research

This section does not aim at developing a taxonomy of research approaches, but rather at presenting a sample of the variety of methodologies and methods deployed to illustrate that there are no “standard” approaches, but rather that these are as varied as the conceptual frameworks adopted. The multitude of research paradigms in this methodological pluralism makes it difficult to identify specific threads or trends. Similar to conceptual frameworks, research in the early days of ICT4D did not tend to refer explicitly to methodologies. For example, other than mentioning that ‘*visits were made... operators and... users were interviewed*’ (ITU 1998), there was no reference to methodologies in an ITU report on a rural telecommunication services project on the Pacific Coast of Colombia.

There is considerable diversity in the level of detail provided by researchers, with some studies covering elements such as sample numbers and techniques, while others simply stating that they conducted interviews and/or focus groups (e.g. Griswold, McDonnell & McDonnell (2006)).

There is a commonly misconceived notion of tensions between quantitative and qualitative methodologies, but these sometimes lack distinct boundaries (e.g. does the counting of frequencies of different responses to a specific question render what is otherwise qualitative research quantitative?). Recognising the value of a mix of quantitative and qualitative data, Batchelor & Norrish (2005) nevertheless relegated qualitative data to a minor, but relevant position on the basis that they are useful within the context of gathering ‘*valid quantifiable parametric and non-parametric data*’ (p.30). They admitted that the ‘*quantitative use of technology does not always demonstrate its role in the livelihoods of people*’ (p.32). Some studies have adopted multi-method approaches (e.g. Hutchinson & Molla (2009) used cross-sectional survey, semi-structured interviews, observation, document analysis and artefact review when studying social enterprises and ICT4D in Cambodia and Best & Kumar (2008), used both

quantitative and qualitative methodologies to study variations in the longevity of different SARI kiosks).

6.1.1 Quantitative methodologies

What distinguishes “pure” quantitative methodologies is their reliance on existing published statistics — i.e. data not suspected of being contaminated by subjective (human) inputs, although in reality, most statistics are ultimately provided, collected and collated through some form or human intervention (e.g. in making judgments on how to classify particular data). The most common form of quantitative studies are at the macro-level, attempting to link economic indicators to various aspects of ICT, as discussed in section 3.1.5.1. While important for understanding drivers for and associations between factors affecting the relationship between ICT and economic indicators, such studies however shed little light on how any benefits were distributed, or whether and how ICT contributed to the political, economic and social factors influencing the quality of life. This is where surveys may be a useful quantitative instrument, applied to qualitative inputs (e.g. in our study we conducted a survey for triangulation purposes, to give a statistically representative quantitative measure to qualitative survey results). In general, quantitative methods have primarily been used for other types of evaluations, such as using regression models in examining associations between availability of Internet-based e-government services and the number of applications received for various services or analysing usage logs to understand reasons behind longevity variances between different SARI kiosks (Best & Kumar, 2008; Kumar & Best, 2006b). User log data, combined with interviews for greater insight, was also analysed by Chand, et al. (2005) in their study of PFNet in the Solomon Islands. In the case of iREACH, it would have been very useful to undertake a quantitative analysis on how it had contributed to agriculture, the area in which it had made the greatest contribution, but such studies would have required baseline studies at the start of the project and detailed subsequent quantitative studies. While quantitative measures were not the focus and beyond the scope and resources of this project, their importance is recognised in section 11.8.3, which recommends an extension of the model to incorporate cost-benefit analyses.

A more subjective way of applying quantitative, or rather mixed methodologies in evaluating a project is the report card methodology, used by Lobo & Balakrishnan (2002), to obtain feedback from users (e.g. on quality, efficiency, adequacy and problems faced when interacting with a service provider). Similar to the survey we conducted for triangulation purposes, this is a mixed methodology, in that the data are qualitative, but the analysis is quantitative.

6.1.2 Qualitative methodologies

The ability of qualitative methodologies to unearth relevant information that may otherwise not be captured was illustrated by Huyer & Hafkin (2007), who discovered domestic violence against women associated with their use of ICTs in some African countries through qualitative research. Much qualitative research is in the form of descriptive, exploratory and/or interpretive case studies even if not defined in those terms by the researchers. A case study normally examines a phenomenon in a natural setting, can use multiple methods of data collection and does not apply control groups (Benbasat, Goldstein & Mead, 1987; Yin 2003). It is, according to Stake (1978), the natural setting that makes case studies appealing, as *'they may be epistemologically in harmony with the reader's experience and thus to that person a natural basis for generalization'* (p.5). In defining what constitutes a case study, Yin (2003) also included blurring boundaries between the phenomenon studied and its context and the use of multiple sources of evidence. Most case studies are qualitative, but can also be multi-method, including quantitative analysis.

Guba & Lincoln (1981) identified four purposes of case studies: to chronicle, depict, teach and test (i.e. to prove or examine), suggesting that the facts produced in such studies are interpreted by weighing and making judgments. The case study mode thus lends itself to the different facets of this research and is sufficiently versatile to be used with positivist, interpretivist, or critical philosophical perspectives (Dubé & Paré, 2003).

Case studies can cover a particular project (e.g. a telecentre), or it can focus on a specific aspect, as was done by Huerta & Sandoval-Almazan (2007) and Parkinson & Lauzon (2008). Both of these case studies were exploratory. In a case study of Akshaya, Rajalekshmi's (2007) explored the relationship between trust and e-governance, developed at telecentres.

Yet another perspective is that of a particular sector, as in a study of the impact of mobiles on different players in a supply chain in the traditional weaving sector in Nigeria (Jagun, Heeks & Whalley, 2008).

Using an interpretive case study based on a social constructivist approach in her research on Akshaya, Madon (2004) conducted face-to-face and semi-structured interviews with different stakeholders. Rather than a fixed schedule of questions, the research instrument consisted of a set of issues for interviews of variable length and additional data through participant observation, attendance at public meetings and study of secondary sources. Prakash & De' (2007) also combined primary and secondary data, the former collected through structured and

unstructured interviews with land-owning and landless farmers, kiosk operators and bureaucrats associated with the Bhoomi project in Karnataka.

ICT4D researchers have deployed different umbrella approaches to collecting qualitative data, e.g. ethnography and action research. Both of these are multi-method, using whatever mix is appropriate to achieve the study objectives.

Examples of ethnographic studies include Miller & Slater's (2000) study of Internet in Trinidad, research by Horst & Miller (2006) on use of mobile phones in Jamaica, an exploration of structures and experiences of poverty and media use in some South Asian ICT projects by Slater & Tacchi (2004) and gender issues in telecentre environments in India and Chile by Kuriyan & Kitner (2009).

Action research combines cycles of action with research and normally sets out to change something deliberately through interventions, offering researchers an opportunity to try theories, using feed-back from participants to modify them (Avison, et al., 2009). Where there is genuine community engagement in this process, the approach is referred to as participatory action research. One extensive action research programme in the ICT4D field is the healthcare information systems (HISP) in African, Asian and Latin American countries (Avgerou, 2009). There are several other examples (e.g. Mchombu, 1996; Rhodes, 2009; Schilderman, 2002). While considering action research appropriate for some forms of evaluation, Batchelor & Norrish (2005) warned that reliance on it could invite criticism that '*they are "only stories" that do not provide evidential data proving the impact of a project*' (p. 35). Such criticism ignores the intellectual rigour of properly conducted participatory action research (Stillman, 2005).

When it comes to research methods, the most commonly employed in ICT4D research are probably surveys, in-depth interviews and focus groups. Survey instruments are common in intentional ICT4D projects, where they can include users and other local residents (e.g. Aral, Escobari & Nishina; Best & Kumar, 2008; Bhagat, 2008; Chand, et al., 2005; Jafri, et al., 2002; Kumar, 2004; Lobo & Balakrishnan, 2002; Parkinson & Lauzon, 2008; Parkinson & Ramirez, 2006; Tiwari, 2008) and in studies of ICT access and usage in general (e.g. Abraham, 2007; Adeoti & Adeoti, 2008; McKemey, et al., 2003; Moyi, 2003; Narayana, 2009; Souter, et. al., 2005). Due to lack of ICT access in developing countries, most surveys are face-to-face, with varying degrees of open-endedness, but a tendency for larger samples to be closed-ended (e.g. Zainudeen, Samarajiva & Abeysuriya, 2006).

In-depth interviews tend to be less structured and more open-ended than surveys to provide richer data, which can be analysed through content analysis. In-depth interviews lend

themselves to study of intentional ICT4D initiatives (e.g. Madon, 2004; Rajalekshmi, 2007), as well as other ICT4D research (e.g. Jagun, Heeks & Whalley, 2008).

Just as quantitative and qualitative approaches can be combined as separate investigations in the same study, so different qualitative methodologies in the same study are not mutually exclusive (e.g. a case study can derive much of its information from surveys and interviews) and different methodologies, whether quantitative, qualitative or a mix, can supplement each other. The mixed method terminology also applies to methods that in themselves contain both approaches, such as Q-methodology (Donner, 2004).

There are limitations of qualitative methodologies. In addition to methodological issues related to rigour, corroboration and validation, they are often unrepresentative, difficult to scale, time consuming and therefore expensive to implement and often result in anecdotal evidence that does not provide sufficient data on which to formulate informed policies.

Similar to ICT4D, there are no “prescribed” methodologies for research informed by the capability approach. While cognisant of methodologies used by others in both fields of study, the main guiding principle when considering methodologies and methods for this thesis has been the ability to answer the research questions.

6.2 Methodologies and methods used in this research

In this section we introduce the general outline and special characteristics of methodologies and methods used for the field research. Uninhibited by prescribed methodologies in the iREACH project design, the ICT4D field or the CA domain, the methodology and associated methods were selected on an opportunistic basis, designed to balance an “ideal” research approach with the limited resources available for this research. The approaches are compatible with the constructivist epistemological tradition, according to which technology is socially constructed and contextualised. Although not formally adopting an ethnographic action research approach, much of the field research accords with some of its principles, as described by Tacchi, Slater, & Hearn (2003), in that there was no attempt at being detached as an objective observer, but instead engaging with the participants and learn from them. Despite having prepared a question framework, we were open to exploring topics of importance to participants.

The methods given serious consideration were: surveys, structured and unstructured interviews and focus groups, as these would best answer the main research questions. Recognising the importance of participatory approaches, we opted for focus groups as the main methodology for eliciting opinions from participants. Focus group can be defined under the wide participatory research umbrella (Cornwall & Jewkes, 1995). There are several advantages

of focus groups, including exchange of views between participants, who can remind each other of issues and corroborate or challenge what others have said. Some people may feel greater confidence to discuss in a group, issues they may not be prepared to do in one-to-one interviews, whereas others may be more hesitant to share views in a group (Axinn & Pearce, 2006). Focus groups can also provide qualitative data relatively quickly with greater depth and detail than large surveys, as they are flexible and offer opportunities for probing. However, as they do not generate statistical data, they are not suitable for statistical analysis and results are not generalisable to a larger population. The lack of privacy may inhibit some participants to discuss sensitive issues or may result in them responding normatively due to peer pressure and observer effects (Bailey, 1994). While aware of the limitations and risks of focus groups, these were seen as providing the optimal balance between those risks and the benefits of participatory nature of focus groups.

Face-to-face surveys were conducted for triangulation. As suggested by Lennie (2006), the use of different methods, in this case for triangulation, gave richer data and access to the views of a larger and more diverse base of informants. The key data sources for the qualitative research consists of primary data in the form of notes from the focus groups and survey results from the study area only and do not include data from any control groups for counterfactual evidence outside of iREACH's catchment areas. Such control groups would not have made much sense, with the question framework designed around the perceptions of iREACH among the informants.

The intention was that the focus groups sessions be open-ended, while the survey had a mix of structured, semi-structured and open-ended questions. One of the benefits of an open-ended approach is that knowledge gained from earlier stages in the research process can be verified and expanded in subsequent interviews (Guba & Lincoln, 1981), thereby intertwining data gathering and analysis. Our blend of methods in an eclectic approach yielded optimum results, particularly in an environment of resource constraints and unfamiliar language and culture. The objective of what Boote (2008) termed "bricolage" to describe how different methods can wield research into a functioning whole, was to address the research questions in ways that were useful for stakeholders and can convince others of the merits of the research findings.

Documents prepared by iREACH prior to and during this research process provided secondary data, in combination with informal discussions with other informants. For example, the claim by many participants at one of the sites that organic fertilisers had increased their rice yields was checked with staff at an agricultural university overseeing that site, who explained that normally such improvements can take up to ten years to be realised, but quicker results

could be due to villagers most likely not having applied sufficient amounts of chemical fertilisers.

The findings are relative, rather than absolute, in that they depend on different perceptions among focus group participants and survey respondents. The unit of analysis is both the individual and the community, consistent with many CA scholars (see section 5.1.1) who recognise the importance of both units and their interdependencies. The study is exploratory, a suitable approach where *'not much has been written about the topic or the population being studied and the researcher seeks to listen to participants and build an understanding based on their ideas'* (Creswell, 2003, p.30).

Villages where iREACH operate have been subject to many extraneous influences (e.g. a multitude of interventions by government authorities and other NGOs as well as general changes in the political and economic environments). In such an open environment, it is more appropriate to think about iREACH's impacts as *'plausible association'* (Hailey, James & Wrigley, 2005, p.20), than attempt attribution, even where informants implied the more generous concept of attribution. This is particularly the case in the absence of control groups.

6.2.1 Research instrument

Having agreed the broad parameters of the research with iREACH stakeholders, the development of the research guide became an iterative process in consultation with them. The initial draft was constrained by an "outsider" perspective on what the participants would be prepared to discuss, avoiding issues they might perceive as too personal or politically sensitive. The research instrument adopted a *'funnel sequence'* (Guba & Lincoln, 1981, p.180), moving from general to more specific questions. Starting with identifying strengths and improvements in communities, the instrument (see Appendix D) then invited participants to reflect in general on how iREACH had contributed to improvements. The next section focussed on issues concerning their ICT use and the usefulness of iREACH. In 2010, the component dealing with use of iREACH was incorporated into the personal information form collected prior to the focus groups. The last part dealt with the critical part of the framework (i.e. discussions on more specific impacts).

The reviews by iREACH's staff and members of its advisory team focussed on the relevance and completeness of the question framework for them (i.e. would the result be helpful for the project and did it include all items they would find useful). The changes resulting from this process reflected minor compromises between the priorities of the project and this thesis, but did not undermine the integrity of the study. Following a few iterations, a pilot study was

conducted to assess the validity and understandability of the framework. Slight modifications resulted from this process.

The nature of the study required a high degree of flexibility in the research design, taking into account practical constraints, accommodating requirements of the stakeholders, adding issues that emerged and removing things that did not work. This led to slight modifications in the research instrument in 2010. For example, in 2009 staff requested the inclusion of data on ICT services used by participants, information that was not required for this thesis, but this was removed in 2010. Although we used the same instrument in each group, there was some adaptation, resulting from the outcome of previous groups. One improvisation emanating from experiences gained in previous sessions was a reversal in the order of questions in 2010, after realising that participants were tired when arriving at the section of the research instrument dealing with impacts of iREACH. So, from the second session at each pilot site, we started with the section dealing with impacts, without formally changing the question framework. Another major change between the two years was the addition in 2010 of questions related to impacts on equality, as this aspect had not been adequately covered in the initial questionnaire, but is imperative in understanding who had benefited from iREACH. There were also additional questions in the general groups relating the “One Laptop per Child” (OLPC) XO laptops donated by Elaine Negroponte and introduced after the 2009 research. In 2010, we also arranged a special group at each pilot site, with family members of children using the XOs, but rather than preparing a formal question framework, these sessions were open-ended.

The relatively loose framework enabled the research to be receptive to input from stakeholders and local peculiarities, a valid approach in research design (Miles & Huberman, 1984). But, due to language issues and the wish of iREACH staff to write the questions in Khmer in advance on flipcharts, the instrument was not as open-ended and unstructured as would have been desirable.

6.2.2 *Informants*

6.2.2.1 Focus Groups

Having agreed on the general focus group (FG) arrangements, designed to reflect broad representation of different interest groups rather than a formally random sample, the participant invitation process was the responsibility of local staff. The two sites opted for slightly different structures, as illustrated in Table 1. The main difference was that, while the groups in Kep had a mix of users and non-users, the KCM team arranged separate groups for these categories. The idea of separate user and non-user groups came from the KCM management committee and was

implemented for all groups in 2009, but only for half the groups in 2010. One reason for the change was to enable everyone in the teacher, commune leader and management committee groups to interact. In any case, there was no strict demarcation between users and non-users, as several non-users would have accessed some iREACH information disseminated via public address systems.

There were 22 FGs in 2009 and 19 (this figure excludes focus groups with family members of children using XOs) in 2010, with each group representing specific interests (e.g. teachers, youth, farmers, women, micro-businesses, village leaders and commune council members), but with overlaps (e.g. most village leaders were farmers and despite there being specific women's groups, women also participated in other groups). The number of participants per group ranged from four to ten and the total number of participants was 149 in 2009 and 119 in 2010. Nobody participated in more than one group, but there were two cases of participants being in different groups in 2009 and 2010, despite the intention that participants as far as possible be the same in both years. Due to some of the 2009 participants having moved or for other reasons not being available, only about half of the participants were the same.

The extent to which participants feel comfortable about openly discussing issues influences the validity and usefulness of FG data and groups comprised of individuals with similar socio-economic backgrounds usually interact more easily (Stewart, Shamdasani & Rook, 2007). While acknowledging differences within the groups, relatively homogenous groups might facilitate communication, as participants would be more at ease with people from similar backgrounds, feeling uncomfortable among individuals from groups, with which they do not normally associate. Groups with common interests also tend to minimise disagreements and miscommunication (Burkey, 1993). The different backgrounds between the groups allowed for a diversity of viewpoints to emerge. With broad consensus and only the occasional within-group variance in views, no quantitative assessments of in-group variances were made. In this structure, it was not considered necessary to identify exactly who said what, which would have been a challenge in an environment with frequent multiple simultaneous conversations. Stewart, Shamdasani & Rook (2007) cautioned about mixed gender focus groups, particularly when researching gender specific topics. However, domestic violence, a very sensitive gender issue, was discussed openly in mixed gender groups with active participation by women. The open discussion of this topic in mixed gender groups could indicate lack of privacy in villages, suggesting it unlikely for this or other sensitive gender issues to be shrouded in secrecy.

The process of invitation started with staff formally advising respective district governors, who informed the commune councils and village leaders of their support for the study. Each

pilot site set the criteria for group composition with respect to gender and users vs. non-users, but these were not always followed by organisations, such as communes and NGOs, which decided on their representation (e.g. the principals of schools and heads of NGOs and regional offices of central government agencies responsible for health, agriculture and education, nominated participants from respective organisations). In KCM, the participants in general groups were nominated by members of the management committee; three users and three non-users for the farming, women's and youth groups, respectively, from each of the communes. In Kep, the iREACH community facilitators (CFs) responsible for the hubs invited participants to corresponding groups from villages in respective hub area, with one CF inviting a participant from a village without a hub. The potential bias of staff being responsible for the process of invitation was somewhat mitigated by them not actually selecting all participants, as many were selected by different institutions. The actual participation reflected who was available on the day and did therefore not necessarily meet the gender and other criteria. Nobody refused to participate in the FGs or surveys, but not everyone invited turned up, as some had other commitments on the day (e.g. a cow belonging to one of the KCM village leaders who had participated in 2009, had walked off just before the 2010 session, and he had to search for it, but another village leader replaced him).

As no promises were made during the 2009 research, there were no grounds on which someone would refuse to participate in 2010 because of unfulfilled promises — an occurrence noted by Adato, Lund & Mhlongo (2007) in a South African study, where some households complained that researchers promised improvements in livelihoods, but this never happened. In order to avoid raising any false expectations, we informed participants, both on the information sheets and at the beginning of each session, that we could not make any commitments about suggested improvements.

No pressure was exercised in trying to convince users or non-users to participate, but iREACH provided an incentive in the form of refreshments and travel cost re-imburement to avoid travel expenses being a reason for non-participation. Everyone received the same amount, regardless of actual travel expenses and this could have been perceived as inequitable, as not everyone incurred the same, or any expenses.

As participants in the FGs were not statistically representative, the views expressed during the sessions did not necessarily reflect wider community opinions, particularly as the majority of villagers had not visited iREACH hubs, whereas more than 50% of participants had. This emphasis on users aligns with Menou's (1999) view that focus on early adopters is appropriate in identifying changes at the hypothesis-testing phase, before embarking on longer term studies,

as long as the researcher is alert to the bias introduced. His suggestion of a control group of non-users was partially adopted in KCM and in the surveys, but as mentioned above, several non-users had been exposed to iREACH in some form. It is not known to what extent the over-representation of users reflected under-representation of the most marginalised.

While this information would have been important, its absence does not invalidate the results, as the study is exploratory, endeavouring to understand perceptions of whether, how and why iREACH had benefited individuals from diverse backgrounds, not just FG participants.

Some socio-economic and iREACH usage related information were collected on separate forms for FG participants, but not everyone filled in all details, despite the absence of questions related to income and other information assumed to be sensitive. The personal information is useful for giving an indication of relevant participant characteristics, but we have not linked this information back to who said what in the analysis, as the focus was on the group, rather than individuals. As shown in Table 1, which details the gender composition and stakeholder interests represented in the different groups, women constituted 42% of all participants in 2009 and 50% in 2010. All groups in Kep and eight of 12 groups in KCM included women in 2009. The only group without women in 2010 was the Kep village leaders group. Almost 90% of participants gave details of their age in 2009 and more than 90% in 2010. The age distribution, shown in Table 2, indicates a reasonable representation across ages, but is skewed towards older generations compared to the population, particularly in Kep in 2010.

2009

	Kep		Kamchai Mear				Women	Men	Total
	F	M	Users		Non-users				
			F	M	F	M			
Teachers	3	3					3	3	6
NGO employees	3	1					3	1	4
Joint teacher, NGO, government				6		6	0	12	12
Village leaders	1	4					1	4	5
Commune council members	1	4					1	4	5
Village leaders & and commune council members				8		9	0	17	17
Farming community	2	3	4	5	4	5	10	13	23
Fishing community	4	1					4	1	5
Business	3	2					3	2	5
Youth	2	3	2	7	4	5	8	15	23
Women	4	0	7		8		19	0	19
Management committee*	4	6	4	4	3	4	11	14	25
Total	27	27	17	30	19	29	63	86	149
Total Kep/KCM	54		95						
Percentage women	50%		38%				42%		

* The management committee in KCN included representatives from the business community

2010

	Kep		Kamchai Mear				Total		
	F	M	Users		Non-users		F	M	Total
			F	M	F	M			
Teachers	3	3					3	3	6
NGO staff & Volunteers	4	1					4	1	5
Joint teacher, NGO, government, doctor, bank				8			0	8	8
Village leaders		8					0	8	8
Commune council members	1	7					1	7	8
Village leaders/commune council members, business			2	5			2	5	7
Farming community	3	2	2	4	3	3	8	9	17
Fishing community	3	1					3	1	4
Business	3	2					3	2	5
Youth	2	3	5	1	4	2	11	6	17
Women	5		6		6		17	0	17
Management committee*	3	5	4	5			7	10	17
Total	27	32	19	23	13	5	59	60	119
Total Kep/KCM	59		60						
Percentage women	46%		53%				50%		

* The management committee in KCM included 3 representatives from the business community

Table 1: Focus group participants (numbers and gender)

2009	Age group							
	18-20	21-25	26-30	31-35	36-40	41-45	46-50	>50
% of total participants	20%	8%	10%	7%	16%	8%	14%	17%
Cumulative		29%	39%	45%	61%	69%	83%	100%
% of Kep participants	13%	13%	13%	2%	15%	4%	20%	20%
Cumulative		26%	39%	41%	57%	61%	80%	100%
% in KCM participants	24%	6%	8%	9%	16%	9%	10%	16%
Cumulative		30%	38%	48%	64%	73%	84%	100%
2010								
% of total participants	15%	7%	12%	10%	10%	11%	10%	25%
Cumulative		22%	34%	44%	54%	65%	75%	100%
% of Kep participants	8%	4%	8%	12%	4%	12%	12%	40%
Cumulative		12%	20%	32%	36%	48%	60%	100%
% in KCM participants	20%	10%	15%	8%	15%	10%	8%	13%
Cumulative		30%	45%	53%	68%	78%	87%	100%

Table 2: Age profile of participants

As shown in Table 3, the FGs included participants with different educational backgrounds, with an almost normal distribution around secondary school. Not everyone who attended a particular education level actually graduated from this level. Information on educational background of participants was not obtained in the 2009 research.

	Percentage
No formal education	3.4%
Attended primary school	21.0%
Attended secondary school	38.6%
Attended high school	24.4%
Tertiary education	4.2%
No information	8.4%
Total	100.0%

Table 3: Education levels of 2010 focus group participants

6.2.2.2 Surveys

The survey was more representative, with 480 (one record was not valid, resulting in 479 records) informants randomly sampled: 50% from iREACH's register of users and 50% non-users, selected among the village population. As shown in Table 4, the gender composition of survey respondents was similar to that of the FG participants.

	Kep*		KCM		Total
	Female	Male	Female	Male	
Number	102	137	140	100	479
Percentage	43%	57%	58%	42%	
Total	239		240		51%
% women					

* gender record missing for one interviewee

Table 4: Gender composition of survey respondents

Table 5, shows that the survey respondents were considerably younger than focus group participants, with 67% below the age of 35 and only 11% above 50.

	Age group							
	<=20	21-25	26-30	31-35	36-40	41-45	46-50	>50
% of total respondents	29%	19%	13%	7%	8%	8%	6%	11%
Cumulative		48%	60%	67%	74%	83%	89%	100%
% of Kep respondents	41%	20%	12%	6%	5%	5%	4%	8%
Cumulative		60%	73%	78%	83%	88%	92%	100%
% in KCM respondents	17%	18%	13%	8%	10%	12%	9%	13%
Cumulative		35%	48%	55%	65%	78%	87%	100%

Table 5: Age profile of survey respondents

The main differences in education between the focus group participants and survey respondents (Table 6) were that twice as many among the latter had tertiary education and they were more evenly spread between primary, secondary and high school.

	Percentage
No formal education	5%
Attended primary school	31%
Attended secondary school	28%
Attended high school	28%
Tertiary education	8%
Total	100%

Table 6: Education levels of survey respondents

6.2.3 *Data collection*

The FG sessions took place during a fortnight in February 2009 and 2010, respectively, one week at each pilot site each year. As the purpose of the field research was to test a framework, the duration of this phase of the study was designed to correspond to the time project staff consider reasonable to devote to this type of evaluation. While the duration may vary from project to project, the one week per site per year recommended by iREACH staff is likely to be a useful benchmark. Each session lasted approximately two hours, after which participants seemed quite tired - understandable in the tropical heat without air-conditioning or fans. This time was in general sufficient to cover the research instrument.

In accordance with the ethics approval from the Human Research Ethics Committee of the Faculty of Business and Law at Victoria University, Melbourne, Australia (HRETH 08/274), iREACH staff gave each participant an information sheet and consent form translated into Khmer, to sign and explained the content to those with insufficient literacy skills to comprehend the documents. The consent form covered confidentiality and complaints procedures, should participants be dissatisfied with any aspects of the research. The sessions started with summarising details of the information sheet and by emphasising that no promises could be made.

All FG sessions took place at iREACH hubs: at the HQs, pagodas, schools, commune council offices and a private home and were conducted in Khmer. While it might have been preferable to have the sessions in neutral places to avoid bias related to location, there was not much choice, as iREACH had hubs in most publicly available buildings within a reasonable distance. The sessions were facilitated by male iREACH staff, with whispering simultaneous interpretation between Khmer and English, also by male staff. When entering into a conversation with participants (e.g. probing, seeking clarification, or questioning), the interpretation was in normal voice volume, enabling me to become part of the conversation. My gender (female) balanced the male dominance in the research team and both genders seemed to relate well to me, as I managed to project an image of myself as an authentic and interested team member, genuinely concerned about the future of iREACH and no apprehension related to my presence or the presence of anyone else in the research team was detectable.

The KCM sessions with non-users took place simultaneously with the user groups at the same locations, but without interpretation. These sessions were facilitated by junior iREACH staff, who summarised the discussions in English. Bias associated with staff being involved as facilitators and interpreters is discussed in section 6.2.5.4.

While the English proficiency of the interpreters was sufficient to provide the correct meaning, their limited English vocabulary might have been insufficient to convey the richness and nuances of the discussions. They sometimes abbreviated long monologues, dialogues or discussions between several participants into only a few sentences. When queried about this, a frequent response was that participants talked about something else. There was no attempt to force the conversations along the direction of the questions, even where it appeared that participants had not addressed the issue, in case this would be inappropriate, or their discussions might lead in an interesting unplanned direction.

In other cases participants discussed between themselves before pronouncing what appeared to be a consensus position. This was despite attempts to explore a diversity of viewpoints rather than pushing for consensus. In some cases, multiple discussions took place simultaneously and some participants interrupted (e.g. by just talking without addressing anyone in particular). The facilitators played a major role in shaping the dynamics of the discussions (e.g. by trying to involve those who were quiet and restrain those who tended to dominate the sessions).

Staff had laid out the main themes of the question framework in Khmer on flipcharts. On a different flipchart, an assistant summarised key points raised by participants, also in Khmer. The 2010, but not the 2009, sessions were voice recorded, but the recordings were not transcribed. The background noise affected the voice quality and moving the microphone closer to the speakers might have interrupted conversations.

In order to avoid influencing the results, prompts were only used to encourage elaborations and clarifications (e.g. where someone indicated iREACH had been useful for agriculture, we asked what had changed). This questioning reflects a reasonable balance between trying to obtain useful data and excessively influencing the discussion. There were problems with engaging in discussions in two groups: participants in the Kep women's group in 2010 (all non-users). While supportive of iREACH in general, they argued it was difficult to isolate its contributions from interventions by others active in the area. The session with the 2010 Kep fishing group also had limited input, as most participants, consisting mainly of elderly women, did not seem to know much about iREACH.

It is difficult to know the extent to which the cooperation in the other groups reflected what Richardson (2009) considered Cambodians being '*accustomed to doing what is expected...*' (p.10), but it appeared that the views presented were genuine. With a few exceptions, nothing mentioned by anyone seemed to be disconfirmed by anyone else within a group or in other groups. In general, the results yielded considerable uniformity and views closely paralleled each other within and between groups. Where there appeared to be different views or

interpretations, explanations for the differences were sought and with the occasional exception, it turned out that there was only limited dissent.

None of the risks or difficulties raised in the section on participatory research (see section 5.2.3) seemed to affect the sessions, in which participants voiced a mix of positive and negative views in an environment that appeared co-operative and interacting. Other than some of the older participants indicating that they were too old to benefit from iREACH, it was not possible to discern signs of adaptive preferences in terms of acceptance of misfortune or any other social conditioning of which Sen (2001) warned, as mentioned in section 5.1.1. Instead their aspirations for better futures were very high, almost to the extent that disappointment could set in, should their expectations not be realised.

iREACH staff and volunteers conducted data collection for the surveys, by administering the survey questionnaire to respondents and entering the data into the Statistical Package for the Social Sciences (SPSS).

6.2.4 Data analysis

The epistemological orientation of interpretivism and constructivism guided the data analysis, which was also shaped by deductive reasoning in that the CES constructs provided the framework for sorting the data. However, proving or disproving the CESVS model was not possible due to the limited data. It was also desirable to understand how the relationships between ICT and CES worked in the iREACH environment and this is where the study applied inductive reasoning.

The semi-structured and open-ended nature of the question framework in both the FGs and surveys made cleaning and organising the data quite complex, time-consuming and labour-intensive. The main data set used for the analysis consists of handwritten notes of the whispering translations, a transcription of these notes into a word document, subsequently inserted into a display matrix for an easy overview of how different groups responded to issues covered in the instrument. The notes and the matrix were re-examined several times to check for accuracy and for possible deeper interpretation. In the final step of the analysis, the responses were tabulated in a Microsoft Excel workbook, with the initial governing structure of the coding system being one spreadsheet for each topic of discussion.

Considerable rearrangement of data was then necessary to structure the data. Related codes, developed in the previous step, were synthesised and consolidated into broader codes (e.g. farming, agriculture and animal husbandry, together with various references to these activities

were coded as agriculture). As an illustration, Appendix E shows how issues raised in discussions about the most significant change associated with iREACH were coded into a spreadsheet. The first column lists different ways in which groups talked about this particular issue, sorted into different categories linked into sub-themes of the model constructs. The rows under a theme elaborate on how different groups expressed their views. For example, some groups may just have referred to improved agriculture, whereas other groups were more specific, referring to new practices for planting watermelons. The decision rules for coding the data into the core themes were usually straightforward, with the codes normally representing meaningful, mutually exclusive and exhaustive categories. Judgment was exercised on how to classify views that did not easily fit into the constructs or spanned several categories. Responses were coded only into manifest content (i.e. focussing on the meaning, rather than latent (answering style) (Weisberg & Bowden, 1977)), due to unfamiliarity with cultural expressions, which made it difficult to notice such nuances. The codes had not been pre-determined prior to the initial research wave, as that would have forfeited the study objective related to listening to how respondents perceived iREACH without imposing pre-conceived ideas on the analytical structure. Despite having approached the analysis with a blank sheet, it soon emerged that the data could be mapped into the constructs of the conceptual model. This coding system influenced the second research wave, encouraging further probing (e.g. rather than being satisfied with “improved agriculture”, we would ask “how”, to a greater extent than in 2009), which resulted in more detailed data in the second wave.

The horizontal axis of the spreadsheet lists the different groups and a “1” was inserted into the cell for each group giving similar responses to a question. The number of groups mentioning a specific issue, say, employment, could then be easily summed. Because of the high level of consensus in most groups on most issues, it was easy to decide whether to assign a “1” to a group on a particular issue.

In the final analysis, a summary matrix (see Appendix F) was arranged in accordance with the constructs of the conceptual framework, incorporating responses from all sheets covering a particular issue (e.g. all comments about agriculture or domestic violence were listed, regardless of the context within which the issue was raised).

Such “manual” analysis, rather than the use of content analysis software tools, was adequate because of the low volume of data, which did not justify the additional overheads associated with entering the data into specialised software. Following Miles & Huberman (1984), there was an iterative process between the tables and field notes to ‘*confirm and deepen conclusions and to unravel puzzles as they appear*’ (p.121). At the completion of the initial analysis, the raw

material was reviewed with the conceptual model in mind, comparing the results with findings from other case studies.

iREACH staff conducted the survey, entered the results into SPSS in English and e-mailed the files to me for analysis, which, because of the many open-ended questions and different ways of describing similar issues, required significant manual input.

After each research wave, a “non-academic” report was prepared for iREACH stakeholders, initially as drafts. These documents were useful both for digesting the material in preparation for applying it to the conceptual model and for the stakeholders who used material from them, e.g. for grant applications. Some results also found their way into conference and journal papers.

6.2.5 Rigour, corroboration, triangulation and validation

In addressing the methodological rigour against the criteria of: truth value (internal validity), applicability (external validity or generalisability), consistency (reliability) and neutrality (objectivity) (Guba & Lincoln, 1981), it is emphasised that requirements for assessing claims of evidence in the constructivist approach adopted in this study differ from the rules of evidence in logical positivistic frameworks. The absence of such rules does not affect the required rigour and this study was conducted in accordance with ethical and intellectual responsibilities in dealing fairly and objectively with the data. iREACH employees were given opportunities to comment on drafts of the non-academic reports and the few changes resulting from these comments, clarified minor misunderstandings, rather than changed any fundamental issues.

Time and funding constraints limited the research. Not covered by any grant, it relied on iREACH resources, which was positive in terms of capacity building and ownership of the process, but it limited the scope to the time staff could allocate. While the research could have been an imposition on the busy schedule of staff members, they also appreciated the external involvement, as this assisted them with evaluations. Staff considered the study constructive, but also had to contend with the pressure of other duties.

This study achieved rigour through multiple sources of evidence, an open research process, maintaining accurate and transparent records and encouraging stakeholder participation in all research phases.

6.2.5.1 Triangulation and corroboration

The FG structure with participants from different interest groups provided multiple sources of information, enabling us to listen to perceptions from different community sectors. Feedback

from participants is one of the most logical sources of corroboration (Miles & Huberman, 1984) and it is also ethical to return the results to those who generated the information, giving them an opportunity to comment. Where this is not done, participants may feel disappointed, as was the case following research at the Women of Uganda Network (WOUGNET, 2003):

'In July 2001 we received two Norwegian students who were doing their Masters degree by then and they wrote their dissertation basing on the findings from our association unfortunately they have never given us a copy of these findings' (p.24).

In line with the view of Reilly & Gomez (2001), that results of evaluation studies should be made public in ways that are appropriate for different stakeholders, the iREACH research plan incorporated participant validation, enabling FG participants to offer feedback at meetings and a summary of the findings was prepared for this purpose. Such fora were arranged after the 2009 study and following heated discussions, there was general consensus that the summary reflected the participants' views. Due to reduction in iREACH staff numbers, no feed-back sessions were arranged for the 2010 study, but the report and data will be included in a village open data system, currently being implemented.

Another important data source for triangulation was the 2010 survey. It was intended that further triangulation take place through the collection of statistics for indicators defined in the FGs. As the establishment of such a system would be beyond the scope of this thesis and in anyway had to be anchored in the community, it required the full support of and resources from iREACH, but these were not forthcoming. IDRC has recognised the importance of such a local statistical system and provided a grant in late 2010 for iREACH to establish an open commune data system, for the collection and dissemination of statistical information of interest to villagers and local authorities. Even with data of this nature, caution must be exercised in attributing improvements to iREACH, as only some of the impacts arose from its activities alone. The allocation of weights to contributions by various parties would be a time-consuming and probably futile exercise, but by acknowledging them, attention is drawn to the difficulty of attribution in an environment exposed to inputs from several agencies.

6.2.5.2 Applicability, construct and content validity and generalisability

As informants did not answer questions directly to fit into the model constructs, the extent to which their expressions validated these is to a considerable extent inferred. Such inferences were particularly challenging for empowerment, which is more abstract than capabilities and sustainability (e.g. how does one determine whether a certain expression reflects empowerment). With no pre-determined factors to measure the constructs, content validity (i.e.

ensuring that what is intended to be investigated is what is actually investigated) has only limited relevance. However, findings from other studies (interleaved with findings from the iREACH research) in the chapters presenting the field research results, were useful in an indirect way for content validity. Comparing and contrasting findings between other projects and iREACH will be even more essential in a potential gradual evolution of the model towards theory building. Although the aim of this research is to develop a model for more general applicability, results from this field study would most likely not be generalisable, as its contributions were contextual. The level of generalisation required for a theory would therefore have to await further field research from this and other initiatives.

6.2.5.3 Replicability

Replicability (i.e. anyone conducting the same research would get the same results) is a common validation method in the positivist epistemology, but in constructivist approaches results cannot be reproduced, as the mere participation in research would affect informants. Also, the very reason for a longitudinal study is to explore changes over time, so a study undertaken at a different time would most likely yield different results, as was found when comparing the 2009 and 2010 studies. So the focus should be on whether the study is believable, rather than replicable.

6.2.5.4 Neutrality, objectivity and bias

While in non-positivist frameworks, *'objectivity in its pure form is an unattainable state'* (Lincoln & Guba, 1995, p.108), there could nevertheless be justifiable concerns about biased outcomes and subjectivity in light of the involvement of iREACH employees, as their presence could have influenced participants to express only positive views. In this research, the general risk of relying on interpreters was magnified by their status as iREACH employees. The reliance on staff for invitations of FG participants could also have introduced strong bias, as could the venues for the FG sessions in iREACH hubs. But, *'independence does not mean isolation; those people involved in, responsible for and affected by the delivery of the projects and programmes being evaluated should make an active and meaningful contribution to the process'* (DFID, 2009, p. 17). As unfavourable views of some iREACH issues surfaced, it is unlikely that staff exerted undue influence (e.g. by stacking FGs or manipulating interpretations). There were actually a few unsolicited negative comments about certain staff. Common themes and diverse views in the different groups appeared to be spontaneous, providing a high degree of confidence that genuinely held opinions were expressed. There was no apparent "kowtowing" — by participants to staff or staff to participants. Although the

research was not about evaluating staff performance in a way that could result in chastisement or reward, it is plausible that being associated with positive outcomes would be advantageous.

In any case, there are not many alternatives for research of this nature, as fly-in-fly-out outsiders operating independently could also be subject to employee influence, neutralising the potential objectivity of total reliance on external resources. As the thesis is testing the feasibility of this type of evaluation, it would probably have been unrealistic and too expensive for an “outsider” to spend sufficient time at the pilot sites to arrange the total study independently. Anyone associated with a project for a sufficient time to gain the necessary trust would probably cross the boundary towards becoming an “insider”, with a stake in seeing positive outcomes, making the researcher sympathetic to the topic of the study (Bailey, 1994). In the same vein, reciprocal influences stemming from the interaction between the inquirer and others could also lead to bias.

