

## Research Article

# Using the Livelihoods Framework to Analyze ICT Applications for Poverty Reduction through Microenterprise

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### **Abstract**

*This paper provides a contribution to theorizing information and communication technology (ICT) and development by applying a livelihoods approach. This is found to provide the basis not only for an information-centered understanding of ICTs but also a means for broad and systematic analysis of poverty. The specific development issue analyzed is the role of ICT in microenterprise because microenterprise represents a viable route out of poverty through increased and more diversified income streams for poor households. A case study of Botswana is presented to demonstrate how the livelihoods framework can be applied. This suggests that ICT applications may only bring marginal direct benefits for poverty reduction.*

*Viewed from the perspective of a livelihoods approach, greater benefits for the poor may be derived from ICTs if they are applied to strengthen a broader range of social and political assets and if they are able to assist in building more effective structures and processes that favor the poor. The livelihoods approach is therefore able to identify information and ICTs as only one part of a much broader development picture, and it avoids the overemphasis on technology that can beset some development informatics/ICT for development (ICT4D) research. Mainstream application of livelihoods ideas tends not to engage explicitly with either information or ICT issues but the framework developed in this paper shows how such engagement can occur. It identifies both an analytical role for information/ICTs that helps understand livelihoods of the poor, and a functional role that uses these assets within livelihood strategies.*

A few researchers have sought to apply the livelihoods framework to assess information and communication technology (ICT) and poverty reduction (e.g., Albu and Scott 2001; Chapman et al. 2001; InfoDev 2005). However, this has as yet involved little conceptual understanding of how the livelihoods framework can be adapted to cater for ICT-oriented analysis. The livelihoods framework was initially developed as a means to understand the reasons for poverty through detailed analysis of social relations in a specific poverty context and to provide a means to empirically investigate the conditions of the poor (Chambers and Conway 1992; Carney 1999; Ellis and Bahiigwa 2003; Homewood 2005). The livelihoods framework does, however, represent a flexible and evolving approach, and it is informed by a number of key concepts and ideas that are applicable to a broad range of poverty-related issues.

This paper seeks to provide a contribution to theorizing ICT for devel-

opment (ICT4D) by applying a livelihoods approach as a suitable framework of analysis, taking a case study of microenterprise as an important potential area where ICT can be applied. Microenterprise has been selected as a topic for analysis because it represents a viable route out of poverty by providing increased and more diversified income streams for poor households. For example, microenterprise activity is observed to enhance livelihoods by reducing risk and vulnerability, by strengthening financial and nonfinancial assets, and by promoting social and economic empowerment (Ellis 2000; Davis 2003).

The paper is structured as follows. The first section presents a brief literature review concerning ICT and microenterprise in developing countries from which some key research issues are drawn. The following section outlines the principal components of the livelihoods framework and assesses the role of information and communication in livelihoods analysis and action. A number of key ideas from information systems are incorporated into an analytical framework employing a sociotechnical approach that prioritizes an understanding of information and communication a priori to considering technology applications. In the next section, the analytical framework is applied to assess the use of ICT for poverty reduction using a case example of microenterprise in Botswana. The final section presents a review of the theory and highlights some key questions for researchers in the area.

## ICT and Microenterprise in Developing Countries

A distinction is drawn in the literature between those microenterprise occupations that are survivalist and those that are entrepreneurial (Duncombe and Heeks 2002; Shaw 2004). Survivalists are pushed into enterprise by the lack of other income-generating activities. They form the majority of microenterprises in developing countries: they are commonly located in households; they are typically unregistered or unlicensed; and they constitute what is generally termed the “informal sector.” They are commonly founded upon the direct sale, trading, or processing of natural resource (primarily agricultural) inputs, including lower-skilled occupations such as fishing, household cultivation, simple brick making, and so forth (Shepherd 1998; Liedholm and Mead 2002).

Entrepreneurs are pulled into enterprise by the opportunities for income generation and growth. Entrepreneurial enterprises tend to encompass more diversified activities, including small-scale manufacturing and the provision of services and trade. Some may be registered and thus part of the formal sector. Microenterprises that are entrepreneurial tend to be comparatively small in number but can play a greater poverty-reducing role than survivalists, because of their higher growth, income, and employment-generating potential (Daniels 1999). Entrepreneurial enterprises may employ some labor and use more sophisticated technologies than survivalist enterprises. They will probably interact more effectively with established local (and possibly distant) markets and their owners are more likely to possess business and technical skills, as well as the personal attributes (e.g., self-confidence and motivation) necessary to identify and exploit market opportunities (Shaw 2004).

Poor households in general will likely step in and out of microenterprise activity depending upon the nature of the activity, seasonal demand, the availability of resources, and other personal and social factors (Shepherd 1998; Ellis 2000). Studies from Malawi (Orr and Mwale 2001), Sri Lanka (Shaw 2004), and Uganda (Ellis and Bahiigwa 2003) confirm that the proportion of earnings from microenterprise are nonexistent or very low for those in extreme poverty but tend to increase in a fairly uniform manner for those who are less poor or non-poor. For most rural households microenterprise is a supplementary activity, with the largest proportion of household income still gained from a wider portfolio of traditional sources—primarily wage labor, crop sales, livestock sales, transfers via social programs, or remittances from relatives residing abroad or in urban areas.

Within this context of microenterprise, this paper defines ICT in its broadest sense to cover the full range of *information handling technologies* that the poor commonly use and to which they may have access (Heeks 1999; Duncombe and Heeks 2002). “ICT” and “information handling technology” will thus be used synonymously and will include the nondigital technologies which are far more widespread than digital technologies, particularly in the rural areas of developing countries (Kenny 2002). Information handling technologies/ICTs therefore include digital ICTs (“new ICT”) but also encompass

hard technologies such as radio, television and analog telecommunication networks, and soft technologies based on information held as the written word such as used in books, manuals, and newspapers (Davenport and Prusak 1998).

In most developing countries ICT applications based on digital technologies still face considerable constraints. Moyi (2003) points toward lack of access to physical resources and infrastructure and stresses the importance of prioritizing information flows via preexisting networks of communication. Other studies also take a cautious approach to new ICT and detect a greater role for information handling technologies that are able to supplement existing systems by improving communications—between buyers and sellers, for example (Heeks and Duncombe 1999; Pigato 2001).

In studying the role of these technologies in the lives of the poor in developing countries, there is a fairly broad consensus that one must move beyond simply focusing on the technology. Given that the central function of information handling technologies is to handle information, a first step will be to found any analysis on an understanding of information and its communication. However, simply adopting an “information first” research approach may not be sufficient. Others have advocated an even broader frame of analysis that encompasses technology and information by looking at the overall condition and context of the poor. McNamara thus suggests we should begin the analysis “not with the presence or absence of ICT, but with the specific, inter-dependent causes (both local and global) and the components of persistent poverty in a given country, the most effective measures for addressing those causes, and then, and only then, the tools (not just ICT, but other resources, policies, partnerships, etc) necessary to proceed” (2003, 5).

This study takes the latter, contextualized approach. It poses a key practical research question: what role can information handling technology (such as new ICT) play in supporting microenterprise? It analyzes this question in an “information first” manner. However, drawing on the view espoused by McNamara and others, it sees that this analysis must itself first be firmly grounded within a contextual understanding that places the requirements for poverty reduction at its center. The livelihoods approach can provide a framework upon which such an analysis can be built.

