BOUNDARY OBJECTS TO GUIDE SUSTAINABLE TECHNOLOGY-SUPPORTED
PARTICIPATORY DEVELOPMENT FOR POVERTY ALLEVIATION IN THE
CONTEXT OF DIGITAL DIVIDES

Adam Blake
Centre for Academic Development &
Faculty of Medical & Health Sciences
Learning Technology Unit
University of Auckland
New Zealand
a.blake@auckland.ac.nz

Margarita Quiros Garzon
Center for Development Research
(Zentrum für Entwicklungsforschung - ZEF)
University of Bonn
Germany
mquiros@uni-bonn.de

ABSTRACT
There is a growing body of evidence to show that sound implementation of information and communications technologies (ICTs) can benefit development goals. However these benefits are still far from reaching those who are most impoverished. In part, this lack of effectiveness is attributed to a lack of clarity in the theory and practice of ICT for development (or ICT4D as it is commonly known). We have sought to address these concerns by reviewing a range of ‘boundary objects’ – conceptual frameworks and participation processes – that have been used to support sustainable development projects with multiple stakeholder interests. Using Sen’s ‘capability approach’ as an organizing principle, we have considered how these boundary objects can be combined to provide a comprehensive framework for sustainable technology-supported participatory development to alleviate poverty. We consider that this framework offers an easily understandable, step-by-step approach to planning, implementing, and evaluating ICT4D projects, yet is based on a growing empirical research base, and points to detailed and concrete methods and tools to facilitate effective practice. By ensuring that stakeholders are central to the process right from the beginning, the framework is intended as a boundary object able to be adopted and adapted by those stakeholders to facilitate grassroots innovation and achievement of community goals as a means to alleviate poverty.

1. INTRODUCTION AND OBJECTIVES

"ICTs alone cannot improve peoples’ lives; the use of ICTs needs to occur within broader strategies that are tailored to make the most use of these tools and techniques in order to reap their potential benefits for human development" Hamel (2010), p.59.

Despite the recognized potentials of ICTs for alleviating poverty, still they are not equally accessible, leaving the poorest people behind (von Braun, 2010). There is a set of interrelated and continually unfolding factors influencing the field of ICT and its role in development (Chambers, 2010):

---

1 We have chosen to adopt the definition of ICTs used in the most recent United Nations Development Program research paper (Hamel, 2010) on information and communications technology for development: We understand ICTs as tools or techniques that allow recording, storing, using, diffusing and accessing electronic information (World Bank, 2002). We also accept more broadly that ICTs are “tools that facilitate communication and the processing and transmission of information and the sharing of knowledge by electronic means” (UNDESA-GAID, 2009, p. 5).
1. Change in the dimensions that define ICT and development has accelerated, not only in communication technologies and the expansion of ‘web 2.0’ (the read/write web) but also in the awareness and aspirations of those living in poverty;
2. Following on from the relatively open and participatory approaches in the aid sector during the 1990s, an emphasis on control, accountability and impact assessment has developed in recent years;
3. Paradoxically, at the same time there has been a multiplication and diversification of participatory methodologies in the development field;
4. Evolving theoretical understandings of the nature of complexity and of technology have afforded additional conceptual tools for the theory and practice of development;
5. There is an increased acknowledgement of the significance of power relations in development.

In the field of ICT for development (or ICT4D as it is commonly known), as in all development work, there are thus multiple complexities at play. Complexities include (Mollinga, 2010):

Ontological: whenever ICT is conceived and implemented in service of development goals, there are multiple human, technical and physical elements in diverse interrelationships in social, economic, political, infrastructural and ecological dimensions, which also evolve in a non-linear, unpredictable way.

Analytical: data about the elements and their interrelationships is incomplete and mechanisms of interaction often unknown, while dealing with problems in a discipline-based way often further fragments our understanding.

Societal: there are multiple actors and groups involved in the contexts in which decisions about ICT and development are made, who often see development problems and goals differently and who bring conflicting interests in ICT and development into the decision-making process.

Within these complexities, contested and evolving ICT4D ‘boundary concepts’ (Löwy, 1992; St Clair, 2006; Mollinga, 2010) such as ‘poverty’, ‘digital divide’ and ‘participation’ work to define the space in which theory and practice are created. This can be assisted through the creation and use of ‘boundary objects’, such as conceptual frameworks and participation processes, to represent the elements and interrelationships at play (Star & Griesemer, 1989; Cash et al., 2003; Star, 2010; Mollinga, 2010).

While ontological and analytical complexity necessitate ‘interdisciplinary’ approaches to research and problem-solving in a field (Lélé & Norgaard, 2005; Mollinga, 2010), the societal complexity that is also present in most development fields (including ICT4D) means that a ‘transdisciplinary’\(^2\) approach is recommended.

Research on the relationship between ICTs and poverty, however, suffers from a lack of theory and a lack of even interdisciplinary research. Specific concerns include (Brown and Grant, 2010):

\(^2\)Transdisciplinary research is interdisciplinary research with interest groups (so-called “stakeholders”) involved in all phases of the research” (Mollinga, 2010, p. S-2)
an apparent disconnection between academic scholarship and the needs of practitioners
an overly utopian and zealous belief in the role that ICTs play in development
a lack of linkage into the overall discourse regarding poverty alleviation
investigation of ‘ICT’ in isolation from ‘development’
investigation of the ICT and development ideal in isolation from other relationships
a tendency for some research to lack academic rigor

In this paper we will review recent literature and consider elements and boundary concepts that constitute the ICT4D field. Our goal is to review boundary objects (conceptual frameworks and participation processes) that have so far been created to aid ICT4D understanding and decision-making, and seek to synthesise these into a framework that goes at least some way to addressing the concerns expressed above. The structure of our approach to this is outlined below.

In Section 2 of the paper, we present a review of different conceptions and measures of poverty and consider the most suitable conception of ‘poverty’ as a target (and means of assessment) for sustainable technology-supported participatory development to alleviate poverty. This is followed in Section 3 by a review of the multidimensional inequalities that underpin digital divides and their parallels with poverty as conceived within the capability approach, and how this can provide a better understanding of the contribution of digital divides to poverty. In Section 4 we build on this analysis to examine the role of ICTs in development, and to elucidate factors at play when ICT4D projects succeed or fail in alleviating the divides that combine to create poverty. In Section 5, we provide an overview of the rationale for participatory and sustainable development using ICTs. In Section 6 we build on our analyses to present a review of existing frameworks and processes (‘boundary objects’) that have been used to facilitate multi-stakeholder development, and from these we construct a comprehensive framework for sustainable technology-supported participatory development to alleviate poverty. Section 7 contains our conclusions and recommendations for future research.