My pro-bono participation in other iREACH activities could be a case in point. While such participation is common when entering a new site as a researcher (Stake, 1994), it can present problems of role dilemmas when conducting research in settings where the researcher is also an employee or has some affiliation. This issue has not been sufficiently addressed in the literature (Hurworth & Argirides, 2005). In this case, the pro-bono nature avoided such role dilemmas and there was congruence in both roles, which aimed at contributing positively to the project. Declaring a high degree of sympathy towards shared access facilities, should make the reader cautious when interpreting the results of this study. The rigorous analysis method adopted should guard against this sympathy colouring the findings.

Balanced against the risks of reduced data integrity are benefits, gained from involvement by employees and the richness and understandability they added. Local staff assisted with explaining certain concepts (e.g. the wider meaning of the term “walk the streets”, meaning gallivanting around). The presence of local staff also enabled the sessions to incorporate the exchange of information and impressions in an unplanned manner. Only staff members would have been in a position to respond directly to the variety of questions from participants and such exchanges are compatible with a naturalistic form of inquiry (Guba & Lincoln, 1981).

To conclude, although some findings might be questionable, we do not consider the limitations and the somewhat unconventional methodologies and nature of conducting the research to have distorted the data or even rendered it unsafe for analysis in the context of its purpose and should not undermine the findings with respect to the research questions. The study does not purport to present objective truths, but rather the perspectives of participants and respondents as presented in the FG sessions and surveys. While similar potential biases could

affect the surveys, these nevertheless serve as a backdrop against which to assess the risk of overstated claims of benefits arising from iREACH by FG participants.

6.2.6 Challenges in operationalising the CA

As this study is about operationalising the CA, we now summarise some methodological challenges in this endeavour.

Designing the research instrument

While not expecting textbook prescriptions, templates, or blueprints for how to design research instruments or frame questions or discussion topics to extract relevant information for a CA evaluative space, there seemed to be a lack of guidance in the CA literature on framing research instruments for relevant information from a CA perspective. This goes to the core of its insufficient operationalisation. Rather than each researcher having to start from scratch, it would have been useful to refer to previous experiences on methods for framing questions in a relevant way (i.e. building on experiences of others). Designed to capture iREACH's contribution in the context of aspirations of communities (i.e. valued capabilities and functionings), the research instrument did not directly generate discussions on relationships between benefits of iREACH and aspirations, so these were in several instances inferred.

Understanding of different concepts

Several concepts at the heart of the development discourse in general and in the CA in particular, were difficult for many villagers, including staff to comprehend, even the term capabilities. So, again, certain meanings relating to capabilities were inferred when analysing responses (e.g. health has been interpreted as capability of being healthy and computer as capability of having access to and using ICT).

Indicators

The difficulty of establishing a system for measuring relevant indicators (see 7.4.6) raises the issue of how proponents of the CA envisage that an informational base relevant for residents in poor rural community be established and maintained. While a key purpose for establishing pilot projects is to gather information of this nature, the short timeframe of many pilot projects, including iREACH, makes it difficult to implement such a monitoring system, particularly where indicators were not established at the initial stages of the project, highlighting the

importance of starting the process of defining indicators at an early phase of project implementation, rather than past the mid-point of a funding period, as was attempted here.

Resources required for this type of evaluation

The data collection and analysis processes have been quite time consuming and the establishment of an indicator database discussed above would require further resources. While cost-benefit analyses of this type of initiative are necessary to justify investments in them, expenditure on research to conduct such studies is rarely a priority. Resources would be required for capacity building of researchers in local communities so they can acquire the skills to conduct their own evaluations and cost-benefit studies.

Excessive focus on use of computers

Many informants were quite fixated on computers and ICT (i. e. learning how to use computers, Khmer and English typing, accessing the Internet and on future opportunities for children). While the capability of being educated is valuable, it is not directly linked to the type of socio-economic impacts a funding agency might be looking for and did not reflect our expectations with respect to the capabilities villagers would value to enable them to lead the lives they have reason to value. It was difficult to extract sufficient rich information relating to other issues, despite several attempts to do so by framing questions in different ways in the research instrument.

Chapter 7 - iREACH case study

In this chapter, we introduce iREACH and its meso- and macro-environments as a case study and conclude with research findings relating to the informants' perception of their communities and iREACH. The research findings pertaining to the model constructs are presented in Chapters 8-10.

When describing iREACH, it is as a micro-level object, but when reporting on the research findings, the focus shifts to villagers and their communities. Such moving boundaries reflect the point made by Alsop & Heinsohn (2005) regarding the distinctions between the levels about which information is collected, where it is gathered and the level at which data is analysed. The level of analysis was not pre-determined, but depended on how participants perceived iREACH's contributions (e.g. it could be at an individual level in the form of self-confidence, the family in the form of ability to deal with domestic violence, at the community and/or political level manifested as courage to deal with powerful individuals and institutions).

Referring to the case study typology of Guba & Lincoln (1981), this case study deals mainly with chronicling and depiction, whereas the main analysis, the weighing and interpretation is in subsequent chapters, where iREACH's contributions are examined.

7.1 iREACH in Cambodia

Continuing the description of iREACH from section 2.2, in this chapter, we set the scene for the presentation of the research findings in chapters 8-10. As this thesis is not a formative evaluation about how well iREACH has functioned, it does not offer a critique of its operations, but reports on problems faced by its users, as expressed by them during the research.

The initial 3-year funding period started in May 2006, with the award by IDRC of a USD 1.3 million grant to the Ministry of Commerce (MoC) in Cambodia to conduct a pilot project, subsequently extended to 2010. There was no additional funding for that extension, but funding for a further 18 month extension was granted in late 2010, albeit in a scaled back version, designed to devolve the ownership and management to local organisations, including community based organisations at the pilot sites, to reduce costs by greater reliance on volunteers and to diversify funding sources and revenue streams.

Due to some teething problems with equipment installation and staff recruitment, the pilot was not fully operational until 2007. Several reasons prompted IDRC to partner with the MoC, rather than a ministry more directly associated with ICT. A high level of trust had been built

with the senior MoC official in charge of iREACH through a successful project on software localisation of Khmer. MoC's responsibility for enterprise development, was also of importance, as iREACH was not about ICT in isolation, but also about building enterprises, which according to UNCTAD (2007) can be facilitated by telecentres.

In the early days of iREACH, when it pioneered computers and access to the Internet in its coverage areas, except for a few landlines, narrowband mobile (2G), radio and television coverage, there was an ICT access gap with respect to computers and Internet. This lack of infrastructure could, from a CA perspective, be considered barriers inhibiting both the development of capabilities and the conversion of capabilities to functionings and illustrates how inadequate macro-level policies affect micro-level livelihoods. More recently, fibre and wireless broadband (3G) infrastructures have been extended to iREACH's catchment areas and 3G is particularly popular among CSUK students in KCM. An Internet café was established just opposite the CSUK campus grounds in 2011. The vision behind iREACH was shaped by the view that communities, rather than waiting on services to arrive at their villages, could adopt alternative methods of gaining access, possibly using this process as a community building exercise (Galperin & Bar, 2006; Galperin & Girard, 2005; McNamara, 2008; Ó Siochrú & Girard, 2005). Positive externalities, where the total benefits of a service exceed the benefits to the individual who receives a service, thereby increasing the value of a service with the number of users on a network (Best & MacLay, 2002; Clarke & Wallsten, 2002; Estache, Gomez-Lobo & Leipziger, 2001), was a main design parameter. This is in stark contrast to the design of most telecentre initiatives, which rather than being network nodes are isolated access points (Menou, Poepsel & Stoll, 2004).

The creation of iREACH formed part of IDRC's ICT4D work in Asia (under the Pan Asia Networking umbrella), which during 2006-2011 focussed on examining three research pillars: policy, technology and socio-economic effects of ICT4D interventions and applied three principal means of delivering programmes: research networks, country programmes and competitive grants. Cambodia met IDRC's criteria for the country programming approach – a transitioning society with a window of opportunity for policy change, significant potential for ICT4D capacity building and local partners and change agents available to champion the project.

7.1.1 Objectives of iREACH

A key objective of iREACH was to build evidence and capacity to influence ICT policy in Cambodia, particularly rural ICT policies related to community access. Providing the pilots

were successful, the intention was to promote the mainstreaming of this type of project across Cambodia (e.g. by influencing regulation that could provide funding from a universal access fund). Other objectives included community capacity building through training in ICT use, pilot-testing of a community-driven system of blended technologies (wireless, solar energy, wind power and community radio) and exploration of how these, together with content development, could contribute to social, economic and cultural development. These objectives lacked measurable outcomes and timeframes and the design did not follow traditional approaches to programme development and implementation, such as logframe analysis. The project was monitored regularly, using a combination of IDRC's Outcome Mapping (OM) and the Strategic Planning, Evaluation and Knowledge system (SPEAK), developed by Nexus (Ó Siochrú, Hak, & Long, 2009). OM/SPEAK focuses on activities and outputs from resources used, rather than contributions to development objectives. Detailed documentation of processes and outcomes for use by researchers, policy makers and practitioners was a central element and a few publications have been produced (Dara, Dimanche & Ó Siochrú, 2008; Grunfeld & Hak, 2009; Grunfeld, et al., 2011).

Although iREACH was not community initiated, it has from the beginning been integrated into local communities and epitomises the macro-, meso-, micro relationships. Its viability depends on macro-level policy and regulatory environments (e.g. for funding under universal access provisions and for e-government applications as a revenue source).

7.1.2 Location of and selection criteria for iREACH pilot sites

The pilot sites were selected jointly by the MoC representative, the manager of the iREACH central office in the capital Phnom Penh (PP), IDRC and an external consultant commissioned by IDRC. Some scholars and practitioners argue that it is imperative that telecentres be designed and implemented through participatory approaches (Cecchini & Scott, 2003; Phillip & Foote, 2007; Kanungo, 2004; Whyte, 2000), but this has been questioned by Bailur (2008b). Although iREACH had a centralised (top-down) design (i.e. the community was not involved in the definition of the general goals of this project), its implementation process was participatory in that, community members were directly involved in deciding where to locate the hubs, priorities for content development, training programmes and other activities.

There were several reasons for choosing Kamchai Mear (KCM) and Kep: their poverty levels were higher than the Cambodian average and they are located at daytrip distances to, but different directions from PP. When the project started, both pilot sites were approximately 3-4 hours by car from PP, but road improvements have since reduced the travel time. Most

significantly, local institutions were supportive and assisted with accommodation, providing space free of charge in schools, pagodas, commune and district council offices. Similar to the case with Akshaya and e-Seva in India (Garai & Shadrach, 2006), iREACH demonstrated that administrations at the micro- and meso-levels can act as facilitators by providing space and other logistical support.

Supervision by local organisations was another critical element and the Chea Sim University of Kamchhai Mear (CSUK) has managed the KCM site from the beginning. The Cambodian NGO, Center for Social Development (CSD), managed the Kep site until 2009, when, following internal problems at CSD, supervision moved to the central office. The pilot sites have collaborated with each other, usually via the central office, which is responsible for the overall project and is the interface with IDRC.

Kep province comprises two districts, one of which is Kep town and the other Damnak Chang Eur. Despite covering only the latter district, iREACH refers to the pilot site as Kep, as does this study. Fishing and small-scale agriculture are the main livelihood sources in the area, which also has a growing tourism sector. The iREACH project covers 11 villages in the more rural district of Damnak Chang Eur, with a population of approximately 20,000 spread among three rural communes: Pong Teuek, Ang Khoal and Ou Krasar.

One of 12 districts of Prey Veng province, KCM consists of eight communes, covering 129 villages. The pilot coverage area includes 56 villages within three communes (Smoang Choeung, Smoang Tbaung and Kranhoung), located adjacent to the district capital, representing approximately half of the population in the district. The economic activity of this region centres on rice cultivation, complemented with small-scale animal husbandry and vegetable growing.

7.1.3 iREACH implementation, services and activities

One of the initial tasks was to establish a democratic governance framework in conjunction with respective communities. Inserted from the outside into a complex socio-political environment, iREACH quickly became an integral part of communities within its catchment areas, assuming a facilitative role in several areas of community activity.

After a preparatory phase of almost nine months, which included overcoming many technical obstacles and recruitment of key staff, an external consultant facilitated baseline studies on socio-economic factors, setting the scene for the human development and physical infrastructure development of the two pilot sites. Throughout its operation, iREACH has experienced varying

degrees of challenges with human resources, including recruitment, management and technical skills.

Each of the ten village hubs at each site (one at the HQ and nine in surrounding villages), initially equipped with only one laptop (most with 17 inch screens) , also had ten OLPC XO's following a donation of 200 devices from Elaine Negroponte in mid-2009. The standard and XO laptops have English keyboards and the hubs provide sheets showing how to use these for Khmer script according to the Unicode localisation. Used by children only, at the time of the study, the networking function of the XO's had not been used for communication between XO's directly or via the wi-fi hotspots installed at each hub. Normally consisting of a small room, the hubs are staffed by a community facilitator (CF), an intermediary interfacing between iREACH and villagers. The hubs are approximately 15 square metres and can fit some ten people.

Most of the CFs are from the local communities and are trained and supported to play a key role in enabling those with low literacy levels and other barriers to effective use of ICTs to benefit from iREACH. It is thus not necessary for users to acquaint themselves with any of the technologies at iREACH. Even users proficient enough to use computers on their own, are "supervised" because of the openness of the hubs (i.e. people come and go to have a look at what others are doing on the computers), limiting the privacy of users and the risk of them accessing illicit material. While the supervision is beneficial for the latter purpose and for providing assistance, being constantly observed inhibits learning facilitated by unobserved trial and error.

iREACH offers a "learning by doing" environment, in which users can learn and practice the range of tasks involved in operating an enterprise of this nature, including governance and democratic processes. The composition of staff, consisting of a pilot coordinator, technical coordinator, research coordinator, multimedia coordinator and several content developers at each HQ and the management committees reflects IDRC's commitment to gender equality and empowerment. This is a very high ratio of staff to computers compared to most telecentres. In addition to providing access to and training on the use of computers and the Internet, iREACH offers mediated access to information on diverse topics, including agriculture, health and human rights via a variety of channels, primarily "narrowcasting" from computer speakers and public address systems, "village-to-village" on-line meetings via the hubs and mobile video shows. In this context, "narrowcasting" is a term used for transmitting information via Skype to a computer loudspeaker connected to a computer at a hub and where available to external loudspeakers (public address systems). It is an inadequate substitute for community radio, which, while forming part of the original design, could not be implemented as the government

renege on an understanding that iREACH would receive a license. The reach of the narrowcasts is limited, making the resources devoted to content development inefficient. As villagers had been promised community radio, there was much disappointment that it was not available.

The hubs suffered frequent service outages, whether caused by the questionable quality of the satellite links (VSAT), particularly during the rainy season, problems with the wireless network that links the hubs with respective HQ and to the Internet, or power outages. The use of satellite for Internet access was not a deliberate choice between various options, but the only technology available, as both sites lacked terrestrial broadband capability when iREACH started. The latency of the satellite affected the quality of some applications, particularly speech. When an optical fibre network was extended to the locations of the HQs in early 2011, they were connected to the Internet via that network. The technology used for the inter-hub wireless networks is based on WiMAX in combination with various software platforms, including Skype, Netop School, Outlook messenger, and TeamViewer. Reliance on solar power in most hubs has limited the effective operational hours and a maintenance contract without stringent service level agreements has exacerbated these problems.

7.1.4 Viability and income generation

While communities have contributed much in terms of space, volunteers and other local resources, most of the services offered by iREACH have been provided free of charge and the research indicated that there was not much willingness to pay for services. Most of the informants had not paid anything for using iREACH, the main exception being that students in the KCM youth groups had paid 1,000 riels/hour (USD 0.25) for using the Internet and someone in another group had paid for printing.

A general attitude was that, as a community facility, iREACH should be free of charge. Most participants considered the non-chargeable nature of iREACH a key benefit and one reason parents were happy for their children to use it. In discussions about the anomaly between the perceived value of iREACH and unwillingness to pay, several groups adhered to their opinions, pointing to the inability of the poorest to afford payments. While some supported the view that the poorest be exempt from paying if some services became chargeable, others considered this inequitable. Kep commune council members were in favour of iREACH charging for its services, realising that this would be necessary for its survival. Opinions about reasonable price levels for the different services varied significantly, and were generally considerably less than the market rates, despite considerable distances involved in using alternative facilities. The

weighted average for groups who responded with a price was 650 riels/hour (USD 0.16) for computer use in 2009, compared with 530 riels (USD 0.13) in 2010. The corresponding figures for Internet use were 744 riels and 810 riels, respectively, compared with a commercial market rate of between 1,000 - 1,500 riels.

The perceptions of iREACH as a community facility that should be available free of charge did not augur well for a user pays future. Referring to viability issues of InfoDes in Peru, Dagrón (2001) commented that communities were so accustomed to initiatives driven by external funding, that their enthusiasm waned for projects aimed at generating local funds.

The only service for which there was universal willingness to pay was calls and it may well be that calls could underwrite telecentre operations (e.g. Best & Kumar (2008) speculated that the lack of voice services was a key reason for closure of some 90% of privately operated SARI kiosks). Included in the initial plans and promised to villagers, iREACH reneged on offering VoIP when failing to receive a license for this service. Following complaints about broken promises, iREACH developed a compromise between full VoIP and delivering on its promise, in the form launching a service termed “Family Link-Up” in 2008, through which users could call family members overseas.

The service proved popular first, but technical problems caused by inferior quality headphones and satellite connections soon reduced its attractiveness and users refused to pay. As iREACH still incurred charges from the upstream service provider, the service was discontinued in late 2009. The lack of VoIP and community radio, both due to macro-level policies, affected iREACH’s viability, both in terms of lost revenue and economies of scale and scope inherent in a converged network offering a diverse range of services.

7.1.5 iREACH's future?

By late 2009, iREACH was at the end of what Fuchs (1998) referred to as the investment phase, the first of a three phase telecentre model. As per the model, iREACH formed partnerships in the local community and institutions to increase capacity, primarily with the commune councils and district administrations. These were characterised by the seven key attributes, identified by Unwin (2005b) as necessary for successful ICT4D partnerships: trust, clear focus, champions, focus on sustainability, balance between demand and supply, investment of time in networking activities and transparency, together with a sound ethical basis. In forming partnerships, attention was paid to the different local contexts at the two sites, an important element of partnership implementation (Geldof, et al., 2011).

In the second, contracts phase, iREACH should according to the model, enter into arrangements with government agencies and other institutions for various services and not until the third phase would payments from end-users support its activities. For iREACH, the second phase started with a grant from the Toyota Foundation for an organic farming project in KCM. IDRC funded two other projects, not managed by iREACH, but using its infrastructure. One was for CSUK to pilot non-formal distance learning for farmers. The other was a secondary distance education programme for youth of a fishing village Kep, implemented by a school. It is at the contract stage that the centre would become an entrepreneur, but it is too early to know whether iREACH can transition to this phase, which Fuchs acknowledged would be difficult. In accordance with the view of UNCTAD (2007), his criteria for success centred on the ability to help generate small private sector start-ups in the information sector.

Fuchs referred to the third stage as the user-pay phase and iREACH is not within sight of this in terms of full financing by users and whether it ever will depends on the definition of user-pay. If it extends to include government agencies, paying for use of the network for educational, health and other applications, iREACH might survive on a user-pay basis, should such applications emerge in the near future. The usage levels of potentially chargeable services have been too low to make the project viable, but with only one computer per hub, there is not much scope to increase usage sufficiently to generate the necessary revenue. Complaints about crowded hubs suggest that even when services are free, long waiting times can dampen the interest. The relatively high utilisation rates stand in contrast to many telecentres, where equipment and services are underutilised (James, 2008). The equation of paying the wages of one CF per hub with only one computer is unlikely to be viable and iREACH recognised this by relying on volunteers in its scaled down version operating from May 2010 and further by reducing the number of hubs from early 2011. While this improves efficiencies, it also increases the distances some villagers must travel to a hub.

Fuchs (1998) also identified three stages, through which telecentre usage often evolves; the first is for potential users to explore how equipment and services at a centre can be useful. In the second stage, users would start learning how to find value, seek and apply information, leading to the third stage, in which they would combine information with communication. Compressed into two stages, Madon (2004) identified a similar pattern in her study of Akshaya, where usage evolved from IT literacy programmes and communication with family members overseas to a wider range of applications, including transactions and dissemination of information in key sectors such as health and education. iREACH did not strictly follow any of these steps, with computer training and literacy programmes, as well as education in livelihood themes forming

part of iREACH's initial activities. Villagers could interact with staff and volunteers presenting narrowcasts and screening mobile video shows. Reasons for not extending much beyond this initial stage include lack of e-government, e-commerce and other e-services in Cambodia and the technical problems.

The original design did not include an exit strategy and with the approach of the extended funding period (April 2010), frantic activities were set in motion, trying to work out how the project could continue. In this uncertain environment with staff cuts, the focus of many employees shifted from iREACH to their own futures. With iREACH at the crossroads, it is worth contemplating the predictions by Whyte (1999) that telecentres established through international donor initiatives or public programmes, rather than being driven by local entrepreneurship or communities, are more likely to become unviable when the initial funding runs out. The challenge is now to transform iREACH into a community driven entity and a small IDRC grant, covering the period until June 2012 is designed to achieve this. Replacement of the satellite connection with optical fibre has overcome a major problem. The worst case scenario would be the realisation of the dire predication that that *'most of these [ICT for development] projects never properly work and for those that might get off the ground, go back 2 years later and it's all crumbled to dust'* (van Rensburg, Veldsman & Jenkins, 2008, p. 77). Whether the end of its seed funding will herald a slow decay, rapid demise or an opportunity for iREACH to re-energise will depend on the entity emerging to provide support, maintenance, training and system upgrades. It will also depend on whether and how it will be supported by its macro- and meso-environments.

7.2 Macro-environment

A major backdrop to the environments within iREACH operates is the tragic history and traumas from which the population of Cambodia is still recovering: the Indochina wars, the genocide by the Khmer Rouge regime and the intervention by Vietnam in 1978, followed by civil war. Cambodia's devastation and isolation continued until the intervention by the UN in 1991. The establishment of the UN Transitional Authority in Cambodia in 1992 marked the beginning of the slow process towards normalisation, which reached a major milestone with the elections of May 1993 (UN, 2003a). However, the Cambodian People's Party has since consolidated its power to an extent that terms such as *'hybrid democracy'* and *'electoral authoritarianism'* (Hughes, 20

07, p. 835) have been used to describe the system of governance, characterised by wide discretion at the top echelons of the administrative, political, police and military sectors,

enabling people in those positions to take advantage of their status (Cock, 2010). The government has used resources ‘*elicited via this discretionary sphere*’ (Hughes, 2009, p. 214), to deliver roads and other visible improvements for the rural poor and the proportion of the population living on less than \$1.25 (PPP) per day reduced from 47.7% in 1996 to 40% in 2005 (UNDP, 2010). UNDP estimated more than half of the population to be multi-dimensionally poor, mainly due to lack of electricity, sanitation and cooking fuel. There are thus still numerous challenges, primarily in poverty alleviation and effective governance, as the public sector suffers from corruption and lack of transparency and accountability (Sang, Lee & Lee, 2010).

7.2.1 ICT policy and regulatory environments

Responsible for formulating and administering ICT and other relevant policies, the Cambodian government is the key actor at the macro-level. There are overlapping jurisdictions and blurred lines of responsibility between several ministries and agencies with responsibilities in these areas. Reflecting lack of transparency, licensing of mobile carriers without an open legal framework (Unger & Robinson, 2008) has resulted in operational problems, e.g. two ministries issued mobile licenses to different operators on the same frequency and some mobile phone operators have blocked calls from other networks (UNDP, 2009). In the absence of a regulator, the Ministry of Post and Telecommunications is responsible for policy and regulation. The objectives of the National ICT Development Agency are to develop ICT policies for development as well as promoting ICT, particularly through an e-government programme. The Ministry of Information handles the regulation and development of the media, with two ministries, the Ministry of Education, Youth and Sport and the Ministry of Labour and Vocational Training involved in the use of ICT in education.

Despite working on an ICT policy since 2004, involving six ministries, there was still no policy in 2010, but an extract from the draft policy on content indicated the government’s commitment to enhancing capacities in rural areas for content development and management on ICT systems (Nguon, 2009). Richardson (2008) attributed the underachievement of the ambitious goals of a 2004 policy on ICT in education to an ad hoc implementation process, characterised by a lack of transparency, equity in distribution and support of the ICT infrastructure and insufficient involvement at the community level.

It is particularly the lack of coherent policies relating to universal access and community radio that hampered iREACH’s achievements. A community radio license would have enabled iREACH to expand its audience and opportunities for raising funds, as would a VoIP licence. In

this somewhat opaque environment, there is no forum through which iREACH can effectively channel its experiences into national policies or become a viable operation.

7.2.2 *Cambodian ICT indicators*

Several composite indicators, collated by international agencies, are useful for comparing Cambodia's ICT performance with other countries and with itself over time. Cambodia is at the lower end of indicators measuring access to ICT. As shown in Table 7, the ICT development Index (IDI) of 1.70, compared to an international average of 3.58 in 2008, placed Cambodia at the lower end of rankings, despite having slightly improved its relative position since 2002. This index incorporates data about ICT infrastructure and access, ICT use primarily by individuals, intensity of use and ICT skills (ITU, 2009).

ICT Development Index (IDI)	2010		2008		2002	
	Rank	IDI	Rank	IDI	Rank	IDI
Cambodia	117	1.99	120	1.63	126	1.07
Average in all countries		4.08		3.62		2.48
IDI access sub-index	112	2.45	116	1.04	142	0.01
IDI skills sub-index	120	4.34	121	4.16	131	3.15
Total number of countries ranked	152		152		154	

Table 7: ICT Development Index for Cambodia (Source: ITU, 2009, 2011)

A more diversified picture would emerge from statistics at the regional level and along the rural/urban divide, as there are considerable disparities in these dimensions. The aggregate national data mask geographical and social differences (e.g. most fixed telephone services of the 0.3% 2008 penetration rate, shown in Table 8, were in Phnom Penh, 76.2% of urban households owned a mobile phone and 15.8% had a PC, compared to 28.8% and 1%, respectively in rural areas. (UNCTAD, 2010)).

Access indicators	2010	2008	2002
Fixed telephone lines/100 inhabitants	2.5	0.3	0.3
Mobile cellular subs/100 inhabitants	57.7	30.7	0.9
International bandwidth/Internet user (bit/s)	28,067	13,476	400
% of households with computers	4.3	3.7	0.5
% of households with Internet	0.4	0.2	0.1
Use indicators			
% of individuals using the Internet	1.3	0.5	0.2
Fixed broadband subscribers/100 inhabitants	0.3	0.1	-

Table 8: Access and use indicators for Cambodia (Source: ITU, 2009, 2011)

The e-readiness index, based on sub-indices on website assessment, telecommunication infrastructure and human resources did not yield much better results, with Cambodia 139th, of

182 countries in 2008, having dropped from 128th in 2005 (UN, 2008). Going by the skills indicators in ITU's IDI, shown in Table 9, authorities responsible for education face considerable challenges.

Skills indicators	2010	2008	2002
Gross enrolment ratio secondary education	43.7	40.4	22.7
Gross enrolment ratio tertiary education	9.2	7.0	2.5
Adult literacy rate	77.6	77.6	69.4

Table 9: Skills indicators - ICT Development Index (Source: ITU: 2009, 2011)

7.2.3 Telecommunication market structure

Low access rates and high prices are usually associated with lack of competition, but do not explain Cambodia's low performance. Its market is very competitive, with nine mobile and four landline operators (Chin, 2010). The incumbent, the government owned Telecommunications Cambodia, operates national and regional backbone infrastructures. The Chinese owned CFCO Network owns an optical fibre ring; and Viettel Cambodia, a subsidiary of Vietnam's military owned carrier, has since 2007 deployed an optical fibre network, connecting all provincial capitals. In addition to serving as backhaul for its mobile network, it is used for Internet access. Emerging as the major telco in Cambodia and attracting headlines such as '*Vietnam sets its sights on dominating Cambodia's telecom market*' (VnnNews.net, 2010), Viettel reportedly owned 42% of base stations and 88% of optical fibre cabling in 2010. It had become the second largest mobile operator six months after starting operations. Its targets are as ambitious, aiming for a 90% share of the mobile and broadband Internet markets and a 46% share of landline services by 2011.

Table 10 shows that the strong competition in the mobile and ISP markets, with some 37 ISPs, 10 of which are major (Green, 2009), has not resulted in affordable prices. Compared to 150 countries in 2008 and 161 in 2009, in actual terms and as a proportion of the gross national income (GNI), Cambodia was in the most expensive quartile for all services.

Telecommunications pricing	Rank		USD		% of GNI/capita	
	2009	2008	2009	2008	2009	2008
Fixed telephone sub-basket	143	133	7.8	8.0	15.7	17.9
Mobile cellular sub-basket	134	121	5.0	5.0	9.9	11.2
Fixed broadband Internet sub-basket	140	125	88.5	90.6	177.0	201.2

Table 10: Price baskets and ranks Source (Source: ITU, 2009, 2010a)

ICT firms considered expensive Internet services a major constraint on the development of the ICT sector and adversely affected the competitiveness of Cambodian enterprises more generally (UNDP, 2009). The high prices could, at least partially be explained by Cambodia's use of

gateways in Thailand and Vietnam and were expected to decline following the completion of a submarine cable connecting Cambodia directly to the international backbone via Singapore (Sorasak & Kosona, 2009).

7.3 Meso-environment

iREACH has engaged at the meso-level with project implementation and to progress its policy input. While this tier has limited potential to address rural telecommunications on its own, it provides a valuable bridge between the central government, which may be too distant to appreciate the benefits of iREACH and the more decentralised institutions that lack sufficient resources to progress policy issues and provide financial support. There are several tiers in the Cambodian governance structure: 24 provinces, each of which has several districts, which in turn includes many communes. The provinces report directly to the Ministry of the Interior, which appoints the provincial administrators. The demarcation of accountabilities between the provinces and the central government has not been totally transparent (World Bank, 2002a). The former have been responsible for issuing land titles, licensing smaller businesses and participate in the development of the budget.

The Cambodian government has for some time been in the process of allocating more responsibilities to districts and the more than 1,600 communes, each of which normally encompasses between four and seven villages, and which, since 2002 have been governed by elected councils with 5-year mandates. The number of councillors per commune varies with population and geography, but is usually between five and eleven. The commune councils appoint village chiefs and Articles 30 and 31 of the Law on Commune (Kingdom of Cambodia, 2001) govern the relationship between those two institutions. Following close co-operation with the districts and commune councils, iREACH has been included in some of the Integrated Commune Development Plans in its catchment areas since 2010. Although the communes lack funds to support the initiative, they are committed to collaborating with iREACH to assist with its viability. iREACH has also forged close links with the village leaders, but as their role is mainly to serve as an interface between villagers and commune councils, they lack decision-making power.

It is at the commune level that women are starting to make inroads into the political domain. In the 2007 election, 21% of candidates were women, an increase of 5% from the 2002 election, with women winning 14.6% of all seats, compared to 8.8% in 2002 (Chhoeun, Sok & Byrne 2008; UNDP 2007b).

7.4 Informants' perception of their communities and iREACH

In this section we start introducing findings from the field research. To give an indication of the level of support for certain views among FGs, we refer to the proportion of groups having voiced an opinion or raised an issue. This should not be interpreted from a statistical perspective, as the sample was not representative. The reason for referring to proportion, rather than number of groups is that the number varied between the research waves and not all questions were addressed in all groups. The proportion relates to the total number of groups discussing the particular issue under consideration.

Although this study is about summative issues, formative aspects are important as a backdrop, as iREACH's infrastructure was far from functioning perfectly. One of the most-recurring themes in both years related to the inadequate quality of service and insufficient computers. Frequent outages, whether caused by the satellite or power problems, combined with long waiting times, discouraged attendance. The problems identified during the research had not created any noticeable disaffection with iREACH in 2009, but, despite giving adequate recognition to its benefits, in 2010 the frustrations generated from malfunctioning equipment and overcrowded hubs became more evident. The desire for iREACH to continue was nevertheless very strong.

7.4.1 *Views about communities, aspirations and the role of iREACH*

To set the scene within which informants considered the impact of iREACH, this section summarises findings related to community strengths, recent improvements and aspirations. The initial study was undertaken at the height of the global financial crises, in which Cambodia suffered from the second-round effects, due to its exposure of its "growth pillars": tourism, construction and textiles (Arnold & Han Shih, 2010; CDRI, 2010; World Bank, 2009b). As a general attitudinal backdrop, we turn to surveys covered by Hughes (2009): a survey on voter attitudes conducted by the Asia Foundation in 2003 found better livelihoods and peace to be high priorities for the Cambodian electorate. According to that study 30% voted for parties they believed could "get things done", while 24% voted for parties they believed could "keep the peace". A 2008 International Republican Institute survey found that more than 75% of the population considered Cambodia was "headed in the right direction", with more than three quarters citing "more roads built" and almost two-thirds referring to "more schools built". This focus on infrastructure for improved standard of living accords with the priorities for change expressed by the participants in this research.

7.4.2 Community strengths

The overall approach to the study is strength based (i.e. focussing on the strengths and assets of the communities, rather than vulnerabilities or needs). In ranking order, the most frequently listed strengths in both studies were education, including schools, agriculture, roads and health services. NGOs were also identified as key strengths, as was the Buddhist faith with its infrastructure of pagodas and schools, much more in KCM than in Kep in both studies, despite several Kep village hubs being located at pagodas and three of the Kep sessions held at such hubs. KCM also received more references to pagodas in the surveys (28%) compared with Kep (19%) of respondents — the average across both sites was 23%. Whereas only one group had referred to community participation, cooperation, collaboration between people and sharing experiences when discussing key strengths in 2009, this increased to three groups in 2010, using terms such as good relationships between villagers, group working, unity and collaboration.

ICTs were mentioned more frequently in 2010 than in 2009, by 53% of the groups compared with 36%, but in an open-ended question about major strengths in the survey, only 8% referred to ICT in general, including a few references to iREACH and some to mobiles. This was in stark contrast to 45% of survey respondents mentioning road infrastructure, a figure that reached 70% in KCM, which at the time of the survey did not even have any paved roads, but considerable roadwork underway. Other strengths identified in the surveys were schools (41%), hospitals and health clinics (32%), education (20%), agriculture (17%), water and irrigation (7%) and community participation and solidarity (5%), information and knowledge in general (5%). The discrepancies between the FGs and survey results with respect to ICT, argues for a cautious interpretation of the results. The higher incidents of reference to ICT by FG participants could reflect their closer association with iREACH and/or perceived pressure to mention what they expected the researchers wanted to hear.

7.4.3 Recent improvements

A question about recent improvements was a precursor to exploring iREACH's contribution to the achievement of these. Views about improvements varied across groups, but there was some consistency between the groups in both research waves in that the four most frequently mentioned improvements were closely interwoven with opinions about strengths. They included schools and education, agriculture (incl. animal husbandry), road infrastructure and health. The reference to education also incorporated informal education, with statements such as '*there is now more knowledge in the villages*' (in 35% of the groups) in 2010. NGO and pagoda activities were raised to a lesser extent in 2010 than in 2009. Whereas several groups in Kep suggested

private capital items, such as houses, cars and motorbikes in 2009, there was less emphasis on these in 2010. A few groups in both studies thought security had improved. Over 60% and 90% of groups in 2009 and 2010, respectively, noted infrastructure, particularly roads and to a lesser extent water, sanitation and energy, compared to 50% in both years referring to ICT infrastructure, including iREACH, as major improvements. In the open-ended survey question, 33% (63% in Kep), pointed to something related to ICT, whether in the form of infrastructure, 'getting knowledge on ICT', or 'children learning to use computers'. Another major difference between KCM and Kep related to roads, identified by 40% in KCM, but only one respondent in Kep. The survey results also showed significant variations between the two sites related to agriculture: 30% in KCM and 5% in Kep, possibly reflecting the presence of the CSUK agricultural university.

Discussions on improvements concluded with identifying factors contributing to these, to place iREACH into a perspective encompassing other factors to which participants might attribute improvements. In both years the centrality of government institutions and civil society, including NGOs, emerged strongly, with almost every group in both studies mentioning these, either by name or through more general reference. Although the question intended to capture NGOs other than iREACH, several groups nevertheless referred to iREACH, more so in 2009 than 2010. There was also more emphasis on communities and community participation in 2009, with a greater variety in responses, including reference to commune council members and village leaders, institutions not mentioned in 2010. In a closed-ended survey question, 88% of respondents pointed to the government and the same proportion to NGOs.

7.4.4 Aspirations

The purpose of discussing aspirations was to understand what functions iREACH could perform in fulfilling these. Most responses in both years fell within the broad categories of agriculture (ranging from irrigation systems to better farm practices), infrastructure, education, health, ICT and local employment opportunities. Roads were the most common infrastructure category, a priority aligning with Abraham's (2007) findings among fishermen in Tamil Nadu. Electricity was only raised in Kep, where villagers hoped for an extension of the distribution network to their villages following the electrification of buildings along the main road after the 2009 study. For improvements in health and education, on the wish list of most groups in both studies, participants alluded to better facilities, staff, as well as knowledge.

In the 2010 KCM teacher group, which included a medical practitioner, an interesting discussion ensued about the importance of education versus health, with the doctor insisting that

efficient study requires good health to which one of the teachers responded that without good education people do not know how to look after their health. Compared to 2009, participants in 2010 mentioned fewer items under this discussion point, possibly because the question occurred later on the agenda when participants had already talked about improvements resulting from iREACH, but the priorities were similar. Approximately 35%, compared to 45% of groups in 2009, specifically referred to changes that could be categorised as improved ICT facilities. The corresponding closed-ended survey question yielded only 3% to ICT, compared with improvements in education 40%, agriculture 24%, health 20% and infrastructure 12%. The frequencies in surveys and FGs are not directly comparable, as the responses in the surveys were mutually exclusive.

We then discussed how participants would go about achieving their aspirations and what they would require to do so, to explore how participants thought about change and explored the potential role of iREACH in this matter. In general, participants would try to collaborate with the authorities and organisations to which they had attributed improvements. As discussed in section 9.5.2, this high level of trust is relevant when considering the relationship between iREACH and social capital. A major difference between the 2009 and 2010 studies was that in 2009, several groups specifically mentioned they would approach iREACH, whereas no groups referred to iREACH by name in the 2010 study, but could have implied it in the general NGO category. A new category not appearing in 2009 and raised by three groups in Kep in 2010 was that participants would prepare plans, possibly implying greater self-reliance in achieving changes. In the survey, this was a closed-ended non-mutually exclusive question, yielding the following results: 20% would try to change things by themselves, 58% would approach the government, 61% would try to work through NGOs and 72% would work with other community members.

7.4.5 Skills and resources required to achieve aspirations

In terms of skills and resources required, as shown in Table 11, in 2009 ICT skills were by far the most prevalent, perceived as being necessary for achieving the desired changes. It appeared as if ICT related capabilities would form a platform, from which participants could launch a range of other activities relevant for priorities related to agriculture, health and education. Better agricultural skills, the most frequent response in 2010, came second in 2009. Several groups mentioned specific farming skills, such as composting, land preparation, plant protection and application of fertilisers. There was more explicit reference to livestock raising skills (included under agriculture in Table 11) in 2009, but could have been implied in 2010, although only mentioned in one group. In the survey, this question was closed-ended, with the categories

shown in Table 11, which illustrates considerable differences between the FGs and the survey - of special relevance is the lower priority given to computer and ICT skills in the survey. The importance of English, raised by half of the groups in 2009 and 2010, was explained by its usefulness for retrieving relevant information from the Internet, for further study and for communicating with representatives of foreign NGOs. However, English was prioritised by only 33% of survey respondents, who attached greater importance to Khmer literacy, which was prioritised in only one group in 2009 and six groups in 2010. The management and administration skills category includes communication, marketing, policy development, small business and creative skills. Two KCM groups in 2009, but none in 2010, mentioned beautician, dressmaking and hairdressing skills. Lack of local employment opportunities generated high emigration rates and these skills were considered useful for improving employment opportunities, whether staying or migrating.

	Focus groups				Survey	
	% of groups		Ranking		%	Ranking
	2009	2010	2009	2010	2010	
Computer and IT skills	91%	71%	1	2	38%	6
Better agricultural skills	73%	82%	2	1	53%	3
Management and administration skills	55%	18%	3	13	21%	8
English	50%	53%	4	5	33%	9
Funds	32%	65%	5	3	70%	2
Better education	27%	29%	6	9	Not included	
Human resources	27%	65%	6	3	85%	1
Equipment and materials	27%	29%	6	9	Not included	
Communication skills	18%	41%	9	6	36%	7
Health care skills	18%	41%	9	6	41%	5
Animal husbandry	18%	6%	9	21	Not included	
Better Khmer literacy	5%	35%	24	8	47%	4

Table 11: Views on skills and resources for achieving desired changes

In both years, the discussions about potential iREACH contributions to the desired changes and expertise required to implement them, centred on its role in facilitating access to information required for improvements in farm produce and associated income. Whereas 23% of the groups in 2009 included market price information for farm produce, there was no reference to this service in the 2010 discussion — the focus was on training to produce higher yields, including sharing of knowledge on how to grow vegetables. The Kep village leaders' group wanted iREACH to become involved in developing agricultural businesses.