## The Livelihoods Framework, Information, and ICTs

The livelihoods framework for analysis provides a way of thinking which views the poor as operating in a context of vulnerability (see Figure 1, adapted from Carney [1999]). Within this context, the poor have access to certain assets or poverty-reducing factors. These gain meaning and value through the structures and processes of the prevailing institutional, organizational, and social environment. This environment also influences livelihood strategies—ways of combining and using assets—that are open to people in pursuit of beneficial livelihood outcomes that meet their own objectives (Chambers and Conway 1992; Bebbington 1999; Carney 1999). Thus, “a livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets, while not undermining the natural resource base” (Chambers and Conway 1992, 6).

The livelihoods approach has evolved principally as an analytical tool that seeks to provide a logically consistent means for thinking through the complex issues and actors that influence the lives of the poor (DFID 1999). The livelihoods approach has a number of key features and is underpinned by a set of principles that guide its application. It starts with an analysis of poor peoples’ lives that is fully involving and participatory. It recognizes multiple causes, multiple influences, and multiple strategies for the reduction of poverty and seeks to provide a model of change that can positively impact on the lives of the poor, that is resilient to external shocks, and not overdependent on external intervention. Thus, it recognizes that the poor have their own portfolio of assets and strategies to cope with vulnerability, while also acknowledging the importance of the external structures and processes that can transform the lives of the poor.

The livelihoods approach has undergone revision and modification and in many senses represents a flexible and evolving framework. The most significant omission from early conceptions of livelihoods related to how the framework dealt with power, powerlessness, and unequal social relations (Moore et al. 2001; Moser and Norton 2001).

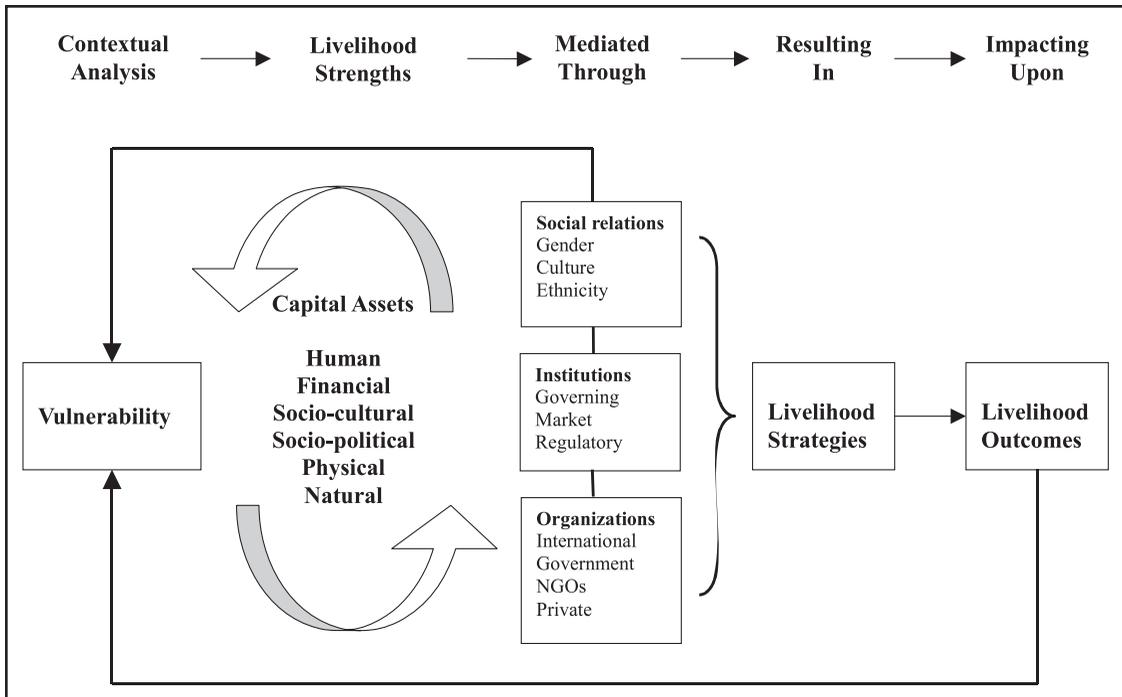


Figure 1. The livelihoods framework of analysis.

Within the conceived set of assets there was no overt reference to political capital. Yet powerlessness is felt most strongly by the extreme poor, those who are most often excluded from microenterprise activity, and not able to take advantage of opportunities provided through market mechanisms (Hulme and Shepherd 2003). The version shown in Figure 1 acknowledges this by highlighting sociopolitical assets as an essential component of social capital.

The livelihoods approach also emphasises the importance of creating effective macro-micro links (Schulpen and Gibbon 2002). In this respect, livelihoods analysis and action is intended to be “bottom-up” rather than “top-down” and employs participatory methods for data collection and analysis that fully involve the poor. Following from this, any methodologies associated with extracting data and assembling and communicating information should also embody those principles. Therein a tension arises between employing the livelihoods approach as a research-led analytical framework and as a developmental objective in its own right. This suggests a dual role for information (and, by extension, for ICT) vis-à-vis the livelihoods framework:

- An *analytical* role that focuses on accessing and assessing empirical evidence (both quantitative and qualitative) to understand livelihoods—by researchers, project/program planners, policy makers, and the poor themselves.
- A *functional* role that focuses on action—the manner in which information is used within livelihood strategies (by the poor themselves and via the structures and processes that impinge on the lives of the poor) to create favorable livelihood outcomes.

Both analytical and functional roles of information can be considered by breaking down the livelihoods framework shown in Figure 1 into four constituent parts: contextual analysis of vulnerability; livelihood strengths or assets; levels of analysis according to structures and processes; and livelihood strategies and outcomes.

**The Vulnerability Context**

The starting point for the development of a livelihoods analysis is firmly rooted at the microlevel, where individuals, families, households, or groups

create their own coping strategies within a context of vulnerability. The extent of vulnerability of the poor is determined by multiple influences related to trends, shocks, and seasonality concerning economic, social, political, geographical, and natural resource factors (DFID 1999). The vulnerability of the poor can increase because of lack of access to resources, weak economic integration, and climatic problems, factors that are often exacerbated by ineffective governance, lack of economic opportunities, social exclusion, conflict, discrimination, and lack of voice for the poor (Hulme and Shepherd 2003). Vulnerability can decrease when trends move in directions that are favorable to the poor.

There is a key analytical role for information when assessing the vulnerability context. Here, though, we can focus on the functional role that involves communicating that information to those who can act upon it. If the poor are themselves to be recipients of such contextual information (or, indeed, any type of information) and to make livelihood-enhancing use of it, it must be recognized that they require more than just the delivery of data; they require other resources, too. These include physical and monetary resources (money, skills, technical infrastructure) and social resources (trust, motivation, knowledge, power) (Heeks 1999). These are required, for example, to assess the credibility of the information source, assimilate the information content into current knowledge and, perhaps most importantly, then take action on the basis of the information provided (World Bank 1998; Heeks 1999).

Data from the wider environment are critical to the vulnerability context. For example, by assembling climatic data, processing it into a usable form, and communicating it to the poor as part of early warning systems, they may be able to protect against natural disaster. Another example would involve accessing data from the poor themselves by gauging the importance of different income-generating activities to households, assessing how seasonal or market fluctuations may impact upon livelihood outcomes, and then feeding that information back to the poor so they can act upon it. In both cases, though, following the “additional resources” point just made, information delivery alone will not be enough—other resources may well be needed in order to allow the poor to trust, assimilate and act upon the information being delivered.