2. **POVERTY, CAPABILITIES AND ICTS**

“We cannot accept poverty. It is a denial of choices. We have to enable people to make choices, to make something better out of their lives” Muhammad Yunus (ZEF, 6 November 2010)

How poverty is defined and measured determines who is defined as poor, how we think about poverty’s causes, and our evaluation of measures to alleviate it (von Braun et al., 2009). If we are to consider how we might address poverty with the help of technology-supported participatory development, we need to be clear on our conception of poverty and how we will assess such attempts to alleviate it.

2.1 **Conceptions and Measures of Poverty**

2.1.1 **Income Poverty**

For many, ‘development’ has long been equated with increases in production and wealth, usually measured as gross domestic product (GDP) per capita. This commonly-held conception of poverty is one of a lack of money, and to alleviate poverty therefore means finding ways to deliver increased incomes to the poor (UNCTAD, 2010). The World Bank has accordingly defined poverty with reference to a threshold of $1.25 per day at 2005
purchasing power parity; those seeking to manage on less than this sum are living in ‘extreme poverty’ (Ravallion et al., 2009). The World Bank proposes four reasons why measuring poverty is important (Haughton and Khandker, 2009, p.1):

- To keep poor people on the agenda
- To be able to identify poor people and so to be able to target appropriate interventions
- To monitor and evaluate projects and policy interventions geared to poor people
- To evaluate the effectiveness of institutions whose goal is to help poor people.

The choice of the single indicator of income is justified in part because it is seen as closely correlated to other dimensions of poverty: “Inadequate income is a strong predisposing condition for an impoverished life” (Sen, 1999, cited in von Braun et al., 2009).

### 2.1.2 Poverty Indices

With the aim of moving the poverty focus from economic factors to broader conceptions of human well-being, beginning in 1990 other measures such as the Human Development Index (Fukuda-Parr, 2003) and Global Hunger Index (IFPRI/ Welthungerhilfe, 2006) have been conceived. These incorporate indicators such as life expectancy, literacy and participation in education, and hunger (von Braun et al., 2009). However these are also not free from controversy. The dimensions selected for the United Nations Development Program (UNDP) Human Development Index (living standard based on GDP per capita, health based on life expectancy at birth, and education based on adult literacy and school enrolment) are criticised because they omit other dimensions such as human rights and political participation, inequalities, gender issues, the environment, governance and corruption (Schimmel, 2009). In addition, the annual Human Development Report released by the UNDP, which has been supplementing the Human Development Index with a growing number of other poverty dimensions (see e.g. UNDP, 2010), has been criticised for focusing on human deficits (Schimmel, 2009, p.95):

“UNDP equates poverty with disease, high infant mortality, low life expectancy, malnutrition, hunger, lack of access to water, education, knowledge, public and private resources, housing, clothes, and security … in other words with lack and deficiency. It contemplates exclusively what poor people do not have and what they are not”.

### 2.1.3 The Livelihoods Approach

The livelihoods approach to assessing poverty evolved from the late 1980s, with particular reference to concerns regarding “production thinking, employment thinking, and poverty-line thinking” (Chambers and Conway, 1992, p.2). The definition proposed was (Chambers and Conway, 1992, p.6):

“…a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living; a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long-term”.

The livelihoods approach to poverty pays particular attention to the vulnerability of the poor within their particular context, in a multidimensional way. By considering use of
available assets (human, natural, financial, social, physical) and how these gain meaning and value in the context of institutional structures and processes (such as government, laws and markets), it is possible to better understand how those in poverty make use of livelihood strategies to pursue their own objectives (UNCTAD, 2010). Insights into the ways in which people’s livelihood strategies are being thwarted, i.e. that they are being impoverished, can thus be gained to an extent that an income poverty or poverty index approach does not enable.

2.1.4 The Capability Approach

While the notion of individual ‘capabilities’ is incorporated within the livelihoods approach (Chambers and Conway, 1992), a more explicit focus on human freedoms and capabilities takes “one further step away from the idea of poverty as being just about money” (UNCTAD, 2010, p.5). The ‘capability’ approach (Sen, 1982) can be distinguished from other economic approaches to poverty and development in that it considers the “means to achieve,” “freedom to achieve,” and “actual achievement” of goals an individual values (Zheng, 2009). Sen uses the notion of ‘freedom’ as the basis for his capability approach, and describes freedom as “central to the process of development” (Sen, 1999, p.4) for two reasons:

1) the evaluative reason: assessment of progress has to be done primarily in terms of whether the freedoms that people have are enhanced;
2) the effectiveness reason: achievement of development is thoroughly dependent on the free agency of people

Freedom is thus both the means and the end of development. It is enacted in five distinct forms that contribute to the capability of a person to develop and to be developed (Sen, 1999):

1. Political freedoms
2. Economic facilities
3. Social opportunities
4. Transparency guarantees (meaning arrangements enabling interaction with others based on basic presumptions of trust)
5. Protective security (meaning institutional measures to protect those who are vulnerable when they encounter situations which may cause them further deprivation)

There is a positive interdependence of these multidimensional freedoms in influencing an individual’s situation in context with others (Sen, 1999, p.11):

Political freedoms (in the form of free speech and elections) help to promote economic security. Social opportunities (in the form of education and health facilities) facilitate economic participation. Economic facilities (in the form of opportunities for participation in trade and production) can help to generate personal abundance as well as public resources for social facilities. Freedoms of different kinds can strengthen one another.

The key characteristics of these four conceptions and measures of poverty are summarized in Table 1.
Having considered various conceptions and measures of poverty, the next step is to consider which is most useful for our purposes.

### 2.2 What is the Most Suitable Conception of 'Poverty' as a Target (and Means of Assessment) for Sustainable Technology-Supported Participatory Development to Alleviate Poverty?

Harris (2004) poses the question, “What is poverty, where is it, and how does it look when it has been alleviated?” (p.7). In discussing this, he notes that even World Bank reporting goes beyond simple income measures of poverty, to include factors such as “powerlessness, voicelessness, vulnerability, and fear” (Harris, 2004, p.7). Furthermore, he notes the European Commission’s assertion that poverty should include factors such as “deprivation of basic capabilities and lack of access to education, health, natural resources, employment, land and credit, political participation, services, and infrastructure” (p.7). These mirror the political, economic and social freedoms and affordances addressed by the capability approach (Sen, 1999).

The latest UNDP Human Development Report (UNDP, 2010) has attempted to address these gaps to some extent by extending its assessment of poverty to include three new measures: an Inequality-adjusted Human Development Index, a Gender Inequality Index, and the Multidimensional Poverty Index (MPI) (Alkire and Foster, 2009). The MPI is “grounded in the capability approach” (UNDP, 2010, p.94).