Well aware that familiarity with ICT is a pre-requisite for employment in the formal sector, participants in both studies saw a role for iREACH in building such skills and in using the

Internet for finding job opportunities. In 2010 participants in a few groups alluded to iREACH as a potential employer, or at least a place where they could obtain work experience.

A male participant in the 2010 Kep farming group illustrated the potential instrumental value of learning about computers and the Internet by comparing the information they can get to a *'useful lecture'*. Participants also thought iREACH could contribute to enhanced livelihoods through continued narrowcasting of general information, including advice about agriculture, health, security and work, in addition to news. A major difference between the two studies was the frequent references in 2009 (45% of groups) to the ability to communicate overseas, an issue raised in only two groups in 2010, probably reflecting the unsatisfactory quality of Family Link-up. The percentage of groups identifying the potential for health improvements from iREACH's dissemination of health related information, including sanitation, increased from 18% in 2009 to 35% in 2010.

The survey results revealed as great variety as the FGs, in terms of functions iREACH could perform, but there was not much variation in response to a general question about iREACH's potential to contribute to achieving their aspirations, to which 83% answered in the affirmative. The variation between genders was insignificant, but there was some difference between users (93%) and non-users (74%). Of the 90% who specified how they thought iREACH could be useful, 31% referred to ICT, many of them incorporating references to services being cheap or free of charge. Linked with ICT were information & knowledge, (26%) and education & training (20%). Other areas in which survey respondents saw a role for iREACH were agriculture (18%), health (7%), employment (5%), while only 2% mentioned reduction in domestic violence.

7.4.6 Indicators

Consistent with the CA's views on the informational base for evaluating outcomes and impacts, in the final part of the introductory section, participants were encouraged to suggest possible indicators that would be useful for measuring the achievement of changes over time. Preferably, a participatory process at the beginning of a project would formulate such indicators, but this was not done for iREACH. The issue of indicators was a difficult concept to convey and after having struggled to explain it in the 2009 study, the local stakeholders wanted to remove this issue in the second study, but agreed to retain in the 2010 FGs, but not in the survey. An attempt at establishing such indicators for a number of ICT projects through a participatory process, as reported by Beardon, et al. (2004), encountered similar problems.

The discussion by those who grasped the concept gave some credence to the CA by validating the importance of non-economic factors and there was an almost total lack of money-metric measures. Also notable by their absence were indicators related to gender empowerment. Key areas for indicators were health, agricultural output, agricultural income, education and road improvements, not all of which relate to iREACH's immediate role but most of them could be useful for tracing influence pathways from the project to contributions. Simply knowing the type of indicators the participants would find useful to measure is not enough. To progress from there requires a system for collecting relevant data. While there were no resources for this during the initial grant period, IDRC has since funded the establishment of a commune data system, as part of iREACH's activities, not only as a data source for evaluating its impact, but for much wider community use.

7.4.7 Issues relating to use and non-use

This section deals with topics that in different ways addressed what participants perceived as shortcomings when we explored whether there was anything they had hoped to do at iREACH, but were unable to. We also invited participants to talk about how problems they faced at iREACH had affected their interest. These topics and a direct question about ideas for improvements quickly moved to complaints and suggestions for overcoming problems.

As alluded to in section 7.1.4, iREACH suffered from serious service quality issues. Another major impediment faced by those wanting to use iREACH was that there was only one computer per hub and several participants expressed their and other villagers' frustration over wasting time waiting, sometimes after having travelled for up to 30 minutes to reach a hub. Some of the adult participants said they had given up on coming, as the hubs were always full of students. Although the purpose of this research is to explore iREACH's contribution to development outcomes, formative factors are important, insofar as they might become powerful obstacles to using the facility.

As the number of villagers using iREACH was quite small, probably representing some 15% of the population, we were interested in understanding why more people did not use it, particularly if there were any impediments to use. As shown in Table 12, the motives for non-use spanned a wide spectrum. When turning to non-users in FGs for answers in 2009, the most frequently cited reasons were: '*busy with schoolwork and/or family obligations*', whether home duties and/or income generating work. Contrary to a common misconception (Chambers, 2006), poor people's time is often very precious, as confirmed by participants, who explained the poorest had to work hard and did not have time to use iREACH. This was exacerbated through

fewer family members remaining in the villages, as lack of local employment opportunities had led many to migrate. Other reasons included: *‘did not know about iREACH, afraid to damage computers, insufficient literacy and other skills, cannot speak English and want to give opportunities to children’*. A few thought they lived too far from a hub, but not everyone living in the proximity was a user. For example, someone in the Kep women’s group had never visited the hub located across the road from her house. Participants in two groups saw no need for and/or benefits of using iREACH. The only self-confidence related reason given in 2009 (in two groups), for non-use was fear of breaking the computer, despite iREACH having addressed such fears through intermediation by the CFs, obviating the need for people to use computers by themselves, so this reason might reflect ignorance of how iREACH operated.

Reasons for non-use	Focus groups		Survey
	2009*	2010**	2010*
Too busy	55%	47%	59%
No need, no interest, not important	36%	59%	16%
Equipment and service related issues	18%	65%	10%
Perceived insufficient knowledge	18%	24%	10%
Afraid and shy	18%	29%	4%
Living too far away from hub	18%	24%	0%
Did not know about iREACH	9%	0%	5%
Too poor (don't know about free serv	0%	6%	4%
* Non-users asked why they don't use iREACH			
** Question related to why not more people use iREACH			

Table 12: Reasons for non-use

As we changed the nature of the question in 2010 to reflect participants’ perceptions of non-use by community members in general, rather than their personal non-use (‘why don’t more people use iREACH’), the responses are not directly comparable. Some 30% of the groups, all of them in KCM, gave reasons linked to fear (e.g. *‘afraid to use new technologies, afraid to break computer and have to pay for it, afraid to go to a private house and commune hall, shy’*). A male participant in the Kep commune council group was of the view that women would not enter a hub with many men. Participants in a majority of groups (65%) related non-use to frustrations stemming from unsatisfactory technical performance and insufficient number of computers. Many complained about long waiting times for accessing computers and one participant in the Kep NGO group reported that she had heard from others that they travel to an Internet café in Kampot (a 45 minute drive) rather than attend iREACH. This was confirmed by a frequent user in the Kep youth group, who was aware that many villagers considered iREACH a waste of time. A few participants gave the more altruistic reason of non-users wanting to give preference to children. In addition to similar reasons as those given in 2009, in 2010, the issue

of some villagers' reluctance to attend hubs in private homes and council offices was raised. As discussed in section 3.1.5.5 similar reasons for non-use have been noted at other ICT4D initiatives.

Similar issues emerged from the survey, with the highest proportion (59%) giving reasons related to being too busy.

Unless iREACH can address the unsatisfactory operational conditions, it is questionable whether its early benefits can sustain interest. They may instead undermine confidence in the system, thereby affecting iREACH's ability to deliver on what appeared a promising start in terms of contributions to the CES.

7.4.8 Introduction to research findings relating to CES

In the next three chapters we present and examine the complex ways in which iREACH related to the constructs of the conceptual model. Rather than just analysing the findings on their own, we also refer to results by other researchers about respective construct, highlighting differences and similarities between our and other findings. We include research about ICT4D projects and general ICT use, as the latter can also indicate how ICT has influenced outcomes with respect to the three key constructs. Although intentional ICT4D initiatives vary in terms of several factors (e.g. ownership and management structure, focus on individuals versus communities, or type of activities offered), such comparisons are nevertheless useful, particularly if different outcomes can be linked back to such operational factors.

We adopt Menou's (1999) definition of impact: '*... the change in the ability of people to satisfy their needs brought by the outcome of the use of the Internet (or any other resource)*' (p.206). While we are conscious of potential negative impacts, we are primarily looking for improvements that make things better, whether by incremental or more transformative changes (Fetterman, 2005). This can be through changes in tangible factors such as actions, activities, behaviour, relationships, agriculture yields and employment, or more intangible aspects, such as empowerment and self-esteem. We relied on perceptions and accounts by participants and survey respondents, data that ideally should be complemented by more objective monitoring, but the establishment of such systems was beyond the scope of this study.

Each sub-section starts with an introduction of the topic and intersperses results from other studies with our field research. Juxtaposing the analysis from our field studies with portrayals of relevant aspects of other projects and synthesising results from different sources in a qualitative meta-analysis was useful for the process towards theory building. While the structure of this

section serves as a basis for theorising the relationships between iREACH and the constructs, the many cross-cutting themes were challenging, making it difficult to decide where to map some of the findings in this taxonomy. For example, agriculture related activities, shown under sustainability, also empowered farmers through new capabilities, as did computer literacy, reflecting the close link between capabilities and empowerment, discussed in section 5.1.2 and noted by Masschelein & Quaghebeur (2006). This indicates a high degree of convergent validity between the three constructs, but it is not helpful to simply state that everything relates to everything else. In some cases it was necessary to deem that certain issues would fit better under one, rather than another category.

Chapter 8 - iREACH's contribution to capabilities

In section 5.1.1, capabilities were defined as '*a person's or group's freedom to promote or achieve valuable functionings*' (Alkire, 2002, p. 184), through a set of available alternatives (Garnham, 1999). We noted the five freedoms defined by Sen (2001): economic, political, social opportunities, transparency and protective freedom and his explicit recognition of the essential capabilities of being educated and healthy. The previous chapter illustrated how the reciprocal relationship between education and health (UNDP, 2003), played out in one of the FGs in KCM between a teacher and a medical practitioner. Capabilities in both education and health emerged during the sessions, together with capabilities related to culture and innovation.

8.1 Capabilities of being educated and becoming knowledgeable

'Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms' (UN, 1948, Universal Declaration of Human Rights, article 26/2).

'While education unlocks the door to development, increasingly it is information technologies that can unlock the door to education' (Kofi Annan, (UN, 2003b)).

We consider the relationship between education and development in general and the CA in particular and then explore what other studies have discovered about the relationship between education and ICT, before analysing the findings of iREACH with respect to capabilities of being educated.

The above quotes imply the right of access to education and ICT, without reference to financial resources. The MDGs also affirm the critical role of literacy and education in building human capacity and supporting overall development goals, with Goal No 2 dedicated to achieving universal primary education. The achievement of these goals requires access to considerable resources and the UN turned to ICT, expecting it to facilitate learning. One practical embodiment of the link between ICT and education in Cambodia was the partnership between UNESCO, the Ministry of Education, Youth and Sport (MoEYS, 2004) and the Japanese government in an ICT for education project, which, as mentioned in section 7.2 failed to achieve its ambitious objectives and there was no sign of government-provided computers or computer education in iREACH's catchment areas.

Education is one of the best instruments for livelihood improvements through integration into higher growth segments of the rural non-farm economy (Haggblade, Hazell & Reardon, 2002). Through its wide-ranging impacts, education could also have flow-on effects on the macro-economy.

From a CA perspective, education has intrinsic and instrumental value as a means to an end, both of which can lead to improved well-being, either directly through more knowledge and insights, or indirectly through better employment. Arguing that education contributes to expansion of human capabilities, Sen pointed to benefits in '*reading, communicating, arguing, in being able to choose in a more informed way, in being taken more seriously by others and so on*' (Sen, 2007, p. 99). When considering iREACH as a tool for capabilities, the focus is on understanding how ICT has been used to facilitate the ability of individuals to lead lives they have reason to value, bearing in mind that: '*the telephone did not radically alter American way of life; rather Americans used it to more vigorously pursue their characteristic way of life*' (Fischer, 1992, p. 5).

8.1.1 Value attached to (ICT) knowledge and education at iREACH

iREACH's capacity building ranged from basic training in the use of ICT to lectures on a variety of livelihoods-related topics. Management committee members and some volunteers received instructions in audio production, project and other management skills. The value attached to education and knowledge was a recurring theme throughout most of the sessions, whether the topic of discussion dealt with strength of the communities, recent improvements, aspirations, or iREACH's role in educational endeavours. When asked to consider the most significant change associated with iREACH, 82% of groups in 2009 mentioned training in computers and other ICTs and 68% referred to knowledge in general, access to information and learning, closely followed by communication (64%). While the proportion of groups mentioning computer related knowledge dropped somewhat in 2010, references to general knowledge remained at the same level.

ICT knowledge, specifically the ability to use computers and other ICTs and understand their importance was a frequently recurring theme under many discussion topics in both studies. Participants overwhelmingly referred to newly gained understanding of and skills in this field, whether for communication, information retrieval, typing, or just knowing about computers and the Internet. For some, the mere exposure to computers and the Internet was a revelation. It was often necessary to use prompts to explore how these capabilities had been applied. This strong emphasis on ICTs gave an initial impression that many informants considered these an end in

themselves. But, as depicted in the discussion of the other constructs this was not the case, also borne out by only 51% of survey respondents including these in answering open-ended questions about the most significant change and main benefits of iREACH. The frequency with which participants responded with *'learning computers'*, *'being informed'* and *'gaining knowledge'*, was initially surprising, but then it seemed that the communities were in a process of demystification of ICT, possibly an initial step towards reaping benefits from it. The intangible capabilities of being informed and being connected appeared to contribute to self-esteem, reflected in people from diverse backgrounds showing considerable interest in iREACH. One sign of this, also identified by other researchers (e.g. Khelladi, 2001; Soriano, 2007), was the expression of a sense of self-confidence when overcoming fear of using ICT (e.g. *'... before I was afraid of computers, but now I can use it and am familiar with the equipment...'* (Male, Kep Teacher Group, 2010)).

Several users had applied their new ICT capabilities to typing, using both the Khmer and Latin alphabets and communicating beyond the village level, using email and Skype. Audio editing by a young man, volunteering with preparation of narrowcasts in Kep, was another example of an ICT capability with a practical application. Others perceived their ability to obtain information as a major achievement. The idea of education and learning had great appeal and there was a noticeable quest for knowledge. Participants contrasted this with the time before iREACH, when only a few villagers might have understood anything about ICT. In some groups, participants specifically mentioned the benefits of the location of hubs in villages and others offered optimistic views on what the capability of using computers might entail for children. There was much focus on children's opportunity to learn, illustrated by quotes from 2010:

'Before, children just played around at home and went walking — now they have something else to do' (Kep Teacher Group, D6)

'Before iREACH, children did not know about computers or the Internet' (Kep Commune Council D4)

'iREACH provides many services, for example for children to get training. Children consider it as a second school and school leavers can get access to education.' (Kep NGO group C1)

'Children are trying to learn — previously they went for walks and played games'. (KCM Farmers Group, D6)

In some cases, reported in the KCM women's group, parents conferred an infomediary role on their children, asking them to obtain specific information. Even those who had never visited a hub, such as the women in the Kep fishing group who considered themselves too old, were aware of benefits children could derive from iREACH. Some participants commented on how encouraging it was to see children teaching other children and adults, volunteering in other ways and finding new friends overseas. The theme of learning from each other, also surfaced at public access venues in rural India (Pal, Lakshmanan & Toyama, 2009), where the researchers found an association between these and the fostering of group collaboration. To the extent this occurs at other telecentres, it is under-reported, but ought to become a critical feature in the debate about telecentres versus individual mobiles, touched upon in section 2.2 and to which we will return in chapter 9.

Closely related to ICT, were the frequent references in both years to measures taken by iREACH to foster information, knowledge, learning and skills in more general areas, whether of an instrumental or intrinsic nature. In response to a question about most significant change, 28% of survey interviewees mentioned something related to these matters, as did 37% in response to a question about main benefits. The 2009 quote from a participant in the Kep farming group that *'villagers have progressed from information poverty to much information'*, was echoed in different ways in the 2010 study, when several groups also commented that iREACH had changed the attitude of people, so that they were more interested in learning. A male participant in the 2010 Kep NGO group expressed a commonly held view:

'Since iREACH started, knowledge has increased, changing our way of thinking, before we did not think as much. ...Now we use computers and the Internet and want our children to learn... iREACH has changed the attitude of people. Before they did not know how to use a WC Before we farmed in the traditional way, now we start using new methods, e.g. when selecting seeds for planting and using fertilisers....'

Another male participant in Kep accentuated the value attached to information in general:

'Here we don't have other sources of information, so the daily iREACH broadcasts are very important'.

The context of this emphasis on education, learning and knowledge is communities where there appeared to have been such a dearth of information in different knowledge domains in the past, that participants considered themselves empowered by the sheer access to so much information. Many of them lacked functional literacy and numeracy skills and this could have limited their ability not only to acquire information, but also to critically assess information

coming their way. Several participants had not completed primary school let alone availed themselves of lifelong learning promised in the MDGs. Low school attendance stemmed from both demand and supply factors. While participants in all groups valued education, we came across young people whose parents could not afford them attending school, as they had to help support their families. On the supply side, less than half of the 14 teachers who participated in the 2010 research were tertiary educated and one had only finished year 10. Low salaries compounded the problem of inadequate teacher training and teachers sometimes engaged in other income generating activities (e.g. one male participant in the 2010 business group was also a teacher).

8.1.2 Knowledge, education and employment

It emerged strongly throughout most FGs in both years that teachers, parents, students and other participants saw additional knowledge, obtained through formal or informal training, as a foundation from which community members could make better informed decisions, whether instrumental and leading to direct action, or intrinsically valuable. The use of ICT for enhancing employability and for finding jobs emerged as the most common instrumental relationship between ICT and education (i.e. improved livelihoods come via education and knowledge). The capabilities of being educated and employable were intertwined, despite a common appreciation of the intrinsic value of education. The instrumental value was usually linked to children and their employment prospects, with participants well aware that education is a prerequisite for reasonable employment conditions. There were great expectations across many groups that the skills the youth learned at iREACH would serve them well when pursuing better lives through income-generating opportunities. Several parents therefore encouraged their children to use iREACH for education as a livelihood strategy. Other researchers have reported similar parental attitudes (Bailey, 2009; Pal, Lakshmanan & Toyama, 2009; Parkinson & Ramirez, 2006).

English, ICT and Khmer typing were high on the priority list of skills considered essential for the youth and these were interrelated in that participants in more than 50% of the groups in 2009 adhered to the view that the use of computers (e.g. by simply using the keyboard) had helped children with their English. They realised that basic grasp of English, valued as an important competence by many, is required to navigate various computer and Internet functions, to find relevant information on the Internet and together with ICT skills was widely viewed as requirements for entering the formal economy. Several parents and teachers pointed to the many students attending the hubs, asserting that iREACH had been a source of inspiration, had sparked an interest in learning and encouraged children to take greater interest in their schoolwork. With the addition of the XO laptops, this had become more noticeable in 2010.

Having opened the minds of villagers to new careers, there is a risk that the expectations of finding better employment may not be fulfilled, leading to disappointment. Similar to findings in an evaluation of UNESCO centres (Creech, et al., 2006), such risks were balanced against more immediate practical benefits of new knowledge about farm practices and preventive health measures, hopefully countering any disillusion that might arise, should the students not be successful in securing employment in the formal sector.

8.1.3 Schoolwork

According to several participants, students used the hubs for homework and through observation during the sessions at hubs, it appeared that this was the case, although the extent to which the usage was for homework or other activities, such as learning computers and typing in Khmer and English was not explored. It was convenient for local students to use the facilities in their villages, but others travelled considerable distances. At one session a group of seven students arrived after a 30 minute bicycle ride from their village, itself an indication of the efforts some of them would exert to access a computer. Displaying considerable patience, six of them waited quietly for their turn to use the computer, while watching silently the one who was using it.

One anecdote illustrates the innovative ways in which students had used iREACH to complement formal education. A female student in KCM, dissatisfied with a teacher's inability to explain a mathematical formula, searched for more information on the Internet and became somewhat of a legend after conveying an explanation she found to others in her class. In addition to the youth group, participants in the village leader and commune council group mentioned this incident as an example of how students had used iREACH as a complementary educational resource to overcome structural deficiencies in the education system where many teachers lacked adequate qualifications. While it would be inappropriate to read too much into this episode, it nevertheless indicates the potential of iREACH to complement the formal education system. This incident also illustrates how ICT engaged students in learning, overcoming rote-learning practices still prevalent in many countries. Contrary to the pride the community took in this student's achievements, Roman & Colle (2002) reported on a case in Mexico where a schoolgirl interviewed at a telecentre indicated that her '*... Teacher is afraid of the computer because we might learn something she doesn't know*' (p.16). This is one anecdote against another, which does not prove anything, but it would be interesting to explore whether and which environmental factors might have influenced the different attitudes, as the different reactions to students gaining more knowledge through ICT could be an illustration of the contextual nature of learning and its relationship with empowerment. At iREACH there was no indication or concern that the use of ICT for educational purposes had affected power

relationships between teachers and students or could do so in the future. Teachers had also used iREACH to complement their, sometimes meagre, knowledge in subject areas they were responsible for teaching, and for administrative purposes.

Other studies have also reported on the use of shared access facilities for homework (e.g. approximately half of the Aguablanca users surveyed by Parkinson & Lauzon (2008) in Colombia indicated that some of their use was directly related to schoolwork). In a study of “Infocentros” in Jamaica, Bailey (2009) found that family members assisted children with their homework. While few needed to use the Internet for school assignments in a study of students from educationally advantaged backgrounds in West Africa, Griswold, McDonnell & McDonnell (2006) found that some used it to supplement their school education. Having to pay for use at commercial Internet cafés limited the risk of Internet use impinging on the time students would allocate to homework. Structural impediments, in the form of only one computer per hub inhibited excessive use of iREACH’s ICT facilities. As, due to provisions of the ethics approval, all participants were above the age of 18, we did not explore directly with many students whether the high student/computer ratio hampered effective use of iREACH for schoolwork. But some inefficiencies (e.g. with the seven students described above) were observed.

8.1.4 Adult and non-formal education

There is not much concrete evidence in the literature of shared facilities having been used for adult education, without concerted efforts (Parkinson & Ramirez, 2006; Tiwari, 2008). Such efforts encouraged adult education at iREACH — participants learned through audio narrowcasts, online meetings and lectures as well as through searching for specific information. Learning thus went beyond absorption of external information and much was learnt from links between communities, facilitated through ICT. Training arranged for management committee members, including courses in management, facilitation, communication, leadership and scriptwriting were examples given of iREACH’s involvement in adult education. iREACH had not used its infrastructure for formal education programmes, but such use was planned for three pilot distance learning projects funded by IDRC (started after the conclusion of the 2010 study). One involved CSUK provided non-formal distance learning for farmers. The other grant will give young adults who dropped out of the formal school system in a Kep fishing village the opportunity to continue their education via distance learning. Children in fishing villages tend to discontinue school attendance, upon reaching the age when they can help their families with fishing and related tasks, as the irregular hours of these activities are incompatible with school schedules. The distance education pilot will schedule classes for times when children are

available and, using iREACH, the teachers will not have to travel the long distance between the school and the fishing village. In an effort to help improve the quality of basic education, the third project will use the iREACH infrastructure for teachers to upgrade their qualifications, taking into account experiences from other developing countries using ICT for professional development of teachers (e.g. Selinger, 2009).

8.1.5 One laptop per child - XO computers

A sizeable increase in the number of children who could actively participate in iREACH's activities occurred in late 2009, with the introduction of 200 XOs. Unlike the OLPC philosophy behind the design of the XOs, iREACH introduced them into the hubs, where children used them on a time-share basis, following a semi-structured training programme as well as experimenting by themselves. In addition to including a question related to the XO in the regular focus groups, we also arranged a special session at each pilot site, with family members (parents, grandparents, siblings, and one uncle) of children who had used the XOs. There were six participants in the special group in Kep and 12 in KCM. The discussions relating to the XOs in the regular groups centred on participants' awareness of this initiative and their views about it, particularly whether they considered it useful, which participants in all but two groups did. The XOs had attracted much attention in communities and only two participants were not aware of them, surprisingly, they were in the KCM teacher group.

Most family members had at least a rough idea of what the children did with the XOs, having found out by observing them at home, at iREACH, or been informed by the children. Some parents had visited the hubs specifically to check up on their children, whereas others, particularly in KCM, would observe them when visiting a hub anyway. There was much enthusiasm for the potential of the XOs to contribute to children's learning and knowledge, in the regular and special groups, expressed in different ways:

- *'makes children clever and creates knowledge'* (5 groups in KCM and 2 in Kep)
- *'before the students did not learn, now they do'* (Kep NGO group)
- *'students using the XO are more willing to learn new things'* (Kep teacher group)
- *'tool to support the thinking in children and helps children pay attention to their studies'* (Kep management committee)
- *'develops critical thinking among children'* (Kep women's group)
- *'they remember keys, can explore, improve intelligence'* (KCM teacher group)
- *'children can explore things by themselves'* (KCM women's group – non users)
- *'improved knowledge and intelligence'* (KCM, mother of two boys: 10 and 14 years).

- *‘Before my son was not studying, but after the XOs came to the hubs, he started becoming interested in the XOs and also teaches his siblings. He plays less with his friends and more with the XO. He has upgraded his knowledge and knows more..... Now he is mainly interested in the XO and schoolwork’* (Kep, special XO group, father of 13-year boy)

Participants considered the XO programme a useful way for children to learn about and get started with computers, a stepping stone from which they could progress to normal computers. For example, a mother of a 13-year old daughter who was using the XO at Kep was intent on her daughter learning computer skills this way before advancing to a “real computer”. Learning keyboard skills was universally acknowledged as beneficial in the special XO groups.

There were a few citations of the XOs having made children more courageous, overcoming fears of asking questions in school, but the ability to learn through discovery, one of the presumed hallmarks of the XO, did not emerge as a theme. It was also common for participants to identify what amounts to the XOs contribution to positive social capital in the form of children seeking assistance from older children in the hubs, with problems they faced when using the devices. Another sign of social capital was peer pressure attracting some children to the hubs to use the XOs when they saw other children doing this, potentially with commensurate reduction in pressure to engage in mischievous activities. Indirect benefits also featured in the discussions, mainly in the form of children being more willing to help at home after using the XOs.

The reaction to the XOs was thus overwhelmingly positive and many family members of children using these devices reported that, in addition to improving keyboard literacy and inspiring children to take a greater interest in their school work, they had improved their behaviour in other ways (e.g. by helping out more at home). Similar to the use of computers in general, there could be a danger that the XOs create expectations of children having a better future because of these skills, as expressed by the mother of a 14-year old girl using an XO in KCM: *‘.... we hope the children will get better jobs. After finishing with the XOs, will the children get a better job? Will they get a job with iREACH?’*

In the surveys, only users were asked about the XOs, an omission due to the question being placed in a part of the questionnaire designed for users only. So, it was not surprising to see a 95% awareness of the XOs, and a high perceived usefulness: 54% of respondents to this question thought it was very useful, 42% that it was useful and 4% that it was somewhat useful. Among the 150 responses to the open-ended question about why it was useful, most referred to children learning computers (49%), getting knowledge and becoming clever (26%), improved employment prospects (5%), and better futures (5%). All interviewees mentioning employment or futures were in KCM, where there was a stronger link between the XOs and better

livelihoods. Also in KCM, four interviewees referred to the reduction in children ‘going for walks’ (implying some form of mischief). In Kep there was more emphasis on just learning to use computers, although a male Kep farmer aged 39 had an interesting perspective on this activity: ‘when learning the children don’t think of spending money’. Only one respondent, a 24 year old male interviewee in KCM, referred to children helping out more at home – a behavioural change coming out quite strongly in the focus group sessions.

8.1.6 Reflections on iREACH, knowledge and education

The importance attached to learning, lends support to the CES virtuous spiral model, in that iREACH had laid the groundwork for knowledge acquisition at a magnitude not previously encountered in its catchment areas and those who had used iREACH to become more knowledgeable, were in turn better able to exploit the potential of iREACH. The benefits appeared multi-dimensional, economic as well as social and psychological in ways that would be empowering. Such acquisition of skills and capabilities is, according to Masschelein & Quaghebeur (2006), a vital drive for empowerment, as it enhances the ability to deal with changing environments. The frequency with which knowledge about computers and improvement in self esteem was raised confirmed this link between knowledge and empowerment. The general thirst for learning, sometimes unrelated to the utility value of the knowledge and the structure of the learning process, points to an appreciation of the intrinsic value of knowledge, a finding that matches the CA’s view that education involves intrinsic as well as instrumental values (Saito, 2003). From a CA perspective, such improvements in capabilities of being educated are steps along the long path toward villagers being able to lead the lives they value and have reason to value, even for those who used iREACH only as a window to the world. As a woman wrote in a Timbaktu telecentre logbook: ‘*Information is the key to all doors*’ (Hudson, 2001, p. 164).

The intrinsic nature of the general thirst for learning by adults, demonstrated in 2009, seemed to have evolved towards more instrumental search for useful information in 2010. Rather than just being in awe of the computers and the Internet, there was greater awareness of the power of these technologies to improve livelihoods and widespread segments of the communities (i.e. not limited to the elites (see section 9.6)) were able to make more sense of how to benefit from them. The more deliberate efforts to learn and leverage new know-how could, in accordance with the CESVS model, reflect that, as villagers became more knowledgeable, they had higher expectations of the value they could derive from ICT and translate this into concrete opportunities. Marketable skills, acquired by staff and volunteers through their involvement with iREACH also attracted more attention in 2010. The almost obsessive interest by adults in

children being able to use computers might in addition to signalling expectations of concrete benefits from iREACH, reflect what others consider ICT's symbolic role, linking it to notions such as social mobility and progress (Kuriyan & Kitner, 2009; Pal, Lakshmanan & Toyama, 2009; Slater & Tacchi, 2004).

The CESVS model envisages that the enlargement of capabilities would assist in the empowerment process leading to people engaging in increasingly sophisticated use of ICT and seeking to improve the local ICT infrastructure. This had not yet occurred and it seemed that, if anything, the infrastructure had deteriorated. The lack of attention to developing skills in computer maintenance, in combination with the reluctance of participants to pay for services, might inhibit the survival of iREACH.

There was a stronger relationship between education and health, mirroring the views of Drèze & Sen (1989) on how education influences how a person converts other entitlements to human capabilities: *'through education one learns to convert, say income, to nutritional capabilities. In order to maximise these capabilities, it is necessary to be educated in basic nutrition.'* (p. 262).

8.2 Capability of being healthy

Being healthy is an essential capability for well-being and a necessary pre-condition for being able to make effective use of educational opportunities. Evidence from several countries, including Cambodia, point to the negative effects of healthcare costs on welfare (Krishna, 2009). The inability of the very sick to work, thereby straining family resources, strengthens the link between poverty and ill health. Costs associated with illness are recognised as a major driver of households into poverty, particularly prolonged illnesses that entail direct expenses on treatment and opportunity costs through lost incomes (Thomas, et al., 2010; Russell, 2005).

There has been a longstanding interest in and practice of using ICT to improve health in different ways in developed and developing countries (Kwankam, Pablos-Mendez & Kay, 2009). Applications in this area generally go under the umbrella of e-health and can be local, national or global in nature, involving the use of the full range of ICT technologies and deal mainly with education and diagnosis, but can extend to treatment. iREACH's e-health activities were limited to the educational sphere, mainly in the form of narrowcasts prepared by staff from material available in the public domain, but usually not in collaboration with government health authorities or NGOs active in the health area. The programmes dealt primarily with preventive measures associated with nutrition and sanitation and protection against infectious, water- and mosquito-borne diseases.

There are examples of how ICT has been used successfully for such education (e.g. by the Indian SEWA, using video footage produced by members to convey basic health information (Gurumurthy, 2004) and Gonokendra's multimedia based public health awareness programmes in Bangladesh (Ashraf, Hanisch, & Swatman, 2009). However, Tiwari (2008) found Gyandoot's, healthcare advice, apparently un-mediated through any human interface, had negligible uptake, with potential users preferring to interact with humans.

The lack of rural health services increases the risk of incapacitating illnesses (UNDP, 2003), and considering that only 13% of government health staff was situated in rural areas in Cambodia, where 85% of people lived, it is understandable that a large proportion of participants appreciated iREACH's health education. In 2009, participants in 59% of the groups gave account of iREACH's contributions to improved health at some time during the sessions and 15% of the groups ranked this among its key benefits. When asked a direct question whether iREACH had contributed to better health in 2010, all groups affirmed that it had and provided several examples, most of them related to the topics in which iREACH had provided training. But in response to the same question in the survey, only half of the interviewees believed iREACH had contributed to improved health and far fewer (9%) referred to health across the open-ended questions in the survey. This combined figure disguises differences between KCM and Kep, 13% and 6% respectively, still not an impressive result, which also lacked specifics, in that the answers were of a general nature along the lines that there was more knowledge about health.

Participants in both studies thought iREACH had provided useful knowledge on disease prevention and remedies, particularly through audio narrowcasts. Topics they had absorbed and applied ranged from better understanding of hygiene, sanitation, nutrition and the importance of boiling drinking water, house cleaning, taking protective measures against mosquito-borne diseases by using mosquito nets and destroying mosquito habitats. Several villagers had started keeping clean water for drinking in special containers. Some participants mentioned greater awareness of substance abuse and domestic violence, including someone in the KCM youth group who claimed to have noticed reduced alcohol consumption following iREACH narrowcasts on this issue. One male participant in the Kep NGO group acknowledged iREACH's importance in disseminating health warnings, as it had done with the H1N1 2009 pandemic. There was no reference to iREACH having been of any benefit to the chronically ill or no indication of anyone actively seeking health related information on the Internet, pointing to the importance of mediation, at least at the early stages of ICT introduction, before potential users are aware of what information can be obtained from the Internet.

A major difference between the two studies is that in 2010, several participants pointed to a link between greater health awareness through information disseminated by iREACH and economic circumstances, in that improved health had reduced the need to visit doctors unnecessarily, thereby enabling villagers to save time and money. This awareness, including a better understanding of when it would and would not be advisable to seek medical advice, had been acquired by learning about how to distinguish between symptoms of less and more serious conditions and how villagers could apply some remedies by themselves (e.g. reducing high temperatures). There was a perception in a few groups, that this informal health education was associated with a reduction in the occurrence of some diseases and a higher incidence of villagers going to hospital when seriously ill. One area in particular where iREACH seemed to have encouraged more visits to government health centres related to pre-natal care and participants in both years, but more so in 2010, claimed health clinics were more frequently attended by women for this purpose after having been encouraged to do so through iREACH's narrowcasts.

There were two possible links between health and agriculture, one of which was picked up by the 2010 Kep youth group in the form of reference to reduced exposure by villagers to chemicals following the uptake by many of organic farming practices. Although participants did not identify any links between nutrition through a more diversified diet associated with crop diversification, addressed in section 10.1.2, such a relationship may develop in the future.

There was no sign of any use of iREACH by the health supply side, not even by a medical practitioner who participated in a 2010 FG. Unlike many teachers, as a non-user, he had not used iREACH to update his medical knowledge.

To summarise, the field research results indicate a small contribution by iREACH to greater health awareness and presumably to better health, supporting the findings by Chaudhry, et al. (2006) that preventive health is the primary domain of improvement in health from the use of ICT.

8.3 Capabilities related to culture

This section examines the links between iREACH and culture. Without attempting a definition of culture, we include in it a broad set of underlying values, behaviour, way of living and other social norms (Roland, 2004), in addition to art, belief systems and cultural heritage aspects. Culture, as an integral part of daily lives, is a view supported by Sen (1989): *'Living in a society cannot be partitioned into two unlinked categories of economic living and cultural living'* (p.28).

While Sen sympathised with those resisting western hegemony, he has not shown much concern over foreign influences on local cultures (Sen, 1996) - at odds with UNDP's (2004) views:

'For many people this new diversity is exciting, even empowering, but for some it is disquieting and disempowering. They fear that their country is becoming fragmented, their values lost as growing numbers of immigrants bring new customs and international trade and modern communications media invade every corner of the world, displacing local culture', (p. 85).

Amariles, et al. (2006) reported similar sentiments about the impact of ICT among indigenous leaders in Colombia, who feared "cultural pollution", implications on oral traditions and their intellectual property. The concern over cultural homogenisation led Khagram, Clark & Raad (2002) to suggest cultural diversity as a complement to biological diversity and that culture should have a prominent role in discussions about sustainability.

Participants demonstrated pride in their local culture through references to pagodas and Buddhism as major strengths. In the field research, despite the participants' openness and welcoming of heterogeneity, one of the findings was a reasonable degree of concern that the Khmer culture was at risk from external influences, particularly from Thailand and Vietnam. While this concern over infiltration from other cultures may seem anomalous in view of the eagerness of most participants for their children to learn English and for communities in general to link up with the outside world, they viewed this influence from a utility, rather than cultural infringement perspective.

Another explanation for the different ways in which communities viewed influences from other cultures could be that these vary with type of ICT technology. A television programme broadcast, say from a neighbouring country into a rural area could potentially exert greater influence than accessing agricultural information in English from the Internet. As Internet use was supervised, there was no risk that children would access inappropriate content, probably a key contributor to the positive attitude of parents to their children coming to iREACH. The attitudes towards local versus other content might also have played a role. Despite considerable content available in Khmer and localisation of many applications in the Khmer script, the information available in Khmer was not sufficient to meet the information requirements of most participants. There may be a limit to how much information can be created in languages spoken by relatively small populations, with insufficient users to justify development costs (UNCTAD, 2008). There are different views on the value of local content, mainly encouraging it as a success factor in ICT4D projects (e.g. Gigler, 2008; Rao, 2004). McNamara (2008) suggested

that with more local content incorporated into ICT, the easier it would be to use the technology. However, most respondents in surveys reported by McKemey, et al. (2003) did not consider lack of local content to be a barrier.

Although iREACH has created much local content, ranging from a website to printed material, audio and video programming, its potential to make a greater contribution in this area was hampered by the restrictive macro-level broadcasting regulations (see 7.2.1), preventing iREACH from implementing the planned community radio station. At iREACH, users did not significantly distinguish between local and non-local content when using the Internet to keep informed of current affairs or search for information, other than the requirement for intermediation where information could not be sourced from Khmer sites. Assistance with finding relevant material was the area in which participants mostly required the support of the CFs. Whether the lack of sufficient local information inhibited use was not explored, but no concerns were raised about the reliance on CFs to access non-local information.

The same technology applied to access foreign material is also useful for recording, storing and disseminating information on the local cultural heritage, thereby increasing pride in traditional cultures (Chapman, Slaymaker & Young, 2002; Weigel & Waldburger, 2004). Although the issue of traditions and culture were not explicitly included in the 2009 question framework, sufficient information emerged to suggest that iREACH had contributed positively in support of the local culture. In 2009, the KCM management committee members referred to the role played by the daily broadcasts in preserving Khmer traditions. Furthermore, by learning how to type in Khmer, users were building the foundation for combining traditional knowledge with ICT, creating skills that would enable them to prepare websites in Khmer script.

Referring to such opportunities, the youth groups in the 2009 study considered that iREACH was a tool for expanding cultural capabilities and protecting Cambodian culture from Thai and Vietnamese influences. In the 2010 study, we incorporated the cultural dimension in the question framework, and of the 16 groups addressing this issue, five had not noticed any improvement or change and the rest mainly attributed the positive influence of iREACH to its dissemination of cultural heritage information through narrowcasts. Participants in the Kep teacher and commune council groups also mentioned information on cultural aspects retrieved from the Internet. Some responses related to iREACH's role in reminding villagers of traditional values, including how to approach and greet people of different status and age to show them adequate respect and to advise community members of suitable conduct, such as not having boyfriends at school (KCM farming group). The report card from the surveys was quite positive

on iREACH's performance in this domain, with 44% of respondents indicating that iREACH had contributed to the preservation of cultural and natural heritage.

Another issue related to ICT and culture raised in the literature refers to traits that might facilitate or impede effective use of ICT (Morales-Gomez & Melesse, 1998; Qureshi, 1998). Centring on different approaches to learning, this debate is relevant for understanding whether and how people are likely to embrace and adopt various ICTs in different environments. For example, question-oriented information-friendly cultures, which encourage individuals to search for information, may benefit more from the Internet than answer-oriented information-restrictive societies (Herdin, Hofkirchner & Maier-Rabler, 2007). But the dynamic nature of ICT could influence the information culture of a society, without this necessarily leading to abandonment of traditional cultures. Not all members of society would necessarily appreciate such influences and tensions could arise where ICTs are used to overcome oppressive and dysfunctional aspects of communities (e.g. where gender inequalities resulting from paternalistic traditions or caste disputes mire communities in conflicts). The field research did not detect any manifest tensions between new and traditional ways of communicating and acquiring information. Instead, communities embraced ICT as something that would only be of benefit, despite signs of its use in ways that questioned power relationships. The female student who found a mathematical formula would have questioned the teacher's authority and possibly traditional ways of learning. However, there was nothing but praise for her achievement. Similarly, the very fact that children knew something their parents did not, could also have challenged some traditions. The question of whether villagers had to change their culture in order to benefit from iREACH or whether iREACH influenced their culture is a moot point and the causal direction of any changes could have been either way and were most likely reciprocal through the dynamics between knowledge and practice, as suggested by Hill (2003).