### ***Livelihood Strengths and Assets***

An understanding of livelihood assets is concerned with analyzing people’s strengths. Again, information has an analytical role in terms of how we can measure the assets of the poor as well as a functional role in terms of how information can be used to strengthen assets. The livelihoods approach typically divides assets into five groupings—human, financial, social, physical, and natural—often displayed as a pentagon. We can therefore discuss each in turn with regard to the role of information. However, these five should be viewed not as distinct entities but as interdependent. As such, information can be considered as a resource that cuts across all forms of capital assets.

#### **Human Capital:**

Human capital describes the skills, knowledge, and ability to work (including good health) that enable people to pursue livelihood strategies. The measurement and analysis of human capital requires information concerning health, education, and skills acquisition. Human capital can be accumulated from a range of sources—both formal and informal—and information, in the guise of knowledge, can be seen as one component. Local indigenous information is often of greater importance than formal sources for sustaining livelihoods, particularly when used together with formal information from external sources. For example, for microenterprise, success has been achieved by combining indigenous knowledge related to traditional production techniques with external inputs of more formalized knowledge related to quality adherence and marketing of produce (Chapman et al. 2001).

#### **Financial Capital:**

Financial capital describes the portfolio of monetary resources that can be accessed to provide a range of livelihood options. These may include savings, gifts, microcredit, remittances, or other transfers via social programs. Analysis of financial capital requires information concerning a broad range of issues including sources of finance, means of access, savings behavior, the role of remittances, and so on. Functionally, the ability of the poor to access finance is heavily constrained by lack of information about finance sources and options (World Bank 1998), and lack of access to financial resources is most often highlighted as a critical problem area for microenter-

prises in developing countries (Liedholm and Mead 2002).

**Social Capital:**

Social capital describes the features of social organization that serve to coordinate actions. It describes the norms, the trust and the extended networks that underlie much income-generating activity (Humphrey and Schmitz 1995; Fafchamps 1999; Lyon 2000). Social capital not only describes the infrastructure of social relations but also the information that is transmitted between actors via their social networks (Granovetter 1993). Thus, it follows, that those who are excluded from such networks are those that are less likely to participate in microenterprise. Conversely, evidence suggests those with the most up-to-date and accurate information will be more able to participate in social networks, and will make better returns on such participation (Daniels 1999; Lyon 1999).

**Physical Capital:**

Physical capital can be seen as synonymous with technology. It describes the basic technological infrastructure and tools usable for the supply of energy, water, transport, shelter, and communications. It also describes the technology required in order to undertake productive processes. Albu and Scott highlight the interconnectedness of assets in this respect:

Our concern has been with the particular combination of physical, human and social assets that is known as technology. Technology is, after all, the mechanism through which people realise the value of their assets by transforming their labour and natural resources into food, shelter, health, income or other desired livelihood outcomes. The associated (technological) capabilities that enhance people’s ability to generate and manage technological change are crucial to sustaining livelihoods, particularly those based on micro- and small-scale enterprise. (2001, 18)

For microenterprise, analysis of physical capital requires information about technological choices and the appropriateness of technological solutions for the supply of infrastructure services and for the transformation of material inputs. In functional terms, it is important that the poor themselves are able to exercise choice based on their own needs, and the manner in which technological inputs are provided raises fundamental questions about the rel-

ative importance of market and nonmarket mechanisms in mediating information for the poor (Doward et al. 2003). Alongside this informational approach, though, a key point is to recognize that information handling technologies are themselves part of physical capital.

**Natural Capital:**

Natural capital describes the naturally occurring resources that are essential inputs for the poor and from which livelihoods are commonly derived. In many cases the vulnerability of the poor will be dependent on the status of their natural capital (e.g., access to land, climatic conditions, local water quality, and so forth). Natural capital also provides a resource input for microenterprise activity such as through reselling or processing surplus agricultural or horticultural outputs. Information systems are playing an increasingly important role in monitoring natural assets, giving rise to a broad range of information requirements for assessing environmental impact and sustainability (Chapman and Slaymaker 2002).

One asset distinction we can draw is between social capital, on the one hand, and other forms of capital—human, financial, physical, and natural capital—on the other. Social capital is recognized as a fundamental sociocultural/political resource that provides the foundation upon which greater economic and political participation can be built. Other forms of capital are more closely linked with the provision of overt resources. The use of ICTs—especially the new digital ICTs—requires a lot of additional overt resources such as a telecommunications infrastructure to provide network access and an electrical infrastructure to make the ICT work (physical capital); a skills infrastructure to keep all the technology working, usage skills to use the ICT, and literacy skills to read the content (human capital); and money to buy or access the ICT (financial capital). In this respect, Heeks points out that “the poor simply do not have these resources and the greater the degree of poverty the less likely you are to have access to such resources” (1999, 7).

**Livelihood Structures and Processes**

Using an ICT analogy, livelihood structures have been likened to hardware—the public, private, and nongovernmental organizations that set and deliver policy, deliver goods and services, and conduct a wide range of functions that affect livelihoods. Pro-

cesses are akin to software—political, economic, social, legal, and cultural mechanisms that govern how structures interact with groups and individuals (DFID 1999). Processes that affect the lives of the poor include the market, government policies, legislation, trade agreements, and so forth. Again we can identify two key roles for information. First, information required for analysis of structures and processes to assess their impact upon the lives of the poor. Second, information that allows processes to be functionally carried out—for example, the information required to facilitate markets, enact policy, frame legislation, or implement agreements. There is also a requirement for communication of information to facilitate: access by the poor to the transforming structures and processes and influence by the poor on the transforming structures and processes.

It is important to recognize the relationship between the transforming structures and processes and assets. Assets can be strengthened directly or indirectly. Thus, information can be applied and acted upon by the poor themselves (given the necessary additional resources noted above) or by the mediating institutions and organizations that influence the lives of the poor. We can term these latter *infomediaries*. Thus, we can assess a potential role of information handling technologies in two main ways: first, through direct means, by suggesting ways in which technologies can strengthen the assets of the poor; and second, through indirect means, by suggesting ways in which information handling technologies can strengthen and build the capacity of infomediaries—relevant institutions and intervening organizations.

We can also identify deeper processes enacted by macrolevel institutions and by mesolevel organizations. Both of these play a role in mediating information and the use of other assets into livelihood strategies. For example, at the macrolevel, national or international governing institutions can enact ICT policies (governing trade, regulatory, or market mechanisms) that have the potential to favor or disfavor the poor; they can choose to provide the type of ICT infrastructure and services that may assist or sideline the poor; or they can put in place forms of governance that may encourage or discourage political participation by groups that represent the poor. Similarly, at the mesolevel, mediating organizations (extension services, NGOs, health and education systems, and so forth) have, for example, the ability to

design programs involving use of ICT that can be responsive or nonresponsive to the needs of the poor and which either enable or disable the transformation of assets into livelihood strategies.