When considering the multidimensionality of poverty, the United Nations Conference on Trade and Development also recognizes that information, communication and knowledge are key planks in building human capability and alleviating poverty (Marker et al., 2002, cited in UNCTAD, 2010, p.3).

“The poor are not just deprived of basic resources. They lack access to information that is vital to their lives and livelihoods: information about market prices for the goods they produce, about health, about the structure and services of public institutions, and about their rights. They lack political visibility and voice in the institutions and power relations that shape their lives. They lack access to knowledge, education and skills development that...
could improve their livelihoods… They lack access to, and information about, income-earning opportunities”.

The development studies literature reveals too that the capability approach is beginning to make a contribution to development of robust theory underpinning the impact of ICTs on development (Heeks, 2010; Hamel, 2010; Zheng & Stahl, 2011). Recent case study examples include use of the capability approach to assess the impact of ICTs on the quality of life of people in rural communities in Uganda (Kivunike et al., 2009), to guide systemic conceptualization of the development process relating to telecentres in rural Chile (Kleine, 2010), to guide and evaluate two ICT4D programs in Aboriginal communities in Australia (Vaughan, 2011), and as the guiding framework for an ICT4D initiative contributing to capabilities and empowerment for education, health and farming at two pilot sites in Cambodia (Grunfeld et al., 2011).

These theoretical reviews and case studies provide evidence of the pragmatic benefits of the capability approach for ICT4D effectiveness. Vaughan (2011) puts it plainly:

…ICT programs which demonstrably and explicitly contribute to community well-being aspirations through the contribution they make to capabilities are being sustained by communities whilst other programs, which do not make this connection but merely provide a generic resource such as access, are falling by the wayside and leading to wasted resources.

We therefore consider that the capability approach to poverty and poverty assessment provides a sound foundation for conceptualising and evaluating sustainable technology-supported participatory development to alleviate poverty. The capability approach enables us to consider how ICTs can support and promote sharing of information, facilitation of communication, and construction of knowledge to expand the political freedoms, economic facilities, and social opportunities that people enjoy; in other words, how ICTs can promote participation, empowerment, health, education and income of people individually and in community.

But can the capability approach to ICT4D assist in overcoming the oft-cited ‘digital divide’? Might the digital divide be seen as synonymous with ‘poverty’ when viewed from a capability perspective? We consider these issues in the following section.

3. **Digital Divides, Poverty, and the Need for Multidimensional Approaches**

“Information is critical to the social and economic activities that comprise the development process. Thus, ICTs, as a means of sharing information, are a link in the chain of the development process itself.” (International Labour Organization, 2001, cited in Harris, 2004. p.10)

When there is a ‘digital divide’ (for reviews see van Dijk, 2006; Wresch, 2009), part of the population is excluded from accessing information and networks that could be used to expand their capabilities and freedoms. Well before the internet arrived to leave developing countries bobbing in the developed countries’ informational wake, Sen (1984, p.302) pointed out that “[t]he role of information in the ethics of international income distribution can hardly be overemphasized”. Even though ICTs have the potential to reduce this digital (informational) divide within and between countries and regions, ICTs and their benefits have not reached poor countries at the same scale as they reach developed countries, particularly
poor rural areas within countries (Torero and von Braun, 2005). Is the ‘digital divide’ essentially synonymous with ‘poverty’ as viewed from a capability perspective?

In the context of analyzing information as a source of exclusion and inequality, van Dijk (2006) proposes three conceptions of ‘information’ as the basis for inequality: (i) as a primary good or input, (ii) as a positional good, or (iii) as a source of skills. Information seen as a primary good means that it is viewed as essential for the survival and self-respect of individuals, without which basic levels of income, freedoms and rights are beyond reach (van Dijk, 2006). Information can also be seen as a positional good, according to which “some positions in society create better opportunities than others in gathering, processing and using valuable information” (van Dijk, 2006, p.231). This amplifies even further the power, capital and resource inequalities already created by differences in physical access to ICTs. Finally, information can also be viewed as a source of skills; internationally and historically, those labour markets that have successfully appropriated ICTs have gained a skills premium that has exacerbated existing income inequalities. (Nathius and de Groot, 2003, cited in van Dijk, 2006).

Further, a number of dimensions make up the digital divide. These include differences in service availability, awareness regarding the benefits of ICTs, opportunity to learn and use new media, mastery of technologies, experience, skills, support, and attitudes regarding use of ICTs, sufficiency of content, barriers relating to cultural, disability, linguistic, or gender factors, and structural, political and governance factors (Harris, 2004).

The digital divide can thus be seen as multi-faceted and heavily socio-political in genesis. This has led to the need to express the digital divide as far more than access to technology and technological devices, rather to express it in terms of the multiple dimensions that have created it and the multi-layered inequalities it spawns. Van Dijk (2006) classified these inequalities into 5 types: technological, immaterial, material, social and educational.

<table>
<thead>
<tr>
<th>Type of inequality</th>
<th>Inequality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technological</td>
<td>Technological opportunities</td>
</tr>
<tr>
<td>Immaterial</td>
<td>Life chances</td>
</tr>
<tr>
<td></td>
<td>Freedom</td>
</tr>
<tr>
<td>Material</td>
<td>Capital (economic, social, cultural) Resources</td>
</tr>
<tr>
<td>Social</td>
<td>Positions</td>
</tr>
<tr>
<td></td>
<td>Power</td>
</tr>
<tr>
<td></td>
<td>Participation</td>
</tr>
<tr>
<td>Educational</td>
<td>Capabilities Skills</td>
</tr>
</tbody>
</table>


Viewed through this lens, the fallacy of the digital divide as a simple lack of access to technology is exposed. Instead, its constituent inequalities closely mirror the definition of poverty derived from the capability approach that we set out in Table 1: “Impediments to an individual’s means to achieve, freedom to achieve, and actual achievement of personal goals.” The efforts aimed at bridging the digital divide therefore need to be refocused as strategies to address the multiple divides within which poverty has been fostered, such as
access to information, education, health services, and political participation. ICTs clearly have significant potential to contribute to such poverty alleviation strategies.

The need to address the differences in access and use of ICTs from a multidimensional perspective has also been acknowledged by the International Telecommunication Union (ITU). From the premise that ICTs can be a development enabler if applied and used appropriately, the ITU constructed and calculated in 2009 an ICT Development Index (IDI) (see Box 1). The goal of the IDI is to measure the development of ICT in different countries and relative to other countries, the level of advancement of ICTs in all countries and the digital divide, i.e. differences among countries with different levels of ICT development and the development potential of ICTs in each country (ITU, 2009).