The lack of resistance could have been due to iREACH using its infrastructure to assist with expanding cultural capabilities, maintaining popular customs and Buddhist principles by offering practical advice concerning acceptable conduct, with a few participants expressing their appreciation of such content. There were however some signs of resistance to being lectured at, particularly during mobile video shows. Not many villagers turned up to mobile video screenings of programmes imbued with "developmental" content, but when shows were combined with videos including entertainment, more people attended. While this seems to contradict the desire for learning, discussed in section 8.1, it could be a matter of a time and place for different types of activities, with night-time, when mobile shows were screened, reserved for entertainment. The mobile video shows were rare events, often screened at pagodas

in conjunction with ceremonies, so they did not really compete for attention with other entertainment, such as watching television, the ownership rate of which in 2008 was 65% and 23% in KCM and Kep, respectively (NCDD, 2009).

Studies have shown that rural poor frequently access entertainment programmes (Pigato, 2001), even to the extent that villagers in a South Indian project rewired speakers so they could listen to local music instead of development related information (Heeks, 2009). This issue, which has cultural connotations, is relevant from the perspective of freedom to choose in the CA, a perspective used by Kleine (2010), who found that one of the most valued Internet applications by a female user at a telecentre in Chile was to make virtual visits to the German hometown of someone she had met. This activity neither promotes local culture nor contributes to development in the “common” understanding of this term. Some researchers have nevertheless argued in favour of the potential educational value of recreational use of ICT (Hsieh, Rai & Keil, 2008; Prensky, 2001).

This section has explored the association between ICT and culture, from the perspective of its potential impacts on local cultures and on how cultures can influence the absorption of potential benefits. The existing body of research and the iREACH study points to the multi-faceted nature of this issue, for which there are no generalised prescriptions or outcomes. The salient thing to note is that, rather than hastening the erosion of local culture, possibly leading to disempowerment, a possibility suggested by Schech (2002), there were ample indications to suggest a positive contribution by iREACH to cultural capabilities. At the same time, it would also have influenced the dynamics of the local cultures (e.g. some of the traditional views on gender in Cambodia were challenged, but did not appear to pose a problem for women wanting to participate in iREACH activities).

8.4 Innovation capabilities

The reason for including innovation in this section, despite this capability not emerging explicitly during the discussions, is that it is a fundamental capability. Pointing to the necessity of fostering learning and innovation capabilities to meet the challenges of development, Arocena & Sutz (2005) referred to the compatibility between the interactive and distributed nature of innovation, emphasising the notion of learning by interacting and to Sen’s (1997) conception of development expressed as *‘getting by with a little help from their friends’* (GALA).

Technology transfers under the modernisation approach represented radical innovations imposed in new environments and were often done in the context of what Sen referred to as

BLAST, the acronym for Churchill's '*blood, sweat and tears*' (1997, p. 533; 2001, p. 35). The benefits of such transfers were rarely questioned and sometimes led to less desirable consequences, such as destruction of local technologies and displacement of people and did not foster endogenous learning and innovation capabilities. Sen's GALA offered an alternative approach that would rely on a knowledge-based local industry to foster rational modernisation of traditional livelihoods. Inherent in this approach is the ability to address problems in new ways, as resources required for known solutions are often missing (i.e. '*capabilities to innovate in scarcity conditions*' (Arocena & Sutz, 2005, p. 218)).

Defining innovation as '*an idea, practice, or object that is perceived as new by an individual or other unit of adoption*' (Rogers, 2003, p. 36), human history can be seen as a history of innovations. In addition to the creation, adaptation and/or adoption of new products and services, innovation involves new practices and processes, whether or not driven by a formal process, the complexity of the change, or the diffusion timeframe (UNCTAD, 2007). Innovations are increasingly vital with the changing natural systems to which livelihoods must adapt where it may not be possible to maintain "traditional" practices.

Castells (1996) went as far as suggesting that the centrality of the current technological revolution is the application of knowledge and information '*to knowledge generation and information processing/communication devices, in a cumulative feedback loop between innovation and the uses of innovation*' (p.32). This implies that by using an innovation, the user innovates and this in turn can lead to new innovations.

Dealing primarily with consumption rather than production of ICT, the ICT4D literature has given only cursory attention to the link between ICT and innovation, except in studying ICT adoption as an innovation (see 4.2.2). This is despite potential of production to be a more effective tool for development (Casal, 2007; Heeks, 2002; Karnani, 2006). Innovation in this context refers both to general innovations and innovative uses of ICT, including repurposing (Liu & San, 2006), that would diffuse through interaction between many actors, rather than purposeful interventions (Schilderman, 2002) (e.g. the practice of disconnecting mobile calls prior to answer, to signal a pre-arranged message).

Exposure to ICT can trigger the urge for innovation, whether or not this urge is fulfilled, as was the case at the Rural Women's Association of South Africa, where one of the respondents said: '*...We have not known what to do and where to go from here we do not want to stay poor and fighting, we need new ideas*' (Rhodes, 2009, p.57). Annamalai & Rao (2003) reported that farmers involved in eChoupals started demanding that ITC, the owner of the project, expand

into additional crops, such as onions and potatoes and Slater & Tacchi (2004) found local content creation encouraged innovation.

Turning now to iREACH and following Rogers (2003) in using the concept of innovation in a broad sense for activities that are new, whether relating to the introduction of new products or processes, rather than something hi-tech and viewing innovation from the perspective of society rather than technology, we identified a number of user-innovations, or innovative activities in 2009:

- In the absence of a community radio license, iREACH initiated narrowcasting over the wireless network to the hubs, using computer speakers and public address systems at pagodas to increase coverage. While monks use these for religious purposes, it was a novel idea to transmit regular news and educational material in this way, which many participants referred to as “audio”.
- In the 2009 study, an experimental mushroom plot at one hub emerged as an innovation. While mushroom growing is not in itself innovative, what was new in this case was that a group of individuals had started this initiative. Such a change in institutional practice qualifies as an innovation (Hill, 2003). The use of information from the Internet and resources from the local university, demonstrated how synergies between online information and local expertise encouraged innovation. However after the plot had washed away during the 2009 rainy season, the experiment ceased, as team members had not yet managed to source new spawn and find out how to protect the mushroom plot from suffering the same fate during the next rainy season. It seemed that their interest in the experiment waned with the disappearance of the mushrooms. This example also serves to demonstrate the importance of taking a longitudinal approach to evaluation.
- One of the commune council members in Kep had for a long time wanted to learn about best mango growing practice and after finding information from iREACH had started planting mango trees.
- Some of the youth searched for Khmer names on Skype and had established contact with Khmer nationals in different countries, an example of repurposing technology, assuming the purpose of the Skype search facility is to find existing contacts rather than building a global network from new expatriate contacts.
- A female participant mentioned that she was singing across the network with a man at another hub.

Unlike the 2009 study, where specific applications were interpreted and defined as innovative, in 2010 we included a specific question related to innovations associated with iREACH. Responses, reflecting an emerging recognition of the innovation concept, varied across a wide spectrum, with some participants pointing to computers, the Internet and iREACH in general as innovations in their communities. The frequent mention of '*use of computers*' could reflect that many villagers were still being absorbed by a new technology, an observation Kubicek & Wagner (2002) made about early adopters in the initial stages of a technical innovation. One man who had started English classes, promoted this as an innovation on the basis that nobody had previously taught English in his village, but the emphasis was on various aspects of agriculture, such as new farm practices in general (50% of groups), organic fertilisers, insecticides and pesticides (50%), home gardens (25%) and new crops (63%). For instance, participants in three groups came up with '*learn how to plant and use fertilisers for watermelons*'. Specific farm practices that serve as examples of what participants perceived as innovations adopted from information obtained through iREACH were: making compost, looking for cow manure and planning to design cow manure storage for home use, collecting husks from the mill and producing good seeds for sale to community members. Among new crops participants claimed to have experimented with, were corn, beans and sugarcane. Further details on innovations related to diversification through agriculture are included in section 10.1.2.

A few groups referred to what for them would have been health related innovations, but for others widely known practices (e.g. use of mosquito nets, home and water sanitation and family planning (deferring pregnancies)). One noteworthy feature was how some participants talked about the dissemination of the above innovations in ways that might gradually transform some practices even among non-users of iREACH. Through the demonstration effect, as they referred to the process where villagers observed an iREACH user apply a new practice, an innovation might spread to non-users, should they notice positive results, thereby opening the way for wider adoption of new ideas.

Apart from a 37-year male user in KCM with an interesting perspective of innovation, who held that he got the new idea from iREACH about educating himself and his family as well as helping others, views about innovation among survey respondents mainly dealt with agriculture. Almost 30% of respondents gave such examples, which were of a similar nature to those expressed in the FGs and only 4% referred to health related issues. Most answers were repetitions from previous questions and general (e.g. agriculture, computer, information, education and health). Seven respondents in Kep thought that iREACH's initiative to provide

volunteering opportunities was innovative. But a large proportion, 43% provided no answer or lacked awareness of any contributions iREACH might have made to innovations.

The limited innovative capability, identified in the focus groups and surveys, had not translated into any monetary gain in the form of income generation or cost savings, other than those related to farming and possibly health.

These innovation-related findings, insignificant as they are in the context of global innovations, nevertheless indicate a capability of adopting technology and adapting it to local resourcefulness and ingenuities. Such processes are envisaged in the structuration and the social shaping of technology perspectives, according to which technology can be shaped by, as well as shape social issues (Bijker, Hughes & Pinch, 1987; MacKenzie & Wajcman, 1999). They also show that villagers had the confidence to seize the new opportunities, translating information they received into knowledge through experimentation.

iREACH in itself was innovative for several reasons, such as the way in which it provided services in a previously underserved area and, in addition, was used to great advantage by anticipating and responding to user requirements, where economically feasible. This view accords with the argument made by Souter, et al. (2010) that innovation for sustainability is required in the ways economies function and societies are organised, as much as for product and consumption.

Rogers (2003) suggested the disadvantaged who most need the benefits of a new idea are the last to adopt them thereby widening the socio-economic gap. Whether this was also the case at iREACH was not addressed for innovations specifically, but iREACH's impact on equality in general is discussed in section 9.6. However, those owning land would have benefited most from the diffusion process described in this section, but the impacts of innovations were not substantial enough to fuel inequality by themselves.

8.5 Summary of contribution of iREACH to capabilities

Using human capabilities provided a firm basis for evaluating some aspects of iREACH and the capabilities covered in this section gave expression to iREACH's contribution to at least two of Sen's (2001) five freedoms. It opened economic facilities, primarily through skills in new farming methods and social opportunities through improved education and health, but there was no evidence of any contribution to political freedoms, transparency guarantees or protective security.

Looking at the insights gained so far about the interaction between iREACH and capabilities in the areas of education, health, culture and innovation, we noted that while the capability of using ICT was the centre-piece from the perspective of respondents, iREACH had also complemented services provided by other institutions operating in the fields of education and health. From the perspective of capabilities covered in this section, it was particularly the role of iREACH in encouraging, promoting and facilitating learning and knowledge and its contribution to enabling villagers to engage with the outside world without adversely affecting local cultures that could be hailed as successes of the initiative.

Except for the adoption of new farming methods, covered in section 10.1.2, the inventiveness discerned in diverse areas in terms of the discovery and creation of opportunities, had limited, if any demonstrable impacts on livelihoods. Importantly, participants found the process of acquiring new capabilities empowering, an issue explored in more detail in the next chapter.

Chapter 9 - iREACH's contribution to empowerment and social capital

In this chapter, we bring together findings that loosely fit under a social environment umbrella, denoted in the CESVS model by the term empowerment, which in this context includes governance, equality, social capital and family relationships. As discussed in section 5.1.2, empowerment is an essential element of the CA (Nussbaum, 2003).

9.1 ICT and empowerment

At the most basic level, several studies have described ICT as a tool for empowerment (e.g. Andrew & Petkov, 2003) without defining what this implies. In other cases, researchers have been more specific (e.g. by pointing to improved self-identity, confidence in approaching institutions, dealing with other people and social status resulting from being involved in ICT, particularly for women (Annamalai & Rao, 2003; Slater & Tacchi, 2004)).

ICT can contribute to power rebalancing, thereby simultaneously empower and disempower people and challenge power relationships quite forcefully (Batchelor & Sugden, 2003; Delgadillo, Gomez & Stoll, 2002; Harris & Weiner, 1998). Examples of projects reinforcing those most empowered include a participatory community-based GIS project in Indonesia (Corbett & Keller, 2004) and Bhoomi in India. The latter had a disempowering influence on opposite sides of the power spectrum: village accountants, who had previously been powerful, and those who were most marginalised (De', 2006). This was also the case at eChoupal, where intermediaries, with whom the farmers had found it demeaning and intimidating to interact, lost power as farmers empowered themselves through this project (Annamalai & Rao, 2003; Bowonder, Gupta & Singh, 2003). But casual labourers also lost employment opportunities. In her study of telecentres in the Chinese city of Wu'an, Soriano (2007) noticed the centres had the potential to both maintain and alter power structures, in that they gave people an avenue through which they could represent themselves.

The mixed results in these illustrations indicate that the question of who can empower themselves from ICT, may also link in with the issue of equality, a topic introduced in section 3.1.5.3 and which is discussed in the context of iREACH in section 9.6. Building on the work of Friedmann (1992), who identified four interrelated forms of empowerment: social, technological, political and psychological, we first give a brief overview of empowerment at

iREACH in these categories, previously used by Lennie et al. (2005) for analysis of an ICT project in Australia.

- Social empowerment: arose from collaboration and participation in different activities, such as volunteering, meetings and courses at iREACH, or simply dropping in to see what was going on and meet others.
- Psychological empowerment: came about by access to information and, for women, claimed reductions in domestic violence was partially attributed to iREACH, as further discussed in section 9.4.3. Psychological empowerment was also manifest in the ability of some farmers to withstand pressure to sell their produce at prices that were lower than the market price, disseminated by iREACH (see 10.1.1).
- Technological empowerment: was generated through exposure to and use of ICT. But the frustrations of long waiting times to use the single computer at each hub and frequent outages were possibly reminders that users were not empowered to remedy this unsatisfactory situation.
- Political empowerment: although an empowerment requisite identified by several authors (Corbett & Keller, 2004; Ristock & Pennell, 1996; Thomas, 1992), it was deliberately excluded from the research instrument to avoid putting participants at any risk in the sensitive Cambodian political landscape. This issue was not raised by any of the participants and the discussions did not reveal any changes in structural power relationships between different groups in the communities and other than the question on equality in 2010 (section 9.6), we did not pursue questioning in this field either, due to sensitivities.

9.2 Inclusion, participation, self-esteem and confidence

Inclusion, participation, self-esteem and confidence are closely related to empowerment, but according to Hill (2003), the CA does not sufficiently recognise and analyse how individuals participate in changing social institutions and therefore does not pay sufficient attention to how the status of different social groups can be improved. Addressing this issue, the study now turns to the influence of iREACH in these more intangible areas.

The feeling that ICT had somewhat brought communities into the modern world, where they wanted to belong, marked discussions in several groups, with participants expressing that they were no longer isolated from the world community, by the mere fact of being better informed of what was going on. While several participants combined this with the ability to discuss issues

with others at the hubs, connectedness is not limited to such intentional ICT4D projects and emerged as the most highly ranked response to a question about the reason for having a mobile service in a study by Donner (2004) in Rwanda: *'Having a mobile makes me feel more connected to the world'* (p. 11).

There was also a sense of inclusion by being able to participate in the iREACH initiative. Numerous authors have argued that ICT4D projects will have greater impact with participation from the local community in the design, implementation, management and evaluation stages (Casparry & O'Connor, 2003; Colle, 2005; Duncombe & Heeks, 2001; Kanungo, 2004; Parkinson, 2005; Proenza, 2001; Puri & Sahay, 2003; Roman & Colle, 2002; Whyte, 1999). Some lone voices have questioned this rhetoric, pointing to insignificant evidence supporting any causal relationship between participation and successful projects (Bailur, 2008b; Cleaver, 2001).

Similar to many other shared facilities, participation at iREACH only encompassed a small proportion of the population and many villagers might have been intimidated by iREACH in general, and computers in particular. Although emanating from outside local communities, iREACH encouraged community participation and interaction between social and ICT networks. But when it came to funding, many participants might have viewed iREACH as an external organisation, as they were reluctant to pay for a "community" service, a sentiment seemingly linked to the notion that either they or iREACH were not part of the community. The two messages: embracing iREACH as a community project and unwillingness to pay, were dissonant, but rather than one of them being misleading, this apparent contradiction could reflect confusion.

The above discussion illustrates that there were some signs of iREACH having contributed to the self-confidence and inclusion of many villagers and the question whether these benefits extended to the most marginalised is discussed in section 9.6.

9.3 ICT, governance and institutions

'ICTs should be used as an important tool for good governance' (WSIS 2003, point 5, p. 38).

There is a reciprocal relationship between governance and empowerment in that the empowerment process is facilitated by a transparent system, which in turn contributes to empowerment. Institutions are critical in supporting the creation of knowledge and ideas (UNCTAD, 2007), for which ICT can be an effective tool.

As indicated in section 3.2, terms such as governance and institutions in the development discourse tend to be euphemisms for overcoming corruption, rent-seeking behaviour and other forms of mismanagement. Sen (2001) defined freedom from such conduct as transparency guarantees, which he considered an important category of instrumental freedom and essential for making systems and processes accountable. Appropriate institutions to govern markets are of essence for freedoms under Sen's (2001) category related to economic facilities. Governance is closely related with poverty reduction and ICT has an important role in this domain through the link between information, an ingredient in transparency, and accountability of government processes (Kaushik & Singh, 2004; Souter et al., 2005; World Bank, 2002b). There is however a lack of understanding of how ICTs can be applied for participatory governance (Smith, et al., 2008).

ICT has been credited with improving institutions by overcoming isolation (Haggblade, Hazell & Reardon, 2002) and with the potential to alter power and control by levelling information asymmetries (Tiwari, 2008). But, as discussed in section 3.1.5.3, ICTs can also entrench the position of those with power. Although Balamoune-Lutz (2003), having analysed macro-level indicators, concluded that ICT diffusion fosters civil and political freedom by improving access to information and encouraging sharing of ideas, there is not much evidence from micro-level studies in the ICT4D literature of such linkages, including e-government applications, and Unwin (2010) questioned the motives behind the strong drive for these.

While there are several success stories among e-government initiatives in the developing world, Heeks (2003) reported a failure rate of 50%. Studies on their contribution to greater transparency and democracy have also shown a mixed picture, as their primary use seems to be to achieve greater efficiencies, without any democratising intentions or impacts. Avgerou, et al. (2007) concluded that, rather than restoring trust in the government, an election system in Brazil relied on the perception of the trustworthiness of government institutions. The pathway can also go in the reverse direction, with e-government applications removing corruption, as in the Kerala FRIENDS single payment system, developed in response to pressure from residents (Madon, 2004).

But corruption can also find its way into e-government systems, as in Bhoomi, where kiosk operators demanded bribes for various functions and contravened policies of issuing receipts (De', 2006; Lobo & Balakrishnan, 2002), although receipts do not necessarily guarantee against corruption (Vasudevan, 2007). Tiwari (2008) estimated that the price per land record reduced from Rs100-500 to Rs15 at Gyandoot as a result of less corruption. But 45% of respondents in a previous study (CEG, 2002), perceived that land records had become more expensive and

difficult to obtain, due the introduction of a third tier in the system. One respondent reported a price increase from Rs50 to Rs200, including “speed money”, but 50% of users nevertheless perceived a reduction in harassment and corruption, at least for some of the services offered. Jafri, et al. (2002) found that 15% charged above listed prices. This is another example of discrepancies between different disjointed studies of the same project, a common trait of un-coordinated ICT4D case studies, referred to previously.

E-government systems are also subject to the vagaries of administrators responsible for the introduction of a specific system, as demonstrated with respect to SARI, where, following the transfer of the government champion for the initiative, support for the project declined. This was welcomed by officials who had perceived the kiosks as a threat to their power (De', 2006) and demands for bribes re-surfaced as support for the project waned. These examples lend credence to findings by Heeks (1998) of the ability of officials to creatively continue corrupt practices, facilitated by a combination of micro-level (personal) and macro-level (systems and culture) factors. They illustrate that e-government systems do not offer immunity from the contagion of corruption or necessarily counteract the ingenuity with which officials can thwart processes designed to overcome it. The role of e-government applications in improving transparency and long-term development is thus, according to Madon (2004), a moot point.

Unlike many ICT4D initiatives that have included some form of e-governance, this was not the case at iREACH. There was also no indication of any online political activity, and this issue was deliberately avoided in the question framework to quell any fears that participation in the focus groups could endanger participants. None of the participants invoked the use of such applications, which probably were limited or non-existent, possibly due to the limited privacy at the hubs, insufficient ICT skills to engage in such activities, reluctance to bring this up, lack of awareness that ICT could be used for this purpose or simply disinterest. In response to a survey question asking whether iREACH had contributed to improvements in governance, institutions and security, 40% of the interviewees indicated that it had.

iREACH's role in governance was limited to narrowcasts of civil and human rights material in ways that encouraged participants to report issues to the law enforcement agencies and other local authorities, whether domestic violence or infringement of their property rights. Awareness about corruption had also been disseminated by posters inscribed with '*Corruption breeds poverty*', adorning walls in the Kep hubs and prepared by CSD, the Cambodian human rights NGO managing the Kep pilot, until it fell victim to its own governance problems. The closest iREACH's ICT facilities came to being used for e-government purposes was typing and email access for administrative purposes by some commune council members and government

officials. Public agencies that could have used iREACH to improve their services (e.g. in health or education) appear not to have done so.

One positive aspect was that the local leadership, rather than feeling threatened by the potential of ICT to undermine their power, were supportive of iREACH and the endorsement by the commune councils was manifested by the inclusion of iREACH in their commune plans, although as mentioned in section 7.3, they lacked funds for financial support.

Another institutional area in which iREACH seemed to have made an impact related to property rights. The emphasis on property rights as a cornerstone in the neo-classical discourse has been criticised for excessive focus on the individual at the expense of the extended family, which holds property rights in many developing countries (Bebbington, et al., 2004; Castells, 1996). But Nussbaum (2000) found that deprived women were favourably disposed to property rights for women through land distribution measures. The discussions at iREACH sided more with Nussbaum, in recognising the importance of property rights, influenced by some participants witnessing encroachment by some of the more influential villagers on land owned by the less powerful, a practice that was previously passively accepted. Following narrowcasts by iREACH, indicating that this was an infringement of their rights, villagers had become more empowered to report such improper practices to local authorities. Participants attributed their greater empowerment in this matter to iREACH and the link to ICT was that awareness about their rights stemmed from dissemination via loudspeakers. While the issue of property rights in general only arose in the 2010 study, there was a specific case in Kep in 2009, where a female management committee member reported how she had withstood pressure from an influential villager to sell her land at a low price. She admitted that prior to her involvement in iREACH, she would not have known how to find out what a reasonable price for her land was and lacked the resilience to withstand the pressure from that particular person.

Security, another issue defined under governance, had according to several participants improved following iREACH's narrowcasts on alerts, whether relating to weather, road accidents or criminal activities in the area. A male participant in the KCM youth group explained that villagers reported suspicious incidents to iREACH for dissemination (e.g. a burglar operating in the area, a swindler trying to sell expensive counterfeit medicines and a trader offering fake lottery tickets with sales of poor quality clothing).

The small encouraging signs of improved governance discerned from discussions on this matter are sufficient to place iREACH at the take-off point of the virtuous spiral from this perspective. Without any suitable macro-level e-government applications for villagers and taking into account the fragile nature of democracy in Cambodia, it might have been

unreasonable to expect more at this early stage. The question is whether the small improvements in governance were of a short-term nature or harbingers of longer-term changes, pointing again to the importance of longitudinal studies, as it is critical to learn more about the ways in which ICT can contribute to better governance.

9.4 Gender empowerment

The first part of this section deals with gender in the context of ICT from the literature, elaborating on issues raised in sections 3.1.5.3 and 4.2.5. The second part explores gender empowerment from an iREACH perspective.

MDG 3, ‘*promote gender equality and empower women*’ (UNICT, 2003, p.3), recognises the centrality of economic and social empowerment of women as a strategy for addressing poverty. Gender empowerment has a prominent place in the CA (e.g. Nussbaum, 2000; Robeyns, 2003), which recognises that the deprivation and inequality faced by many women restrict their capability to enjoy lives they have reason to value and affect the well-being of their children (Nevile, 2007; Sen, 2000b).

Huyer & Hafkin (2007) noted the lack of relevant indicators for measuring gender and ICT, despite ITU’s (2006) attempts to monitor the impact of ICTs on MDG3. The indicators it suggested, shown in Figure 4, would not measure empowerment. Notwithstanding the importance of the many initiatives designed to measure the role of women in ICT and associated indices, we embrace the suggestion by the ICT Task Force that anecdotal evidence and profiling of success stories are useful complements to indexing efforts (UNDP 2005), leaving the indexing to those with resources to implement it.

	Inputs	Outputs	Outcomes (Impact)
Indicators at the organisational level	Set up multipurpose community centres (run for/by women) that provide ICT training	Number of women trained in ICTs	Increased number and type of jobs obtained by women
Indicators at the national level	Number of ICT activities directed at women trained	Increased number of women taking part in ICT training/ Activities	Positives changes in women's status and

Figure 4: Proposed ITU indicators for measuring impact of ICT on MDG3.

(Source: ITU 2006)

The scant attention to gender issues in ICT research reflects the long-standing male dominance of this field (Walsham 2005). This, despite the critical role of women in many dimensions of ICT (e.g. as users and employees, including the many women who work in call centres and female entrepreneurs). Literature on gender and ICT covers the portrayal of women in the media, gender in the ICT workforce and impacts on well-being of women's ICT use and/or lack thereof outside the formal workforce. Researching ICT from the perspective of gender, as it relates to women has become more central with the greater focus on gender equality by donor countries. Although mostly affecting women, gender biases can also impinge on men (e.g. men might fear to appear less knowledgeable than women and therefore refrain from attending training sessions (Bailey, 2009; Kuriyan & Kitner, 2009)). It is such attitudes that justify use of the term "gender" rather than "woman" with respect to empowerment, as men can lack empowerment due to their societal gender roles.

The early introduction of ICT in some developing countries was far from empowering for many women (e. g. those who lost their jobs in the Indian manufacturing sector in the 1980s (Mitter, 1993)). But the loss of employment opportunities was not the main concern related to ICT at the Beijing 1995 Fourth World Conference on Women, the first international policy framework addressing ICT and gender issues, but rather the portrayal of women in the media (Gurumurthy, 2004). This contrasted with the perceived positive outcomes for women of the introduction of cable television in rural India, which, according to one study (Jensen & Oster, 2009), reduced the acceptability of domestic violence, preference for sons and increased women's autonomy. Even if just perceptions, the authors commented that these might indicate a role of the media in creating awareness of these issues.

9.4.1 Gender and ICT4D projects

The extent to which ICT4D projects have improved the situation of women is heavily debated, despite gender empowerment being a key objective in many intentional ICT4D projects (Swamy, 2007). There are studies showing women emerging from such initiatives with enhanced self-esteem (Colle & Roman, 2001; Hafkin & Huyer, 2002; Kanungo, 2004; Ofir & Kriel, 2004; Warnock & Wickremasinghe, 2005), but the extent to which this applies to the most disadvantaged women, rather than only women who were more privileged is usually not addressed. Diverse initiatives with strong gender focus include Grameenphone in Bangladesh, the village knowledge centres (VKCs) established by MSSRF, the Kerala Kudumbashree outsourcing project and the Self Employed Women's Association (SEWA), the latter an e-governance initiative in South India, in which women's collectives act as infomediaries, linking people to the state administration (Gurumurthy, 2004). In SEWA, which has provided training

for poor women in the use of video cameras, other audiovisual equipment and on the importance of insurance (Cecchini & Scott, 2003; Harris & Rajora, 2006; Nanavati, 2000), ICT was a natural extension of the activities of a women's organisation. Despite being portrayed as a gender empowerment project, with mainly female owners and operators, Aminuzzuman (2002) found that male household members often interfaced with customers at the Grameenphone system and that only 22% of users were women. Richardson, Ramirez & Haq (2000) noted that, preferring to deal with someone of their own gender, only a small proportion of women would use a male operated mobile phone. In their sample, only 6.3% of users were women at sites with male operators, whereas females made up 82% of users at women-managed call offices. This may suggest that men avoided call offices managed by women, indicating that traditional values may have prevented both genders from realising their demand for calls in the most convenient way. The several SARI kiosks operated by women were particularly successful in attracting women and communicating with officials and professionals enhanced the status of the female kiosk entrepreneurs (De', 2006), but it was not clear whether the women were already among the more privileged when starting in these roles.

Africa has also been home to several ICT4D initiatives targeting women (e.g. WOUGNET (2003), an NGO established in 2000 by several women's organisations in Uganda to promote and support the use of ICTs). Also in Uganda, centres run by the Women's Information Resource Electronic Service provided female entrepreneurs with information on issues ranging from market prices to details on credit and trade support services. Dalvit, et al. (2007) suggested that women became the driving force in a rural ICT project in South Africa, despite it not being established with a specific gender empowerment objective, as an attempt to acquire status in a patriarchal society.

But the prevailing view seems to be that women have been under-represented at ICT4D initiatives (Amariles, et al., 2006; Kumar & Best, 2006; Chand, et al., 2005; Furuholt & Kristiansen, 2007; Jafri, et al., 2002; Meera, Jhamtani & Rao, 2004). Among initiatives without gender biases against women and some with bias in favour of them were Future Stations and Sampa, both of which were situated in Brazilian shantytowns and predominantly frequented by younger women (Batchelor, et al., 2003), at a village knowledge centre in a Tamil Nadu fishing village (Govindaraju & Mabel, 2010) and Akshaya (De', 2006). In addition to the social space it offered, the high female participation rate at Akshaya could be due to the large number of men working abroad (Kuriyan & Kitner, 2009).

Reasons for under-representation of women in ICT4D initiatives include: lack of time due to heavy workloads with multiple roles, inability to forego potential earnings, location and

illiteracy, women traditionally confined to their homes, early curfew hours, and the lack of relevant content and applications (CEG, 2002; Hafkin, 2002; Slater & Tacchi, 2004; Zainudeen, Iqbal & Samarajiva, 2010). Women are also deterred by lack of female operators and the environment in many centres that have become entertainment spots for young males, often accessing pornographic content (Gurumurthy, 2004; Khan & Ghadially, 2010; Mahmood, 2005). Where families perceive an activity to be useful, they allow female members to attend as was the case for female students at SARI (Kumar & Best, 2006a; Best & Maier, 2007), but this does not necessarily lead to empowerment and where it does, may not extend to empowerment within family relationships (Corbett & Keller, 2004), although this can change over time (Ramilo, 2003).

9.4.2 Gender empowerment and iREACH

Findings related to gender empowerment emerged without having conducted a deliberate or “formal” gender review. When considering gender in Cambodia, two issues stand out: domesticity and domestic violence (Brickell, 2008; Brickell & Chant, 2010). Having increased since the early 1990s (Surtees, 2003), domestic violence represent a key challenge for Cambodia in reaching its gender equality MDG target (MOP, 2005). Brickell linked the culture of acceptance and impunity related to domestic violence to forced marriages under the Khmer Rouge and coercion and corruption in public life following that period. Whatever the reasons, there is now an increased awareness of a link between violence against women and ICT and it is not only a positive link, as the same technology that can provide information and help to women in violent relationships can also facilitate human trafficking (Manavy, 2010).

Tradition, culture and social norms related to their roles tend to discourage women from building leadership skills and featuring in the public sphere (Thun, 2009). Leadership roles can be detrimental to family relationships in an environment where married women often stay at home and find it difficult to get support from their husbands (e.g. when standing for election). Public roles can be detrimental to their standing in communities. Once in a leadership position, Chhoen, Sok & Byrne (2008) found that women often feel less confident than men about making decisions and asserting themselves.

This was also the case initially at iREACH, where women who attended iREACH meetings did not participate actively in discussions and rarely expressed their views. After some time, they became quite vocal and very active at meetings and in activities, such as planning and hub monitoring, the result of significant capacity and confidence building.

The iREACH implementation team encouraged women to come forward in the management committee elections by stipulating gender equality in the composition of the committees and the election process reflected this objective. At the start of the project, it was very difficult to attract women to iREACH, let alone encourage them to stand for the interim management committee elections. However, after having been involved with iREACH for some time, many women were comfortable contesting the management committee elections, evidenced through strong competition for the female quota (Grinfeld & Hak, 2009) and once elected, women became active in the management committees or other activities, even rising to prominence by taking on chairing responsibilities.

In response to a question about iREACH's impact on equality, discussions in the 2009 FGs emphasised its policies and practices related to gender (e.g. that iREACH was "transparent", meaning that it did not discriminate against women or anyone else). Some groups went further, expressing the view that iREACH had motivated women to participate actively in its activities through gender awareness, promoted throughout the project's history (e.g. the management committee election process) and encouraged them to attend regular training. iREACH's policies seemed to have shaped views on gender issues.

With a small travel allowance, involvement in the management committees was an opportunity for women to earn some money, but more importantly to equip themselves with new skills, both through formal training sessions and from just engaging in new pursuits. Other activities reflecting gender awareness were gender-based recording of hub attendance, training in gender awareness and incorporation of a gender perspective in different topics. A notable finding was the awareness among participants in all FGs that iREACH had encouraged women to take part in its activities, almost holding this up as a model for gender empowerment. An example of the concerted effort to involve women, reported in one group, was home visits made by the CF at a hub to encourage women to attend regular training. As a result, a group of women in that village attended a weekly typing course, a manifestation of iREACH's ability to mobilise women who may not have turned up by themselves. Several women, school age and above, developed skills in using computers, including typing and finding information by themselves, skills many of them had not expected they would be able to acquire. iREACH represented a new opportunity for learning by women who lacked basic education and of becoming aware of the potential of knowledge to improve their livelihoods (e.g. through new farming skills). Some women aspired to use their ICT skills in working with NGOs and for teaching computer use to others.

It also emerged that previously women had nowhere to go outside their homes and therefore rarely ventured out, other than to attend to necessities, so iREACH had been welcomed almost as a village well or “modern village square” (Akpan-Obong, 2010). Unlike the cyber cafés she described, where users incurred expenses and women might not attend, iREACH enabled both genders to engage in conversations at hubs and take part in activities. Using iREACH as a meeting place, in combination with its information and communication facilities, several participants noted that the lives of female users have become easier, more enjoyable and equitable.

Other studies have noted the perception of telecentres as acceptable places for women to gather, with the consent of their families, even if otherwise rarely allowed to leave their homes (Conroy, 2006; Gomez & Gould, 2010; Madon, 2004). At iREACH, this village square perception was more due to its character than it being an ICT facility, a benefit that would not be obtained with individual ownership of ICT, such as mobile phones. The role of iREACH in providing spaces where women could meet came across very strongly, from male and female participants alike, heralding a new form of mobility and engagement for women, but women perceived the hubs as more than a space for meeting and learning. A new perspective on these emerged in 2010; the link between a “legitimate” venue and reduction in domestic violence, reflecting a greater focus on iREACH’s role in this decrease, a significant theme reiterated across several groups and topics.

Despite a tradition of gender specific roles and conduct in Cambodia, no socio-cultural restrictions emerged that would prevent women from making use of iREACH and there were no signs of reluctance by men or women to deal with each other or to undertake joint activities. The only exception, brought up in the 2009 Kep business group, was the reluctance of women to sit close to monks and according to participants in that group, with increasing number of monks attending hubs at pagodas, many women had been shying away from those hubs. User statistics did not support this view. At 44%, the average proportion of women using hubs at pagodas was slightly higher than the average for all hubs, which was 40-41%. There was great disparity in the proportion of women at the different pagoda hubs and in one it dropped from 42% in 2008/09 to 15% during May-Aug 2009.

Many of the women who did not have time to attend, benefited from information obtained by their children and others attending iREACH, as someone in the KCM women's group commented: '*we delegate to our children to learn and bring home knowledge*'. Other studies have found incidents of such "proxy" use (i.e. women asking their children to obtain information) (Griswold, McDonnell & McDonnell, 2006; Ulrich, 2004).

Without being included as a specific talking point in the research instrument and raised independently by two groups in KCM (the all male commune council and village leader group and the women's group) in 2009 was what men thought about women's participation in iREACH. There was consensus that, although at times worried about the security of women outside their homes, men were in general supportive of their wives attending iREACH and the opportunity for learning this represented, but this support was conditional on women not neglecting their home duties, which could at times be onerous. While the support of men was a positive development from one perspective, its conditionality implied that the empowerment aspect was limited to marginal improvements in small areas of women's life and did not question their role within the structure of households (i.e. it could not threaten existing family institutions). When some participants in the KCM women's group reported on how they, equipped with greater awareness about domestic violence from iREACH's training, had lectured their intoxicated husbands on this topic when returning home from iREACH, they did not indicate anything about the reaction of their husbands.

The many female students using iREACH hubs for homework, to learn Khmer and English typing and for finding additional information reflect iREACH's contribution to gender empowerment from an education perspective. There were some very outspoken female students in the 2009 KCM youth group, explaining how iREACH's resources had helped them in their studies. Other examples, previously referred to, illustrate how meaningful use of iREACH had facilitated empowerment: the management committee member who refused to sell her land (see 9.3), several women taking a leading role in the experimental mushroom growing experiment and the woman singing with a male singer in another hub (see 8.4).

Although the female proportion of hub visitors was only 35% during the initial funding period (iREACH, 2010), viewed against the overall gender situation in Cambodia, this was nevertheless an indication that iREACH's practices had borne fruit in attracting women. But hub visits might not in themselves have translated into empowerment in the form of decision-making powers or improved economic conditions for women, the latter consistent with findings by Hafkin (2002). But one way in which iREACH went further than many telecentres was by offering an environment of learning by doing, probably instrumental in achieving a relatively high level of female participation and by opening new doors for women to become actively involved in the management of different projects, as users, members of the management committees, employees and volunteers. There is not much point in capacity building programmes without opportunities for applying skills. iREACH provided such opportunities, whether in day to day activities, planning, project implementation and evaluation, and through

these activities many women became further motivated and developed skills to contribute to iREACH and their communities — along the virtuous spiral.

Although it is not possible to generalise findings from this qualitative research to the overall gender empowerment influence of iREACH, the consistency of responses from FGs representing diverse stakeholder interests imbues confidence that iREACH had a significant impact. For example:

- *‘Before, women stayed home and now they can go to meetings and training. This is what they want’* (Male, Kep Village Leaders Group, 2010).
- *‘Women have more opportunities to be involved and express their opinions’* (female in Kep teacher’s group).
- *‘iREACH provides opportunities for women to volunteer and participate’* (male in Kep business group — the women did not comment on this).
- *‘Women work more in the community and talk more, sharing ideas and do similar things as men do’* (male in Kep management committee).
- *‘Before women did not join village development assistance committees’* (KCM women’s group).
- *‘There is more shared decision-making at home, e.g. if the husband wants to buy a moto, it is discussed at home’* (discussion at KCM farming group).

However, the survey results only partially supported these encouraging views, with 38% responding that iREACH had improved the situation of women, with results quite consistent among genders (40% and 36% by male and female respondents, respectively) and among users (44%) and non-users (33%). Another indication of the lower significance of empowerment in the survey results compared to the FG sessions, was that this issue was raised less frequently in response to any of the open-ended questions, but could have been implied in some responses, particularly those referring to reduction in domestic violence.

From this overview of ICT and gender empowerment, both from the existing body of work and from the iREACH research, there is a plausible link between some ICT4D initiatives and empowerment. It can confidently be concluded that any changes in empowerment were evolutionary, rather than revolutionary, representing small steps along the virtuous spiral. Several factors contributed to this gradual empowerment process: the “respectable” place to gather, management committee elections, audio narrowcasts on topics of relevance to gender empowerment and the CFs. iREACH had been an effective tool for the extension of capabilities

by many women, enabling them to engage in a variety of activities, through which they equipped themselves with the confidence to increase their input into decision-making processes, at least at the family and possibly at the village level. This initial step might lead to greater involvement at the institutional and societal levels.

This link between ICT projects and empowerment is not inherent in ICT and is not automatic, as illustrated by the many examples where ICT4D initiatives have entrenched gender inequalities. However, given the frequent references to iREACH's gender policies and practices, it is reasonable to conclude that these played a major role in the empowerment processes, even if it would be false to attribute achievements in this area solely, or even chiefly to iREACH, as participants acknowledged the contribution of several other NGOs and government agencies to these improvements. iREACH would at least have complemented these in different domains: primarily through activities, providing a venue and awareness raising, which by also affecting the attitudes and behaviour of men, influenced positive outcomes for women, particularly with respect to domestic violence.

9.4.3 *Domestic violence*

A study by Kishor & Johnson (2004) indicated that in 2000, 19% of ever-married women in Cambodia had reported spousal/intimate partner violence and that there was an association between reduction of domestic violence and education. As this relationship only held for secondary or more schooling, compared to women with no education it is not of direct relevance for iREACH, but in our field research, there were some references to the perceived reduction in domestic violence being linked to greater awareness, to which iREACH had contributed. For example:

‘... we learnt that we cannot commit violence at home or in villages as it is illegal. Women use their rights when abused, for example by telling village leaders or the police’ (Male Kep Management Committee Member, 2010).