### ***Livelihood Strategies and Outcomes***

Chapman and Slaymaker (2002) suggest time-dependent roles for information in contributing to livelihood strategies. The first role relates to *long-term* capacity building through education, training, and technical support, such as has been traditionally provided through government-run extension services. Within a livelihoods perspective a broader role should also be considered: information for enhancing the long-term rights and entitlements of the poor (their sociopolitical capital) in areas such as health, education, participation, and empowerment. The second role relates to information concerning *short-term* decision making. For microenterprise, this type of information is likely to be gained predominantly by building and extending sociocultural resources and facilitating access to (predominantly local) economic networks. In terms of livelihood strategies, therefore, information can be seen to play a dual role: informing and strengthening the short-term decision-making capacity of the poor themselves; and informing and strengthening the longer-term decision-making capacity of the infomediaries that facilitate, assist, or represent the poor. Whereas the former will be solely functional, the latter may have an analytical, as well as functional, role.

The role of information handling technologies within livelihood strategies can be further understood by drawing a second distinction between information types—formal and informal. The poor hold informal information as indigenous knowledge. Davenport and Prusak define such knowledge as “a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers” (1998, 5). On the other hand, formal information is that which is recorded and available in a readable form and is more likely to be mediated through formal structures, such as technical information from manuals, market information from a market report, official government information, or information accessed via the Internet (Duncombe and Heeks 2002).

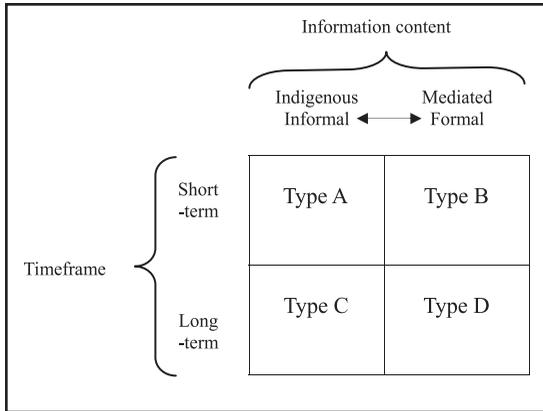


Figure 2. Typology of information roles for livelihood strategies.

Combining the two aforementioned two-dimensional constructs creates a matrix as shown in Figure 2. Within the matrix, information falls into four distinct categories:

- *Type A*: short-term information that serves the immediate day-to-day decision-making needs of the poor and forms of communication that enable participation in social networks (those that govern rural markets, for example). For example, information on market prices or about remittances from relatives, perhaps accessed via a mobile phone.
- *Type B*: short-term information that serves the immediate day-to-day decision-making needs of the poor but that is mediated and communicated through more formal structures and processes. For example, information relating to markets, government services, rights, entitlements, and so forth that might be accessed via local telecenters or other community-based infomediaries.
- *Type C*: longer-term information that serves to strengthen social capital (cultural and political) assets and extend the economic reach and political rights of the poor to more distant markets or centers of power. For example, information required to strengthen market- and nonmarket-based institutions that favor the poor, such as through Web-based marketing portals and e-trading platforms that support fair trade initiatives, or through e-

democracy channels designed to encourage participation and access for the poor.

- *Type D*: longer-term information required to access resources that are mediated through the organizations that are seeking to strengthen the other assets (human, financial, physical, and natural) of the poor. For example, through the provision of information and resources concerning health, education, training, microfinance, ICT or other material and technology infrastructure inputs and services.

**Summary Model**

The preceding sections have laid out the main components of the livelihoods framework and discussed ways in which information relates to those components. It has been recognized that information and communication are basic needs of the poor that should be considered a priori to assessing the application of information handling technologies. Figure 3 outlines a model that encapsulates these ideas and provides a livelihoods-based model for analyzing ICT applications for poverty reduction. The model specifies for information (and, thus, for ICTs) an analytical role in terms of how information can be used in an applied research capacity to assess vulnerability, identify and measure assets, and investigate structures and processes; and a functional role in terms of how information and ICTs can be applied within livelihood strategies to create favorable outcomes. The arrows signify an iterative, participative and communicative process that incorporates both research and action.

The following section applies this view of the livelihoods approach to analyzing ICT applications for microenterprise in a developing country context, taking Botswana as a case study.

**Analyzing ICT Applications for Microenterprise in Botswana Using the Livelihoods Framework**

Botswana presents a positive case of modern African development but is still constrained by considerable problems of poverty, inequality, and deprivation, with 30% of its citizens still living below the official Botswana poverty datum line in 2003 (reduced from 47% in 1993) (CSO 2003). It is not surprising therefore that Botswana has been described as a country of poverty amid plenty (Wikan 2000).

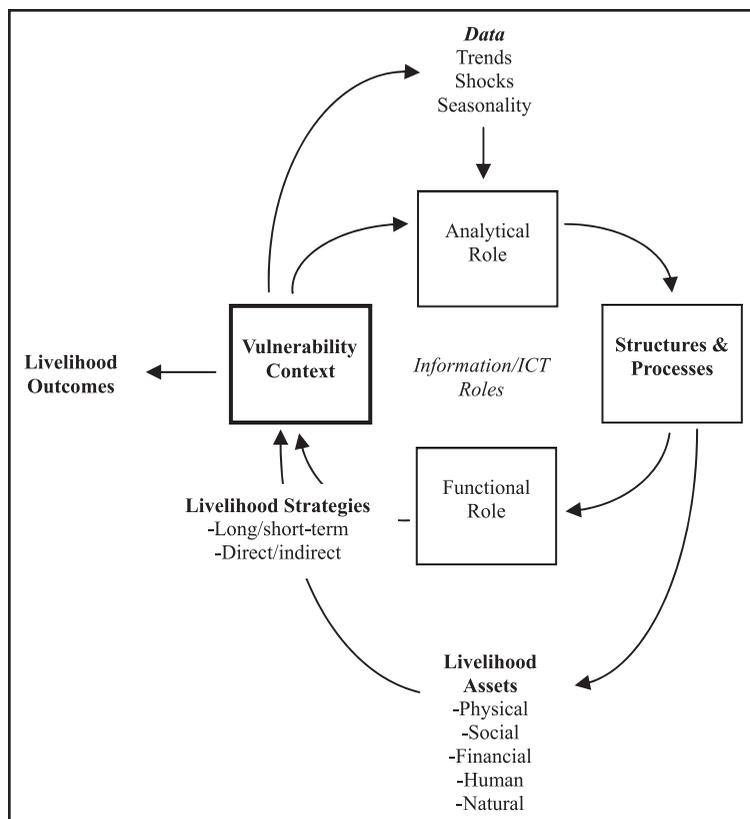


Figure 3. Model for understanding information and ICTs within a livelihoods framework.

Botswana represents a useful case study of ICT application for microenterprise because it possesses an urban and rural-based population that participates in a broad range of microenterprise activity; a rapidly expanding and modern communications infrastructure; and a government that has made a strong commitment to poverty reduction through expansion of the business sector and the use of new technologies (UNDP 2005).

The starting point for any livelihood analysis is an understanding of the vulnerability context and of livelihood assets. This is important because of the need to provide a contextual view of the potential area of ICT application—in this case, microenterprise. Such a view can be built mainly from secondary data. The main sources of evidence for the analysis are official reports published by the Botswana Central Statistical Office (CSO). These include household income and expenditure surveys (HIES) for 1992–93 and 2002–03 as well as an informal

sector survey carried out in 1999. In addition, contextual understanding is drawn from Botswana-specific data in the African e-Index (Sebusang et al. 2005) and the Botswana Human Development Report (UNDP 2005).

This analysis is complemented by use of a range of research studies that have focused on the micro- and household enterprise sector in Botswana (Lisenda 1997; SMME Task Force Report 1998; Wikan 2000; Liedholm and Mead 2002). This includes primary field data on information and ICTs in Botswana microenterprise, which has also been reported elsewhere (e.g., Duncombe and Heeks 2002).