**Box 1. The ICT Development Index (IDI)**

This measure includes access, use and skills measures toward ICTs within a conceptual framework in which countries’ evolution towards information societies goes through 3 stages:

- Stage 1: ICT readiness, reflecting the level of networked infrastructure and access to ICT,
- Stage 2: ICT intensity, reflecting the level of use of ICTs in the society, and
- Stage 3: ICT impact, reflecting the result of efficient and effective ICT use (ITU, 2009).

The indicators used for the first stage (ICT infrastructure and access readiness) include some previously used to measure access, i.e. fixed telephone lines per 100 inhabitants and mobile cellular telephone subscriptions per 100 inhabitants, with additional measures regarding infrastructure such as international Internet bandwidth (bits per second) per Internet user, and to measure home access to technology such as proportion of households with a computer and proportion of households with Internet access at home.

The second stage (ICT intensity of use) is measured with data about Internet users per 100 inhabitants, fixed broadband Internet subscribers per 100 inhabitants and mobile broadband subscribers per 100 inhabitants.

ICT impact, the third stage, is not measured directly but through the measurement of skills for the use of ICTs, based on the presumption that ICT skills are needed to make the best use of ICTs and are critical for the potential impact that ICTs can have on development. Skills in the use of ICTs are captured in this index through proxy measures, while data that more directly measure ICT skills is available for many countries. These proxy measures are the adult literacy rate, the secondary education gross enrolment ratio and the tertiary education gross enrolment ratio.


4. ICTs, Development and Poverty Alleviation

“ICTs, if conceived and accommodated in locally meaningful ways can provide a platform for advancing development agendas in ways that are sustainable in the longer term” Maiye and McGrath (2010, p.2).

We have already considered conceptions and measures of poverty in relation to ICTs. We have also reviewed the nature of digital divides and the way these contribute to poverty

---

3The International Telecommunication Union is the leading United Nations agency for information and communication technology issues worldwide (http://www.itu.int/).
as viewed from a capability perspective. What then has been the role of ICTs in development and in helping alleviate the divides that coalesce to create poverty?

By reducing the costs of information sharing, improving its timely availability and providing the opportunities to create networks between people sharing particular interests or information needs, ICTs have been found to contribute to the improvement of socio-economic conditions in developing countries.

The impacts of ICTs for rural households include savings in time and other resources, access to better information leading to better decision making, improvements in efficiency, productivity and diversity (Leff, 1984; Tschang et al., 2002; Andrew et al., 2003, cited in von Braun, 2010), information on new technologies and expanded market reach (von Braun, 2010). In a typical case, Jensen (2007) empirically demonstrated how the access to information by fishermen through the use of mobile telephones in the Indian state of Kerala had an effect on market performance, improving the welfare of the people deriving their income from this economic activity. This impact was measured by observing the changes in the dispersion of prices in 15 fish markets along the coast of Kerala. Through the use of mobile telephones, fishermen were able to share information about prices in the different markets along the coast and make a decision about where to sell their produce. This resulted in a more efficient allocation of the catch along the markets and a decrease in the dispersion of the prices.

ICTs have also proven successful in the provision of services such as banking and health and the creation of knowledge networks between universities in India and Africa to support open, distance and e-learning institutions (von Braun, 2010). They have proven useful too as a source of multimedia entertainment and edutainment, providing information that raises awareness regarding health issues such as AIDS (von Braun, 2010). The use of ICTs such as fixed phone lines, mobile phones, radio, television and mobile banking services have been shown to have improved the livelihoods of poor people living in rural areas of developing countries (von Braun, 2010; UNCTAD, 2010).

Reviewing the range of cases in which ICT has been found to contribute to poverty alleviation, in agriculture, fishing, and small-scale (often subsistence) manufacturing and services, the conclusion is that the benefits flowing from ICT use can be attributed to (a) reduction in information search and transaction costs, and (b) improved communication within supply chains resulting in individual enterprise benefits and overall market efficiency improvements (UNCTAD, 2010).

However, for every ICT4D success, there have been many more failures. Experiences from early attempts to utilise ICTs for the improvement of livelihoods in developing countries have been characterised by cycles of “heavy over-promising followed by noticeable under-delivery” (Heeks, 2010, p.629). Projects following the rural telecentre model were particularly problematic; this was extensively implemented without consideration of the local realities of the context telecentres were being placed in (Heeks, 2010). Considering such failures alongside the ICT4D project successes outlined above, it seems that the successful projects have managed to primarily target the ‘technological’, ‘material’ and (to a lesser extent) the ‘educational’ inequality types identified by van Dijk (2006). But even these successful projects appear to have been less adept in addressing the ‘immaterial’ and ‘social’ inequality types (van Dijk, 2006). Importantly, these inequality types include elements that go to the heart of the capability approach: life chances, freedom, positions, power and participation.

Nearly a decade ago now, Chapman and Slaymaker (2002) were already recommending that for ICTs to serve the development needs of rural communities, there was a need for pluralistic or participatory approaches.
To establish the role of ICTs in supporting and building the capacity of indigenous knowledge systems, the mechanism for information sharing must initially be assessed within the local context. ...ICTs have the potential to initiate new rural networks of information exchange but their use in the first instance will need to be determined locally, according to local choices. (Chapman and Slaymaker, 2002, p.25).

Harris (2004) also saw ICTs as an ingredient towards solving poverty, providing the potential of information was understood as a strategic development resource that should be incorporated as a routine element into the development planning process.

Reflection by ICT4D practitioners on project successes and failures, along with wider appreciation of the multidimensional nature of poverty discussed above, means that ICT4D research has undergone a transition. Research in the relationship between ICTs and development has now largely moved from examining if there is a causal relationship between technology and development to trying to understand how to maximise the benefits that ICT use and adoption may provide to meet development purposes (Brown and Grant, 2010).

However, demand for ICTs continues to be perceived as less urgent than demand for primary infrastructure and social services, when “[a]ctually the poor are hungry for ICT, knowing well that information serves access to education, markets and health services” (von Braun, 2010, p.4). Attempts to remedy this have ended in failure when developing countries have introduced information systems “without explicit consideration of the concept of development being advanced or the processes through which it may be achieved” (Maye and McGrath 2010, p.1).

In the remaining sections of the paper, we consider the implications of participatory development approaches for sustainable development using ICTs, and propose a framework for such development to alleviate poverty.