The male KCM management committee member also admitted his awareness of the unacceptability of domestic violence was quite recent. A few female participants, both in Kep and KCM, disclosed that they had suffered domestic violence, which ceased when they informed their husbands of their recently acquired awareness of their rights to seek redress from this infringement of their rights.

Some participants offered another plausible hypothesis for the perceived reduction in domestic violence, associated with iREACH: villagers were busier with applying new skills in

agriculture and raising animals and with improving their livelihoods in general. This gave them less time to engage in violent behaviour. Others held the view that more information leads to higher incomes, which in turn leads to less friction and better relationships within families. Participants in several groups also attributed what they perceived as a reduction in conflicts in general to people being more knowledgeable.

Acknowledging that other NGOs and government authorities had also campaigned against family violence, there was some theorisation about the specific role of iREACH in reducing this scourge, in addition to dissemination of information about it. The KCM teacher group offered the following logic:

Information from iREACH (e.g. on chicken raising) → better knowledge → improved livelihoods → better relationships → less domestic violence.

The same logic would apply for reduction in violence in general, with some participants ascribing what they considered a decrease in the level of conflict to people being more knowledgeable, without making the link to improved livelihoods. While there was no reference to conflict in discussions about family relationships in 2009, half the groups in 2010 attributed reductions in conflicts in general and domestic violence in particular to iREACH. In addition to the factors covered above, the foremost indirect factor associated with iREACH's role in reducing domestic violence was the very fact that both men and women had somewhere to go. The logic was that the more time the family spent together at home, the higher the probability of domestic violence. The capability of having somewhere to go, a freedom not explicitly recognised in the CA, thus had other benefits than just an ICT or education centre. The association between telecentres and reduction in domestic violence is an under-researched field. Further insights into this relationship, with particular focus on the most marginalised, would be an important input into the debate on respective roles of shared ICT facilities versus private mobile use to advance development objectives. The use of such venues could also have a role to play in building positive social capital.

9.5 Community building and social capital

The link between social capital (SC) and empowerment is that the capability of using SC to form groups has been suggested as a mechanism by which empowerment takes place (Friedmann, 1992; Chambers, 1997; Malhotra, Schuler & Boender, 2002). In building an argument of a mutually reinforcing relationship between positive SC and ICT, we first introduce the different facets of this construct and refer to findings about this relationship in the literature, before exploring how it operated at iREACH.

SC is about the web of relationships, facilitating or inhibiting certain outcomes. Bonding SC refers to what binds individuals and groups and what transpires within these, whereas bridging SC links disparate groups, enabling them to network with each other (Gittel & Vidal, 1998; Kay, 2005; Woolcock & Narayan, 2000). SC's potential for development is reflected in its status as an asset in the SLA. The World Bank's interest in this concept (Fine & Green, 2000; Standing, 2000) testifies to its potential in the economic sphere.

9.5.1 *ICT and social capital*

Studies have identified positive links between ICT and SC in developed (Kavanaugh, 1999; Mariscal, 2005; O'Neil, 2002) and developing nations (Amariles, et al., 2006; Duncombe, 2006; Gomez & Gould, 2010; Huerta & Sandoval-Almazan, 2007; Pigg & Crank, 2004; Souter, et al., 2005), largely because of ICT's ability to extend social networks. Duncombe (2006) identified what might appear as the beginning of a virtuous spiral in Botswana in that ICT facilitated the expansion of social networks, used to obtain better information, which then strengthened assets. While useful for upward mobility, bridging capital may not be an option for the most marginalised, who might have suffered from a legacy of exclusion. This raises the spectre of Castell's (1996) dire predictions that ICT could lead to localities '*globally connected and locally disconnected, physically and socially*' (p. 404), a view echoed by others (Benjamin & Dahms, 1999; OECD, 2008; Putnam, 1995). Some First Nations chiefs in Canada feared that ICT could lead to people becoming more insular within their communities (Mignone & Henley, 2009).

Such conflicting views can emerge if ICT is decontextualised, in that its relationship with SC is likely to reflect the nature of its implementation. In a community setting, there is a greater likelihood of positive SC, particularly if accompanied by deliberate education and community development activities (Mariscal, 2005; Proenza, 2001; Soriano, 2007). Individual behaviour, rather than ICT as such, also affects the formation of SC, including negative (e.g. Corbett & Keller, 2004; Lengyel, et al., 2006).

Only a few researchers studying the association between SC and ICT have indicated how this construct has been operationalised (e.g. Pigg & Crank (2004) used five dimensions of SC: networks, resource(s) for action, reciprocity transactions, bounded solidarity and enforceable trust, while Ferlander & Timms (2001) operationalised it through questions about formal and informal social networks, trust and sense of belonging).

9.5.2 *Social capital and iREACH*

Rather than adopting an existing method for operationalising SC, three questions relating to this construct were included in the research instrument. The first two explored whether participants and survey respondents thought iREACH had improved relationships within and between villages and we construed most of the findings from discussions on these and other topics where relevant issues were raised. The third question, included only in 2010, approached the issue from a gender perspective by exploring what informants thought about iREACH's influence on the engagement by men and women in their communities.

In addition to its importance as a social community space from a gender empowerment perspective, the appreciation many participants expressed for hubs for both types of SC for both genders came across very strongly. By facilitating communication within and between villages as well as with the outside world and by serving as an access point for information, iREACH had created conditions for an increase in both bonding SC within the place-based communities and bridging capital beyond. There was a perception that iREACH had encouraged small groups and individuals, men and women, who previously might have been isolated, to communicate, network and share information. Villagers who would probably not have interacted otherwise, found common ground in iREACH activities, whether as parents accompanying their children to a hub, volunteers or passive listeners to news. According to participants in the 2010 Kep youth group, people stayed home more before, but with training and other opportunities to cooperate, community engagement had increased. The iREACH local narrowcasts, considered more relevant to community issues than the radio stations, gave communities a common frame of reference and there was a widespread view that with information to share and an increase in activity levels, villagers had more issues to talk about and this had improved social cohesion and reduced violence within communities.

The distributed architecture of iREACH, i.e. the inclusion of ten dispersed village hubs into the same network in some form of e-community, facilitated bridging SC, enabling users in different villages who would otherwise probably not have known of each other, including management committee members and employees from different villages, to join in iREACH activities. Examples of joint activities included volunteers assisting with the survey used in this thesis, villagers attending lectures on agriculture through online meetings and singing together across the network. Another bridging SC activity, presented in the context of innovation (see 8.4) was the establishment by some in the youth group of overseas contacts with relatives and others in the Khmer diaspora and the intention to extend these networks to others with improvements in English proficiency. iREACH was thus perceived as a window to the world,

not only for obtaining information, but also for establishing networks. The online activities were also a mechanism for breaking, or at least reducing, the isolation of some villages during the rainy season when potholes on the unpaved roads inhibited travel. The establishment of links with partner organisations (e.g. community institutions, other NGOs and pagodas) represented another form of bridging SC.

A picture of iREACH’s role in cementing ties among the local population also emerged from the survey, in which 65% thought iREACH had improved relationships within villages and 62% between villages.

With respect to the third question in operationalising social capital, dealing with the gender aspect, almost 90% of the groups considered men more involved as a result of iREACH and 70% of the groups held this view about women. However, almost every group that considered women more engaged thought they were much more involved, whereas references to men were equally shared between somewhat more and much more. As shown in Table 13, the survey covering this question yielded some interesting results, particularly the many respondents in KCM who thought men were less involved. (The option of being less involved was not explicitly included in the focus groups, but participants had the opportunity of raising this). This view was held relatively evenly across genders, users/non-users and age groups. On a more positive note, an overwhelming majority of survey respondents perceived both men and women to be more engaged.

	Involvement of men				Involvement of women			
	KCM	Kep	Total	%	KCM	Kep	Total	%
Less involved	82	15	97	20%	20	13	33	7%
No change	33	32	65	14%	22	28	50	10%
Somewhat more	72	65	137	29%	71	52	123	26%
Much more	35	105	140	29%	110	129	239	50%
Don't know	18	20	38	8%	17	17	34	7%
Total	240	237	477	100%	240	239	479	100%

Table 13: Perceptions of iREACH's impact on community involvement – survey

The conditions for negative social capital, associated with peer pressure (e.g. for anti-social activities) had diminished, with many in younger generations preferring to spend time at iREACH rather than “loafing around with nothing to do”. The recurring theme of children and youth having somewhere to go, reducing the time they spent walking around and playing games, raised in different contexts in both years in several groups (e.g. Kep and KCM teachers and family members of children using XOs, KCM farmer and youth groups), again points to the importance of the hubs as a social space.

To summarise, achieving social participation was a valued capability to which iREACH was perceived as having made a major contribution. This applied also within families, where iREACH seemed to have shifted the ground in the dynamics of some families.

9.5.3 Family relationships

To explore whether any family member was concerned or had apprehensions about anyone in the family attending iREACH, its impact on family relationships was included as a separate issue in the question framework. Huyer, et al. (2005) reported on a study in West Africa, where men frequently felt threatened by women's use of ICT and the freedoms these afforded. So we wanted to explore whether anyone attributed adverse impacts to iREACH, such as family destabilisation, weakening of harmony, coherence or social norms, including cultural, parental authority, family power structure, or fear that children would access inappropriate content.

Contrary to parents having such anxieties, results in both years overwhelmingly pointed to villagers valuing the opportunity iREACH provided for families, who encouraged their children to use its facilities. They appreciated and took pride in the new skills children had learnt there, particularly ICT skills. A female participant in the 2010 youth group reported that her parents were happy she spent time at iREACH, rather than loafing around. The issue of inappropriate use did not arise, as this was an unlikely occurrence with usage constantly supervised.

Participants in both years thought iREACH had contributed to improved family cohesion through its communication services. In 2009 they emphasised the Family Link-up service and, to a lesser extent e-mail and Skype, as useful for maintaining ties with relatives working or studying elsewhere. The reduced significance of iREACH for this purpose in 2010, only one reference to Family Link-up and one to Skype, both in the Kep NGO group, was probably due to the announced withdrawal of the service following sound quality problems.

Bonds within family members remaining in their villages had strengthened by children passing on knowledge and news to their parents. Many adults learned new agricultural skills and obtained international, national and local news (e.g. security alerts) in this way. Some parents knew about Family Link-up from their children, who had encouraged them to use it and others had asked their children to obtain information they could apply at home (e.g. farming methods). This proxy use, in the form of parents asking their children to obtain information, especially related to agriculture, bolstered relationships within families.

In the 2010 study, the focus shifted to how knowledge had reduced conflicts within communities and families, including a reduction in domestic violence (see 9.4.3). Several

groups alluded to increased levels of teamwork within families, reflected in more joint decision-making practices, including discussions related to when to sell produce in the context of the market price (a subject covered in section 10.1.1) and which family member should go to iREACH to get what information. One participant in the KCM women's group explained how her husband had not allowed their seven-year old daughter to attend iREACH when she first tried to convince him of the benefits, but he changed his mind when seeing other children acquiring computer skills. A teacher in Kep had noticed that children learned good manners at iREACH and that this was appreciated by their parents.

While the importance of iREACH services being free of charge emerged under different discussion topics throughout the sessions, only two groups in 2009 and one in 2010 raised this issue in the context of families, referring to the likelihood of different dynamics, had it been necessary to pay for use of iREACH facilities.

The 2010 Kep youth group was the only group with a divergent view on family relationships, in that it did not identify any improvements, despite having done so in 2009, when participants thought new knowledge passed on by children to their parents had been useful for family cohesion.

A vast majority (80%) of survey respondents answered the question about improved family relationships in the affirmative. Of those who offered reasons for their views, 18 in KCM and two in Kep pointed to a reduction in family violence, but only eight respondents in KCM and three in Kep referred to iREACH services being free of charge. Only one interviewee, in Kep, was of the view that it had an adverse impact, but gave no reason.

9.5.4 Was it ICT, iREACH or was the community spirit already there?

There are two main reasons for not inferring any uni-directional causality between the positive results related to community participation and iREACH and for rendering a more complex account of this relationship. Firstly, it appeared that iREACH could harness a high level of SC at the start of the process, in the form of trust in authorities and NGOs, as exemplified in responses to the question about how participants would go about realising their desired changes. As mentioned in section 7.4, participants in just about every group would approach appropriate government authorities and/or relevant NGOs. Several responses to a question about major strengths referred to various aspects of a community spirit (e.g. NGOs, pagodas, good relationships between villagers, group working, unity and collaboration). There was also much support for iREACH from local authorities.

Secondly, as many researchers have emphasised, ICT4D implementation approaches influence whether an initiative becomes a ‘*catalyst for cooperation within a community and thus as an instrument for building social capital*’ (Mariscal, 2005, p. 415). ICT projects do not have a monopoly on being catalysts and, conversely, ICT provided in other ways (e.g. without training and other support activities) might have no or negative influence on community or family cohesion.

It is however difficult to imagine another community development project with such encompassing influence on both bonding and bridging SC in so many different areas — ICT provided the means of communication between villages and facilitated dissemination of information that contributed to improved family relationships and reduced domestic violence. Beyond the confines of geographic space, the “virtual” networks established with the Khmer diaspora were only possible through ICT. The multiple forms of human intermediation, performed by the CFs, volunteers and management committee members, which linked rather than isolated people, is unlikely to be required for other types of development projects.

Against this stands the argument that the sense of value to the community did not extend sufficiently to attract payments from users (see 7.1.4). The assertion by Hutchinson (2005) that: ‘*There is a tendency in Cambodia not to value things that are free; the logic is “if it’s free it must not be worth anything”*’ (p.24), seems anomalous with our findings that iREACH was much valued, but maybe not sufficiently for villagers to overcome their reluctance to pay for services. This unwillingness to pay contrasted sharply with the existing and expressed future intentions to contribute time in the form of volunteering with iREACH. There is a potential contradiction in poor people donating time without economic benefit to a place devoted to poverty alleviation (Creech, et al., 2006). It could be that participants considered volunteering to be more of an investment — a way of engaging with the community and gaining marketable skills while building SC. There was also the hope of future employment at iREACH.

The increase in both bonding and bridging SC was mainly in the social sphere, primarily through community engagement, but without dividends in the form of business or entrepreneurial opportunities. Enhancing their capabilities of engaging with others and in converting these to functionings, many villagers had formed and sustained groups, reinforcing and extending social relationships across previous social and geographic boundaries. iREACH was thus a catalyst for people to interact and for knowledge sharing and communication. As iREACH’s future hangs in the balance, can communities rely on Putnam’s (1993) prediction that: ‘*Stocks of social capital, such as trust, norms and networks tend to be self-reinforcing and cumulative*’ (p. 177)? Contemplating the fate of users of the many failed ICT projects, Gaved &

Anderson (2006), feared that such failures could be more detrimental to SC than benefits that might have accrued during its operation. Whether and how this would affect the more disadvantaged would depend on whether they benefited in the first place, an issue discussed next.

9.6 Equality

“...every normative theory of social arrangements that has at all stood the test of time seems to demand equality of **something** (emphasis in original)...” (Sen, 1992, p. 12).

Having addressed equality and ICT in general in section 3.1.5.3 and from a gender perspective in section 9.4, this section deals with equality related to specific ICT4D initiatives and reports on relevant findings from iREACH.

In studies addressing inequality, the results generally hint at initiatives having engendered inequality, however defined, because of the skewed access and usage patterns. It appears that the ‘*emerging middle classes rather than the poor benefit most from ongoing telecentre projects*’ (Kuriyan & Ray, 2009, p. 1663).

In their study of SARI kiosks, Kumar & Best (2006a) found that most of the user households were in the middle to upper income groups and where the kiosks attracted a large proportion low-income users, this was attributed to efforts by the kiosk operators. While the aggregate data did not display significant differences between scheduled castes and others, usage in this group was higher in kiosks situated closer to SC households, pointing to the importance of location (see section 3.1.5.5).

Despite some incompatible results on Gyandoot users’ socio-economic background, a general conclusion has been that most were literate and middle-income groups (Ceccini & Raina, 2004; Sreekumar, 2007), with CEG (2002) commenting: ‘*the poor laborer or landless farmer is not aware or even interested, as he sees no value addition in it for him*’ (p.11). In the Tiwari (2008) study, 80% of users, compared to 66% of non-users, were above the poverty line, but Meera, Jhamtani & Rao (2004) found a more equal representation of the poorer among users. The literacy rate was higher among users than non-users in surrounding areas, with education levels also affecting awareness (Jafri, et al., 2002). As the three studies would have used different sampling techniques, it is not possible to draw any conclusions on the different results. The land records project Bhoomi did not benefit smaller and landless farmers (Prakash & De’, 2007). Parkinson & Lauzon (2008) found that all adults using the Internet at Aguablanca had more than primary education.

In 2009, we approached the issue of iREACH's impact on equality indirectly, by including a question of perceptions on this matter. As mentioned in section 9.4.2, discussions centred on iREACH's policies and practices related to gender. In 2010, the nature of the question was expanded to specifically enquire about iREACH's influence on equality between those who were socio-economically advantaged and disadvantaged from the perspectives of education and wealth, as well as gender. This questioning aimed at exploring whether all groups had an opportunity to benefit from iREACH. We particularly wanted to know what participants thought of its usefulness for the less advantaged villagers by offering services they valued and could use (e.g. while everyone listening to the news would be aware of the market prices, only those with resources to act on these could actually benefit). However, the discussions did not go into such details, but gave only snippets of descriptive information on how poor people could use the facilities because they were free of charge.

While an overwhelming majority (approximately 90%) of groups acknowledged iREACH's contribution to increasing equality between genders and between those with different educational backgrounds, fewer groups, but still a substantial proportion (72%), considered iREACH had contributed to greater equality between rich and poor, mainly through knowledge. Actually, several groups objected to the term "rich", on the basis that there were no "rich" people in their villages, only "medium". Participants did not see a clearcut correlation between education and economic status, with a prevailing view that many of those who were better off financially were in business and not necessarily educated, whereas teachers and government employees who might have better education did not earn high salaries. While participants in most groups suggested the poor had benefited as much from iREACH, there was also a perception that members of the poorest families could not afford the time to come to iREACH, as they had to work, a view also aired when talking about reasons for non-use (see section 7.4.7). They could nevertheless benefit indirectly, through some form of spillover effect by watching farmers using new methods, or being informed by those who had learnt something else from iREACH (e.g. on disease prevention). This is what Heeks (2010a) referred to as '*digital provide*' (p. 632) (i.e. that those who do not themselves access ICT can also benefit), but as he noted, there is limited evidence for this in the literature. Due to an omission, the direct question in the research instrument dealing with equality did not canvas views on other forms of disadvantage, such as age, disability and ethnicity. Apart from one group, drawing attention to problems faced by the elderly, there were no references to other marginalised groups. According to NCDD (2009) data, no members of the Cambodian Indigenous minority groups lived within the iREACH catchment areas.

As shown in Table 14, at 80% of survey respondents, the perceived impact of iREACH on gender equality was higher than for any of the other equality categories. There was no difference in the responses to this question based on gender. However, this result is somewhat inconsistent with answers given in response to a question whether iREACH had contributed to improvements in the situation of women, to which only 38% answered in the affirmative (section 9.4.2). A reasonable majority perceived that iREACH had improved equality between the more and less educated and a slight majority that it had an equalising effect between poorer and better-off villagers.

	Equality between								
	Men/Women			Rich/Poor			More/Less Educated		
	KCM	Kep	Total	KCM	Kep	Total	KCM	Kep	Total
Increased	82%	78%	80%	78%	40%	59%	63%	76%	69%
Reduced	3%	3%	3%	10%	17%	14%	4%	3%	3%
No change	15%	19%	17%	12%	43%	27%	33%	21%	27%

Table 14: Perceptions of iREACH's influence on equality

In 2010 we invited suggestions on how iREACH could contribute to more egalitarian outcomes. Participants in several groups proposed different ways in which it could mitigate impediments within its control, including not having hubs in private homes or commune council offices, as those who were most marginalised were afraid of frequenting such venues, emphasising again type of location as an important determinant for use. Psychological barriers could thus reinforce disadvantage, by acting as deterrents for using services that were affordable. Moreover, participants noted that physical access to hubs was also not equally available to everyone and another suggestion to overcome this was for hubs to be available in all villages, or at least in more villages. The inequality associated with the lack of a village hub also arose in response to other discussion items and while this is a geographic inequality (see 3.1.5.3), it also had implications in the economic domain, as those with motorised vehicles could more easily travel to a village with a hub. Other suggestions were additional mobile video shows, more agricultural and vocational training, encouragement of more information sharing and training for the poorest. The line of replies in these discussions articulated awareness of both equality as a concept and how it had played out in relation to iREACH.

Poverty and disadvantage are not static conditions (Krishna, 2009), in that formerly poor people can escape, while others may fall into poverty, often due to illness. iREACH might have played a role in cushioning the downward spiral into poverty, if not always preventing the slide, as well as assisting people escape poverty — in both cases diminishing potential inequalities.

While iREACH took into account entitlements of the more marginalised in its design, there were impediments to them benefiting as much as others, some of which were beyond its control (e.g. lack of time to attend). The perception of most informants that iREACH had contributed to equality, rather than replicated or deepened inequalities, contrasts with findings of many other studies. Similar to UNESCO's community multimedia centres (Slater & Tacchi, 2004), many poor were attracted to using iREACH, believing this would contribute to longer term improvements, particularly for children.

Several factors might explain what appears to have been an equalising influence of iREACH. The intermediaries, in the form of CFs helped reduce the barrier of illiteracy, making iREACH relevant for a diverse range of users. The location of the hubs made iREACH more accessible than one centre with more computers at a single location. A third factor was the focus on relevant content, often decided by the management committee members. The multi-dimensional nature of socio-economic status uncovered in the study could have been another factor (i.e. the view that the better-off in the communities tended to focus on business activities and were not necessarily the most educated). This implies that there may not have been only one socio-economic ladder, which, as suggested in the knowledge gap theory (Tichenor, Donohue & Olien, 1970) would widen the gap, as those with higher status would acquire knowledge faster.

But we also found, by coincidence, rather than through design, at least one example of someone too poor to attend iREACH, a pre-teenage girl who had to look after her siblings while her mother worked. She hovered around the Kep farmer's group session on her bicycle, still with some unsold fish she had caught in a nearby dam, illustrating what participants had mentioned and the observation made by others that the chronic poor may fail to gain access to NGO programmes (Thomas, et al., 2010; Thorp, Stewart & Heyer, 2005). How policy-makers can address constraints faced by people in her situation would require more exhaustive analysis than was possible within the scope of this study.

9.7 Summary of iREACH's contribution to empowerment

This chapter paints a picture of a meshed relationship between iREACH and elements more or less associated with empowerment, including governance and institutions, gender issues, family relationships, community building, social capital and equality. Mindful that many of the findings were informed by interpretations of perceptions and incidents that were to some extent anecdotal, they nevertheless offer useful insights in the absence of more substantial measures that were beyond the scope of this study. Examining how individuals achieved empowerment through direct and indirect interactions with iREACH, the research revealed that, while none of

the changes were transformational, iREACH had provided space for decisive progress in several empowerment domains (e.g. by spurring new forms of co-operation), thereby strengthening the capabilities of individuals and communities. There was far more evidence of this in 2010, with examples spanning a wide field, together with strong indications that social life for many villagers had improved, particularly for women, as they became more active in their communities and less prepared to accept abuse of power, whether within or outside families. iREACH's role in alleviating domestic violence was strongly recognised in KCM and less so in Kep, especially in 2010.

A link between capabilities and empowerment appeared in the form of increased awareness of the importance of information from external sources, reflected in a motivation for learning and for sharing knowledge within communities. By providing opportunities for villagers to become active in their communities, iREACH had connected individual well-being with the social environment, a vital element in empowerment theory (Zimmerman, 2000).

One domain in which iREACH had not lived up to expectations was governance, including use of e-government applications and influencing policy. There were no relevant applications and participants might have been fearful of raising governance related issues. Herein lies the limitations of an initiative such as iREACH — without relevant applications from the macro- and meso-layers, the scope for e-government and for addressing possible community concerns surrounding governance are limited. However, governments that do not introduce such applications could be the ones where the need for improved governance is greatest. The perils of bringing out these issues in research, potentially endangering participants, is a dilemma in this type of research as it prevented us from drilling further into governance. The challenge is how to break out of this cycle to generate greater understanding of how governance could become an element in a virtuous spiral.

From the perspective of Sen's five freedoms, protective security in the form of security alerts, included under governance, was somewhat enhanced. Other domains covered under empowerment have mainly contributed to social opportunities and to a lesser degree to economic facilities in that empowerment made it easier for villagers to guard their entitlements. The main contribution to economic facilities came from application of knowledge for more sustainable livelihoods, the third and last construct in the CES virtual spiral model, the subject of the next chapter.

Chapter 10 - iREACH's contribution to sustainability and livelihoods

Cognisant of the importance of a wider view of sustainability that takes into account broader societal issues (see section 5.1.3), in this chapter we focus on iREACH's role in support of livelihoods, which in this context means the ability of individuals and communities to sustain themselves in ways that enable them to lead the lives they value and have reason to value. The many pathways to sustainability occurring simultaneously at an individual, firm or community level do not necessarily equate to self-sufficiency, as this may not always be possible. For example, family members satisfied with working under reasonable conditions in Phnom Penh or overseas, sending remittances to relatives remaining in their villages would contribute to sustainability. While several aspects covered in the capabilities and empowerment chapters (e.g. education and social capital), might contribute to sustainability, this section explores whether and how such capabilities have manifested themselves in improved agriculture and in non-farm related livelihoods, such as entrepreneurial activities, employment and remittances, elements through which sustainability is operationalised in this chapter.

10.1 Agriculture and fishing

Blattman, Jensen & Roman (2003) identified information needs related to two key efficiency categories affecting agricultural productivity: allocative and technical efficiency. The latter refers to issues such as new crops and new farming methods resulting in higher yields, and the former to activities that enable farmers to obtain improved income through other means, such as better marketing, potentially possible through market price information. Claims abound in the literature of how ICT has improved both efficiency types and we present some of these findings before introducing the results from iREACH. The terms agriculture and farming are used interchangeably and include animal husbandry, which was so interlinked with agriculture in the research that it was difficult to separate the two types of primary production.

10.1.1 *Allocative efficiency*

An examination of the literature yields voluminous references to the ability of ICT to reduce the power of intermediaries in their dealings with small-scale farmers and fishermen, alluded to in section 3.1.5.1, particularly through market price information for farm produce (Falch & Anyimadu, 2003; Kenny, 2002; Soriano, 2007; Ulrich, 2004). The theme of who benefits from better access to market price information has recurred in other studies (e.g. research on

Gyandoot found the ability to sell grain at higher prices was only available to those able to wait for favourable market conditions and lack of timeliness in updating the prices, leading to losses (CEG, 2002; De', 2006)). Furthermore, this type of information would be of interest mainly to landowners, rather than the poorest, who are predominantly landless (Conroy, 2006). In a study of the Kerala fishing sector, Abraham (2007) found mobile phones useful for tapping into wider markets, but, rather than fishermen, intermediaries were the main beneficiaries. Having invested in the boats, they could decide when and where to sell the catch, maximising their commission, rather than the price, which would have benefited the fishermen. In another study of mobile use among Kerala fishermen, Jensen (2007), found that fishermen's profits increased by an average of 8%, without addressing who appropriated the benefits, which also included flow-on effects of a 4% consumer price decline and consumer surplus increase of 6%.

Zainudeen (2008), who did not find much evidence of farmers using mobiles to check on prices at the nearest markets, noted that some farmers instead spent time travelling to obtain information. The informal nature of economic relations, combined with the value of face-to-face interactions could play a role in farmers not using mobiles more extensively for market information (Rashid & Elder, 2009). Some studies of the Grameenphone found value attached to accessing agricultural pricing information (Bayes, von Braun & Akhter, 1999; Islam, 2005), whereas Richardson, Ramirez & Haq (2000), indicated that only 7% of calls were business related, not necessarily about market price information. But, ICTs, primarily mobile phones, are also used for communication of price and other market information on an informal basis (i.e. not through a formal system) and this use can extend to incorporate ordering, delivery and other supply related information (Overå, 2006; Urbach, 2007).

Turning now to iREACH, which in addition to disseminating agriculture market price information received from the Cambodia Agricultural Market Information Project (CAMIP) (an initiative funded by the Canadian International Development Agency and the Cambodian Ministry of Agriculture, Forestry and Fisheries) in its narrowcasts, provided insights into the workings of the market in these programmes. Market price information featured in the FGs in both years across several topics, including general discussions on iREACH's contribution and expectation on how it could contribute in the future, useful knowledge provided by iREACH, its main benefits and the most significant change brought about by it. Although 30% of groups referred to CAMIP prices in different contexts throughout the sessions, only the occasional participant claimed to have applied them when attempting to negotiate higher prices for their produce.

In 2010, a few participants had, or knew someone who had, declined to sell produce at the initial prices offered by traders who usually visit their villages. Among them were the sister of a female participant in the Kep NGO group, a male commune council member, a male farmer in Kep and a participant in the KCM women's group. Only the latter had been successful in obtaining a higher price. At the completion of the rice harvest, a trader offered her 900riels/kg when the CAMIP price was 1,020, but after waiting a few days, she managed to sell it for the price announced through CAMIP, gaining approximately USD 30 from her 1 tonne. Despite attempts to receive the CAMIP market price, the others who had withheld their produce in anticipation did not know at the time of the study whether they had made the right decision. However, the very fact of having access to the market information appeared to have been empowering in itself, as indicated by this issue also having been raised in the context of discussing whether iREACH had provided opportunities for more choice and influenced decision-making capabilities. According to one female participant in the KCM management committee group, the market price information reduced the scope for cheating by traders.

Another interesting perspective on this topic emerged in the Kep NGO group, where one participant used the availability of CAMIP information to illustrate improvements in family relationships, in that it gave families another topic to talk about, namely whether or not to sell at a specific price offered, against the background of knowing the market price (see section 9.5.3). Despite the strong emphasis on market price in the FG sessions, none of the survey interviewees referred to this issue in any of the open-ended questions.

It could not be taken as a given that everyone who mentioned market price information would actually be in a position to benefit financially from it and oddly enough, many who maintained its usefulness probably would have faced a series of obstacles in strengthening their bargaining position with traders, reflected in the less than overwhelming practical use of this information. They would have lacked resources required to act on the information, including storage for produce not sold immediately (Sreekumar & Rivera-Sánchez, 2008) and/or transport to markets that could have enabled them to realise the potentially livelihoods enhancing nature of market price information. Similar obstacles prevented farmers from making use of information they found about potato wholesalers at a telecentre in a mountainous region of Peru – they lacked resources to meet the quality requirements (Heeks & Kanashiro, 2009).

Another determining factor for use of market price information is whether farmers had the freedom to decide conditions for sale of their produce, which would not be the case for those indebted to a trader, similar to the situation of the fishermen in Kerala (Abraham, 2007). There was no discussion of this or any other aspects pertinent to the dynamics of the agriculture value

chain and the role of iREACH in this process, to at least partially explain the limited use of this information. In any case, the information would only be useful for farmers with surplus rice to sell and those owning land on which to plant rice. There was also no reference to fish pricing despite one of the hubs in Kep being located in a fishing village and some farmers engaged in aquaculture in dams on their properties.

Another potential benefit of market price information is its potential to signal to farmers what crops to grow (Beardon, 2009; Lokanathan, de Silva & Fernando, 2011), but there was no mention of this influence when participants talked about new crops they learnt about at iREACH and experimented with, as covered in the next section. Neither were there any references to having used iREACH for information about input prices (e.g. fertilisers).

10.1.2 Technical efficiency

The major contribution ICT can make to agriculture would most likely come through two sources: improved farming methods and crop diversification, the foci of attention in this section, and these emerged as key tangible benefits of iREACH.

Returning to the fishermen in Kerala, mobile phones played a major role in changing practices, enabling fishermen to stay at sea longer by using their phones to arrange for supplies and pick-up of their catch by smaller vessels when their boats were filled to capacity. The same ICT tool that could lead to over-fishing through this practice, could also limit the catch to known demand, communicated from markets to fishermen at sea through mobile phones (Abraham, 2007; Jensen, 2007). Estimates of waste reduction from such practices varied from 5-8% in Kerala (Jensen, 2007) to 30% in Senegal (Batchelor, et al., 2003). One way of achieving waste reduction in vegetable growing is to stagger planting times to avoid over-production where everyone harvests simultaneously, but this requires co-ordination. MSSRF assumed such a co-ordination role through its VKCs for tomato growing, resulting in higher per unit prices (Harris, 1999). Through telecentre training in the Chinese province of Wu'an, farmers could learn about poultry- and livestock-raising, but many farmers lacked sufficient funds to invest in new methods (Soriano, 2007).

These cases illustrate that, similar to market price, technical information alone is not always sufficient to change practices. The fishermen needed someone to arrange smaller boats to pick up the catch, MSSRF coordinated tomato-planting and farmers in the Wu'an province lacked capital to benefit from the information. There is a risk that information, without additional resources or co-ordination can be counterproductive in that it can raise false expectations. But there are also examples where it appears that information alone can influence farm practices, as

implied by Ulrich (2004), who found that 86% of respondents indicated that they had improved farming practices as a result of information available from telecentres in the Chinese provinces where the study took place. The text did not indicate whether additional resources became available to facilitate the exploitation of the information. Similarly, farmers trained through video on various aspects of seed management through the Good Seed initiative could act on the information alone, increasing their yield by 10% through better seed management (McNamara, 2008).

Farming was mentioned in discussions about major strengths in 73% of groups in 2009 and 59% in 2010, reflecting the importance of agriculture in the household and local economies in iREACH's catchment areas. Half the groups in Kep mentioned fishing, but when this activity was discussed in the fishing group, participants complained about illegal fishing affecting their livelihoods. A high proportion of the groups also referred to agriculture when discussing recent improvements, with many participants pointing to water infrastructure, such as dams and irrigation that reduced the dependence on rain-fed agriculture and enabled two crops per year, as one of the contributing factors. Although iREACH cannot take the credit for this infrastructure, villagers attributed some of the improvements to the many ways in which it had provided guidance on farming methods, including new crops, organic farming, pest- and disease-control through narrowcasts, online village-to-village meetings and assisting individual hub visitors with information. With the advent of iREACH, they argued, there were new ways in which villagers could obtain and exchange information about agriculture and participants indicated an overall positive picture of how iREACH had facilitated their progress towards higher yields, lower costs for farm inputs and crop diversification.

Many community members of both genders had embraced the opportunities provided by iREACH to improve their farm practices and experiment with new crops and several participants emphasised the constructive role it played in increasing yields and incomes through information and knowledge. In general, participants in both studies identified pathways from improved practices and higher yields derived from this knowledge to better living conditions. In addition to learning about new farm practices from iREACH first, it emerged that iREACH served to reinforce training offered by other organisations, such as the International Fund for Agriculture Development (IFAD), the Cambodian Center for Study and Development in Agriculture and Bridges across Borders, Cambodia (BAB), by supplementing information received from those agencies. Participants nevertheless acknowledged iREACH's direct contribution to technical efficiency, speaking of how lectures over iREACH's network, village-to-village meetings, information in daily narrowcasts and retrieval by individuals of agriculture

information, sometimes with the assistance of CFs, had encouraged them to try new farming methods and practices, including new plants. iREACH's ability to provide on-demand information (i.e. through use of ICT) distinguished it from other providers of agricultural information, as it would have been difficult to source information of this nature from printed material.

Several participants argued that the ability to obtain further information from iREACH, either by villagers themselves or with the assistance of the CFs, had facilitated the application of new practices, even when they first learned about them from other agencies. A participant in the KCM women's group learned from IFAD how to grow watermelons in the rice fields after the rice harvest and then obtained additional information from iREACH. According to participants in the Kep youth group, after learning from BAB about harmful impacts of chemical pesticides and insecticides and receiving instructions on alternatives to these, they had gone to iREACH for further details and then initiated dissemination of relevant information in their villages. This complementary nature of shared access facilities, both for obtaining additional information and disseminating it, does not appear to be widely, if at all, identified in the literature about ICT and poverty reduction. For example, it would be important to explore whether the ability to access more information in an open environment where it can be discussed with others enhances self-confidence to the extent that users are prepared to deliberately diffuse innovations.

While there was agreement on the general value of iREACH in improving farm practices, participants in 2009 did not often identify specific cases of improvements and gave only a few examples of how they had applied new knowledge on their farms. Among them was a male Kep commune council member, who told the group he had searched for information on how to grow mangoes for a long time, when he finally obtained it via iREACH and had subsequently planted a few mango trees. Participants in the KCM teacher group pointed to a village-to-village lecture on how to plant sugarcane as having contributed to crop diversification.

Compared to more general and vague indications of improved agriculture knowledge in 2009, discussions in 2010 were more robust and concrete on this matter, with many participants providing specific examples of what new farming practices, in the form of new methods and new crops they had employed, using information acquired at iREACH. Such details referred to how their yields had increased through better understanding of soil fertility, application of new methods for seed selection and fertilisers and getting multiple harvests per year. Organic farming practices received much more attention in 2010 than in 2009, with participants in several groups indicating how information obtained at iREACH about such practices had been useful and how this new knowledge had enabled them to improve yields and reduce expenses on

chemical fertilisers. Discussions with staff at CSUK indicated that, while it may normally take many years for organic farming to match the productivity of non-organic methods, farmers unable to afford the optimum amount of chemical fertilisers could generate improved yields within a shorter period. There is widespread inappropriate pesticide use in Cambodia and safety measures are often ignored or misunderstood, particularly where labels on illegally imported sprays are written in Vietnamese or Thai (Jensen et al., 2011).

Another benefit of applying organic farming methods was a reduction in pollution from burn-off of straw and leaves, instead used for making compost for fields and home gardens. Having encouraged villagers to grow home gardens, iREACH had, according to a participant in the KCM women's group, contributed to an increase in the number of these in her village from 10 to 50.

There were also several references to improved skills in animal husbandry in both studies (e.g. in 2009, one woman in the KCM women's group and one in the management committee group remarked that, based on information from iREACH on how to feed, water and clean pigs and subsequent application of these practices, their animals were much healthier). Participants in the KCM youth group had focussed on obtaining information on how to raise poultry. A participant in the 2010 women's group had embraced the advice about vaccinating her cows and buffaloes, having heard about the importance of this in an iREACH narrowcast and confirmed the details in a general question session at a mobile video show event. Several of the examples above and the illustrations in Box 2 of how some participants in the 2010 study had used relevant information from iREACH on their farms, were innovations.

iREACH's impact on agriculture and animal husbandry was also a recurring theme in most open-ended survey questions, particularly in KCM. On average, at least 36% of interviewees mentioned something related to these topics across a range of questions. Interestingly, only 50% of those mentioning agriculture in KCM in response to questions about most significant change and main benefit of iREACH identified themselves as iREACH users, as did five of the seven respondents in Kep who had listed agriculture when discussing these questions.

The average proportion referring to agriculture masks significant differences between the pilot sites; in KCM, at least 63% listed something associated with agriculture, compared to only 10% in Kep. One plausible explanation for this discrepancy could have been greater reliance on fishing in Kep, but only one of the hubs was located in a fishing village. And the surveys did not include any reference at all to fishing. There were also qualitative differences between the sites, with interviewees in Kep mainly using general terms relating to agriculture and animal feeding,

whereas the respondents in KCM were more specific, with several references to natural fertilisers, higher rice yields and planting of new vegetable types.

One female participant in the KCM farmer's group estimated that her rice yield had increased by approximately 10% since she started applying organic farming methods two years ago. Another incentive for adopting these practices was that she saved money by not having to purchase chemicals, approximately two bags for her one hectare farm. At 300,000 riels/bag, this corresponded to a saving of approximately USD 150 per year. Instead, she was making her own fertilisers from manure and leaves. She was very pleased with the quality of the rice, which she thought was tastier, with a better, softer texture than the rice to which she had applied chemical inputs.

A male farmer in the same group had started growing water convolvulus (spinach), for domestic consumption, after hearing about it at an iREACH online village-to-village meeting, where someone from another village suggested it. At the meeting, he also learned how to make organic fertiliser from cow, buffalo and chicken manure.

A male participant in the KCM youth group explained how information from the Internet, accessed initially with the support of a CF, had assisted his family with increasing the yield of its eggplant produce, used for domestic consumption. Previously the yield was only 5-6 fruits per plant, but after learning to prepare wider holes when planting (diameter of 20cm rather than 10cm), this increased to 8-9 eggplants. He also reported a high probability that these would be larger, with the change from chemical to organic fertilisers.

A female participant in the KCM commune council and village leader group made use of information from iREACH to grow watermelons and claimed she had not been aware of the appropriate amount of water required for growing these. She also learned how to make and when to apply organic fertilisers. As this was her first season, she did not yet know about the results, but she had observed that the plants looked healthy and expected increased yields. Having learned to appreciate the value of organic methods, she intended to extend the use of these to rice growing the next season.

Using information that a neighbour had obtained from iREACH, a male commune council member in KCM had reduced the time to slaughter of his pigs from 5-6 months to 3-4 months.