### Background to the Microenterprise Sector

Botswana's 1999 informal sector survey estimated that 16 percent of all households in Botswana were operating business activities predominantly from residential premises, with microenterprise activity constituting approximately 90,000 units in total (CSO 1999, 2003). In Botswana, such household enterprises are defined as having five or fewer workers including the owner, with the majority generating incomes of less than P500 (c. US\$200) per month (CSO 2003). They are divided fairly evenly between the main urban centers (31%), urban villages (37%), and more remote rural areas (32%), with the majority found in the more populous northeast of the country or in villages and settlements close to the main arterial routes. Most are unregistered and counted in the informal sector, with the majority (66%) owned and run by women (CSO 2003).

The majority of household enterprises (65%) are involved in retailing and personal services, with only a small proportion processing and selling agricultural outputs (Lisenda 1997; CSO 2003). This makes Botswana not typical of other sub-Saharan African countries, primarily because it has no developed cash crop sector (Liedholm and Mead 2002). Over-

all, evidence indicates that the incidence of self-employment and family business is relatively low in Botswana. According to the 2003 HIES survey, only 9.3% of the economically active population are involved in self-employment, but across all regions the percentage of females in self-employment is significantly higher than that for males (CSO 2003). Research conducted by Wikan (2000) showed that the contribution of rural microenterprise to the incomes of the “very poor” in Botswana is virtually nonexistent, and evidence suggests that paid employment far outstrips self-employment (by a factor of ten in main urban centers and urban villages) as a source of household income (CSO 2003). Overall, the evidence suggests that microenterprises on average contribute only a small proportion to total household incomes for the poor in Botswana, albeit a potentially significant proportion for that minority of households that is involved in microenterprise.

### ***Assessing the Vulnerability Context***

The vulnerability context of microentrepreneurs in Botswana differs according to a wide range of variables. For the purpose of this short analysis, three variables will be highlighted: the location of the enterprise; the type of activity undertaken; and the gender of the business entrepreneur.

Evidence suggests that location will be a key predictor of vulnerability for the poor. A report on the nature and extent of poverty in Botswana (CSO 1996) stated that the primary factor that has reduced poverty levels was the trend toward urbanization alongside rapid increases in formal sector employment opportunities. Unlike much of Africa, urbanization in Botswana is positively associated with rising per capita incomes and there is greater prospect of increased urbanization in Botswana also leading to substantially improved access to infrastructure and resources—including employment in the formal urban small- and medium-scale enterprise sector—which also brings greater access to ICT.

Higher degrees of vulnerability are associated primarily with remote rural areas, and to a lesser extent with urban villages, where those who seek to conduct economic activity are vulnerable to the shock effects of drought, causing, for example, crop failures and wasting of livestock, thus cutting off supplies of inputs to some microenterprise activities. High levels of vulnerability in rural areas have also

been exacerbated by economic and political factors, such as the imposition of border controls in many parts of the country, thus restricting cross border trade, communications and movement of labor (Kruger 1998; Wikan 2000).

There is a relationship in Botswana between the type of business activity undertaken, the gender of the business entrepreneur, and the level of income that is commonly extracted from business activities. Female entrepreneurs predominate in more survivalist activities, such as in the production and selling of crops, fruit and vegetables, beer, craftwork, clothes and food. These are lower-income activities with the vast majority generating less than P500 (c. US\$200) per month. On the other hand, male entrepreneurs tend to predominate in more entrepreneurial activities such as making and selling of furniture, blacksmithing, metalworking, vehicle repair, taxi services, building, and plumbing—activities that generate much higher incomes—typically more than P1000 (c. US\$400) per month. Higher-income enterprises, therefore, tend to be male headed and are much more likely to be located close to urban centers, whereas female-headed lower-income enterprises are found predominantly in more remote rural areas (CSO 1993, 2003).

### ***Vulnerability Context and Information Handling Technologies***

Vulnerabilities arising from location, income group, and gender impinge directly on access to information handling technologies. Botswana has seen year-to-year increases in teledensity, and approximately one-third of main urban households now have fixed-line telephone connections (Sebusang et al. 2005). This falls to less than 10% in urban villages and less still in remote rural areas. A similar urban-rural gap is observed for ownership of mobile phones, televisions and personal computers (PCs). The only technologies that offer countrywide penetration are radio (and newsprint), with approximately 55% of all rural households owning a radio. Mobile phones have achieved a 41% penetration in urban households, but only 11% in rural. For TVs the figures are slightly better than for telecommunications, but PCs are found in just over 10% of all urban households but only 1% of rural. Internet connections are found in 5% of urban households and 0% of rural. The location of the enterprise,

therefore, is a key determinant of access to information-handling technologies.

In terms of affordability, the choices of poor households are constrained because a large proportion of household expenditure is required to meet basic needs. Households with low incomes spend a far larger proportion of their total income on food and clothing compared with households that are better off. The proportion of income spent on housing is fairly constant between socioeconomic groups, but the largest differentiation is found with regard to transport and communications. Evidence suggests that low-income households spend only 0.6% of their total income on communications (mainly post and telephone usage), whereas high-income households spend approximately 2.8%. Rural dwellers spend the least on communication services—only 0.12% of total monthly expenditure (CSO 1996, 2003). Data on access and affordability according to gender are not readily available. However, it has already been pointed out that that vast majority of household enterprises that are women headed also tend to be located in rural areas and involve activities that generate lower incomes. This suggests that, for household enterprises, the urban-rural gaps and the income-expenditure gaps associated with ICT access and affordability are also representative of significant gender gaps.

For micro-enterprises (the majority of which are run by women on low incomes in rural areas) some form of communal or intermediated access represents the only viable alternative to ownership. Here, the data show that those outside the main urban centers are still at a disadvantage with regard to the availability of payphones, kiosks, telecenters, and so forth. For example, 69% of households in urban areas have a kiosk (predominantly using mobile connections) within five minutes walking distance. This drops to 15% in the rural areas that are covered by mobile networks (Sebusang et al. 2005).

### ***Assessing Livelihood Assets***

In this part of the analysis we can consider the five livelihood assets of microentrepreneurs.

#### **Human Capital:**

The quality of the human resource base has been seen as Botswana's most significant structural weakness. This is not surprising, in light of the comparatively short history of education and training in Botswana, with less than 10% of those leaving Bot-

swana's schools having access to any form of vocational and technical training. Eighty-eight percent of all microenterprise owners have primary or no education, and only 1% have some form of tertiary education (Lisenda 1997). Ninety percent of all microenterprises keep no effective information records, including financial records (e.g., cash book, expense ledger, and so on) but also other records of transactions such as invoices or receipts. This suggests little scope for direct ICT application in a business support role particularly in rural areas. Field research in Botswana (Heeks and Duncombe 1999; Duncombe and Heeks 2002) identified lack of business and technical skills as a primary constraint, and suggested that microentrepreneurs are more likely to benefit from improvements in their underlying information handling skills, such as via improved interpersonal communications, enhanced financial management to improve business efficiency, and training in sales and marketing techniques. Within such enterprises, it is only when such basic skills have been significantly improved that any true benefit is likely to be gained from applying ICT.