5. PARTICIPATORY AND SUSTAINABLE DEVELOPMENT USING ICTS

“Development strategies, including ICTs for development, should serve growth and the needs of the poor, as they perceive them” (von Braun, 2010, p.4)

As lack of progress in addressing poverty in the decades after the second world war led to dissatisfaction with the modernist, production- and income-focused conception of development associated with the ‘income’ concept of poverty described earlier (Leys, 2006; UNDP, 2010), new approaches began to emerge from the 1980s onward. These included the notion of “sustainable development” (United Nations, 1987) and “participatory development” (Chambers, 1997).

‘Sustainable development’ was initially defined as development "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987, paragraph 2). It has also come to have an associated meaning (and sub-discipline, ‘sustainability science’ (Mollinga, 2010)) that focuses on the nature of communication and relationships surrounding development and the way in which development can be self-sustaining without ongoing external inputs (Harris, 2004; Horton et al., 2009).

‘Participatory development’ (and ‘sustainable development’ in the latter sense) grew out of a recognition that knowledge is embedded within language and practices that are locally situated, and that lasting development can only be achieved through consensus,
namely “communication, social interaction, dialogue, and mutual understanding“ (Chapman and Slaymaker, 2002, p.7).

We should look more deeply at the ideas that create the dichotomy between development founded upon participation and sustainability on the one hand, and development focused on capital and income growth on the other. This will better enable us to create a sound framework to assist in creating and evaluating sustainable, technology-supported participatory development.

When ICT is deployed in service of development goals, this is usually done in one of two ways (Harris, 2004):

a) as a top-down, local or state government-led project
b) as a bottom-up “grass roots“ initiative led by local communities or non-governmental organisations

Correspondingly, it has been suggested that the theory and practice associated with IT and ICT have an essentially functionalist rationale (“what is and what can be achieved“), while ICT4D has a “profoundly moral agenda“ (“what should be done and how we should do it“) (Unwin, 2009, p.33). We might therefore broadly classify the approaches as functionalist/top-down, and humanist/bottom-up. In keeping with this, Chambers (2010, p.12) characterises the dichotomy as one of ‘things’ and ‘people’:

Table 2: Things and People

<table>
<thead>
<tr>
<th>Point of Departure and Reference</th>
<th>Things</th>
<th>People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode</td>
<td>Blueprint</td>
<td>Process</td>
</tr>
<tr>
<td>Keyword</td>
<td>Planning</td>
<td>Participation</td>
</tr>
<tr>
<td>Goals</td>
<td>Pre-set, closed</td>
<td>Evolving, open</td>
</tr>
<tr>
<td>Decision-making</td>
<td>Centralised</td>
<td>Decentralised</td>
</tr>
<tr>
<td>Analytical assumptions</td>
<td>Reductionist</td>
<td>Systems, holistic</td>
</tr>
<tr>
<td>Methods, rules</td>
<td>Standardised, universal</td>
<td>Diverse, local</td>
</tr>
<tr>
<td>Technology</td>
<td>Fixed package (table d’hote)</td>
<td>Varied basket (a la carte)</td>
</tr>
<tr>
<td>Professionals’ interactions with local people</td>
<td>Instructing ‘motivating’</td>
<td>Enabling, empowering</td>
</tr>
<tr>
<td>Local people seen as</td>
<td>Beneficiaries</td>
<td>Partners, actors</td>
</tr>
<tr>
<td>Force flow</td>
<td>Supply-push</td>
<td>Demand-pull</td>
</tr>
<tr>
<td>Outputs</td>
<td>Uniform, infrastructure</td>
<td>Capabilities</td>
</tr>
<tr>
<td>Planning and action</td>
<td>Top-down</td>
<td>Bottom-up</td>
</tr>
</tbody>
</table>

A parallel dichotomy has also been viewed as a fundamental flaw in the research relating to the link between ICTs and development, regarding the lack of recognition of a
distinction between research that is about implementation of ICTs “in developing countries” – which has a predominantly functional, technology-related focus – and research that is about implementation of ICTs “for development”, which is directed at empowering marginalised populations (Brown and Grant, 2010).

While it is still early days in the building of a robust body of evidence regarding the effectiveness of ICTs used to support development, already early this century the experience was that “bottom-up approaches to the design of information systems for community development are superior to alternatives“ (Harris, 2004, p.49). A corresponding and far more recent view is that “many of the errors and failures of development policy and practice have stemmed from the dominance of the things paradigm“ (Chambers, 2010, p.13).

But participatory development cannot be seen as some kind of ‘cure all’ for the challenges and complexities inherent in ICT4D. Without proper attention to power relations and the way that these are embedded in social and cultural practices, there is a danger that well-intended ‘participatory’ development may hide or widen existing divides (Zheng, 2009). There is a need therefore to manage the tension between “participative citizenship” and “reinforcement of existing power hierarchies and exclusionary practices” (Grimshaw & Gudza, 2010, p.10).

There are also calls, from past and present, for clearer guidelines for development and evaluation of ICT4D projects:

There is a need for a methodology that will enable field workers involved with ICT projects to mobilize communities towards achieving optimum outcomes from them. If a detailed methodology can be formulated, tested and documented, then large numbers of field operatives can be trained to implement it across many communities. Such a capability would enhance the likelihood of optimal development outcomes from a nationwide implementation, effectively incorporating the benefits of focused small-scale grass-roots projects into a large-scale national programme.

(Chambers, 2010, p.13)

ICTs can enhance capabilities for human development when applied with foresight, clear objectives, a firm understanding of the obstacles that exist in each context and proper policies that establish an institutional framework that promote the use and benefits of ICTs for the poor.


Our aim in this paper is to provide such guidelines, and to incorporate strategies to help ensure ICT4D is undertaken in a genuinely participatory way. Below we review and synthesise a range of evidence-based ICT and development approaches to provide an overall development framework and evaluation strategy for ICT4D projects.

6. A COMPREHENSIVE FRAMEWORK FOR SUSTAINABLE TECHNOLOGY-SUPPORTED PARTICIPATORY DEVELOPMENT TO ALLEVIATE POVERTY

"Technology goes where you want it to go" Muhammad Yunus (ZEF, 6 November 2010)

We have so far mapped out a conception of poverty informed by the capability approach (Sen, 1982; 1984; 1999) and by multi-dimensional approaches to the nature of digital divides (van Dijk, 2006). Building on this foundation, we have considered
participatory, people-centred approaches to ICT4D projects (Zheng, 2009; Unwin, 2009; Chambers, 2010; Vaughan, 2011). Given the typically ill-structured, contested, cross-cultural nature of ICT4D work, how can these be put into practice effectively to alleviate poverty?

In order to carry out effective ICT4D work, we are in need of suitable boundary objects: “devices and methods that allow acting in situations of incomplete knowledge, nonlinearity, and divergent interests” (Mollinga, 2010, p.S-4). Boundary objects “are both adaptable to different viewpoints and robust enough to maintain identity across them” (Star & Griesemer, 1989, p.387).