According to the Kep commune councillors, some villagers had used information from iREACH to plant vegetable types they did not previously cultivate, particularly during the dry season, when it was unusual for anyone to grow vegetables. Examples of new plants introduced in this way were watermelons and beans. They also related how, when someone in a village starts something new, whether a crop or farming method, there tends to be a demonstration effect, with other farmers looking on and if the experiment is successful, they follow, indicating that iREACH's influence stretched well beyond those who attend its hubs.

A female participant in Kep applied information obtained from iREACH to grow potatoes and watermelons, while a male participant in that group learned about rice fertilisers and other aspects of rice growing.

A male management committee member in KCM had started on a migration path from self-sufficiency, to the creation of surplus in the production of watermelons and cucumbers, to the extent that he intended to employ his unemployed brother next year to work on his farm.

Box 2: Illustrations of how information from iREACH has been used in agricultural innovation.

The differences between the two sites could imply an ambiguous effect in Kep, possibly suggesting that the presence of the CSUK rural agricultural university would have been significant in advancing awareness of new farming practices. We did not explore reasons for the differences, but should the role of CSUK prove to be a key factor in further research, it would validate what several researchers and practitioners have found, that ICT alone cannot do the job and that a catalyst may be required, pointing to the importance of appropriate intermediaries, as discussed in section 3.1.5.7.

This research did not go into details of impacts on issues such as crop productivity or incomes. To do so, would have required before and after surveys of a representative sample, with the “after” having to establish to what extent any improvements could be attributed to iREACH and other agencies providing advice and training on agriculture, respectively. Even in the absence of such detailed studies, it is reasonable to conclude from both the FGs and surveys, that, while not suggesting that iREACH had a transformative impact on agriculture, it assisted farmers through its crop management and animal husbandry advice, adopted by many farmers. Whilst incremental and not requiring sizeable additional resources, as would have been necessary to benefit substantially from the market price information, these changes, resulting from more knowledge and capabilities, appeared to be more than marginal.

There was also sufficient evidence to assert that the new practices were not at the expense of ecological sustainability, as the new methods used less, rather than more inputs that could be harmful to the natural environment. The reduced reliance on commercial agricultural inputs might also have positive distributional impacts, as organic farming methods would be more affordable to the poorer farmers, thereby linking the agriculture to equality issues, discussed in section 9.6. While there was no direct reference to reduced vulnerability, the extent to which crop diversification was encouraged and embraced had the potential of making communities more sustainable by enhancing their food security and, as described by Krishna (2006) when encountering agricultural diversification in an Indian study, to provide a pathway out of poverty. iREACH also influenced non-agricultural livelihood diversification to a lesser degree, as dealt with in the following sections.

10.2 Livelihood diversification through entrepreneurial activity

Non-farm income generation in rural areas can have significant value in addressing poverty (Davis, 2003; Heeks, 2008). Scoones (1998) identified two broad non-farm clusters of livelihood strategies from an SLA perspective: livelihood diversification and migration. There are different ways in which ICT could facilitate both of these strategies — by providing access

to employment and creating more opportunities for interactions, which may lead to new economic opportunities (e.g. through improved market information whether for supply or demand purposes) and for communication (Duncombe, 2006; McNamara, 2008; Parkinson, 2005).

There is considerable evidence of how ICT has facilitated business activities, such as customer acquisition and retention, in remote communities, for marginalised people and others in developing nations (Batchelor, et al., 2003; Boateng, et al., 2008; Dalvit, et al., 2007; Donner, 2007; Molony, 2006; Odame, 2005; Soriano, 2007; Ulrich, 2004; Wood, 2004). In the Solomon Islands, 11% of respondents in a survey about PFNet indicated that this initiative had enhanced their enterprises. The project was quite successful in attracting business use — its email service had been used to facilitate the establishment of two new enterprises in the seafood and seaweed businesses, the latter exporting to Japan (Chand, et al., 2005). Tourism is another sector in which the Internet has been useful for customer acquisition by micro-enterprises and where intermediaries (e.g. in the form of government tourism sites) perform valuable functions (Curtain, 2001; Karanasios & Burgess, 2006). While more than 60% of telecentre networks have supported the tourism sector, such support has not been consistent (UNCTAD, 2007).

Some of the above examples may implicitly come under the umbrella of social enterprises, while others do so explicitly. ICT can facilitate such enterprises, either by using ICT in other sectors, as in the textile sector in Cambodia, or in an enterprise built around ICT, such as the company Digital Data Divide, also in Cambodia (Hutchinson & Molla, 2009) and the women's ICT co-operative, Kudumbashree in Kerala (Heeks, 2010b).

But there are also cases where endeavours around building enterprises from ICT4D initiatives have been less successful, as was the case with Peoplelink, a website established to facilitate sale of craft goods directly to the public (UNDP, 2001a). In other cases, telecentre objectives to assist people with their economic needs have not been fulfilled, as in Aguablanca where, with the exception of producing business-related documentation, representing some 15% of total activity, none of the usage supported economic development (Parkinson & Lauzon, 2008; Parkinson & Ramirez, 2006). The potato growers in Peru (see 10.1.1) found it too difficult to engage with new wholesalers and a plan by female weavers in Bhutan to find new foreign markets through the Internet met a similar fate when realising the resources required for such an endeavour (Terada, 2005).

Sometimes the use of ICT for trading has been heralded as an opportunity to eliminate intermediaries, or the “middle-man” from transactions (Bowonder, Gupta & Singh, 2003). But ICT can also strengthen the position of intermediaries, as was the case in the trade of yams and

onions in Ghana, where mobiles enabled them to operate more efficiently, reducing information asymmetries, transportation and other transaction costs (Overå, 2006). The power of intermediaries increased after introducing mobiles into the traditional micro-weaving business in Nigeria (Jagun, Heeks & Whalley, 2008), bringing this issue into the domain of equality. Another reason for using ICT in business is that such use has the potential of conferring a higher status to those involved in the informal economy (Brammah & King, 2006; Haan & Serriere, 2002).

Findings about the Internet's potential for business activities within the same community may be contradictory, as in the case of the indigenous Ashaninka community in Peru, where Roman & Colle (2002) reported that community members boosted revenue by 10% from selling organically grown oranges in Lima over the Internet. However, Gigler (2008) noted that their initial high hopes of using an ICT centre for marketing farm produce and artisan products to markets in Lima were dashed, due to a combination of an immature online market for such products in Peru and the limited knowledge and experience with e-commerce within the communities.

Many ICT4D initiatives represent diversification of livelihoods in rural villages, through offering employment and/or opening opportunities for small entrepreneurs, through public-private partnership arrangements, opportunities that may have multiplier effects on local economies (Kuriyan & Ray, 2009; Madon, 2004; Tiwari, 2008). With respect to Akshaya, Madon noted that the entrepreneurs involved in the project learned how to maintain their systems and built networks to sustain their livelihoods and to generate local socio-economic activity. From other cases, it appears that entrepreneurial activities do not happen by themselves and where ICT4D initiatives have engaged in livelihood diversification through new businesses, this has usually been the main purpose of the project.

The above examples serve to illustrate that there are pertinent differences in how ICTs can both strengthen and weaken the same layers in a supply chain. Despite the above list of more or less successful uses of ICT for entrepreneurial activities and the explicit intention of facilitating this type of application through iREACH, only scant discussions occurred regarding its use for this purpose. While the 2009 study did not identify any new enterprises, in 2010 one of the teachers in Kep was aware of someone who had bought a computer after attending iREACH and offered courses on a commercial basis in his village. In a similar vein, one participant capitalised on what would have been basic skills in English he learned at iREACH to give private language lessons. One male participant in the commune council member group had started a new business, typing letters and invitation cards, using skills he learned at iREACH.

Rather than encouraging the sale of local produce, trade-related applications were limited to price comparisons of goods between Cambodia and Vietnam, taking into account the exchange rate, also obtained from iREACH. Traders making use of this application found most goods would be cheaper to purchase in Vietnam, taking into account transport costs, so their use of iREACH for business purposes would have been detrimental, rather than beneficial for local producers of those goods. To understand the social benefits and costs and deeper economic implications of this application would require further research on the winners and losers of the supply chain changes resulting from this use (e.g. were local wholesalers bypassed through the users dealing directly with Vietnamese suppliers and were manufacturing opportunities in Cambodia lost through this trading?). While we did not investigate these details, it would be a worthwhile exercise to do so, also incorporating potential benefits for consumers if the lower prices flowed on to them.

Also notable was that, with a few exceptions, none of the participants said they were aware of the potential of using iREACH for entrepreneurial activities, let alone being intent on exploiting iREACH for such purposes. In response to the survey question asking interviewees whether they had used iREACH for business purposes, 6% referred to agriculture, 5% to information on prices, some of which would have been agriculture market prices, 3% to communication with customers, 2% to obtain information in general, 1% to exchange rate information and 1% to researching the market for selling. As some respondents gave multiple answers, in total 12% indicated they had used iREACH for business purposes,. Although none of the answers related to new initiatives associated with diversification away from farming or trading activities, this response rate nevertheless indicates an awareness of the usefulness of ICT for business purposes. Opportunities for entrepreneurship through managing the hubs at iREACH, as existed at Akshaya and Gyandoot, were not available, with the hubs managed by employees and/or volunteers. Another difference was that the intended financial viability (not always realised) of those initiatives was predicated on revenue from e-government applications and other government services, options that were not available for iREACH.

We cannot profess that iREACH made much of a contribution to livelihood diversification through encouraging entrepreneurial activities, despite this being one of its main purposes, as suggested in section 7.1, through the association with the Ministry of Commerce (MoC). This raises the question of why this might have been the case. Despite the involvement of MoC, there was no concerted effort to focus on entrepreneurial activities and no concerns over the absence of such activities, seemingly ignoring the iREACH objective relating to this matter. Contrary to its objectives, iREACH did not play a prominent role in promoting business activities. There

was no attempt at establishing any form of incubator activity or of the government awarding limited outsourcing tasks to iREACH that could have acted as catalysts for expansion in the direction of business activities. Issues in early dealings with the abovementioned Digital Data Divide seemed to preclude collaboration that could have resulted in some activities being outsourced to iREACH.

Communication and information alone are not sufficient for diversifying livelihoods, as enterprises would require resources to act on new information (Duncombe, 2006; Duncombe & Heeks, 2002). It could be argued that limitations in the trading environment (e.g. lack of online banking facilities and credit cards) could explain the absence of entrepreneurial activity, but several of the abovementioned projects that have engaged in business activities would have been in a similar situation. It also raises the issue of whether it may be a question of time (i.e. whether one could expect more activities in this area, should the project continue) or whether there was something systemic in the design and operation of iREACH that failed to attract or inspire an entrepreneurial spirit. The inferior technical quality and waiting time to use the computers would not have been conducive to business use. For whatever reasons and finding reasons could be a study in its own right, the use of iREACH as a vehicle to pursue new business opportunities for livelihood diversification did not succeed in any substantial way. However, the implications of this may not be sufficiently severe to prevent the virtuous spiral from getting a foothold with respect to sustainability, to start its upward twisting movement, as the diversification within agriculture, may compensate for iREACH's insignificant contributions to non-farm related economic activities. But not using iREACH as an effective income-generating tool beyond agriculture, nonetheless seems to be a missed opportunity in terms of potential contribution to capabilities, poverty reduction and sustainability. With the limited attempts to use iREACH for livelihood diversification, it was not possible to identify whether there were any particular barriers preventing this type of use, other than possibly the inadequate attention by the project on exploiting iREACH for this purpose. The scorecard was not much better for employment.

10.3 Employment

This section investigates the role of ICT in employment, another way of diversifying and improving livelihoods. The potential of ICT for this purpose has long been recognised, particularly for youth employment (Curtain, 2001), but only a few studies have addressed or found direct relationships between ICT and employment, including self-employment. Several telecentre pilot projects have created opportunities related to the centres themselves, whether through formal employment or self-employment, for those working at the centres, including

women. A study on eCenters in Kyrgyzstan (Best, Thakur & Kolko, 2010) and another of telecentres in China (Ulrich, 2004), found comparable success rates, 15% and 19% respectively, of users finding jobs as a result of using the centres, but there was no reference to gender balance among those who had been successful. This level of success contrasts with findings from the Aguablanca telecentre, where even unemployed Internet users did not use the centre for job searches to any significant extent and most considered it inappropriate for that use (Parkinson & Lauzon, 2008). No reason for this was given.

Consistent with a common theme in several studies (Corbett & Keller, 2004; Parkinson, 2005; Parkinson & Lauzon, 2008), there was a widespread view among FG participants at iREACH that computers and the Internet form part of the social and economic reality and knowing how to use them is necessary for anyone aspiring to enter the formal economy. The eagerness with which they wanted children and students to become knowledgeable in ICT reflected this link with employment.

In light of the limited employment opportunities in iREACH's catchment areas, it was surprising that only five groups in both years mentioned employment when asked to suggest priorities for improvements in local communities. Neither did employment feature prominently when discussing possible indicators for assessing progress and in the open-ended survey question related to priorities, only two respondents made vague references to employment.

However, participants paid more attention to employment in considerations about how iREACH could contribute to future improvements. There were two ways in which they expected iREACH to be useful for this purpose: through access to information about employment opportunities and by equipping children with skills, not only ICT-related, to improve their employment prospects. In 2010, a few groups also pointed to iREACH as a place where students can get work practice and actual employment. But when discussing the relevance and usefulness of iREACH, only two groups in 2010, but none in 2009, made reference to the potential of students to find work. In the survey, only 3% of participants mentioned employment related aspects in the context of how iREACH could contribute in the future. These were expressed as: *'finding jobs on websites, improving children's capacity to find work and the potential of children being more employable later in life and experience gained at iREACH'*, the latter mentioned by three interviewees in Kep.

To explore further the relationship between iREACH and employment, we turn to information obtained about success rates in gaining employment, which, with the exception of those working at iREACH, was meagre. The only case was someone in the KCM youth group in the 2009 study who knew someone who had been successful after finding the vacancy at an

NGO on the Internet and then applied through the Internet, using iREACH. And then there was the man mentioned last in Box 2 who planned to employ his brother on his farm. In communities where not many jobs were available for school leavers, iREACH, which employed some 15-20 people at each pilot site, most of whom were young local villagers, would have had some impact on the employment market, including multiplier effects from the staff's purchasing power. Participants showed greater appreciation of iREACH's employment creation opportunities in 2010 than in 2009, when in addition to full time staff there were several part-time CFs, mainly management committee members. iREACH was particularly mentioned as a potential employer in the KCM management committee group. There were also expectations that the administrative and other skills the volunteers learned at iREACH would be useful when seeking employment in the formal sector.

The survey results validated the insignificant contribution of iREACH to employment, with only 4% alluding to employment in response to questions relating to most significant change and main benefits of iREACH. Most of those were in KCM, where 8% (16 users and 4 non-users) mentioned employment, but only one person did this in Kep. The majority of those mentioning employment in KCM were women (65%) and their ages ranged from 18 to 56. Considerable references to the potential of students and children finding employment, often intertwined with their ICT skills, were scattered in response to many of the survey questions.

The findings in this section suggest a vague awareness of the link between ICT and employment, but without much evidence of the productive use of iREACH for this purpose it remains an untapped potential, as it did for financial transactions, the last element considered under sustainability.

10.4 Financial transactions, remittances and microfinance

Receiving remittances from family connections is another way in which ICT can have a role in diversifying income sources (Horst & Miller, 2006; Parkinson, 2005; Parkinson & Lauzon, 2008; Richardson, Ramirez, & Haq, 2000). Despite many references to villagers having migrated and use of the Family Link-up service, none of the FG participants mentioned having used iREACH for remittances.

ICT can be useful in the microfinance (MFI) sector (De' & Ratan, 2009) for the provision of financial services to alleviate poverty among low-income individuals who traditionally lack access to finance. The only reference among participants to the potential of iREACH playing a role in this area came in the Kep farmer's group in the 2010 study, where someone suggested that iREACH get involved in establishing savings groups. The only occasion where anything to

do with finance emerged in the survey was in response to a question asking respondents whether there was anything they had hoped to use iREACH for, but were unable to. In total, some 3-4% had wanted to use iREACH in conjunction with some form of financial transactions, five interviewees in KCM and one in Kep wanted to use it as an MFI to borrow money for capital investments, six respondents in Kep had expected to be able to use it for money transfers and two for savings.

Several MFIs operated within both catchment areas, the most visible of which was ACLEDA, one of the major banks in Cambodia that started as an MFI and then expanded to become a commercial bank. The only bank use of iREACH was by some ACLEDA employees working in a branch across the road from the KCM HQ, resorting to iREACH when the bank's Internet access was out of order.

10.5 Summary of findings about sustainability

Based on key strands in the synthesis of the literature and findings from iREACH, we can now proceed to draw some linkages between ICT and sustainability. We focussed on exploring whether and how iREACH had contributed to agriculture and associated animal husbandry, trading, other ways of diversifying livelihoods, employment and financial transactions. While it is inherently difficult to assess iREACH's contribution to sustainability at this relatively early stage and without quantitative measures of changes in agriculture, there were nevertheless strong indications that iREACH made a reasonable contribution to agriculture. To quantify benefits would have required baseline surveys of farm outputs at the start of the project, identification of other factors contributing to changes in agriculture and assessing iREACH's share of the total improvement. It emerged from both the FG sessions and surveys that farm related information, whether delivered through narrowcasts, village-to-village meetings or lectures, downloaded from the Internet or distributed via word of mouth, had encouraged farmers to experiment with new crops and new techniques. Diffusion of these innovations through the "demonstration effect" had beneficial consequences well beyond users, pointing to the importance of social forces, linking sustainability to issues covered in discussions on community building and social capital in section 9.5. The limited direct relevance of computers alone supports this view, in that it was rather the way in which staff and others mediated information and shared knowledge that encouraged farmers to experiment. This accords with the view that '*... there are many ways in which people communicate, and this diversity should also be something that those involved in ICT4D practices should try to replicate*' (Unwin, 2009, p.66). A crucial reason for the progress in agriculture was also that it combined ICT with

practical livelihood matters, but the lack of resources required to act on the increased knowledge constrained the process of assimilating and benefiting from the knowledge.

From an ecological sustainability perspective, the changes also involved some dematerialisation, referred to in section 5.1.3 as an important element of sustainability, and other environmental benefits through reduced chemical inputs in favour of organic farming methods that found a productive use for leaves and straw that villagers would otherwise have burnt. Growing more vegetables, thereby reducing transport for imports from Vietnam, would also have contributed to dematerialisation. No assessment was made on whether the environmental gains of achieving this with only one computer per hub, were sufficient to offset the carbon footprint of this device and associated power for the network, most of which was solar, as well as the additional use of fuel by those who travelled to the hubs on motorbikes. But because of the large number of villagers who shared the benefits of the system and despite growing evidence that *'ICT is part of the solution and part of the problem at the same time'* (Hilty & Hercheui, 2010, p. 228), there is a strong case for placing iREACH on the positive side of the balance sheet. The potential of the interplay between the environment and telecentre type activities is an area deserving more attention than it has received so far, through further research and by bringing it to the attention of policy-makers, for them to take into account when considering whether to support such initiatives.

The reasons for less successful impacts on other sustainability issues covered in this section (i.e. enterprise creation and employment) would require further investigation.

In terms of Sen's five freedoms, the closest relationship was with economic facilities by creating opportunities for better use of resources and protective security by reducing vulnerabilities through crop diversity and better farming methods.

This concludes the last chapter on findings related to the CES model constructs. The field research found that the three constructs were interrelated and driven by knowledge, which facilitated the enhancement of capabilities in various domains, including education, health and farming. There were strong indications that this had been achieved in combination with greater equality, particularly through gender empowerment and by encouraging the more marginalised villagers to use iREACH's services. By promoting new agriculture techniques, including crop diversity and organic farm practices, iREACH contributed to sustainability. Although these outcomes were facilitated by ICT, they were not driven by the technology itself, but rather by the ways in which ICT had been implemented (i.e. in a community setting). The next and final chapter reflect more on these issues and the findings.

Chapter 11 - Summary and conclusions

Following a literature review encompassing the topics of ICT4D, development studies and evaluation, we identified knowledge gaps relating to evaluations of ICT4D initiatives from a development perspective. After unsuccessful attempts at finding an existing framework from the ICT4D literature on which to build, we set out to design a new approach, consisting of a model, informed by the CA and designed to understand the relationship between ICT, capabilities, empowerment and sustainability and a framework on how to go about studying initiatives of this nature. The framework and model were tested at iREACH, an ICT4D project in Cambodia. In concluding, we first reflect on the study results and then consider limitations and strengths of the methodology. Next we summarise the review of literature and deal with the relevance of the model and the suitability of the framework. The chapter then refers to how the research question was addressed, how this study contributes to knowledge, the significance of the research and concludes with recommendations for further study.

11.1 Reflections on study results

In this section we provide a brief overview, revisiting the main outcomes of the field research, considering whether and how it has illuminated the relationship between iREACH and the three constructs. Although far from perfect in meeting the information and communication requirements of villagers, iREACH was still an attractive proposition for them and the research revealed indications beyond reasonable doubt that, perceived by many as an icon of the modern world, it had opened many possibilities in areas related to capabilities, empowerment and sustainability. It has mainly done this by removing obstacles for individuals, families and communities who might not otherwise have had the opportunity to familiarise themselves with ICT and its potential for improving livelihoods. Perhaps the most striking finding was the dynamics between the three constructs. Using Menou's analogy (1999) that '*impact is the collision of two bodies and their resulting alteration*' (p.206), the research found that iREACH would at least have made a dent on the communities, at the same time as villagers shaped the way iREACH operated, both formally through the management committees and informally. Such mutual shaping, as mentioned in section 4.3.1, accords with the structuration and social shaping of technology perspectives. The findings reveal the diverse ways in which iREACH made effective contributions to socio-economic development, improvements in quality of life and well-being, with the reciprocal linkages between the CES constructs being of particular importance:

- **Capabilities:** Just like a bicycle is only instrumentally of consequence as long as it can expand capabilities (Robeyns, 2005), so it is with ICT and ICT4D projects. At iREACH, the greatest change in capabilities was in the ICT field, where most villagers went from knowing nothing about computers and the Internet to a situation where many, but by no means everyone, had at least a rudimentary knowledge of how to use these and of the benefits associated with different applications. It also emerged, both from teachers and parents, that iREACH had inspired and motivated several children and older students to take a greater interest in their studies. The capabilities of being healthy, expanded through more knowledge about disease-prevention measures, also appeared to have an economic impact in the form of reduced medical expenses. The key thing about capabilities in the different spheres, including innovation and cultural heritage, is that they enabled those villagers who converted these capabilities into functionings to take actions and make decisions they were previously unable or hesitant to do, thereby creating a link with empowerment.
- **Empowerment:** iREACH made considerable contributions in the domain of gender empowerment, exemplified in how women had started asserting themselves in defending their rights. Community lifestyles changed somewhat, in part by iREACH offering a community space that villagers could attend “legitimately”, without incurring any expenses. While a community space does not have a direct association with ICT, it is difficult to imagine a different type of venue offering the diversity of opportunities to socialise, whether dropping in for a chat, obtaining information or participating in structured activities. Spending less time at home emerged in the 2010 study as a contributing factor to reduced domestic violence. One indication of the positive social capital generated by iREACH’s presence was the high level of volunteering. While some villagers had challenged the more powerful in their communities, ICT services were not deployed for improved governance.
- **Sustainability:** farmers and livestock owners acquired information on market pricing and new techniques, which some had acted on, particularly in the 2010 study, but market price information was of limited utility. As many new methods were organic, thereby of a dematerialising nature, the gains in agriculture yields were not at the expense of longer-term sustainability. By encouraging crop diversification, iREACH also facilitated improved nutrition. Informants overwhelmingly acknowledged iREACH’s contribution to agriculture, but there were no signs of any material

outcomes on non-farm diversification, whether employment or entrepreneurial activities.

Knowledge was a common theme at the centre of and a link between the three constructs. It seemed to have been created from access to information when this was '*combined with experiences, context, interpretation and reflection so that it can be applied to actions based upon human decision-making*' (Unwin, 2009, p.21). The local production of much of the content was an important element in this process and, as suggested by Day & Greenwood (2009), the creation and distribution of such material can '*...initiate a positive spiral of continuous development and use of new knowledge and innovation to benefit the rural economy and society*' (p.342).

The study produced considerable evidence to suggest that iREACH had created conditions that enabled villagers to appropriate its services to suit their economic, social and cultural needs, thereby enriching individuals and enabling them to broaden their outlook on matters of personal, community and global concerns. The changes facilitated by iREACH were of a gradual, rather than transformational nature. While releasing new aspirations and yielding sizable outcomes, it did not fundamentally change communities or the structure of development. It appeared that the influence of iREACH was strengthened by involvement from supporting micro-level (commune councils) and meso-level (other NGOs) organisations and by the fact that its activities reflected emergent interests among users, interests that might have been dormant, waiting to embrace an opportunity such as iREACH.

Participants in most groups, particularly in 2010, agreed that iREACH had made strong strides toward improving the capability of villagers to make meaningful choices, generated enthusiasm in the communities and that it was useful in enhancing local development capacity. Seen from a CA perspective, iREACH had removed at least some roadblocks that prevented the expansion of important capabilities. It might well be the freedom to achieve that villagers valued most and that permeated so much of the discussions, expressed in terms such as '*the ability to use ICT*' and '*access to so much information*'. The anticipated, or hoped for, greater emphasis on socioeconomic impacts from a "development" perspective, did not emerge as spontaneously as the ICT related responses. This could reflect what participants thought the researchers wanted to hear, as they perceived iREACH as an ICT project, but it could also stem from their genuine perception of iREACH's greatest value. Or maybe any such link was still tenuous, and might appear stronger in future research waves, just as it did in 2010 when the initial overwhelming focus on using computers in 2009, gave way to a more widespread realisation that iREACH could be used for other things. This was the most distinct difference

between the two studies and could be an indication that we were witnessing a virtuous spiral, which could lead to other interrelated benefits of informational and strategic importance in the lives of villagers.

Whereas “conventional” evaluation approaches would probably classify the use of computers as “outcomes”, rather than “impacts”, the expressions relating to ICT use could actually imply some form of impact, from a CA perspective (i.e. iREACH’s impact was the removal of informational roadblocks), thus being an important element in a new state of freedom. While other organisations provided services leading to valued functionings, they may not necessarily have enabled freedoms in the way iREACH did. Conversely, many users of iREACH had not necessarily used their new ICT and information related capabilities to influence their functionings (i.e. they had not used their freedoms to improve their livelihoods) but may value the opportunities available to do so.

Another salient research finding was the insignificant attention to what might be considered “traditional” measures of development, such as income and personal belongings (e.g. motorised vehicles). Spanning several topics in the FGs and survey responses, there was a strong focus on the three constructs: capabilities (learning to use ICT, increase knowledge), empowerment (removal of some gender barriers, cooperation within and between villages) and sustainability (organic and other farming methods). It was the reciprocal relationship between technology, people and their activities that facilitated the educational, social and development factors underpinning progress towards the CES, reflecting that iREACH was not primarily a technological system, but rather a system of interaction between the technological and social environments.

Despite attempts at eliciting comments about adverse unintended outcomes (e.g. by posing questions relating to iREACH’s impact on families and equality), most responses turned out in iREACH’s favour. The failure to achieve some of its objectives (e.g. policy influence and new enterprises) should not detract from iREACH’s achievements and underscores the usefulness of both summative and formative evaluations.

From a policy perspective, these findings could be relevant, not only for ICT4D initiatives, but as a guide for more general anti-poverty policies. They give credence to what Sen has articulated that development should be about — expanding capabilities. Rather than seeking to justify ICT4D interventions by reference to utility maximisation, yield, income increases and/or any other economic factors, the justification could be contingent on interventions providing the type of opportunities leading to enhancements in CES. In such an approach, it would become less pertinent to look for a chain of causality from intervention to improvements in economic

indicators, which in any case are difficult to attribute to inputs by a particular organisation. By focussing on how multiple factors interacted to produce certain outcomes, iREACH emerged as an institution offering freedoms to acquire capabilities that can remove barriers to empowerment and improve sustainability.

But what if there were no confluence between the capabilities villagers valued and outcomes expected by donor communities? This question is worthy of further investigation, together with how to mitigate this risk and/or mediate between conflicting interests. Another policy challenge would be to resource initiatives of this nature in a cost-effective manner. With a price tag of USD 1.3 million, it can be argued that the outcomes could have been satisfied more cost-effectively in other ways, but exploring this aspect was beyond the scope of this thesis. Pilot projects are inherently expensive, with limited economies of scale to dilute overheads over a mass market. While it might be tempting to save on staff, the human resources were instrumental in complementing the physical infrastructure, both in the form of the CFs, who mediated use of the technologies and the content developers who prepared useful material.

The importance of staff reinforced that iREACH is not about technology alone, but technology was significant, whether it was there, as in the case of the computers and intermittent Internet connections, or whether it was lacking, as the promised, but undelivered community radio. But the technology choice is not only a technological one. It is difficult to imagine results of the nature presented in this study, had the investments been made in mobile infrastructure, in the form of individualised handsets. But to be viable, projects such as iREACH must take concrete steps to link in with the macro-policy environment for funding and for the development of applications that would make them even more useful. In addition to the difficulties of finding a pathway to the macro-level, a key question is how to deal with policy challenges arising from findings such as those presented in this study, in an environment where hard figures might be expected. A first step could be to place CES at, or at least near, the centre of an ICT policy development process, which would require concerted efforts in terms of building enduring partnerships at the micro- meso- and macro levels. Benefits generated by this initiative could be of a short term and localised nature, unless it becomes viable and its experiences are communicated. In addition to the potentially detrimental effect of closing down such projects, there is also the issue of lost experience if policymakers fail to learn from them. Both iREACH's survival and learning from its experiences would require interventions at the macro level, without which a downward spiral might take hold.

Whereas government policies affected iREACH from its inception, influences in the reverse direction were a recent phenomenon in the form of another Cambodian ICT4D scheme initiated

by the Ministry of Agriculture and the National ICT Development Authority, funded by the Asian Development Bank. An investment of USD 3.6 million to establish 20 pilot telecentres in three different provinces (Dyer, 2010) was initially planned without any reference to iREACH. However, following concerted efforts by iREACH, some of the partners in this new initiative became interested in learning from iREACH and following field visits to its pilot sites, may change their design, if the project proceeds. In this process, the reports of field research covered in this study were distributed to relevant parties.

11.2 Limitations and strengths of the research methodology

Methodological limitations are associated with data we collected and data not collected. These limitations reflect the resource constraints, which also turned out to be beneficial, by testing what was possible to achieve with a limited budget, thereby developing a tool that local communities could adopt for their own research. As indicated in section 6.2, the study is not representative, making it necessary to proceed with caution in making claims and refrain from implying causality. Neither is it fully interpretive, as it does not incorporate sufficient in-depth description and analysis. Many nuances may have been lost through reliance on simultaneous translation, rather than arranging for recording, transcription and translation of FG discussions. There are some holes in the data (e.g. not all groups or survey respondents addressed all questions and this might prevent the painting of a fuller picture). The dependence on local iREACH staff to arrange FGs, interpret and translate could be seen as both a methodological weakness due to potential bias and a strength in that it contributed to their capacity building and a dialogue with participants. In an attempt to complement the indirect and proxy measures from the study, such as perceptions, with hard facts, the plan called for the establishment of a data system for collection of information related to indicators identified in the FGs (see 7.4.6). However, there was no support for this extra workload and it would be neither feasible, nor appropriate for an outsider to establish a system not grounded in communities.

While it might have been possible to understand other factors that could have contributed to changes and spurious relationships through a counterfactual study, we did not attempt to address what the outcomes might have been in the absence of iREACH. Significant resources would have been required for a control group to compare communities within iREACH's coverage areas with other villages. It would not have been appropriate to treat non-users of iREACH as a control group, as there was no discrete demarcation between users and non-users (e.g. narrowcasts reached both categories). Furthermore, the relevance of control groups is questionable in studies dealing with perceptions, rather than facts. Had the study incorporated indicators and had it been possible to find similar villages, in terms of leadership and other

agencies operating there, a control group might have strengthened the case. However, it is intended that the framework be deployed by project staff on their own and iREACH, or any project of this nature, is unlikely to have resources for such studies.

Finally, there could have been limitations with respect to who we listened to, echoing the concern expressed by Moore, Choudhary & Singh (1998), that it is doubtful that the voices we heard were those of the '*sick, old, disabled, addicted, shy, shunned or inarticulate*' (p. 8). In retrospect, more attention should have been paid to this issue.

The engagement with practice is a key strength, particularly the collaboration with local staff in the fieldwork. Drawing comparisons and contrasts between iREACH and other projects by intermeshing experiences from other studies into this research has strengthened the understanding of the contextual issues.

The field research gave insights into iREACH's contributions and served its purposes as an illustration of the conceptual model and an empirical test of the framework. Without a pragmatic approach to research methodologies, it is unlikely that this research could have taken place, as it would have made the study prohibitively expensive. There is limited value in applying costly methodologies for testing a framework designed to be useful in situations with resource constraints. Representing a compromise between a methodologically perfect study and methods that are useful for local staff, this work complements existing literature.

11.3 Literature review

Drawing on the growing ICT4D literature, section 3.1 illustrated the different strands in the wide body of work about ICT4D and the range of perspectives and priorities brought to this interdisciplinary topic from diverse fields. Academic literature represents only one component of this field of study, with much of the research on impacts in other publications, produced by or for funding agencies, with the wheel constantly re-invented, wasting valuable resources (IICD, 2007). Despite many vibrant ICT4D initiatives still in place and great strides made by such projects in achieving positive development outcomes, the process of understanding the circumstances under which this occurs is still in transition. The fragmented nature of evaluation efforts, with a diversity of methodologies and conceptual frameworks conducted over various timeframes in different cultures at different levels of society, has not adequately filled the knowledge vacuum. Evidence from various interventions rests on broad claims rather than on demonstrated and testable links between ICT and development or are too contextual to be useful for framing policy or building theory.

Further insights into the contributions made by ICT would require more in-depth research as well as synthesis and analysis of existing research. So how does one balance the need for micro-level research that can uncover specific processes, structures, contexts and impacts, with the desirability of some form of generalisation, so as to avoid falling into what might be a trap of arguing that everything is different? The process could start with a conceptual model into which data from diverse experiences could feed, but the literature review did not give much guidance on the features of such a model. The design of the CESVS model and associated framework is an attempt to fill this gap.

11.4 Relevance of the CESVS framework and model

The contribution of this thesis does not primarily stem from the field research findings, which in several ways resonate with what other researchers have found, but rather from the conceptual model and research framework as well as the combination of these. Both the model and the research framework are also useful on a standalone basis as well as in conjunction with other conceptual frameworks (e.g. those covered in chapter 4) and other methodologies (e.g. those discussed in section 6.1).

11.4.1 CESVS model

The CESVS model, introduced in chapter 5, formed the underlying structure for coding and analysing data, reporting findings and understanding interactions between the constructs of the model. Its central tenet is the reinforcing relationships between ICT and the three constructs in the model: capabilities, empowerment and sustainability, as well as between the three constructs, in their interactions with ICT. One crucial feature was the convergence and almost seamless interconnectedness between the three constructs that shaped and influenced each other. This made it difficult to get out of a circular reasoning and identify a causal chain with a starting point from which to begin a theory, in that everything seemed to relate to everything else. This interrelationship between the constructs made the model at the same time useful and challenging to apply. For example, in order for women to empower themselves, they required knowledge, but the process of acquiring knowledge was also part of the empowerment process and both knowledge and empowerment enabled them to take action to improve sustainability. This brings to the fore the issue of causality, which is avoided in this study because of difficulty of proof and in any case is not required for theory in the social sciences, for which terms such as “associated and linked with”, rather than “caused by”, are sufficient for describing relationships (Gregor, 2006). In these relationships, knowledge stood out as both a driving force and an outcome of processes that had been ignited by iREACH.

Here a distinction between ICT in general and the iREACH project must be made, in that the former would not necessarily have provided an environment conducive to fostering knowledge, whether in the form of individually owned mobile phones or inadequately designed telecentres. So how useful is this model then for building valid knowledge claims about the impact of ICT? The systematic way of analysing the contribution of ICT initiatives, from the perspective of the three constructs, helped with giving an insight into the interplay between different factors, how benefits of ICT can be realised and could be useful in explaining key differences between different types of ICT implementations. Populating the CESVS model with experiences from iREACH demonstrated its usefulness in increasing understanding of the dynamics in the benefits realisation process of one ICT4D initiative.

However, as the model could not be fully developed in this thesis (e.g. no indicators were agreed or monitored), its full capacity could not be observed. To do so, would require trialling it in other places and over a longer period at iREACH. Building on the exploratory insights generated so far and with further validation and incorporation of findings from other projects, the model's coherent and systematic approach to building knowledge would lend itself to evolving into an embryo of a mid-range theory, a moderately abstract theory with limited scope, but one that can lead to hypotheses that can be tested and which is particularly relevant for practice disciplines (Merton, 1968). With its focus on factors that matter for development, it is also useful for standalone evaluations.

The model addresses Heeks' (2009) concerns about techno-centric approaches to ICT4D, dominated by an informatics worldview, by paying attention to broader social, political and economic structures that frame the way in which people can benefit from a project such as iREACH. As a testable proposition, it is worthy of resources required for its further elaboration.

11.4.2 CESVS framework

With respect to the CESVS framework, presented in section 5.2, the research process allows us to draw some conclusions concerning the use of the forward looking longitudinal horizon, attention to the micro-, meso- and macro-environments and the participatory approach. Covering only two research waves, it was nevertheless possible to discern an evolution in the appreciation of the potential of iREACH to facilitate movement along the virtuous spiral; the excitement and curiosity about ICT in the initial research, fading somewhat and giving way to greater emphasis on what it could be used for, an insight requiring a longitudinal perspective. In terms of the micro-macro relationships, the study touched upon the importance of the tiers interacting in a constructive manner. In addition to its inclusive potential, enabling participants

to articulate their views, we found the usefulness of the participatory approach lies in its ability to identify unforeseen outcomes and indicate fundamental concepts that are useful as starting points for determining criteria to be subject to more rigorous analysis.

The framework also has its drawbacks, foremost its time-consuming nature. Analysing qualitative data from one research wave is challenging in itself and comparing longitudinal qualitative data requires more than twice the time, allowing time for the comparisons as well as the data analysis. There is potential for facilitating this process by applying pre-determined indicators derived from previous studies to subsequent ones. The intent is not to suggest the CESVS framework as a prescriptive approach but rather as a possible instrument that could be used and modified (e.g. in combination with other methodologies and models for ICT4D evaluations).

11.5 Answering the research question

Recapping the three research questions:

1. Is a conceptual model exploring how an ICT4D initiative contributes to capabilities, empowerment and sustainability of practical use for the project being evaluated, for policy formulation and for designing future ICT4D projects?
2. What are the characteristics of a research framework that could answer the first research question?
3. Can structuring a meta-analysis of existing ICT4D research into capabilities, empowerment and sustainability be useful in advancing knowledge about impacts of ICT4D initiatives?

Through a disciplined enquiry, using field research in combination with synthesis of research from other projects, this study has supplied evidence and logical arguments in building a case to suggest the merits of both the model and the framework. We showed how each of the constructs played a central role, often reinforcing each other, in assisting villagers with their aspirations and with matters they might not have aspired to, but found valuable. The model made sense of the results and prevented the study from drifting, but nevertheless unveiled unexpected outcomes, which were incorporated into the model to the extent possible by broadening the definition of the constructs.

While the research findings are credible, the time and geographic limits of the study render the conclusions provisional and not generalisable, but they can serve as a guide to further research. Similar information from other settings could provide a solid empirical base to

improve the theoretical understanding of the model. The combined model and framework provide a firm basis on which to claim a contribution to knowledge.

11.6 Contribution to knowledge

This study has contributed to knowledge in several areas, by:

- A. Producing and testing a model for summative evaluations of ICT4D initiatives informed by the development discourse and a research framework for evaluations, based on a longitudinal perspective that considers the micro-, meso- and macro-environments. This substantive contribution has filled gaps identified in section 3.4, namely the lack of theoretical underpinnings from the development discourse in the ICT4D field of study and poor representation of the longitudinal and combined micro-, meso- and macro perspectives.
- B. Demonstrating the importance of integrating the micro-meso-macro dimensions for policy and practice and incorporating equity considerations. This research has advanced the understanding of the interdependencies between the three levels for achieving desired outcomes. It goes some way in addressing Avgerou's (2010) call for theory that can address links between socio-political context and ICT innovation, thereby better understanding how ICT can contribute to improving the livelihoods of those most in need of such improvements.
- C. Generating new plausible and credible and insights into the interplay between ICT and the three constructs, thereby improving the understanding of whether and how a particular initiative can contribute to the ability of people to lead lives they value and have reason to value. In so doing, this work points to a possible multidimensional and dynamic model that could address the lack of coherent conceptual frameworks or underlying analytic schema for ICT4D evaluations.
- D. Progressing the operationalisation of the CA, through a focussed perspective in the form of classification into a typology encapsulating central aspects of the CA. To our knowledge, this is an innovative way of operationalising the CA, thereby contributing to the literature on the CA in general.
- E. Producing empirical knowledge surrounding the developmental impacts of a particular ICT project, thereby adding to the body of knowledge on shared access facilities and ICT in Cambodia.
- F. Adding to the field of evaluation methodologies. The power of the approach is that, in assimilating empirical data, it can be adapted to reflect the environment in which it is used (e.g. by analysing dependent variables that are valued).