#### **Financial Capital:**

Surveys of the microenterprise sector identify lack of financial capital as the greatest perceived constraint for microentrepreneurs (Daniels and Fisseha 1992; Lisenda 1997). Eighty-nine percent of all trading microenterprises have never received credit but have established their businesses largely through informal credit and personal funds. Thus, most microenterprises have no access to external sources of finance. It was also found that only 7% of micro-business owners were aware of most finance and business assistance programs; and only 27% were aware of the availability of capital expenditure grants delivered via the government's financial assistance policy despite extensive publicity campaigns (Lisenda 1997). This information gap is highlighted by field research in Botswana (Heeks and Duncombe 1999; Duncombe and Heeks 2002) that identifies considerable difficulties in accessing information resulting from information barriers erected by lending institutions and the lack of ability of business owners to search out and access such information successfully. In this case the application of ICT—through improved communication of information and greater transparency—may be a route to help in overcoming such institutional and skill-based constraints.

**Social Capital:**

Markets for microenterprise in Botswana are predominantly local, with access to customers facilitated through networks of contacts in the immediate locality. Generally speaking, such networks are underdeveloped in Botswana (Lisenda 1997). For access to customers, local informal networks are essential, but evidence also shows that reliance on them can restrict entrepreneurial activity—particularly for those that wish to extend their market reach into urban areas. Such microenterprises have greater information needs: for example, for information concerning formal credit facilities requiring written applications; for information on market prices within urban areas; for information on availability of inputs of raw materials and technologies from further afield (possibly from outside Botswana); or for information concerning access to representative organizations that can advocate on their behalf. Research conducted in Botswana (Heeks and Duncombe 1999; Duncombe and Heeks 2002) suggests that ICTs help to facilitate the expansion of social networks, thus forging linkages to sources of formalized and better-quality information that can serve to strengthen both sociocultural and socio-political assets.

**Physical Capital:**

Botswana has benefited from large-scale investment in physical capital, which has led to rapid expansion of a digital fixed-line telecommunications infrastructure into the main urban centers, the major towns, and large villages. Botswana Telecommunications (the national incumbent operator) has embarked upon a rural telecommunications program extending fixed line services to those previously unconnected. In addition, there has been a rapid expansion of mobile networks to more than 500,000 subscribers in 2004 (Sebusang et al. 2005). Thus, access to telecommunication networks is considerably better in Botswana than other sub-Saharan African countries. As outlined earlier, however, the majority of microenterprises are unable to benefit from existing infrastructure provision because of inequalities of both access and affordability. This is compounded by additional physical capital constraints experienced by microenterprises—particularly those in rural areas—including lack of transport, material inputs, labor deficiencies, inadequate tools and machines, inadequate business premises, and lack of access to utilities, including electricity and water (Lisenda 1997).

**Natural Capital:**

Although the natural capital assets of the poor in Botswana are primarily made up of land (smallholdings and cattle post lands) and livestock (cattle, goats, and donkeys) such assets do not provide a significant volume of inputs into microenterprise activity. This is reflected in the type of occupations that are chosen by microentrepreneurs that tend to be those that source material and natural resource inputs from external sources, predominantly as imported inputs (e.g., cloth, metals and timber) sourced via wholesalers or through direct cross-border trade. Microenterprise occupations do, however, create increased demand for effective (often cross-border) communications that are able to facilitate purchase and delivery of such goods.

**Assessing Structures and Processes**

A comprehensive analysis of structures and processes would be wide-ranging and detailed and would assess a broad range of factors concerning both influence and access. The following analysis of organizations, institutions, and social relations is more limited but illustrates a number of areas from which we can draw evidence.

Historically, the Botswanan government has played a key role in direct microenterprise support acting through research and training networks, integrated field services, agricultural extension services as well as local government. It is now generally accepted that government—through such top-down extension services—does not represent the most effective body for administering the implementation of policy in the enterprise sector (SMME Task Force Report 1998). It is particularly poor at disseminating information within a market environment and lacks the experienced personnel who are able to deliver information via effective interaction with entrepreneurs (Levitsky 1989).

Thus, policy changes during the latter half of the 1990s have seen a gradual diminution of services delivered exclusively via government structures and, instead, the promotion of partnerships with the third-sector or exclusively private sector solutions for the delivery of (predominantly rural) services to microentrepreneurs. For example, vocational training provision, rather than being delivered directly by government agencies, is licensed to private sector providers, and validated by independent agencies. There is a gradual move, therefore, toward redefin-

ing structures and processes that are market based—involving both private and nongovernmental suppliers and of inputs and utilities—including telecommunications and ICT services.

Private sector involvement in the provision of telecommunication and ICT services has developed faster than for enterprise support, largely because of the liberalization of the telecommunications sector. Rapid expansion of fixed-line and cellular infrastructure has created considerable potential for the type of value-added network services that could be of benefit to microenterprises. These include local Internet service providers and providers of collective access to telecommunication services (phones shops/booths) and Internet services (telecenters/cybercafés), which can act as infomediaries by also providing business information services. However, evidence indicates that the extension of such services outside the main urban centers is extremely limited in Botswana (Sebusang et al. 2005; UNDP 2005). In addition, private sector provision is skewed toward services that are in demand within the community and for which people are prepared and able to pay. The data reviewed earlier suggest that this will suit only that minority who are able to afford access. Poor entrepreneurs (the majority of whom are women) will remain excluded and dependent upon either government or other community-based support structures.

The third-sector—predominantly made up of local community-based organizations (CBOs)—is able to interface directly with poor microenterprises and offers more potential. However, they are often constrained in the same way as their clients by lack of local infrastructure access, poor skills, and lack of financial resources. Evidence from Botswana (Heeks and Duncombe 1999; Duncombe and Heeks 2002) illustrates the limits placed on such infomediaries when extending into rural areas. Problems arise not only because poor entrepreneurs lack access to information per se but also because they will not act upon and trust information unless it is delivered at a personal level. Therefore, agency staff have to communicate face to face with entrepreneurs. Notification of meetings, for example, could only be done by physically going to the villages and passing on messages. There were public phones in the villages, but there were often large queues at these and/or they were often out of order.

Although government is gradually withdrawing

from direct support in Botswana, it will continue to play an important role in overcoming or forestalling the social inequalities that may constrain microenterprise activity—such as through the dissemination of public-good information about health and education, about rights and entitlements. In collaboration with other agencies, government also plays a central role in collecting the data that are able to inform livelihood strategies at different levels. Here ICT can play an important support role for livelihood analysis: by providing data concerning key indicators of livelihoods—agricultural development, poverty, and other environmental factors. ICT also plays a role by generating information that supports the implementation of policy—contributing to monitoring, evaluation, internal management processes, decentralization of decision making and participation (Chapman et al. 2001; UNDP 2005). However, considerable caution needs to be exercised when expanding the digitization of information for the microenterprise sector. Even for mesolevel organizations, digital formats—transmitted via e-mail, the Internet, or DVD, for example—may not represent the most appropriate or cost-effective means for information communication and dissemination and may only serve to further exclude those who already lack access.