There are two broad categories of boundary object that can assist us in our objectives: assessment frameworks as learning and decision tools, and participatory processes with which to negotiate boundaries (Mollinga, 2010). Frameworks are useful because they link science, policy, and varied knowledge domains in a practical way to aid decision-making and learning. Participatory processes ensure that the socio-political power relations inherent in resource planning and knowledge development are taken into account (Mollinga, 2010).

Our aim is to create a comprehensive and adaptable boundary object (a conceptual framework) for the use of stakeholders, practitioners, researchers and policy-makers involved in ICT4D planning, development and evaluation. This framework (Star, 2010, pp.604-605):

- should function “as a set of work arrangements that are at once material and processual”
- should reside “between social worlds (or communities of practice)”
- will be “worked on by local groups who maintain its vaguer identity as a common object, while making it more specific, more tailored to local use within a social world”

There are a range of existing frameworks and participatory processes that can assist in our goal. We summarise these below, both to contextualize them within the concepts of poverty, participation, ICT4D and sustainability so far discussed, and to enable readers to determine which may be of particular benefit given their own context. We then set out our comprehensive framework derived from them.

6.1 e-Development Capability Approach Framework and Research Questions

Mirroring the dichotomy between the ‘things’ versus ‘people’ approaches to ICT4D (Chambers, 2010), and ICT “in developing countries” versus “for development” (Brown and Grant, 2010), Zheng (2009) expresses concern that “‘e-Development’ is often pursued with a lot of thinking on the ‘e’ and little on the ‘development’” (p.66).

In order to address this, he uses Sen’s capability approach to propose an overall capability approach perspective of ICT for development, along with a set of detailed e-development research questions to guide ICT4D based on elements of the capability approach:
Table 3: A Capability Approach Perspective of ICT for Development (Zheng, 2009, p.74)

| Means and ends of development | Considers substantive individual freedom as the ends of development Essentially concerned with ICT’s contributions to people’s capabilities to achieve a valuable life Concerned with effective opportunities for people to use ICT for what they consider valuable |
| Human diversity | Questions what conversion factors are in place to generate potentials to achieve, and to allow people the freedom of choice to realize the achievement Attention to diversity of and discrepancies in human conditions |
| Agency | Concerned with not just “haves” and “have nots,” but “cans” and “cannots” Emphasizes the agency of ICT users, therefore taking into account their aspirations and needs Accommodates and critically evaluates the design of social arrangements and cultural values in relation to individual capabilities |
| Evaluative spaces | Questions in which space should ICT projects be evaluated If we are concerned with equality in e-society, equality of what? |

Table 4: e-Development Research Questions Generated from the Capability Approach (Zheng, 2009, p.75).

<table>
<thead>
<tr>
<th>Elements of the CA</th>
<th>Research Questions for e-Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Means and ends of development</td>
<td>What kind of “development” is ICTs supposed to promote? How do ICTs help people to achieve what they consider to be valuable?</td>
</tr>
<tr>
<td>Commodities, capabilities, and human diversity</td>
<td>What capabilities can potentially be generated from a certain type of ICT? Are they appropriate for local conditions at this stage? What conversion factors (personal, social, environmental) need to be in place for capabilities to be generated from a certain type of ICT? What decision mechanism affects the actual adoption of a certain type of ICT, or the selection of certain characteristics of a type of ICT over other characteristics? How does ICT interact with these decision mechanisms (and their changes)?</td>
</tr>
<tr>
<td>Agency and restricted agency</td>
<td>What are the needs and aspirations of the potential ICT adopters? What are the rationales behind those needs and aspirations? What conditions enable or restrict the “agency” of the ICT adopters? How does ICT interact with these conditions?</td>
</tr>
<tr>
<td>Evaluative spaces</td>
<td>What essential capabilities are deprived? Who may be disadvantaged by the deprivation of these capabilities? What are the relationships between different types of capability deprivations?</td>
</tr>
</tbody>
</table>
Zheng’s (2009, p.79) capability approach framework and research questions aim to ensure ICT4D is focused on expansion of human freedoms and capability:

Seeing development as the expansion of capabilities of humans to lead a life as they value, ICT should be viewed as means to achieve such a goal in the process of development, in which a whole set of conversion factors are required to be in place. Addressing these conversion factors, which affect the well-being freedom and agency freedom of individuals, is as important (if not more important) than ensuring the availability of technology.

6.2 Adaptive Methodology for Ecosystem Sustainability and Health (AMESH)
This framework is based on a methodology developed over many years and tested in projects in Nepal, Kenya, Canada and Peru that integrates complex systems theories and community engagement into sustainable development projects (Waltner-Toews and Kay, 2005). It has five phases:

1. A ‘presenting situation’ or problem is raised by local people, researchers or a third party agency. This is seen as situated within an existing social, political, economic, physical and ecological context.
2. Those who respond work to understand the situation by considering the interaction of stakeholders and their viewpoints, the governance structures that exist, and the multiple social, political, economic, physical and ecological issues that are relevant.
3. Local stakeholders and researchers work together to identify systems-based alternative options for action at various scales and from various perspectives; stakeholder narratives are the primary focus, supplemented by other qualitative and quantitative data that can assist decision-making.
4. Stakeholders choose a course of action, develop a plan that incorporates collaborative learning for all involved, start implementation, and ensure that governance, monitoring, and management all co-evolve as the situation changes.
5. Developments in the situation are fed back into the second phase so that the process can continue to evolve to achieve stakeholder aims in relation to the presenting situation.

AMESH treats each development context as a holistic ecosystem, specifically integrates researchers as stakeholders, and “supports the full participation of local people and the inclusion of nonexpert perspectives to shape and inform our understanding of the ecosystem” (Waltner-Toews and Kay, 2005, ‘Applying the heuristic’ section).

6.3 Framework for ICT Intervention and Evaluation
This framework is the result of reflection on ICT implementation for poverty reduction in a wide range of development projects in Asia and Africa (Urquhart et al., 2008). The researchers have sought to provide a theoretical foundation for how ICTs can help build human capacity for poverty reduction based on social capital and knowledge management theories, and soft systems methodology.

Social capital comprises both human capital (with a predominant focus on development of an individual’s skills and capabilities) and the social capital inherent in the relations between people (Coleman, 1988, cited in Urquhart et al., 2008). Any project that seeks to leverage information and communication to produce knowledge to address root
causes of poverty will be limited by a lack of social capital (or by situations of mistrust that constitute ‘negative social capital’): “the weaker the social capital, the harder it is for the knowledge and human capital to grow in a community, thereby perpetuating poverty” (Urquhart et al., 2008, p.205).