11.7 Significance and implications for practice

As an evidence-based process that can feed into a policy-setting process, the application of the model and framework can provide a basis for optimising policies and interventions and avoiding mistaken priorities. From both research undertaken by others and the iREACH field study, it emerged that carefully designed ICT4D initiatives can significantly contribute to CES, thereby deserving a central role in development strategies. To maintain this status, it is necessary to continuously engage in evaluations to avoid ICT becoming a passing fad, where it is found useful, or consuming more resources that can be justified by the benefits it delivers, where it has been less useful. While implementation strategies must be contextual, experiences from other projects can nevertheless be of benefit to existing and new projects and avoid pitfalls.

The type of knowledge able to be generated through the CESVS framework would enhance decision-making capabilities through its effectiveness in gaining an understanding of how ICT can affect the lives of people. What makes the CESVS model suitable for practical use is the way it enables the accumulation and consolidation of unstructured data into a systematic framework through its focus on the three constructs and their interrelatedness. Such systematic knowledge generation, focussing on outcomes, contributions and impacts, has not sufficiently informed debates on ICT policies. More knowledge about the interplay between ICT and CES can help in the efforts of extending the benefits of ICT beyond those who have their own resources and capabilities to enjoy the fruits of these technologies. Better insights into how people experience ICT in their everyday life can provide inputs into defining adequate policies and strategies. The framework could also be useful in studying non-intentional ICT4D, such as the general expansion of mobile phones and then compare the results to understand how different types of ICT may affect outcomes. The model and framework could have significant appeal beyond ICT interventions for local communities, funders and policy-makers by providing input into policy formulation and for identifying capabilities that are useful from a development perspective.

The wider applicability of the model would depend on the cultural-social framework (e.g. political, social, legislative, institutional systems as well as ethnic and religious values). However, as it centres on individuals and communities formulating their own priorities, it is envisaged that it would have broad appeal and find relevance in diverse cultures, but the actual capabilities valued and results for the other constructs might differ. If this potential can be realised, this work has significance beyond the local project level.

It is intended that a simplified version of this framework be prepared and handed over to iREACH to enable project participants to continue the evaluation process. The current version

would be too time-consuming to be practical without external support and a useful assessment method must achieve an appropriate balance between simplicity and relevance. That version will involve a renewed attempt at incorporating indicators.

In the meantime, this research itself has contributed to capacity building of staff and volunteers involved in conducting the research, been helpful in identifying ways in which iREACH can improve its services and provided input to potential sponsors. Its significance extends to the identification of a research agenda.

11.8 Where to next — a research agenda

The limitations of this research also point to future work that, with access to greater resources, could improve understanding of shared facilities designed to achieve development objectives, particularly how they compare with standalone ICTs, such as mobiles, whether for private or shared use. In this section we propose three distinct, but related areas of further research, which, taken together can help policy-makers and practitioners promote better use of ICT. While the suggestions in this section address ICT in developing countries, they might also be applicable to developed nations, including the CESVS model and framework.

11.8.1 Further development of the CESVS model and framework

Further work on both the framework and the model is required to test them in different socio-cultural contexts, as the norms and values of a society may significantly influence outcomes. A continuation of the longitudinal evaluation process of iREACH would also be valuable, particularly to study what happens to achievements when initial funding runs out, an under-research field of study.

11.8.2 Clearinghouse for ICT4D research

By synthesising knowledge from different studies, as has been attempted to a limited degree in this thesis, it would be possible to add to the collective understanding of what works, where and why, by categorising the current state of what is known about projects in different circumstances. Knowledge accumulated in a systematic manner can be useful for both theory building and practice. The usefulness of consolidating a critical mass of empirical evidence into a more complete taxonomy would justify the resources for such an endeavour. In such a process, anomalies between different studies could also be addressed (e.g. among the multiple studies dealing with the Gyandoot project). New experiences added on an on-going basis to such a body of knowledge in a systematic way, rather than through ad hoc, fragmented studies,

would address the quest for understanding how ICT can contribute to desirable outcomes. Such a database would be a useful tool for anyone designing a new project, as this information source could be used to assess the probability of “fit” between different design principles and the context of the project.

Information in such a database could populate a model akin to the CESVS, thereby enhancing understanding of and the precision with which ICT can deliver benefits in an equitable manner. The role of cultural, institutional and other factors influencing project outcomes could emerge from analysis of raw data archived in this manner. Further research of a systematic nature would strengthen knowledge of the impacts of different methods of implementing ICT and provide some form of cohesion in the fragmented ICT4D discipline.

If funding for projects such as iREACH cease prior to evidence from proper evaluations is available, more than a decade of experience might be lost. Whether or not they deserve further investments should be determined through systematic evaluations, including indicators and possibly “control” communities.

When ICT4D research was still in its infancy, Menou (1999) commented that this research area is:

‘so complex that no one could seriously hope to make a breakthrough on his/her own, even with the most impressive support and funding, which anyway are mere wishful thinking these days. It is rather through the patient accumulation of piecemeal specific evidence gathered in a variety of "spaces" that one can expect to progress step by step toward a better understanding of what the Internet is changing in people's life. To that end however the studies should be reasonably coherent’ (p. 214-215).

Recommending how this could be implemented, Menou included an inventory of related research groups, a clearinghouse to facilitate access to research results, reconciling the various models and frameworks, building and maintaining a research agenda and facilitating interaction among research groups, the sector and user organisations to develop combined comparative studies. Almost ten years later, McNamara (2008), in addition to recommending more case studies, called for examples collected and compared across different geographical areas and institutional contexts and more meta-evaluations for updating the global knowledge base on suitable methodologies for livelihood-oriented ICT evaluation. We add to the above recommendations, that the clearinghouse should also contain a database of initiatives seeking assistance with evaluations and of researchers looking for projects to evaluate. This would benefit the projects, as well as facilitate the task of finding suitable field research sites, thereby

contributing to practice, knowledge, research capacity in developing countries and collaboration between research centres, policy makers, funders and practitioners. A proper knowledge management system (KMS), operating on the principles and procedures of “open data” and “open access” would make this information accessible, addressing the need for more sharing of information and collaboration through user-friendly sources (Unwin, 2009). It would address the irony that a field of study dealing with ICT and through it, knowledge creation and dissemination, has not yet produced a satisfactory KMS for its own activities in a manner that would establish a symbiotic relationship between various parties with an interest in this area. Such a KMS would facilitate acquisition and dissemination of raw research data, including cost related information, which is in even shorter supply, but necessary.

The WSIS stocktaking database (<http://groups.itu.int/Default.aspx?tabid=740>) was intended to partially fulfil a similar role, but it has in general not been kept up to date, particularly not with the type of data required for research of this nature, but this database could provide the foundation for a clearinghouse incorporating primary research data.

11.8.3 Cost-benefit analysis

The work in this thesis represents only one, partial, side of the equation required for justifying investments in projects that can provide pathways from ICTs to CES. While this study was not designed to quantify any outcomes, developing the model to do that would be a worthwhile challenge. It would have to be a dynamic model, incorporating assumptions on how to measure and allocate benefits to the ICT4D initiative, taking into account other organisations providing development-oriented services in a study area.

The other side of a cost-benefit analysis (i.e. costing) was also beyond the scope of this study and as discussed in section 3.1.7.2 it is an under-studied field of ICT4D research. The challenge arises when allocating total costs to different benefits. Again, this would require dynamic modelling with various assumptions, just as cost allocation in general in situations of shared and joint costs.

The output of the model could be in the form of annual costs per unit of benefit, however defined and represent some form of social return on investment (e.g. based on triple-bottom-line reporting (social, environmental and economic)), signalling to potential sponsors the expected net benefits of investments in a particular project. Hobbled by lack of financial viability, telecentres might then justify their value from an established framework, rather than by ad hoc studies. Making use of a database, as recommended above, could provide sufficient data for cost and benefit comparisons in different environments and deployment practices. Evidence-based

cost-benefit analyses could thus influence whether initiatives such as iREACH remain interesting niche operators, let alone survive, or whether they deserve a more transformative role on a wider scale. Comparisons would be more meaningful from a sustainability perspective with the addition of life cycle assessments and/or life cycle costing of different approaches (Streicher-Porte, et al., 2009; Unwin, 2009).

With a critical mass of focussed research around a common framework, including cost-benefit analysis, it might be possible to develop a model with some predictive properties to increase the likelihood of success, enabling ICT4D research to make a quantitative and qualitative leap. The ICT4D community could work constructively on a framework and associated database infrastructure to produce models of theoretical and practical use and, subject to finding that shared facilities can deliver positive net benefits, confront the challenge of donor disillusionment and enable funding institutions to treat initiatives such as iREACH as a legitimate domain for support.

11.9 Concluding remarks

This thesis set out to develop and test a framework for understanding whether, how and under what circumstances ICT can contribute to development. The result is the capability, empowerment and sustainability virtuous spiral model and a research framework, characterised by a forward-looking longitudinal perspective, exploring the interaction between micro-, meso-, and macro-levels. Informed by the capability approach, the framework represents a new way of operationalising this multi-purpose normative framework that prioritises freedom and capabilities for development.

The framework was tested in field research at an ICT4D initiative, iREACH, in Cambodia. Having listened to different voices in villages where the research took place and systematically analysed what they had to say, the framework was found to be useful in gaining insights into links between ICT4D and various domains of development (e.g. capabilities, empowerment and sustainability).

The framework and the research findings are also timely in light of the increasing realisation of ICTs potential contribution to climate change adaptation and mitigation. Telecentres may carve out a role in this process, e.g. as places for learning about environmentally friendly farming methods and as collection points for data on environmental indicators.

Should the framework be further developed, it could take ICT4D project evaluation to a new level of systematic analysis, generating the knowledge required to pave the way toward realising the potential of ICT to benefit the most marginalised populations and play a constructive part in

addressing issues facing them and the wider community through climate change. The next step in operationalising the methodology would require a more formal structure as well as more attention to tools, e.g. indicators.

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List of acronyms

3G	Third generation cellular wireless standard
4G	Fourth generation cellular wireless standard
ANT	Actor network theory
BOP	Bottom of the pyramid
CA	Capability approach
CES	Capabilities, empowerment and sustainability
CESVS	Capabilities, empowerment and sustainability virtuous spiral
CF	Community facilitators (managing iREACH hubs)
CI	Community informatics
CR	Community Radio
CSD	Center for Social Development (NGO in Cambodia)
CSUK	Chea Sim University of Kamchaymear
DFID	Department for International Development (UK)
DOI	Diffusion of innovation theory
DOTForce	Digital Opportunities Task Force
FAO	Food and Agriculture Organization of the United Nations
FDI	Foreign direct investment
G8	Group of 8 countries: France, United States, United Kingdom, Russia, Germany, Japan, Italy and Canada
GDP	Gross domestic product
GEM	Gender evaluation methodology
GIS	Geographic information system
GSM	Global system for mobile communications, the most common standard for mobile telephony systems
HDI	Human development index
HDR	Human development report
HQ	Headquarters
ICT	Information and communication technologies
ICT4D	Information and communication technologies for development
IDI	ICT development index
IDRC	International Development Research Centre
IICD	International Institute for Communication and Development

IMF	International Monetary Fund
iREACH	Informatics for rural empowerment and community health
IT	Information technology
ITU	International Telecommunication Union
KCM	Kamchay Mear. The location of one of iREACH's pilot studies
KIS	Knowledge information system
KMS	Knowledge management system
LDC	Least developed countries
LFA	Logical framework analysis
MDG	Millennium Development Goals
MFI	Microfinance institution
MMSRF	M.S. Swaminathan Research Foundation
NGO	Non-government organisation
OECD	Organisation for Economic Co-operation and Development
OLPC	One laptop per child
OM	Outcome mapping
PCO	Public call office
PLA	Participatory learning and action
OLPC	One laptop per child
PP	Phnom Penh
PRA	Participatory rural appraisal
SC	Social capital
SLA	Sustainable livelihoods approach
SME	Small and medium enterprises
SMS	Short message service
SPEAK	Strategic planning, evaluation and knowledge system
SSM	Soft system methodology
SROI	Social return on investment
TAI	Technology achievement index
TCO	Total cost of ownership
TAM	Technology acceptance model
TRA	Theory of reasoned action
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme

UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICT	United Nations ICT Task Force
VKC	Village knowledge centre
VoIP	Voice over Internet Protocol
WSIS	World Summit on the Information Society

Appendix A – Map of Cambodia showing iREACH pilot sites



Figure 5. Map of Cambodia showing iREACH pilot sites
(Prepared by the iREACH team and published in Unger, B., Huor, C. & Grunfeld, H., 2010).

Appendix B – Summary of some ICT4D initiatives cited in the text

Aguablanca Telecentre

Location: urban area in Cali, Colombia.

Description: pilot established to explore whether democratisation of ICT can foster sustainable development.

References: Parkinson & Lauzon, (2008), Parkinson & Ramirez (2006).

Akshaya

Location: Kerala, India. In October 2009 there were 2,670 centres across the 14 districts of Kerala.

Description: information centres initiated by the Kerala government, offering ICT training and access.

References: De' (2006), Gurusurthy, Singh & Kasinathan, (2005), Kuriyan, Ray & Toyama (2008), Madon (2004), Rajalekshmi (2007).

Bhoomi

Location: Karnataka, India.

Description: built around computerised land record system with kiosks at sub-district levels (taluks) - multiservice rural business centres. Initiated by the Karnataka government.

References: De' (2006), Lobo & Balakrishnan (2002); Prakash & De' (2007), Garai & Shadrach (2006).

eChoupal

Location: Across India.

Description: initiated by the international business division of the Indian conglomerate, India Tobacco Company as a supply chain instrument.

References: Annamalai & Rao (2003), Bowonder, Gupta & Singh (2003), Garai & Shadrach (2006), Kumar (2004), Prahalad (2005).

e-SEVA

Location: urban areas in Hyderabad-Secunderabad, Andhra Pradesh, India.

Description: designed for centralising utility bill payments and later expanded to include other services.

References: De' (2006), Harris (2006).

FRIENDS (fast, reliable, instant, effective network for disbursement of services)

Location: Kerala, India.

Description: service delivery platform implemented by Kerala's IT department.

References: Harris & Rajora (2006), Madon (2004).

Grameenphone

Location: across Bangladesh, particularly in rural areas. It has since been extended to other countries, particularly in East Africa, but the references below cover only Bangladesh.

Description: Partnership between several organisations, including private, to extend mobile services through shared access and more recently telecentre type facilities to rural areas previously lacking ICT infrastructure.

References: Aminuzzaman (2002), Bayes (2001), Bayes, von Braun, & Akhter (1999), Islam (2005), McNamara (2008), Richardson, Ramirez & Haq (2000).

Gyandoot

Location: rural Dhar district, Madhya Pradesh, India.

Description: e-government, service delivery portal, combined with kiosks located in villages.

References: CEC (2002), Cecchini & Raina (2004), De' (2006), Jafri, et al. (2002), Meera, Jhamtani & Rao (2004), Puri & Sahay (2007), Sreekumar (2007), Tiwari (2009).

InfoDes

Location: Cajamarca, Peru, in areas with lowest education levels.

Description: pilot project promoting local and rural development through ICT.

References: Dagron (2001), Phillip & Foote (2007), Hafkin (2002), Proenza, Bastidas-Buch & Montero (2001), Schilderman (2002), Talyarkhan, Grimshaw & Lowe, (2005).

Kudumbashree

Location: Kerala, India.

Description: a social ICT outsourcing project for poor women, undertaken under the auspices of the Kerala's Poverty Eradication Mission.

References: Heeks (2010b), Heeks & Arun (2010).

MS Swaminathan Research Foundation (MSSRF)

Location: rural villages, mainly in Tamil Nadu, India.

Description: Co-ordinates and supports village knowledge centres with a knowledge system for sustainable food security.

References: Arunachalam (2002), Conroy (2006), (Fillip & Foote (2007), Ofir & Kriel, (2004).

PeopleFirst (PFNet)

Location: throughout the Solomon Islands archipelago.

Description: established to provide information flows via email for rural people and for peace-keeping among remote and largely subsistence communities.

References: Chand, et al. (2005), Curtain (2004).

SARI (Sustainable Access in Rural India), Madurai district, Tamil Nadu, India.

Location: Madurai district, Tamil Nadu, India.

Description: kiosks connected via wireless, to provide e-government services to improve the quality of life among the rural poor by creating employment opportunities with the help of ICTs.

References: Aral, Escobari & Nishina (2001), Best & Kumar (2008), De' (2006), Kumar & Best (2006).

SchoolNet Namibia

Location: across Namibia.

Description: its mission: '*youth empowerment through the Internet*'. Main objective: to provide low-cost Internet solutions for all Namibian schools. It provided volunteer opportunities for youth from poor backgrounds.

Reference: Ballantyne (2004).

Appendix C - Capability approach applied to ICT4D – a few examples

Reference	Focus/case study	How CA is applied	Methodology Methods	Findings	Comments
Alampay, E. A. (2006c).	<p>Philippines - individual households in two separate areas: Carmona, an industrialising municipality at the fringe of Metro Manila and Puerto Princesa a city on the island of Palawan.</p> <p>Investigated capabilities of using ICT and functionings, i.e. whether people are able to access and use ICT. The latter is linked to the level of universal access. Also investigated what people do with their functionings, i.e. frequency and purpose of use.</p>	<p>Sen's concept of freedom, pertaining to choice was used to determine capabilities and opportunities to use ICT.</p> <p>Operationalisation of constructs: <u>Freedom</u>: people's preferences and perceived value of ICTs. <u>Realised functionings</u>: recent use of ICT <u>Unrealised functionings</u>: "unfreedom": comparison between perceived value and actual use.</p>	<p>One focus group and survey interviews by local researchers. Multi-stage cluster sampling was applied to select households. Interviewees in randomly selected households chosen purposively, alternating between fathers, mothers and other family members > 12 years. Disproportionate sampling for sufficient numbers in each subpopulation. 250 in each area.</p>	<p>Not everyone with access to ICT knew how to use all features. Better educated, younger and more affluent segments more capable of using ICTs. Higher proportions of women capable of using ICTs. Limitations of aggregate national statistics in presenting the state of ICT access. Lack of ownership does not prevent capabilities of using ICTs. Importance of social use contrasted with economic arguments.</p>	<p><u>Micro-Macro</u>: Basically a micro-study with reference to macro-policies. Recommendations relate to universal access policies.</p> <p><u>Timeframe</u>: No reference to when the study was conducted, but it was a snapshot.</p>
Barja, G. & Gigler, B-S. (2005).	<p>Proposed methodology: poverty line location approach to the measurement of ICT poverty, emphasising that ICT is a variable included in a group of interdependent variables related to poverty.</p>	<p>Sen's five freedoms used as informational base for measuring information poverty. Freedoms strengthen capabilities to participate in the information society; poverty represents lack of basic capabilities.</p>	<p>Defined information and communication capabilities corresponding to physical, human, social and economic assets.</p>	<p>There are no findings, as this is just a description of a framework informed by the CA, but the measuring approach has not been tested.</p>	<p><u>Micro-Macro</u>: Comparisons would be made between different locations in the same country, rather than between countries.</p> <p><u>Timeframe</u>: Not referred to.</p>
Byrne, E. & Sahay, S. (2007).	<p>Participatory design and development of a community-based</p>	<p>'Expansion of health care, education, social security, etc,</p>	<p>Interpretive case study. Action research.</p>	<p>Findings relate to processes, rather than health outcomes.</p>	<p><u>Micro-macro</u>: Although reference is made to the Department of</p>

	<p>child health information system in a rural area of South Africa.</p>	<p>contributes directly to the quality of life and to its flourishing' (Sen, 1999, p. 144).</p> <p>Informational base reflecting the connection between public expenditure on health care and poverty, e.g. if social benefits are to assist in alleviation of poverty, there is a need to have information on the criteria for the selection of those entitled to benefits.</p>	<p>Participatory approach to developing indicators. Collection and analysis processes were iterative, evolving and connected cyclically.</p>	<p>Community members viewed becoming part of the data flow and developing a community-level information flow as fundamental to their capacity to act.</p> <p>The link to the CA is related to the process for defining indicators, although this point was not made in the paper.</p>	<p>Health, this is primarily a micro study.</p> <p><u>Timeframe:</u> Recognises that ICT is not only about end products, but also process by which they come into being and are redefined over time.</p> <p>Design-evaluation 2002-Nov 2003.</p>
De', R. (2006)	<p>Seven Indian e-government projects, mainly delivered via kiosks, with special focus on the Bhoomi project in Karnataka.</p> <p>Examine the role of e-government systems in addressing needs of the marginal sections of India's society, particularly women and dalits.</p>	<p>Five Freedoms perspective. Political freedoms: did Bhoomi increase political participation? Economic facilities: did Bhoomi help users access economic resources such as credit, markets? Social opportunities: did Bhoomi improve access to education, health, justice, information? Transparency guarantees: did Bhoomi improve transparency of citizen dealings with government? Protective security: did Bhoomi protect against natural disasters?</p>	<p>Explored first- and second-order effects.</p> <p>The only information about methodology is: 'This discussion is based on primary data collected by the author and some secondary sources'.</p>	<p>Bhoomi's contribution to freedoms:</p> <p>Political: citizens not involved in design. Village accountant lost power. Economic facilities: marginal relevance for landless, poor farmers and women. Benefits for land speculators. Social opportunities: limited with no access to broader services. Transparency guarantees: limited reduction in corruption. Protective security: some improved access to insurance, but also loss of security for marginalised.</p>	<p><u>Micro-Macro:</u> Focus on micro-level: individual users</p> <p><u>Timeframe:</u> No information on when the study was conducted and limited reference to secondary data in text.</p> <p>No reference to capabilities in analysis – only in text, introducing the framework: '<i>freedoms enable and are enabled by capabilities</i>'.</p>

<p>Garnham, N. (1999).</p>	<p>Focus on inequality “of what” – a conceptual chapter, rather than field research.</p> <p>Deals with the concept of entitlements from a CA perspective.</p>	<p>CA provides theoretical framework for evaluating broadcasting and universal access policies.</p> <p>The CA moves away from the utilitarian metrics of money and pleasure toward ways of being and doing enabled by ICT and analysis of barriers preventing people from benefiting from the potential of ICT. Could justify positive discrimination to overcome barriers to equality.</p>	<p>No field research is involved. The chapter is a discussion of what policies would be appropriate from a CA perspective.</p>	<p>Concluded that it is distribution of social resources making access usable that is important, rather than access.</p> <p>From a CA perspective, there should be measures and indicators that reflect what people in practice can or cannot do with ICT services and benefits derived, rather than measures relating only to access and expenditure.</p>	<p><u>Micro-macro:</u> The paper deals mainly with macro-level policy issues, but seen from the perspective of the individual.</p> <p><u>Timeframe:</u> No reference to timeframe.</p>
<p>Gigler, B-S. (2008).</p>	<p>Case studies in Venezuela and Peru to explore under which conditions ICT can enhance the well-being of indigenous communities in Latin America.</p> <p>Importance of intermediaries addressed.</p>	<p>Alternative Evaluation Framework (AEF): CA in combination with the sustainable livelihoods framework into which Gigler introduces informational capital.</p> <p>The expansion of capabilities is defined as the strengthening of people’s capitals.</p> <p>Advantage of using CA is the emphasis on the ability of ICTs to improve the daily livelihoods.</p>	<p>Qualitative study, mainly descriptions of projects and events, with commentaries.</p>	<p>Relationship between ICT and enhanced well-being is dynamic and multi-dimensional, affected by technology and social context rather than direct and causal.</p> <p>Success of Venezuelan project partially attributed intermediary.</p> <p>Failure of the Peruvian project was to a large extent due to the community not having defined its own development priorities before embarking on the ICT project.</p>	<p><u>Micro-macro:</u> Refers to broader socio-political context of the countries and international level – e.g. through UN. At the regional level – identifies importance of coordination of activities. AEF is mainly applied to community level.</p> <p><u>Timeframe:</u> Describes historical developments over unknown period.</p>
<p>James, J. (2006).</p>	<p>Analyses two separate studies, one from an African telecentre and the Sri Lankan mixed technology</p>	<p>Contrasts traditional consumption theory with the ‘functioning’ approach, i.e. what happens at</p>	<p>Data from a 2000/01 IDRC survey on low telecentre usage and another study on the Sri Lankan Kothmale project.</p>	<p>Argued that the Kothmale model was more appropriate than the African telecentre model, as it included a</p>	<p><u>Micro-macro:</u> both case studies were at the micro-level and no references were made to any other levels.</p>

	project, Kothmale.	the point of purchase with what happens after the purchase.	Telecentre model is critiqued. Advocates ethnographic approach to understand impacts.	mix of technologies.	<u>Timeframe</u> : no reference was made to any of them being longitudinal.
Kleine, D. (2009).	<u>Chilecompra</u> : a public e-procurement system – compulsory for government procurement. <u>Red Comunitaria</u> , a network of telecentres offering free internet access and training. How empowerment, choice and ICT4D relate to small carpenters in a small village in Chile.	Focus on “development as freedom to choose”. Operationalisation based on Alsop & Heinsohn, 2005: focus on agency and empowerment. Choice→ →empowerment →development	In-depth expert interviews at the national, regional and local level. Two focus groups with public servants and micro-entrepreneurs at the local level. Ethnographic fieldwork - five months participant observation in shops, workshops, offices and at meetings between public services at regional and local levels.	Chilecompra increased transparency in government procurement, but excluded many micro-entrepreneurs who had not registered. Too complicated for them. Larger local enterprises had registered but found it difficult competing online with larger companies in the regional and national capitals. Telecentres improved digital inclusion.	<u>Micro-macro</u> : Both ICT policies at the national level and their impact on the most disadvantaged: micro-entrepreneurs in a rural town, were included. Also included interviews at regional level. <u>Timeframe</u> : 3 rounds: Jan–Mar 2005, Jul–Aug 2005 Feb–Mar 2006
Madon, S. (2004).	FRIENDS and Akshaya e-government projects in Kerala, India.	Used the CA as an evaluative space for assessments. Analysis of functionings enabled, what people do with opportunities and barriers to achieving functionings.	Interpretive case study with social constructivist lens. Semi-structured interviews with officials, local politicians, entrepreneurs, private sector employees and other citizens. Research instrument: set of issues, rather than fixed questions. Same people interviewed over time. Participant observations and secondary sources.	Usage evolved from IT literacy programmes and communication with family members to a wider range of applications, e.g. transaction services, e-government, bill payments and banking, dissemination of information in key sectors such as health and education. Gender empowerment: women had somewhere to go.	<u>Micro-Macro</u> : Focus on micro-level, but meso- and macro-level taken into account, as the project was e-government <u>Timeframe</u> : Longitudinal study over 15 months with 6-monthly intervals.
Mansell, R. (2006).	Used OLPC and similar initiatives to illustrate that ICT4D initiatives	Suggested Sen’s (1999) views on entitlements can be used to shift	Thematic analysis of the online moderated discussion:	Suggested that one way of ensuring greater participation of	This is not an evaluation of a specific project, but rather a critical

	are not necessarily the best means of responding to the entitlements of users.	the emphasis in ICT4D away from economic assessments towards focus on politics of any particular technology solution.	‘Measuring the Impact of Communication in Development Projects and Programs’, January–February 2005, hosted by DFID, the World Bank, IDRC, etc.	the poor in ICT4D would be to evaluate priorities in the light of entitlements as outlined in DAF.	analysis of ICT4D practices in general. <u>Micro-Macro:</u> includes elements of macro (policymakers) and micro (referring to greater participation of the poor).
Musa, P. F. (2006).	Develop modified technology acceptance model (TAM), which was validated by analysing survey data gathered in Kenya and Nigeria.	Used the CA to define a modified version of TAM. Added accessibility through appropriate technical infrastructure and extent of exposure to ICT. 2-way interaction between individual’s perception of socioeconomic environment and accessibility of technology to individuals.	Survey questionnaire and structural equation modelling to validate the revised TAM. 450 questionnaires distributed in Nigeria and 150 in Kenya to ‘agent organisations’. Response rate 33%.	Found statistically significant relationships between: perceived negative impact factors and perceptions of socio-economic environment, individual’s perception of socio-economic environment and accessibility of technology and perceived ease of use of technology and perceived usefulness.	<u>Micro-Macro:</u> Reference to importance of understanding processes that affect interactions between global, regional and local levels <u>Timeframe:</u> not indicated, but snapshot study Contrasted use of ICT for entertainment in Nigeria with use for human development applications, e.g. health.
Olatokun, W. M. (2009).	Analysis of socio-demographic differences in access and use of different types of ICTs in rural and urban communities in Nigeria.	Used Alampay’s framework for the capability approach. Separated analysis into capability of using and realised functionings translated into actual use.	Randomly selected survey (500) in two areas. Purposeful sampling within households, alternating between father, mother and others >12 years. Structured questionnaire. Chi-square analysis to determine significant factors affecting access and use of ICTs.	Found differences in capabilities of using different types of ICTs based on gender, education and location (urban vs. rural), age and income levels.	<u>Micro-Macro:</u> Macro referred to in the context of policy implications of the findings. <u>Timeframe:</u> Not mentioned when study was undertaken, but only one snapshot.
Thomas, J. J. & Parayil, G. (2008).	Links between the digital divide and larger social and economic divides. Akshaya in Kerala and Kuppam in	CA used to interpret empirical research results to answer how socio-economic differences in Kerala and AP affect capabilities	Stratified sample survey of 45 households for each of the projects.	Capabilities to use ICTs and convert information to useful knowledge higher among households in Kerala than AP. Higher proportion	<u>Micro-macro:</u> The three levels incorporated: central government policies, state policies and surveys at the micro-level

	Andhra Pradesh (AP).	to use ICTs and information provided by ICTs among rural populations of the two states.		of less educated users in Kerala. Conditions for agricultural growth: more favourable in Kerala→ greater demand for info on agriculture. Digital divide is part of a larger developmental problem in which the poor are deprived of capabilities to use ICTs, acquire and convert information into useful knowledge.	<u>Timeframe:</u> July–August 2004
Tiwari, M. (2008).	Impact of Gyandoot in Dhar District, Madhya Pradesh.	Conceptualisation of poverty based on the CA. Poverty reduction impacts considered both in terms of economic dimensions, such as the expansion of the employment potential and non-economic dimensions, such as improvement in education, health and the living environment.	Surveys of 100 households with users and non-users from 3 economic groupings. Primary data set comprising two categories: quantitative on household members' literacy levels, livelihoods, assets and other indices. Semi-structured, open-ended interviews on usage and views on Gyandoot and understanding of poverty and its causes.	The only service with reasonable uptake was land records, an entitlement enabling service. Benefits of public-private partnerships in the Gyandoot : encouraging entrepreneurship in local economy. But gap in perceptions of how Gyandoot can facilitate wider entitlements and capabilities of being educated, skilled, healthy and overall well-being.	<u>Micro-macro:</u> State context in terms of literacy rates <u>Timeframe:</u> No timeframe for the study provided
Walsham, G. & Sahay, S. (2006).	This is an overview of literature dealing with ICT and the only reference to the CA is in a recommendation for future studies.	NA	NA	NA	Suggested evaluations of ICT4D be broadened by wider definitions of development, e.g. by exploring how freedoms, opportunity and choice can be extended using ICT.

<p>Zheng, Y. & Walsham, G. (2008).</p>	<p>Social exclusion in the e-society from the human development perspective. Empirical studies of health systems in South Africa and China. What capabilities are essential in the e-society? Who may be disadvantaged when deprived of these capabilities?</p>	<p>Social exclusion conceptualised as capability deprivation, affecting well-being and agency freedom.</p> <p>Conversion from commodities to capabilities (i.e. the opportunity set of achievable functionings, rather than the actual choice of realising those opportunities.</p> <p>Illustrate how social exclusion can manifest in different forms under different conditions, as deprivation of different capabilities.</p>	<p>Interpretivist study.</p> <p><u>South Africa:</u> participative observation, interviews with officials and hospital staff and one focus group with 15 hospital staff.</p> <p><u>China:</u> Primary research data through participant observation, semi-structured interviews and questionnaire surveys. Also secondary data on SARS.</p>	<p>Demonstrate relational features of social exclusion and different types of capability deprivation “unfavourable inclusion” which can be masked by technological diffusion.</p> <p><u>South Africa:</u> ineffective mobilisation and exploitation of health information due to low literacy levels and insufficient attention to cultural factors → capability deprivation of staff.</p> <p><u>China:</u> health workers deprived of agency freedom – unable to communicate effectively, be informed of an epidemic and perform their health care role effectively. Public deprived of freedom to participate in public affairs → deprivation of well-being freedom by being exposed to SARS.</p>	<p><u>Micro-macro:</u> Implications for government policies, which should consider socio-political, cultural and institutional aspects for effective use of ICT.</p> <p><u>Timeframe:</u> South Africa: two cycles for a total of two-and-a-half months</p>
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Appendix D – Research instruments

1. Questionnaire for 2009 focus groups

A Personal details

For focus groups, the personal details obtained prior to the meetings.

Name.....

Address.....

Gender (M/F) Age: 18-20, 21-25, 26-30, 31-35, 36-40, 41-45, 45-50, >50

Education: highest level of formal schooling:

Primary Secondary Trade Tertiary

Number of years in education:.....

Other qualifications:

Literacy and numeracy levels and English language skills

	Comprehend	Speak	Read	Write	Numeracy
Khmer					
- Basic					
- Intermediate					
- Advanced					
English					
- Basic					
- Intermediate					
- Advanced					

Occupation and other income sources

Primary occupation:

Other household income sources:

Role of interviewee in household

Single breadwinner Joint breadwinner Student Other

If other, please specify:

B Participants' views and perceptions about the community

What do you consider to be the major strengths and assets of the community?

Prompts: good fishing, fertile agricultural land, good cooperation between villagers

Can you think of some recent improvements in the community?

Prompts: new road, electrification, new enterprise with employment opportunities, more involvement by villagers in groups.

Did iREACH make any contribution to this improvement? Yes/No. If yes, how?

Prompts: by improving literacy, enabling villagers to contact government authorities, learn about new agriculture methods.

What were the main/other factors contributing to this improvement?

Prompts: external funding and partnerships with organisations outside the village, government initiatives, local initiatives, better co-operation between villagers.

If you could change something in the community, what would it be?

Prompts: food security, improved health, better sanitation, more employment, better education for children, more say in local issues.

How would you go about making these changes?

Do you think iREACH can contribute to making your life and the life of others in the village better? If so, how?

Prompts: education, e. g. children can be better educated, adult education, find employment improve agriculture using new knowledge found on the Internet, get better prices for produce by information on pricing on the Internet, easier to deal with the government, e. g. for benefits and certificates.

Whether or not iREACH has been useful, can you suggest any changes that would make it (more) useful to you and others in the village?

If we were to measure how the community is improving, what indicators might we use to measure and how might they be measured?

C Use and views about iREACH

How long have you been coming to iREACH?

How often do you use it? Average hours per week:

What other ICT facilities do you use?

- Landline phone
- mobile phone
- radio/TV
- Other

What do you use iREACH for and why? The services and applications in the table will be used as prompts, if necessary. The list will be amended to reflect applications and services available when the research is conducted. As it is a 3-year longitudinal study, it is expected that all of these applications will become available towards the end of the study period).

	Landline	Mobile	Family-Link up	Voice/Video (e.g. Skype)	Email	Web browsing	Other
Social, incl. remittances							
Formal education							
Informal education (e.g. on agriculture methods)							

Looking for work							
Buying							
Selling							
Government interactions, incl. forms							
Other							

Which of these do you find most useful and why?

How relevant or useful are the services and the equipment available at iREACH for your day-to-day activities and what you want to do in the future? Record responses on this 5-point Likert scale:

- Very relevant Relevant Slightly Not relevant or useful Don't know

Additional comments

Is there anything you were hoping to use the iREACH facility for, but have not been able to? If so, what would you like to do and for what reason?

Prompts: find more information on how to improve my rice yield, find the market price of rice, learn how to read and write.

Do you need assistance with or training for using the computers or the Internet? Yes/No. If yes, what assistance do you need?

Are you satisfied with what iREACH offers?

Prompts: availability (e.g. opening hours, reliability – the computers and Internet are working most of the time, assistance from staff, scope of technologies and services on offer?)

If you have encountered any problems, have these affected your interest in using the centre? How?

Do you pay anything for using any of the iREACH equipment or services? If you are paying, do you think you get value for money?

If you are not paying, how much would you be prepared to pay for:

- using the computer without Internet.....
- using the Internet.....
- training.....
- Other activities you do at iREACH

If you are not using the iREACH services, why not?

Prompts: tried to use it, but found it (eg. difficult), don't know how to use it, don't have anything to use it for, don't have time.

Depending on the reason(s), follow-up questions to be asked to explore whether there is anything iREACH can do to encourage usage (e.g. training, longer opening hours).

Are you prepared to assist on a voluntary basis at the iREACH facility to help others use computers and the Internet or with some other tasks? Yes/No

Can you suggest anything that would improve the iREACH facilities to better meet your needs?

Prompts: more training, longer opening hours

D Participants perceptions of iREACH's impacts

In this section participants will be encouraged to talk about the impact of iREACH in their own terms. If they have not addressed the issues listed below, they should be prompted. The list will be amended to reflect reasonable outcomes, taking into account what applications and services are available when the research is conducted. While it is unreasonable to expect most of the impacts listed below to have been achieved during the initial phase of the study, some of these impacts could become apparent towards the end of the 3-year longitudinal study.

For each of the issues raised, participants will be asked whether:

- the impact relates to themselves and their families and the extent to which it applies to the whole village
- they think it would be useful to measure changes and benefits in the future and if so, how this would be done and what indicators would be useful.

What is the most significant change you have noticed a result of iREACH?

Prompts: Better school outcomes, higher income for local produce, improved health?

What is the main benefit of the centre?

Prompts: Communication with others, access to more knowledge about (e.g. agriculture), better information about government benefits.

What difference has it made and what difference is it likely to make in the future?

Has iREACH had any impact on:

(Questions below will be used as prompts if they have not already been addressed).

Education

- education opportunities for children
- school retention rates
- literacy and numeracy, including digital literacy.

Health of individuals

- access to information about diseases
- access to information about nutrition, particularly for infants
- better communication with medical staff (e.g. tele-medicine)
- assistance for people with disabilities.

Economic development opportunities

- have any new companies been established or existing ones expanded?
- is there information about the weather that makes it easier with fishing and agriculture?
- is it easier for entrepreneurs to do their accounting and other administrative work?
- is there better access to credit?
- have there been any inventions in the community?

Governance, institutions and security

- awareness of institutions, associations and organisations that serve the community?
- awareness of community projects, activities and events in the community?
- amount and quality of government information and services?

- does the local authority listen more to your views?
- general security in the neighbourhood?

Knowledge and/or preservation of cultural and natural heritage

- have you learnt anything about your culture and history?
- have you provided any information about your culture that has been stored on the computer or on the Internet?

Empowerment

- are villagers more prepared to take an active role in the planning and maintenance of facilities in the village?
- are there volunteer opportunities in the community? Are participants involved in those and what is the contribution iREACH has made?
- do the villagers have more control (e.g. in the form of knowledge and/or power) to make changes in the village?
- have villagers been involved in organising activities in the village since starting to use the iREACH facilities? If so, what activities?
- have women and youth become more involved in the village?

Rate (eg. on a Likert scale), the extent to which the following skills have been improved: decision-making, managing resources and working with others.

Social capital

- more cooperation between villagers?
- more cooperation or joint activities with other villagers/villages?
- have more people joined organisations? If so, what type of organisations?

Concluding/summarising questions

- Has iREACH provided new useful knowledge? If so, how has this knowledge been used?
- Has iREACH enabled you to do anything that you had not realised you could do?
- Has iREACH had an impact on equality (e.g. between genders and social groups)?
- Has iREACH had an impact on the relationship between parents and their children?

2. Research instruments for 2010 study

2.1 Focus group sessions

A. Personal details -- to be completed before the start of the session

A1. Address (village)	
A2. Gender: M/F	Age: (last time we used age ranges, but I would prefer actual age)
A3. Role of interviewee	<input type="checkbox"/> Single <input type="checkbox"/> Married
A4. Education and qualifications	<input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> High school <input type="checkbox"/> University <input type="checkbox"/> No school <input type="checkbox"/> Other Number of years in education: Other qualifications:

A5. Literacy and numeracy levels and English language skills

	Comprehend	Speak	Read	Write	Numeracy
Khmer					
- Basic					
- Intermediate					
- Advanced					
English					
- Basic					
- Intermediate					
- Advanced					

A6. Occupation and other income sources

Other income sources	Primary occupation						
	Farming	Fishing	Trading	Teaching	NGO work	Gov work	Other specify
Farming							
Fishing							
Trading							
Teaching							
NGO work							
Government work							
Other - specify							
None							

A7. Are you active in any organisation (e.g. sporting club, community group)? Yes/No. If yes, which

A8. How familiar are you with the following?