A final important area relates to the social relations embodied within structures and processes—which, for microenterprise in Botswana, are largely determined by gender roles rather than by ethnicity or cultural diversity. As indicated earlier, gender impinges strongly upon microenterprise and poverty reduction. Underlying constraints of patriarchy and rigid gender roles tend to restrict the movement of women from survivalist (predominantly rural-based) to more entrepreneurial (often urban-based) activities (Somolekae 1994; Ntseane 2000). Lack of separation between household and business finances and multiple gender roles also place restrictions on the ability of women to invest in their businesses (Ryne and Otero 1992). Educational and training levels are also particularly poor among female microentrepreneurs (CSO 2003), and only a small proportion of female entrepreneurs succeed in expanding their businesses. However, women-owned enterprises also exhibit positive aspects—creating a stronger community orientation, providing for supportive networking, and facilitating collective and group-based action (Ntseane 2000). There is a need,

therefore, to consider ICT applications in the context of the particular characteristics of women-owned microenterprises. In addition, there is a need to consider the extent to which ICT can be considered gender neutral. For example, in an environment where the provision of ICT services and capacity is dominated by male-headed organizations and enterprises, this may put women at a disadvantage.

**Application of Information-Handling Technologies for Livelihood Strategies**

This section draws evidence from the preceding analysis to suggest some ways in which information handling technologies can be used to support information and communication processes for micro-entrepreneurs, using the information types suggested in Figure 2 as a reference model.

**Type A: ICT applications that can be used directly by microentrepreneurs to serve their immediate information needs and their day-to-day decision-making requirements.**

In this respect, all the evidence suggests that communication should be prioritized ahead of information processing (Duncombe and Heeks 2002). The thirst for communication in Botswana is reflected in the high level of demand for new telecommunication services. A study published by McKemey et al. (2003) suggests much higher levels of usage of telephony (both fixed line and mobile) than is suggested by the data on ownership. In remote rural areas the study points toward regular use of phones by 75% of the sample surveyed. Respondents indicated they were prepared to travel long distances to use telephone services, via a range of access methods, including booths (public pay phones), teleshops, and private fixed or mobile lines. The purpose of calls was recorded as predominantly to friends and family (70%), a proportion of which concerned arranging financial remittances. Approximately 15% of respondents indicated that they were using telephones for business purposes. This suggests that poor entrepreneurs have an urgent need to facilitate the communication of their existing information resources.

**Type B: ICT applications that serve immediate information needs and day-to-day decision-making requirements but are mediated on behalf of microentrepreneurs.**

Overall, there is a lack of community-based intermediaries outside the main urban centers in Botswana.

Radio and newsprint are still the most popular means for disseminating information. Both are effective for dissemination of transmutable information—information that can be gathered from different sources and redistributed widely. Examples included information about improving agricultural productivity, new seeds and livestock, as well as more general information concerning weather conditions or market opportunities. Kenny observes that radio as a method of information delivery has several advantages for the poor: “firstly, both the radio unit and programming and delivery mechanisms are among the cheapest forms of mass media. Secondly, radio signals can penetrate remote geographic regions, and any individual with access to a radio set can receive information, regardless of literacy or education level. Finally, rural radio provides region specific information, easily incorporates local concerns and feedback, and can operate in local languages” (2002, 8). Until other ICT (e.g., computer-based technologies such as the Internet) can replicate these advantages at the same cost, it is likely that radio will continue to be the most easily accessed and affordable mediated technology for poor microentrepreneurs—particularly those in rural areas.

**Type C: ICT applications that strengthen longer-term social capital assets.**

There is evidence that ICT has the potential to reduce the transaction costs associated with the exchange of information relevant to microenterprise activity (Duncombe and Heeks 2002). ICT (primarily via telephony) can reduce the time (and hence costs) associated with receiving market information (such as prices) and the costs of conducting and agreeing to transactions. Telecommunication services are particularly advantageous for microenterprise because they support real-time communication and two-way flows of information.

Telephony also supports informal information systems and helps to support the social networks that substitute for absent market functions. As previously indicated, for the poor, sufficient trust to justify decisions is created predominantly through personal contact, interaction, and, usually, a shared context and proximity to the information source. Enhanced communications (facilitated via mobile telephony, for example) can serve to reinforce trust, confidence, and security by helping to break down the insularity

of entrepreneurs' social networks. This can assist microenterprises to break away from being mainly survivalist entities to becoming more entrepreneurial.

New networks of communication can also help to build sociopolitical assets. New ICT (including e-mail and the Internet) have the potential to support networks of communication between community-based organizations and other support structures that directly serve the needs of microenterprise. However, ICT can also become a tool of powerful interests in the community and further exclude the poor. This has been experienced in other African countries with regard to rural telecenters, where issues of ownership and control have come to dominate the establishment of such facilities (Etta and Parvyn-Wamahiu 2003).

#### **Type D: ICT applications that can assist in the provision and strengthening of other assets.**

The evidence suggests that microenterprises need to build on their existing livelihood assets in order to provide the resources they need to assess and act on information received (Duncombe and Heeks 2002). For example, many microenterprises in Botswana make use of rural telephony for arranging delivery and collection of goods. However, without means of delivery (transport) and finance to pay for transport, the provision of telecommunications proves less useful. Census data showed that in 1994, only 8.5% of rural households owned a vehicle, rising from 4.8% in 1986 (CSO 1996). Here the focus should be on how ICT can be applied to strengthen the local structures which can provide or coordinate better transport facilities. The same argument applies to providing other forms of capital such as the provision of finance, training, technology, and natural resource inputs. In this respect, ICT can be applied to strengthen local CBOs, private sector providers, and other infomediaries that directly interface with the poor and that have the potential to provide and combine assets on their behalf, such as through supporting delivery mechanisms for microfinance (Attali 2004) and building the capacity of traditional structures and community-based organizations (Talyarkhan et al. 2005).

#### **Case Study Conclusions**

Differing vulnerabilities (e.g., due to geographical isolation, economic exclusion, and so forth) will affect different groups of poor entrepreneurs differ-

ently. The case study application of the livelihoods framework has identified gender, location, and the type of income-generating activity as being important differentiating factors in Botswana. The assets possessed by those involved in microenterprise will also vary. In answering the originally posed question about ICTs and microenterprise, we can therefore say that the potential for application of information handling technologies will depend not only on financial assets and affordability but also on access to a broad range of other assets encompassing social, political, and educational resources. All these resources are necessary for poverty reduction.

There is evidence to suggest that microentrepreneurs need to build trust and confidence through locally contextualized social networks more than they need access to new information via digital ICT. Where ICT is used, it should provide a supplement to, not substitute for, existing information systems and technologies. In this respect microentrepreneurs would be best served through the provision of affordable and accessible communication networks. Rural telecommunications and new radio formats will likely play an increased role in this regard. The demand for ICT is increasingly being determined through a regulated competitive market, and, for the majority, affordability is the critical access issue. The hope, of course, is that market liberalization and competition will, over the long term, lead to lower prices for individual ownership and access. However, the market will not reach those who are in deepest poverty.

Because direct access is still for the minority, digital ICT can fulfill an important role in building capacity within organizations that interface directly with poor microentrepreneurs and by giving the poor a voice via existing community-based infomediaries. In this respect, there is scope for private sector provision, but community-based (both governmental and nongovernmental) organizations will continue to play a critical role in reaching the poorest entrepreneurs—particularly those in rural areas. Community-based infomediaries are advantageous as they are in close proximity, they are trusted, and they are also able to add value to information delivered via digital ICT by providing additional capital resources. Such intermediaries can also be advocates on behalf of the poor, and interact more effectively with relevant structures and processes at the macro level. However, community-based infomediaries

must also be careful not to distance themselves from the poor through the introduction of new ICT.