Urquhart et al. (2008) propose an ICT intervention and evaluation framework comprising four stages:

**ICT development**: this is the strategic planning and needs analysis stage, and draws heavily on soft systems methodology (SSM). SSM was developed to apply system theory to difficult problem situations with significant socio-political elements (Checkland and Scholes, 1990, cited in Urquhart et al. 2008). A key component of SSM is CATWOE analysis (Urquhart et al., 2008, p.208):
- C: ‘Customers’: the victims or beneficiaries of T
- A: ‘Actors’: those who would do T
- T: Transformation process: the conversion of input to output
- W: Weltanschuung: The World View that makes this T meaningful in context
- O: Owners: those that could stop T
- E: Environmental constraints: elements outside the system which it takes as given

**ICT intervention/ICT infrastructure/ICT capacity building**: The CATWOE analysis conducted during the development stage also informs the ICT intervention stage. This is bracketed with both ICT infrastructure and capacity building because they are viewed as essential for the success of any ICT intervention. The CATWOE analysis should highlight whether available and planned infrastructure and social capital is likely to support the intervention. The analysis can also clarify roles in the project, and help the important consideration of how power relations may influence outcomes.

**Evaluation of the ICT intervention**: The intervention is evaluated for its social, cultural, and economic impact, which are all considered necessary for the intervention to have a positive impact on social capital development. As an aid to evaluation, there is a review of three dimensions of social capital (ability, opportunity, and motivation) and how they are represented in the community in relation to information, communication, and knowledge, and likewise how these three dimensions of social capital are represented in the ICT intervention in relation to information, communication, and knowledge.

**Poverty reduction**: This final and most contested stage seeks to consider a set of holistic poverty measures relating to access to information, social networks and knowledge creation, and their effect on access to education, health and other services, and income.

The researchers make it clear that their framework is not intended to be a comprehensive framework that alone will ensure that an ICT intervention in a developing country will be effective. Rather, it is intended as a ‘sensitising device’ to prompt mindful use of ICTs to reduce poverty.

### 6.4 VALuation for Sustainable Environments (VALSE)

Although the VALSE project was conceived “to demonstrate effective social processes for valuation of environmental amenities and natural capital for conservation and sustainability policy purposes” (O’Connor, 2000, p.165), it incorporates a ‘multiple criteria decision analysis’ (MCDA) method that also has the potential to help overcome the complex power relations and collective choice challenges that are inherent in ICT4D projects (O’Connor, 2000, p.165):

All choices, individual and collective, can be seen as value statements (implicit and explicit)... Valuation practices have a greater chance of social
legitimacy and policy usefulness when they are implemented with awareness of the deep social and institutional dimensions of value formation.

The steps in the MCDA method can be summarised as follows:

- Clarify the problem
- Determine the stakeholders
- Determine possible options for action
- Determine the performance criteria for the options for action
- Create a multi-criteria impact matrix and rate the options for action in relation to the performance criteria
- Create a multi-criteria impact matrix and rate the options for action as perceived by the stakeholders.

VALSE is not intended to produce ‘answers’ to difficult collective choice problems. Rather, it serves as a means of highlighting points of conflict and bringing value judgements to the surface to focus discussion and negotiation by the stakeholders involved. It also helps make transparent the political components of such choices so that the process of decision-making is itself subject to deliberation (O’Connor, 2000).

### 6.5. ‘Appropriate ICT’ Framework

This framework is founded upon the notion of ‘appropriate technology’ already in use in fields such as architecture, building technology, and agriculture: “technology that is suitable for the environmental, cultural and economic conditions in which the technology is intended to be used” (van Reijswoud, 2009, p.3). Illustrated by way of African health and education ICT4D projects in which the author has acted as advisor, the ‘Appropriate ICT’ framework provides a set of pragmatic guiding questions that deal with the product (hardware and software) and process (change management) aspects of ICT4D.

Table 6: Key guiding questions for Appropriate ICT Development (van Reijswoud, 2009, p.8).

<table>
<thead>
<tr>
<th>Phase</th>
<th>Hardware</th>
<th>Software</th>
<th>Change Mgmt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Are there specific requirements to hardware in terms of climatological and environmental conditions? What are the possibilities in terms of enabling factors (Internet connectivity, electricity)?</td>
<td>What are the needs? What are the expectations?</td>
<td>What are ICT knowledge levels? What are the financial constraints? What is the cultural context? What added value is created? How is the economic equilibrium affected? What new ways of working are introduced? What will the impact be of the system in terms of organizational change? What is the involvement in the idea generation of key decision makers (political leaders, religious leaders)?</td>
</tr>
</tbody>
</table>

The Electronic Journal on Information Systems in Developing Countries

http://www.ejisdc.org
The practical questions that the *Appropriate ICT* framework provides fill a gap that the other, typically higher level, frameworks do not address directly. If it is accepted that working within a local context and acknowledging local needs is fundamental to sustainable development, then there is a need to engage in detail with the complexities of the ‘on the ground’ conditions and infrastructure and implications for personal and community development (van Reijswoud, 2009).

### 6.6 Good Practice for ICT4D Project Implementation

This framework is presented against the backdrop of a retrospective look at the changing focus of ICT4D research over time, from a ‘readiness’ phase focusing on infrastructure and digital divide, through ‘availability’ and ‘uptake’ phases, to the latest ‘impact’ phase focusing on outcomes and development contribution (Heeks, 2010). The framework represents a successful ICT4D project as the outcome of a range of conditions and inputs conceptualised under three categories (Heeks, 2010, p.636).

1. Governance and actors: multi-stakeholder partnerships, and an open and competitive environment
2. Design: participation of local users, appropriate technology mix to match local realities, alignment to local development goals, and consideration of project risks
3. Sustainability: financial and social sustainability, development of local capacities and use of local institutions, and local ownership

This high-level framework is based upon the author’s extensive oversight of the evolution of ICT4D theory and practice and the factors that impact upon the success or
failure of development projects utilizing ICTs. As such, the framework can act as a broad checklist for ensuring that key success factors are attended to, in “a process that involves ‘the local’ at all stages” (Heeks, 2010, p.635).

6.7 Multidimensional Poverty Indicators

We described the Multidimensional Poverty Indicator (MPI) (Alkire and Foster, 2009) and the multidimensional ICT Development Index (ITU, 2009) earlier in the paper. Alkire and Foster (2009) emphasise that the MPI is “very adaptable to different contexts and purposes in that different dimensions and indicators can be selected depending on the purpose at hand” (p.79). This means that for an ICT4D project or group of projects, poverty indicators could be chosen that relate to information, communication, and knowledge and the particular context of implementation, as well as the particular focus of the evaluation.