	Don't know about it	Know about, but have not used	Can use with assistance	Can use independently
Computers				
Skype				
Internet				

If you use iREACH, continue, if not, end here.

A9. How long have you been coming to iREACH?

- One week One month Three months Six months
 One year Two years Three years Other (please specify)

A10. How often do you come to iREACH? times per day/week/month/year

A11. On average, how long do you stay each time you come?

A12. How do you come to iREACH?

- Walking Bicycle Moto Other: Please specify

A13. How long does it take you to come to iREACH?

A14. What do you do at iREACH and why?

Activity	Business & livelihood	Private	Education	Other
Listen to news				
Hear Lectures				
Volunteer				
Computer course				
Use computer (e.g. word/excel)				
Search for info				
Email				
Skype				
Homework				
Overseas calls				
Other				

A15. If you have used iREACH for business, what was the main reasons (e.g. get information, communicate with customers or suppliers)

A16. Which iREACH services do you think are the most useful to you?

B. Participants' views and perceptions about the community

B1. What do you consider to be the major strengths of the community?

B2. Can you think of some recent improvements in the community?

If improvement(s) are identified, continue to question B3, otherwise skip to question B5.

B3. Did iREACH make any contribution to these improvements?

Yes No. If yes, how did iREACH contribute? If not, why?

B4. What were the main/other factors contributing to this improvement?

Prompts: Government agencies NGOs Finance agencies Others

B5. If you could change something in the community, what would be your highest priority?

Prompts: Education Agriculture Health ICTs Infrastructure others (please specify)

What is your highest priority for change?

B6. How would you go about making this change?

Prompts: Do by yourself Work with other communities members

Work with NGOs Work with government agencies other (please specify)

B7. What would you require to achieve these changes?

Prompts: better skills and more knowledge in/about:

Khmer literacy Agriculture Health ICTs Communication Management

Finance Development English Literature Other skills (please specify)

Other resources (e.g. ICT infrastructure?) other (please specify)

B8. Do you think iREACH can contribute to making your life and the life of others in the village better?

Yes No Don't know

If yes, how?

B9. Whether or not iREACH has been useful, can you suggest any changes that would make it (more) useful to you and others in the village?

B10. If we were to measure how the community is improving, what indicators might we use to measure and how might they be measured?

C. Use and views about iREACH

C1. How relevant or useful do you think the services and the equipment available at iREACH are for the communities?

Very relevant Relevant Slightly Not at all relevant or useful don't know

Additional comments ?

C2. Is there anything villagers were hoping to use iREACH for, but have not been able to? If so, what would you like to do and for what reason?

C3. Do most people need assistance with or training for using the computer or the internet?

Yes No Don't know

If yes, what assistance do they need?

C4. Are most people satisfied with what iREACH offers?

Yes No Don't know

C5. If people have encountered any problems, have these affected their interest in using the centre?

Yes No Don't know

If yes, what problems?

C6. Why don't more people use REACH?

C7. Are you prepared to assist on a voluntary basis at the iREACH facility to help others use computers and the Internet or with some other tasks?

Yes No Not sure

C8. Can you suggest anything that would improve the iREACH facilities to better meet your needs?

C9. Do you pay anything for using iREACH? If yes, how much, for what services?

C10. What do you think are reasonable charges for iREACH services?

Using computer without internet (r/hour).....

Using the Internet (r/hour).....

Making overseas calls (r/min).....

Training (r/day)

Other activities you do at iREACH

D. Perceptions of impacts of iREACH

D1. Has iREACH provided opportunities for villagers to have more choice over their lives?

Yes/No. If yes, how?

D2. Have villagers been able to influence more decisions as a result of iREACH? Yes/No. If yes, please specify.

D3. Can you identify any useful knowledge community members have received through iREACH and how this knowledge has been used?

D4. Can you identify anything that iREACH has enabled villagers to do that they did not realise they could do?

D5. Have you heard about the XO/OLPC used at iREACH? Yes/No. If yes, do you think these are

Very useful	Useful	Somewhat useful	No value	Waste of time	Don't know
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In groups with teachers and parents of children using the XO, ask why they think it is useful or of no value and what impact it has had.

D6. What is the most signification change you have noticed as a result of iREACH?

D7. What is the main benefit of iREACH?

D8. Has iREACH improved/worsened/not changed relationships within families? Please specify how?

D9. Has iREACH contributed to changes in equality between:

	Increased	Reduced	Not changed
Men/women			
More/less educated			
Rich/poor			

If any changes, please specify:

What could iREACH do to improve equality?

D10. Can you think of any innovations (new things or processes) resulting from iREACH. E.g. does anyone grow new crops, using information from iREACH?

D11. Are villagers more involved in the community as a result of iREACH?

	Less involved	No change	Somewhat more	Much more	Don't know
Men					
Women					

D12. Has iREACH improved – please give examples):

- a. Education and/or knowledge levels
- b. Health of individuals
- c. Economic development opportunities
- d. Living standards for the poorest people in the area
- e. Governance, institutions and security
- f. Knowledge and/ or preservation of cultural and natural heritage
- g. Empowerment (e.g. to make decisions)
- h. The situation of women
- i. Relationships within your village
- j. Relationships with other villages.

2.2 Survey questionnaire

A. Personal details

A1. Address (village)	
A2. Gender: M/F	Age:
A3. Role of interviewee	<input type="checkbox"/> Single <input type="checkbox"/> Married
A4. Education and qualifications	<input type="checkbox"/> Primary <input type="checkbox"/> Secondary <input type="checkbox"/> High school <input type="checkbox"/> University <input type="checkbox"/> No school <input type="checkbox"/> Other Number of years in education: Other qualifications:

A5. Literacy and numeracy levels and English language skills

	Comprehend	Speak	Read	Write	Numeracy
Khmer					
- Basic					
- Intermediate					
- Advanced					
English					
- Basic					
- Intermediate					
- Advanced					

A6. Occupation and other income sources

Other income sources	Primary occupation						
	Farming	Fishing	Trading	Teaching	NGO work	Gov work	Other specify
Farming							
Fishing							
Trading							
Teaching							
NGO work							
Government work							
Other - specify							
None							

A7. How familiar with the following?

	Don't know about it	Know about, but have not used	Can use with assistance	Can use independently
Computers				
Skype				
Internet				

A8. Are you active in any organisation (e.g. sporting club, community group)? Yes/No. If yes, which?

B. Respondent's views and perceptions about the community

B1. What do you consider to be the major strengths of the community?

B2. Can you think of some recent improvements in the community?

If improvement(s) are identified, continue to question B3, otherwise skip to question B5.

B3. Did iREACH make any contribution to these improvements?

Yes No. If yes, how did iREACH contribute? If not, why?

B4. What were the main/other factors contributing to this improvement?

Government agencies NGOs Finance agencies Others

B5. If you could change something in the community, what would be your highest priority?

Education Agriculture Health ICTs Infrastructure others (please specify)

Please describe your highest priority for change.

B6. How would you go about making this change?

Do by yourself Work with other communities members

Work with NGOs Work with government agencies others (please specify)

B7. What would you require to achieve these changes?

Better skills and more knowledge in/about:

Khmer literacy Agriculture Health ICTs Communication Management

Finance Development English Literature Other skills (please specify)

Other resources (e.g. ICT infrastructure? others (please specify)

B8. Do you think iREACH can contribute to making your life and the life of others in the village better?

Yes No Don't know

If yes, how?

B9. Whether or not iREACH has been useful, can you suggest any changes that would make it (more) useful to you and others in the village?

C. Use and views about iREACH

If you are not using any iREACH facility, please skip to question C13.

C1. How long have you been coming to iREACH?

One week One month Three months Six months

One year Two years Other (please specify)

C2. How often do you come to iREACH?

..... times per day/week/month/year

C13. If you are not using any iREACH service, why not?

C14. Are you prepared to assist on a voluntary basis at the iREACH facility to help others use computers and the Internet or with some other tasks?

Yes No Not sure

C15. Can you suggest anything that would improve the iREACH facilities to better meet your needs?

C16. What do you think are reasonable charges for iREACH services?

Using computer without internet (r/hour).....
 Using the Internet (r/hour).....
 Making overseas calls (r/min).....
 Training (riels/day)
 Other activities you do at iREACH

If you have not used iREACH, please skip to Section E

D. Impacts of iREACH on you as a user

D1. Has iREACH given you more opportunities to make choices? Yes/No If yes, how?

D2. Have you been able to influence any decisions as a result of iREACH? Yes/No. If yes, please specify.

D3. Can you identify any useful knowledge you have received through iREACH and how this knowledge has been used?

D4. Can you identify anything that iREACH has enabled you to do that you did not realise you could do?

D.5. Have you heard about the XO/OLPC used at iREACH? Yes/No

If yes, do you think they are

Very useful	Useful	Somewhat useful	No value	Waste of time	Don't know
-------------	--------	-----------------	----------	---------------	------------

If you are a teacher or parent of a child using the XO, please give further comments on your answers (e.g. why is it useful or of no value?).

E. Perceptions of impacts of iREACH on the community

E1. What is the most signification change you have noticed a result of iREACH?

E2. What is the main benefit of iREACH?

E3. Has iREACH improved/worsened/not changed relationships within families? Please specify how.

E4. Has iREACH contributed to changes in equality between:

	Increased	Reduced	Not changed
Men/women			
More/less educated			
Rich/poor			

If any changes, please specify.

What could iREACH do to improve equality?

E5. Can you think of any innovations (new things or processes) resulting from iREACH. E.g. does anyone grow new crops, using information from iREACH?

E6. Are villagers more involved in the community as a result of iREACH?

	Less involved	No change	Somewhat more	Much more	Don't know
Men					
Women					

E7. Has iREACH improved (please circle and give examples, if possible):

- a. Education and/or knowledge levels
- b. Health of individuals
- c. Economic development opportunities
- d. Living standards for the poorest people in the area
- e. Governance, institutions and security
- f. Knowledge and/ or preservation of cultural and natural heritage
- g. Empowerment (e.g. to make decisions)
- h. The situation of women
- i. Relationships within your village
- j. Relationships with other villages.

Appendix E – Discussions on most significant change

Table 15 and Table 16 show issues raised in discussions on the topic of the most significant change associated with iREACH in 2009 and 2010, respectively. Where any of the groups had raised anything related to the heading of a sub-category, a “1” was inserted in the row of the heading (shown in red). The headings were prepared during the data analysis phase of the research. The sub-category title rows were then summed to get an indication of the total number of groups that had referred to a particular issue. There were 22 groups in 2009 and 19 in 2010. The grey vertical line in the 2010 women’s group indicates that this question was not discussed in that group.

Issues raised in 2009 discussions about most significant change.	Kep								KCM users					KCM non-users					Total KCM	Grand total							
	Teachers	NGO staff	Village leaders	Commune Council	Farming group	Fishing group	Business group	Youth group	Women's group	Management committee	Total Kep	Teachers, NGO, Government	Farming	Village/commune leaders	Women's group	Youth group	Management committee	Total KCM users			Teachers, NGO, Government	Farming	Village/commune leaders	Women's group	Youth group	Management committee	Total KCM non users
ICT	1	1	1		1	1		1	1	7	1	1	1	1	1	1	1	6	1	1	1	1	1	1	5	11	18
- Know how to use computers, did not understand before	1				1	1			1	4	1	1	1	1	1	1	1	6	1	1	1	1	1	1	5	11	15
- Understanding of ICT	1	1			1				1	4			1		1	1	3	1	1	1	1	1	1	5	8	12	
- Ability to type										0	1		1				2							0	2	2	
- Fast		1								1							0							0	0	1	
- Computers at the village hubs				1						1							0							0	0	1	
- '10-20% of the population can now use computers										0					1		1							0	1	1	
Information, knowledge, learning, general skills		1		1	1				1	5	1	1	1	1			4	1	1	1	1	1	1	6	10	15	
- Access to information										0			1	1			2	1	1	1	1	1	1	4	6	6	
- Have more knowledge, which is very important				1	1				1	3							0					1		0	0	3	
- Important news		1								1							0							0	0	1	
- Can help poor people get knowledge because it is free		1								1							0							0	0	1	
- Better education					1					1							0							0	0	1	
- Example - son not interested in learning, but now he is									1	1							0							0	0	1	
- Teachers can come and prepare lessons										0	1						1							0	1	1	
- From information poverty to much information										0		1					1							0	1	1	
- Better English knowledge										0							0	1						1	1	1	
- Literacy improvement										0							0				1			1	1	1	
- Can learn free of charge										0							0					1	1	1	1	1	
Communication	1	1	1					1	1	6	1	1		1		1	4	1	1	1	1	1	1	4	8	14	
- Cheaper to keep in contact with family and friends		1								1			1			1	2	1	1	1	1	1	3	5	6	6	
- Improved communications system for total community								1	1	2	1					1							0	1	3		
- Sharing information and knowledge with community	1		1							2						0							0	0	2		
- Close to home. Before they had to travel to communicate		1								1		1				1							0	1	2		
- Access to national and international networks								1	1	2						0					1	1	1	1	3		
Agriculture										0	1			1	1	3	1	1	1	1	1	3	3	6	6		
- Agriculture knowledge that can be applied in households										0	1			1	1	3	1	1	1	1	1	3	3	6	6		
Higher living standards - better livelihoods				1						1			1	1		2			1	1	1	1	2	4	5		
- Positive changes in livelihoods, poverty reduction, better incomes				1						1				1		1			1	1	1	1	2	3	4		
- Villagers know that there is info on many things that can improve their livelihoods										0			1			1							0	1	1		
Children				1						1	1	1		1	1	4							0	4	5		
- Before children played - now they learn at the hubs										0		1		1	1	3							0	3	3		
- Children can volunteer, e.g. teaching other children and adults				1						1						0							0	0	1		
- Children can find friends overseas										0	1					1							0	1	1		
Employment					1					1				1		1	1	1	1				2	3	4		
- Better jobs					1					1						1	0	1					1	1	2		
- iREACH has created employment opportunities										0				1		1		1					1	2	2		
Social capital										0		1				1						1	1	2	2		
- Communicate between hubs										0		1				1							0	1	1		
- Community improvements										0						0					1	1	1	1	1		
Entertainment		1								1						0							0	0	1		
No change yet, but they are hoping for something in future						1				1						0							0	0	1		

Table 15: Results from 2009 discussions on most significant change

Issues raised in 2010 discussions about most significant change	Kep								KCM users					KCM non-users			Grand total							
	Teachers	NGO staff	Village leaders	Commune Council	Farming group	Fishing group	Business group	Youth group	Women's group	Management committee	Total Kep	Teachers, NGO, Government	Farming	Village/commune leaders	Women's group	Youth group		Management committee	Total KCM users	Farming	Women's group	Youth group	Total KCM non users	Total KCM
ICT	1	1			1		1			1	5	1					1	3	1	1	1	3	6	11
- Know how to use computers, did not understand before		1			1					1	4	1						1	1	1	1	3	4	8
- Internet knowledge and understanding of ICT		1								1	1						1	1	1	1	3	4	5	
- Computers at the village hubs & training for children		1					1			2	2						0	0	0	0	0	0	2	
- Scan		1								1	1						0	0	0	0	0	0	1	
- Computer training					1					1	1						0	0	0	0	0	0	1	
- Improved communications system - before Prey Veng										0	0				1		1	1	1	1	0	1	1	
- Love of ICT and learning about ICT		1								1	1						0	0	0	0	0	0	1	
- People consider ICT valuable		1								1	1						0	0	0	0	0	0	1	
Information, knowledge, learning, general skills	1	1	1		1	1	1			1	7		1	1	1		3	1	1	1	3	6	11	
- Access to information			1					1		1	3						0	0	0	0	0	0	3	
- IR has changed attitude of people, willing to learn	1			1			1			3	3						0	0	0	0	0	0	3	
- Have more knowledge, which is very important									1	1	1				1		1	1	1	1	0	1	2	
- Better English knowledge and training						1				1	1		1				1	1	1	1	2	3	3	
- Listening and learning at hubs						1				1	1						0	0	0	0	0	0	1	
- Ability to type									1	1	1						0	0	0	0	0	0	1	
- Can learn free of charge							1			1	1						0	0	0	0	0	0	1	
- Knowledge has increased, changing the way of thinking				1						1	1						0	0	0	0	0	0	1	
- Community is more knowledgeable										0	0			1			1	1	1	1	0	1	1	
- Bring more understanding and they pay attention			1							1	1						0	0	0	0	0	0	1	
- Now they can get so much information, e.g. about weather			1							1	1						0	0	0	0	0	0	1	
- Before people had to go to Kampot to get info									1	1	1						0	0	0	0	0	0	1	
- Even those who don't come to IR benefit from knowledge									1	1	1						0	0	0	0	0	0	1	
- Previously nobody trained them - now iREACH does									0	0	0		1				1	1	1	1	0	1	1	
Agriculture		1	1	1	1					1	5		1	1	1	1	4	1	1	1	2	6	11	
- Agriculture knowledge that can be applied in households					1					1	2						5	1	1	1	2	7	9	
- Before did not understand soil fertility										0	0				1		1	1	1	0	1	1		
- Farmers use new methods - seed selection and fertilisers				1						1	1						0	0	0	0	0	1		
- Learned how to get two harvests/year			1							1	1						0	0	0	0	0	0	1	
- Access to market prices		1								1	1						0	0	0	0	0	0	1	
- Increase yield in agriculture production										0	0			1			1	1	1	1	0	1	1	
- Increase amount of home gardening										0	0			1			1	1	1	0	1	1		
- Planting water melons in rice fields - initially taught by IFAD										0	0			1			1	1	1	0	1	1		
- Improve livelihoods through aquaculture and pig raising										0	0		1				1	1	1	0	1	1		
Children	1			1	1	1	1			5	1	1	1	1			4	1	1	1	5	10	10	
- Children are more knowledgeable					1	1				2	2			1			1	1	1	1	2	4	4	
- Before, children just played around at home and went walking, playing games - now they try to learn	1									1	1	1					2	0	0	0	2	3		
- Children can type and use computers										0	0	1	1				2	0	0	0	2	2		
- Now parents encourage their children to learn	1			1						2	2						0	0	0	0	0	2		
- Children come to learn at hubs						1				1	1						0	0	0	0	0	1		
- Children can get better jobs when they grow up					1					1	1						0	0	0	0	0	1		
- Children more interested in studying						1				1	1						0	0	0	0	0	1		
- Children have opportunity for more education										0	0					1	1	1	1	0	1	1		
Health		1	1	1		1				4	1		1		1		2	1	1	1	3	7	7	
- Better health and healthcare		1								1	1		1		1		2	0	0	0	2	3		
- Improve knowledge of community related to health										0	0						0	1	1	1	1	1		
- Reduce sickness because they know importance of sanitation				1						1	1						0	0	0	0	0	1		
- Before they did not use lavatories				1						1	1						0	0	0	0	0	1		
- A man in his village got info on alcohol abuse and stopped drinking						1				1	1						0	0	0	0	0	1		
Higher living standards - better livelihoods	1		1							2	1						1	1	1	1	2	3	5	
- From application of new knowledge	1		1							2	2						0	0	0	0	0	2		
- Saving time										0	0	1					1	0	0	0	1	1		
Social capital	1									1	2	1					1	1	1	1	2	3	5	
- Better communication between communities	1									1	1	1					1	0	0	0	1	2		
- More participation in communities										0	0					0	1	0	0	1	1			
- Good communication and team work by meeting at hub										0	0					0	0	1	1	1	1			
- People learn from each other and come together to help each other									1	1	1					0	0	0	0	0	0	1		
Security						1				1	1	1	1	1	1		4				0	4	5	
- Better understanding and reduction of domestic violence										0	0	1	1	1	1	1	4				0	4	4	
- Less time for violence when busy with livelihood										0	0		1				1				0	1	1	
Communicate with relatives abroad		1			1					2	1						0				0	0	2	
The women considered themselves too old						1				1	1						0				0	0	1	
People closest to the hub can access more.									1	1	1						0				0	0	1	

Table 16: Results from 2010 discussions on most significant change

Appendix F - Consolidation tables of key research results

In Table 17 and Table 18, results have been consolidated into the capabilities, empowerment and sustainability constructs, from the following topics in the research instruments:

- Did iREACH make any contributions to improvement?
- What was the most significant changes resulting from IREACH?
- What were the main benefits of iREACH?
- Has iREACH provided new useful knowledge? If so, how has this knowledge been used?
- Has iREACH enabled you to do anything you did not realise you could do?
- Has iREACH had any impact on: education and knowledge, health, conomic development opportunities, living standards of the poorest in the area (only in 2010), governance, institutions and security, knowledge and/ or preservation of cultural and natural heritage, empowerment, the situation of women, relationships within your village and relationships with other villages.

There were 22 groups in 2009 and 19 in 2010.

Topics related to capabilities, empowerment, and sustainability raised in iREACH 2009 focus group sessions	No of groups raising issue		
	KeP	KCM	Total
CAPABILITIES			
ICT			
- Know how to use computers, did not understand before	9	11	20
- ICT education for children and adults	8	9	17
- Community knowledge and understanding of ICT	4	8	12
- Computer knowledge, incl. how to use the Internet	4	8	12
- Using Internet services, e.g. to get info, email, skype	3	4	7
- Computer knowledge - making children more clever	0	3	3
- Use Internet to find information by themselves	1	2	3
- Use skype	0	3	3
- Audio programme production	1	1	2
- Children who have learnt ICT teach other children	1	0	1
- Previously the community did not understand the benefits of ICT	0	1	1
- Teaching children about the importance of ICT	1	0	1

- Access to and use of photocopier and printer	0	1	1
Education, Information, knowledge, learning, general skills			
- Domestic and international news - find out what is going on in the world	2	10	12
- Students coming to learn is useful for better quality of life	4	7	11
- Access to information	2	8	10
- iREACH provides useful information	3	4	7
- Ability to type	2	5	7
- Learning English, better English knowledge	1	5	6
- Education and information on education	3	1	4
- Sharing information and knowledge with community	3	1	4
- Before children played - now they learn at the hubs	0	3	3
- Have more knowledge, which is very important	3	0	3
- News about border conflict with Thailand	1	1	2
- Children and adults are able to learn	0	2	2
- Place for training	0	2	2
- Information used for teaching children	2	0	2
- Improved general knowledge in community	0	2	2
- Use IR to motivate children - did not know how to do this	1	1	2
- Short courses on useful things	1	0	1
- Information through loudspeakers	1	0	1
- Community receives info on many improvements from iREACH	0	1	1
- Women delegate to their children to learn and get info	0	1	1
- Learn numeracy	0	1	1
- Learn minute writing	0	1	1
Health			
- Health education, including hygiene, water, sanitation	3	9	12
- Health improvement	0	5	5
- Information on importance of mosquito nets	0	2	2
- Information on importance of boiling water	0	1	1
- Information on dengue fever	0	1	1
- Information on pre-natal care - iREACH encouraged them to go to hospital for births	0	1	1
Empowerment			
- iREACH does not discriminate/equality/transparency	7	10	17
- Powerful for women and their situation is easier - previously they stayed at home, now they can go to iREACH	0	2	2
- Develop personalities	0	2	2
- Not afraid to use computers	1	0	1
- Able to withstand pressure to sell land	1	0	1
- Domestic violence awareness through IR broadcasts	0	1	1
- Improved decision making with more information	1	0	1
Communication			
- Family linkup and overseas communication	6	7	13
- Access to improved communication system for communities	3	4	7
- Cheaper to keep in contact with family and friends	1	5	6

- Communicate with friends, outside people, incl. donors	2	1	3
- Communications between communities	0	3	3
- Access to national and international networks	2	1	3
- Agriculture officer now sends attachments via email	0	1	1
Develop and strengthen local community			
- Develop community, incl. new knowledge in the community	0	6	6
- Find out what goes on locally and communicate through the village-village service (Note 1)	0	3	3
- Establish good relationships within communities and abroad	0	2	2
- Improve capacity of MC and share knowledge with community	1	1	2
- Educate each other in the community	0	2	2
- Strong contribution to community, including government	0	1	1
- Develop social situation	0	1	1
Impact on culture			
- iREACH can protect culture, e.g. by Khmer typing	1	5	6
- Mobile video shows	3	0	3
Governance and security			
- Warned through hot news when there is danger	1	1	2
- Improved road traffic - warned of hazardous conditions	0	2	2
- Information on security	0	1	1
SUSTAINABILITY			
Agriculture and animal husbandry			
- Learned agriculture and animal husbandry methods	7	12	19
- Agricultural information, better yields, improve livelihoods	2	9	11
- Better prices through market price info - economic dev.	3	4	7
- Learned about and applied better pig raising practices	0	2	2
- Weather information useful for agriculture	1	0	1
- Information on home composting	0	1	1
- Information on how to grow mushrooms	0	1	1
- Obtained and applied knowledge on planting mangoes	1	0	1
Development			
- Positive changes in livelihoods, poverty reduction, better incomes	1	6	7
- general comments about positive impact on development	0	5	5
- iREACH is helping with many things	2	0	2
Employment			
- Opportunity for better jobs. Difficult without ICT skills	3	4	7
- Employment - finding skilled jobs on the Internet	0	4	4
- iREACH has created employment opportunities	0	2	2
Cost savings			
- Cheap or free service - reduce telecommunications expend	1	7	8
- Reduce time to travel and lower travel expenses	1	5	6
- Easy to access - conveniently located in village	1	3	4

Table 17: 2009 results in capabilities, empowerment and sustainability

Topics related to capabilities, empowerment, and sustainability raised in iREACH 2010 focus group sessions	No of groups raising issue		
	Kep	KCM	Total
CAPABILITIES			
ICT			
- Computer knowledge and training, incl. Internet, email...	9	6	15
- Know how to use computers, did not understand before	8	7	15
- Hubs are at village levels - easy access to information	8	0	8
- Villagers can get help at hubs, e.g. with typing documents	5	0	5
- Knowledge about Internet & search for info	5	0	5
- Use computers	1	4	5
- Before we had not used Internet, now we can use it	2	3	5
- Using Internet services, e.g. to get info, email, skype	1	3	4
- Students can teach other students and others about computers	2	1	3
- Opportunity for children to learn the XO	1	1	2
- Children can type and use computers	0	2	2
- Easy for children to go to hubs for training, email, info, typing	2	0	2
- Easy for villagers to use computers because they are in villages	2	0	2
- Improve knowledge on computers, Internet, ICTs	0	2	2
- Can access computers	1	1	2
- Learned audio-editing, write episodes, window movie maker	2	0	2
- Understanding of ICT	0	1	1
- Improved communications system - before Prey Veng	0	1	1
- Love of ICT and learning about ICT	1	0	1
- People consider ICT valuable	1	0	1
- Easy to learn when they can see pictures	1	0	1
- Skype	0	1	1
- Can get more knowledge from computer knowledge	1	1	2
- Tell children to go to iREACH to learn computers	0	1	1
- Before children did not have access to computer training	1	0	1
- Encourages students to get computer knowledge	1	0	1
- Use Office applications: excel, word	1	0	1
- Keyboard, can use a little, sometimes she asks for assistance	1	0	1
Education, Information, knowledge, learning, general skills			
- English - improved knowledge and training	5	8	13
- Improve community knowledge; community more knowledgeable	5	3	8
- Ability to type	4	3	7
- Access to much information	5	1	6
- Children are more knowledgeable	3	2	5
- Have more information and knowledge, which is very important	1	3	4
- IR Disseminates, shares, and provides useful information	3	1	4

- Opportunities to learn and educate people in villages	3	1	4
- Human resource development	1	2	3
- Students and children come to hubs to learn	3	0	3
- Education and Information on education	2	1	3
- Villagers get information and knowledge	3	0	3
- Contribution to information sharing	3	0	3
- Before, children just played around at home and went walking, playing games - now they try to learn	1	2	3
- Information in hubs and pagodas	0	3	3
- IR has changed attitude of people, they are willing to learn	3	0	3
- Community centre - can get any info they need	0	3	3
- Now parents encourage their children to learn	2	0	2
- General knowledge by audio and mobile videoshows	0	2	2
- More people are educated	2	0	2
- Get knowledge by using information and hot news	2	0	2
- Information through the Internet in communities	0	2	2
- Domestic and international news	0	2	2
- Info for daily lives and disseminate information to others	2	0	2
- Use technology to teach others, eg children	2	0	2
- Children more interested in studying	1	0	1
- Children have opportunity for more education	0	1	1
- Khmer literacy	0	1	1
- Children who have been taught can teach other children	1	0	1
- Provides information on practical skills	1	0	1
- Access to info faster through Internet	1	0	1
- Listening and learning at hubs	1	0	1
- Knowledge has increased, changing the way of thinking	1	0	1
- Bring more understanding and they pay attention	1	0	1
- Now they can get so much information, e.g. about weather	1	0	1
- Even those who don't come to IR benefit from knowledge	1	0	1
- Previously nobody trained them - now IR does	0	1	1
- Before people had to go to Kampot to get info	1	0	1
- Knowledge of community and children	1	0	1
- CF gets from the Internet people ask for	1	0	1
- Hubs - useful place - villagers can learn the same things	1	0	1
- Listen to iREACH programme on Kampot radio station	1	0	1
- Information to community and children	0	1	1
- For adults: agriculture and health	0	1	1
- Can get info, e.g. on border dispute	0	1	1
- Children can provide info to villagers	1	0	1
- Students listen to weather and tell their parents	1	0	1
- For children and youth: computer training and English	0	1	1
- More people attend training	1	0	1
- Before they did nothing - now they seek knowledge	1	0	1

- Opportunity for management committee members to learn	0	1	1
- Village-village information	1	0	1
- Parents send children and then ask for info from them	0	1	1
- Previously many were too lazy to study	0	1	1
- Many learn from mobile videoshows during ceremonies	1	0	1
- Children go to study at iREACH	1	0	1
- Retrieved books and articles for study	1	0	1
- Children can type English characters	1	0	1
Health			
- Learned home sanitation and how to clean homes	5	3	8
- Learn about health from IR information	4	1	5
- Information on health (Teacher group: reduce medical expenses)	3	3	6
- Improved health and healthcare	1	3	4
- Health improved through audio on disease prevention	0	4	4
- Now villagers understand importance of sanitation	1	2	3
- Reduce sickness because they know importance of sanitation	1	1	2
- Info on pre-natal care and many go to hospital as a result	0	2	2
- Learn about boiling water, house cleaning	2	0	2
- Alcohol consumption reduced a little - websites and audio	1	1	2
- Before did not take care of her health - body or sanitation	0	2	2
- Improve knowledge of community related to health	0	1	1
- Before they did not use WCs - relieved themselves everywhere	1	0	1
- Reduction in diarrhoea: IR broadcasts info on hygiene	0	1	1
- Now almost everyone boils drinking water	0	1	1
- Before when we got sick, many did not go to hospital	1	0	1
- Water tanks, with clean water in special containers	1	0	1
- Now understand importance of commune health centres	1	0	1
- Before we used more chemicals - change to natural	1	0	1
- Before we had no access to info on health	1	0	1
- Now we try to apply what they have learnt	1	0	1
- Now he eats fruit without chemicals	0	1	1
- IR advised how to reduce temperature. Before they went to hospital. Now they go quickly only if temperature does not reduce	0	1	1
- Learned to use mosquito nets	1	0	1
- Learned how to clean water tank and keep boiled water in tanks	1	0	1
- Learned not to eat food that has expired	1	0	1
- Learned how to protect against dengue fever - mos nets	0	1	1
EMPOWERMENT, SOCIAL CAPITAL, COMMUNITY BUILDING			
Empowerment			
- Better understanding and reduction of domestic violence	2	5	7
- With knowledge, people can decide for themselves rather than having others decide	2	0	2
- First afraid to break computer - don't worry now	1	1	2
- People can do anything they want if they have information	1	0	1

- Got knowledge and teach others	1	0	1
- Decided to look for work	1	0	1
- Improved because IR disseminates legal info	1	0	1
- Both men and women do similar things now	1	0	1
- When problems, they go to the police rather than fight	1	0	1
- Rice seller example of empowerment and also property boundary	0	1	1
- Can pressure contractor of roads if they are not happy with the works – IR always broadcasts new road constructions	0	1	1
- The poor can get involved in all IR activities	0	1	1
- Empowerment to make decisions: improved	0	1	1
- Woman can find info on website by herself	0	1	1
The situation of women			
- Women more opportunities to be involved, e.g. meetings	3	0	3
- Women go to training and have more knowledge	2	0	2
- Recognising importance of education for girls – decided to send girls to school	1	0	1
- women have more knowledge	1	0	1
- Women have more opportunities to express her opinions	1	0	1
- Shared decision-making at home, eg buying a moto	0	1	1
- Women work in the community and talk, sharing ideas and do as men do	1	0	1
- Before women did not join village development assistance committee	0	1	1
- Now more women are on commune councils	0	1	1
- Women's situation improved through training	0	1	1
- IR helped women decide in households and the community	0	1	1
- IR encouraged women to participate. Previously women did not part in community development associations	0	1	1
- IR broadcasts info on women's rights – encouraged women to get involved	0	1	1
- IR encouraged women to stand for (MC) election	0	1	1
Communication			
- Improved communication and relationships between villages	3	4	7
- Communicate with relatives abroad	7	0	7
- Opportunity to communicate, access to communication	0	2	2
- Communicate, eg with family in Phnom Penh	1	1	2
- Emails to friend in Kampot	1	0	1
Develop and strengthen local community			
- Involved in Commune Integrated Plan	1	1	2
- Children have become more involved	1	0	1
- More participation in communities	0	1	1
- Good communication and team work by meeting at hub.	0	1	1
- People learn from each other and come together to help each other	1	0	1
- Learn to share information and work in groups	1	0	1
- Better relationships with better standard of living	1	0	1
- Parents communicate when their children go to IR	1	0	1

- Families are happy when children learn	1	0	1
- Families come together to learn	0	1	1
- Before people used to stay home more, with training, etc there is more community	0	1	1
- Received info on pre-natal care and informed others in the village	0	1	1
- IR gives opportunity to meet each other in the hub – improves relationships	0	1	1
- We tell other villagers what they learn at IR	0	1	1
- Opportunity to meet - referred to research team	0	1	1
- IR can help communicate in village, eg mobile video show – help people come there and build relationships	0	1	1
- Problem with youth - IR broadcasts consequences of violence and encouraged youth to speak out	0	1	1
- IR broadcast about property rights and boundaries so nobody should encroach on land of others	0	1	1
- Observed children sharing knowledge and XOs when they play.	0	1	1
- Volunteers volunteer with other things after iREACH	1	0	1
Relationship with other villages			
- Improved by using skype and village-village meetings	4	4	8
- Training & contact between villages;	0	2	2
- Getting to know people in other villages	1	0	1
- IR conducts meetings with several villages - get to know and learn from each other	1	0	1
- Students from different villages communicate	1	0	1
- Example with man selling medicine - warning to other villages	0	1	1
- Participants in the FGD from different villages - did not know each other	0	1	1
Impact on culture			
- Improved through by broadcasting and loudspeakers	2	0	2
- Learning to type Khmer (unicode)	2	0	2
- IR provides info on preservation of natural resources - reduced tree cutting	2	0	2
- Buddhism knowledge improved - IR informs about traditions	0	1	1
- Improved, because IR provides info on cultural heritage	1	0	1
- Improved because children get info from the Internet	1	0	1
- IR can find info on culture	1	0	1
- Students learned not to have boyfriends at school	0	1	1
- IR helps protect against Thai and Vietnamese culture	0	1	1
- Improved because of Khmer websites	0	1	1
- Advise community to take good action – conduct videoconferences and enable monks to speak to communities	0	1	1
- Uses iREACH for entertainment	1	0	1
Governance and security			
- IR provides info about security to villagers	2	1	3
- Less time for violence when busy with livelihood	0	1	1
- Info on traffic laws and traffic accidents	0	1	1

- Understanding safe migration	0	1	1
- Safety has improved with weather forecasts	1	0	1
- Information on criminals in the area	0	1	1
- Reduced violence	1	0	1
- Children don't have so much time making trouble	1	0	1
- Mobile video shows has reduced violence	1	0	1
- Less violence at ceremonies	1	0	1
- Hot news information, warn of a child abuser	0	1	1
- Gave example of salesman selling clothes in village: lottery ticket without any prizes to entice purchase of bad quality clothing. People reported this to IR, which broadcasts to other villages	0	1	1
- broadcast crime and security issues, warns community members to be careful	0	1	1
- Human trafficking, IR broadcasts information re emigration of women. Informs police if someone is picked up	0	1	1
- IR broadcasts on drink driving	0	1	1
- Gang activity reduced - IR broadcasts about gangs fighting each other	0	1	1
SUSTAINABILITY			
Agriculture and animal husbandry			
- Information on market prices (some decided not to sell)	7	2	9
- Learned about agriculture & animal raising and apply it	2	5	7
- Agriculture knowledge that can be applied in households	2	4	6
- Learned about rice production, insect protection and fertilisers	2	2	4
- Learned about and got info on pig raising	1	2	3
- Improved yields in agriculture production	0	2	2
- Weather information	2	0	2
- Info on home composting - learn and use	2	0	2
- Learned how to get two harvests/year	2	0	2
- Learned about water melons - fertilisers	0	2	2
- Can get information about agriculture	2	0	2
- Better harvests - sell produce at markets - earn more	2	0	2
- Learnt how to plant and grow vegetables	1	1	2
- Learnt to make and apply natural fertilisers and increase yield	1	1	2
- Learning about chicken raising	0	2	2
- Middlemen cannot cheat now that they know market prices	0	1	1
- Information about the environment	1	0	1
- Before did not understand soil fertility	0	1	1
- Farmers use new methods - seed selection and fertilisers	1	0	1
- Increase amount of home gardening	0	1	1
- Planting water melons in rice fields - initially taught by IFAD	0	1	1
- General knowledge in agriculture	0	1	1
- Improve livelihoods through aquaculture and pig raising	0	1	1
- Less produce when they used chemicals	1	0	1

- Learnt about eggplants - plan to plant	0	0	0
- Learned about cucumbers - from IR notes	0	1	1
- Planting of sugarcane, water convolvulus, eggplant	0	1	1
- Planting watermelon & cucumber	0	1	1
- One supplier lost business with more home gardens	0	1	1
- Improved agriculture skills	0	1	1
- Most villagers are farmers and want relevant info	1	0	1
- Plant water convolvulus using organic fertiliser	0	1	1
- Checks farmer magazine and accesses Internet for agriculture	0	1	1
- Many farmers have received info; they want new knowledge	1	0	1
- Provide agriculture information to neighbours and other villages	0	1	1
- Information on rice production	0	1	1
- Mushroom plot discontinued - had been flooded	0	1	1
- Learned agriculture from audio broadcasts, compost, fruit	1	0	1
Livelihood diversification			
- Could improve business because of IR-trading with Vietnam	2	0	2
- Learned about exchange rates for trading with Vietnam	1	0	1
- Started business typing letters and invitation cards	1	0	1
- Man started his own business teaching ICT	1	0	1
- Learned English at IR - teach and earn money for family	0	1	1
Economic Development - Improved living standards			
- Improved living standard from application of new knowledge	4	0	4
- Improved living standard from saving time	1	1	2
- Contributed, but don't know to what activities	1	0	1
- Save money and time by not having to travel	0	1	1
- Poverty reduction	1	0	1
- Improved livelihood by using knowledge	0	1	1
Living standards for the poorest people in the area			
- Free of charge - poor children get access	2	1	3
- Located in community - save money by not having to travel	1	1	2
- Poorest can get info on agriculture - increased yields	0	2	2
- They work harder and apply new farming methods	2	0	2
- Training and knowledge for children	1	0	1
- Before the poor did not do much	2	0	2
- Before the poor begged	1	0	1
- Now the poor know how to earn money	1	0	1
- Poorest get an opportunity to learn	0	1	1
- Reduce family expenses	1	0	1
- Now they understand importance of education	1	0	1
- Families send their children to school	1	0	1
- More important for poorer people, cannot afford private lessons	0	1	1
- IR teaches about soil fertility	0	1	1
- Grandfather very poor - previously bought vegetables, learned to grow his own	0	1	1

- They learned about health - also from other NGOs	0	1	1
- > than 80% of farmers live in poverty and depend on agriculture. Poorer people benefit from IR	0	1	1
- Poorest people have many children – they can learn computer and get better lives because of computers	0	1	1
- Poorest take advantage of the opportunity	0	1	1
Employment			
- When older can look for and better opportunities to find work	2	1	3
- More knowledge when looking for jobs in the future	3	0	3
- Hope children can get better jobs when they grow up	1	1	2
- Opportunity to work with IR (4 MCs do that in KCM)	0	2	2
- Volunteers opportunity to learn admin and other things	2	0	2
- Capacity building when looking for work	1	0	1
- Used for typing CV - before had to write by hand	1	0	1
- Teachers used it for administration and browsing	1	0	1
- Next year expect to employ brother in agriculture	0	1	1
- ACLEDA uses IR when his office is off-line	1	0	1
- Learned about safe migration for work	0	1	1
Cost savings			
- Free of charge or cheap	1	0	1
- Can learn free of charge	1	0	1
- free of charge training – saves money for other training	1	0	1
- children can learn computers free of charge	0	1	1
- People had to spend a lot of time going to Kampot	1	0	1

Table 18: 2010 results in capabilities, empowerment and sustainability