Evidence suggests that microenterprise is undertaken by only a small proportion of poor households in Botswana, and for participating households it constitutes only a small proportion of total income. This suggests that the application of ICT should be directed not only at supporting enterprise but should also support information and communication requirements for a full range of income-generating activities—such as facilitating remittances and transfers via social programs, for example. In fact, ICT applications for microenterprise may only bring marginal benefits for poverty reduction. Greater benefits for the poor may be derived from ICT if they are applied to strengthen a broader range of social and political assets, and if they are able to assist in building more effective structures and processes. There is a danger that a narrow focus on entrepreneurial activities will distance ICT applications from the broader factors that sustain livelihoods.

### Reflection and Review of the Livelihoods Framework

The livelihoods framework is of value as an *analytical* tool for investigation of ICTs and poverty reduction because it helps us to contextualize the analysis within a particular set of social, political, and economic relations, and encourages analysis largely from a nonbusiness perspective. This is important because it enables the researcher to highlight ICT as one (possibly relatively unimportant) asset among many others that may be more important for poverty reduction. It also demonstrates that information (hence information handling technologies), while a necessary component of poverty reduction, is by no means a sufficient one. More important are the human, social, financial, physical, and natural resource-based assets that enable the poor to enhance their capabilities and reduce their vulnerabilities. By drawing out to a very broad scope, the livelihoods framework therefore serves to give an “only one among many factors” weighting to both information and ICTs and thus acts to prevent the danger of any undue overemphasis on either information or its related technologies.

The methodologies associated with livelihoods research are of value because they suggest a bottom-up approach to collecting and analyzing data at the

household and community level. This allows for evidence-based research that can be operationalized within an accepted framework for understanding poverty and implementing poverty reduction strategies. Livelihoods approaches are already being integrated into ICT and development research (for example, as prescribed by InfoDev 2005), making use of household surveys, attitudinal and behavioral surveys, and participatory appraisals for assessing ICT pilot projects.

In this respect, the principles associated with livelihoods analysis can be applied to questions about various informatics life-cycle stages—from research on initial development of ICTs, through research on how ICTs are adopted and used, to research on the developmental impact of the technologies (Figure 4). However, because of its strength in contextualizing situations, and providing a broad analysis, the livelihoods approach may be particularly relevant as an *ex ante* assessment tool applicable to research on the early stage of projects and programs when ICT adoption is being considered. Livelihoods analysis enables all other options and alternatives for poverty reduction to be researched alongside any possible application of ICT. It also encourages a holistic understanding that emphasizes how ICT applications may form part of an integrated approach to poverty reduction that takes into account other cross-sectoral priorities. This is particularly important when researching expansion (replication or scaling up) of ICT interventions for poverty reduction. As largely applied in this paper, it can also be seen as particularly relevant for research that focuses on post hoc evaluation of the impact of technology on livelihood context, assets, structures/processes, strategies, and outcomes.

The livelihoods framework is also action oriented. The *functional* role of information and communication shows how improved information and communication can lead to better decision making within livelihood strategies. The livelihoods approach emphasizes building strategies upon the preexisting information and communication practices of the poor. By emphasizing the strengths of the poor, rather than their needs (perceived or otherwise), the livelihoods approach focuses on the role of information and communication a priori to considering any possible role for information handling technologies: it is thus consistent with the “information first” approach. This ensures that research gives sufficient

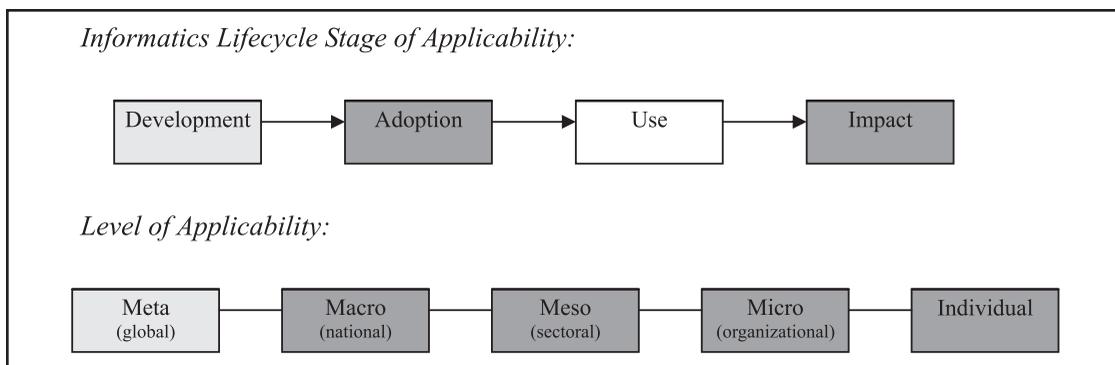


Figure 4. Applying the livelihoods framework in development informatics research.

attention to the diversity of information and communication requirements of the poor and that informal and indigenous information systems are fully incorporated. In this respect, a livelihoods approach is more likely to lead to appropriate information and communication solutions being attached to the multiple problems that are faced by the poor.

However, as presently constituted, the livelihoods approach deals rather inadequately with the role of information, communication, and associated technologies, which tend to be treated as separate physical assets. Rather, information should be viewed as a cross-cutting resource and as a constituent part of each component of the livelihoods framework and not necessarily as an asset in its own right. This paper has illustrated this through creation of the new model outlined in Figure 3. It has also emphasized that the poor need information to access a broad range of assets: information about access to training/new knowledge, information about finance, information about technologies, and information about natural resources. In this respect, information can be viewed as a lubricant that oils the organizational wheels and two-way communication (in preference to one-way dissemination) as the critical channels along which the oil flows. Information and communication are, therefore, an intrinsic part of the livelihoods framework.

In terms of levels of applicability (Figure 4), the livelihoods approach dictates that the starting point for research analysis should be at the microlevel—that is, the level of the individual or household. This is advantageous because it takes full account of poor people's real strengths and requirements. However, decision-making processes that affect the poor,

and that guide livelihood strategies, will take place within organizational environments at all levels, including local, sectoral, national, and even global. Livelihoods analysis pays special attention to these organizational forms and the institutional frameworks within which they operate—governmental, nongovernmental, or private. The livelihoods approach is thus of research value because it is able to integrate different levels of analysis and action and to illustrate the flow of information and the transfer of knowledge between different levels.

In addition, the livelihoods approach is of value for researching development informatics issues not fully addressed in this paper. The most important of these is the sociopolitical context within which ICT is applied. This may include analysis of the existing power relations between the poor and the nonpoor, or an assessment of the potential divisions between groups within a given community, or those based on other factors such as gender and ethnicity. The role of intervening structures should be considered in areas of rights and entitlements—raising broader issues of communication and political participation and the evolving role of ICT and new media in these processes. In this respect, ICT may play a greater role in enabling the poor to articulate themselves so that they are able to press government and other powerful organizations to develop and implement policies in their favor, thus altering their vulnerability context. It is hoped that this paper will stimulate further research in these areas as well as those covered by microenterprise.

In summary, then, the livelihoods approach has a range of applications in ICT4D research. Its main application is likely to be for research on how informa-

tion, communication, and all types of information handling technologies impact the lives of the poor in developing countries. However, it can also offer insights for research on policy and institutional context and on issues around the adoption and use of ICTs. More generally, it demonstrates the value to ICT4D of theories drawn from development studies. Use of development theories has been surprisingly limited in ICT4D research. This paper, though, has shown that such theories can provide a focus on development realities and development goals in a way that theories from other disciplines may not. ■

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