Further, we also referred above to a set of holistic poverty measures used by Urquhart et al. (2008) as part of their framework for ICT evaluation. These are framed as questions and relate to access to information, social networks and knowledge creation, and their effect on access to education, health and other services, and income. The authors describe their intention

to formulate measures based on the idea that some poverty is caused by lack of access to information and knowledge, and other resources such as networks of contacts. The measures have been developed specifically for use with the [framework for ICT intervention and evaluation] and thus assume that an ICT network has been implemented. (p.209).

In relation to the capability approach (Sen 1982) and the multidimensional freedoms that underpin it (Sen, 1999) outlined earlier, we also described how Kivunike et al. (2009) used these concepts as the basis for evaluating the potential impact of ICT on the quality of life of people in rural communities in Uganda. Using multidimensional indicators that they had generated that related mainly to information, communication, and knowledge and their concrete impact on the day-to-day lives of those in the communities, the researchers evaluated the positive impact of ICTs on quality of life. Given the criticism levelled at the UNDP poverty indices that these focus only on human deficits (Schimmel, 2009), Kivunike et al. (2009) can be said to have successfully demonstrated a converse approach.

The work of Urquhart et al. (2008) and Kivunike et al. (2009) thus demonstrates the inherent need for multidimensional indicators to more meaningfully evaluate the impact of ICT4D projects on poverty alleviation, while Alkire and Foster (2009) provide a generic (and more theoretically robust) template that can enable creation of such multidimensional poverty indicators driven by the desired evaluation goals for ICT4D projects.

6.8 A Comprehensive Framework for Sustainable Technology-Supported Participatory Development to Alleviate Poverty

The ‘boundary objects’ (Star & Griesemer, 1989; Mollinga, 2010; Star, 2010) described above all provide valuable perspectives and tools to guide and evaluate development and evaluation of ICT4D aimed at alleviating poverty. However each addresses only part of the ICT4D for poverty undertaking. We consider that there is much to be gained by synthesising the frameworks and participatory processes we have outlined into a comprehensive framework that can serve as a development and evaluation strategy for ICT4D projects to alleviate poverty. This should be of benefit to communities, groups and agencies involved in ICT4D, as well as researchers and policy makers. Our comprehensive framework is depicted in Figure 5.
This framework as depicted provides a ‘bird’s eye’ view of the core stages and components of a transdisciplinary ICT4D development and evaluation process to alleviate poverty. This can assist all stakeholders involved in an ICT4D project to work from a common starting point in approaching the process, researchers to conceptualise their research focus and questions, and policy-makers to address policy gaps. The sub-components from which the framework has been synthesised provide the concrete methods and tools that can support sound development and evaluation of ICT4D projects that seek to alleviate poverty. The framework’s grounding in the people-centred capability approach to poverty, along with good practice and sustainability guidelines for ICT4D projects drawn from lessons learned in development projects over many years and in varied contexts, provide solid guidance to maximise the likelihood that ICT-related projects will be effective in alleviating poverty. As a boundary object, the framework will be subject to ongoing negotiation and change as the groups using it adopt and adapt it for their particular purposes. “These common objects form the boundaries between groups through flexibility and shared structure—they are the stuff of action” (Star, 2010, p.603).

7. **Conclusions and Recommendations for Future Research**

The application of Information and Communication Technologies (ICTs) for development is now a primary focus of the development agenda.

We began this paper by defining the notion of poverty that we could use in order to be able to choose a development and assessment approach for its alleviation. Poverty, as seen through the lens provided by the capability approach, refers to constraints on individual
freedoms that hinder or prevent full development of human capabilities. Freedoms can thus be seen as both the means and the end of development. Freedom to access information, networks for communication, and lifelong learning to enable creation of knowledge are fundamental in determining the possibilities of a person or community to develop to full potential.

In considering the nature and limitations of such information, communication and knowledge freedoms, the unequal access to information and communication technologies has been referred to as the digital divide, which exists both between and within countries. Developing countries that have been left behind in this digital aspect have felt an urgency to ‘catch up’ with more advanced countries. Efforts have also been undertaken to try to advance rural communities that have lagged behind more developed urban centers in terms of access and use of ICTs. In doing so, project implementers and researchers have used a range of approaches, which initially tended to focus on top-down projects for providing physical infrastructure: ICTs ‘in developing countries’. More recently, the discussion about ICTs and development has turned to deal more explicitly with the human development impacts of ICT implementation: ICTs ‘for development’. In this view, the target is human development strategies, with ICTs being only one ingredient.

There is already a growing body of evidence to show that sound implementation of ICTs does benefit development goals. However these benefits are still far from reaching those who are most impoverished. In part, this lack of effectiveness is attributed to a lack of clarity in the theory and practice of ICT4D as referred to in the Introduction to this paper:

- an apparent disconnection between academic scholarship and the needs of practitioners
- an overly utopian and zealous belief in the role that ICTs play in development
- a lack of linkage into the overall discourse regarding poverty alleviation
- investigation of ‘ICT’ in isolation from ‘development’
- investigation of the ICT and development ideal in isolation from other relationships
- a tendency for some research to lack academic rigor.

We have sought to address these concerns by reviewing a range of frameworks and participation processes that have been used to support sustainable development projects with multiple stakeholder interests. All of these have a contribution to make to sound planning, implementation and evaluation of ICT4D projects to alleviate poverty, however we have sought to integrate suitable elements of each to provide a comprehensive framework with an overall ‘capability approach’ focus. We consider that this framework offers an easily understandable, step-by-step approach to ICT4D projects, yet is based on a growing empirical research base, and points to detailed and concrete methods and tools to facilitate effective practice. By ensuring that stakeholders are central to the process right from the beginning, the framework is intended as a boundary object able to be adopted and adapted by those stakeholders to facilitate grassroots innovation and achievement of community goals. Further, by ensuring that human capabilities are central to the framework, not ICTs, we also consider that it can in fact serve as a useful tool in any development project.

Although we have sought to base our framework on research derived from extensive ICT4D practice in the field, we acknowledge that it has not yet been tested. As a next step, we encourage those involved in ICT4D practice and research to consider projects that they have worked on, and to review them against the framework that we have synthesised. If the framework and its underlying methods and tools help to highlight project elements that either contributed to or hindered project success in alleviating poverty, then we will know it stands to serve the purpose that we intend.
ACKNOWLEDGMENTS
The authors wish to thank the anonymous reviewers of this paper for valuable feedback and suggestions.

8. REFERENCES


