

EXPLORING THE LINK BETWEEN ICT AND DEVELOPMENT IN THE CONTEXT OF DEVELOPING COUNTRIES: A LITERATURE REVIEW

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ABSTRACT

The article contributes to the ongoing discussion on relating information and communication technology (ICT) to development (D). The quest to relate ICT to D is a topic of open deliberation and critical scrutiny in ICT4D research communities. To enhance the understanding in this regard, we conducted a literature review. The review examines 80 articles to identify various development theories and the role of technologies in the development process. While scanning the articles, Sen's capability approach (CA) emerged as a suitable framework with which to explore the link between ICT and D. To show the relevance of the link, we used the CA as a guiding framework, and reanalyzed ten empirical case studies focusing on projects in remote and rural areas. Furthermore, the article suggests six gaps in the current research, and, accordingly, six areas for future research.

KEYWORDS:

ICT4D; developing countries; capability approach; literature review

1. INTRODUCTION

ICT4D is an interplay among information (I), communication (C), technology (T), and development (D) (Heeks, 2007). It is a multidisciplinary research domain (Unwin, 2009), which integrates the wider perspectives of three study areas: computer science, information systems, and development studies. The research focuses on the technology and potential possibilities, on issues related to the feasibility and organizational influences through introducing ICT, and on what is desirable and what the consequences are of introducing ICT (Heeks, 2008). Researchers acknowledge that, the notion of development is the consequence of interplay between socio-technical components (Walsham & Sahay, 1999). Technology needs to be designed to be able to operate in a complex social, political, economic, and cultural context. Thus, it is important to understand the multi-perspective approach of the ICT4D domain.

The notion of ICT4D was introduced around the 1980s. In terms of technology, it progresses through radio, television, the Internet, and mobile technologies. The dimension of applications proliferates around social, political, physical, natural, human, and financial issues. ICT is considered as important in terms of achieving the millennium development goal, introduced by the United Nations (UN) to fight poverty, improve healthcare, provide better education, foster gender equality, and extend global partnerships for development in developing countries (World Bank, 2003). However, despite the huge investment each year by the public, non-governmental organizations (NGOs), and the private sector in ICT development projects, only minor impacts on remote communities have been identified. The rather disappointing results are explained by the lack of political will, motivation, and knowledge on how to evaluate the impact of ongoing and initiated projects (Heeks & Alemayeh, 2008). Impact evaluation, when conducted, often emphasizes the measurement of technical and financial aspects, with less concern placed on the potential impact on development issues in broader terms.

ICT4D research focuses on different subjects such as the diffusion of ICT artifacts, infrastructure building and the implementation of ICT services (Braa & Hedberg, 2002; Meso et al., 2005; Walsham & Sahay, 1999), impact evaluation of ICT interventions (Kumar & Best, 2006), linking ICT and Development (Avgerou, 2003; Ngwenyama et al., 2006; Urquhart et al., 2008), and the digital divide (Warschauer, 2003). Research related to implementation issues analyzes the different social and technical factors as well as the actors who impede the implementation process. Several authors argue that ICT4D projects may suffer if socioeconomic, political, cultural, and financial factors are ignored (Lishan & Wood, 1999; Thapa & Sæbø, 2011). Likewise, diffusion of the ICT products and technologies from one pilot study to a broader context might be an obstacle through a focus being placed more on technology and the vision, while ignoring other socio-cultural, political, and economic factors.

Existing research shows how numerous projects involving ICT innovation in developing countries have failed to achieve the anticipated benefits (Heeks, 2002b). Some of the factors identified are poor management, resistance to change, and complex power structures. Not only for impact analysis, but also for the successful penetration of an IT artifact in developing countries, socially oriented implementation policies have been recommended (Braa et al., 2007; Heeks & Stanforth, 2007; Walsham & Sahay, 1999). Some studies examine the effects of ICT services through multiple perspectives (Heeks & Shoba, 2009), but there is still a need to undertake a holistic research approach to understand the relationship between ICT and Development. Since a misalignment between the development context and the design and implementation of the ICT4D project may lead to project failures (Prakash & De, 2007), and, consequently, to little or no impact on the development of the local communities, scholars call for more research on understanding the “D” aspect of ICT4D (Walsham, 2013).

The role of emerging technologies in the development process varies within different development paradigms. A transition has taken place from a more technically oriented view toward a more socially oriented view, focusing on the influence that ICT may have on development. The term “development” also emerges linked to a change in the quality of life, empowerment, enhancing basic capabilities, equality, and poverty reduction (Pieterse, 2001). Among other development theories, as later discussed in section 3, Nobel Laureate Amartya Sen’s capability approach (CA) of development argues that individual substantive freedom is both the primary end objective, and the principal means of development (Sen, 2000). The CA suggests that impact evaluation may focus on the influence on people’s capabilities to do and to be, on the quality of human life, and on the potential decrease in the obstacles in people’s lives, to maximize everyone’s freedom to live and choose the kind of life that they have reason to value (Sen, 2000). Therefore, the CA places the emphasis on the contribution that technologies may have to increase the capabilities (freedoms and opportunities) of individuals to function in their societies (Zheng, 2009). In this article, we present Sen’s CA as one of the guiding frameworks through which to understand the complex link between ICT and Development.

The rest of the paper is organized as follows. Section 2 illustrates the research methodology and discusses the potential limitations of the review process. Thereafter, a different development paradigm and the role of technology are explained in sections 3 and 4. Section 5 illustrates ten selected articles to show the use of CA in exploring the link between ICT and D. Section 6 discusses the research gaps and suggests future research areas, before we conclude in section 7.

2. RESEARCH METHODOLOGY

Literature reviews can create a firm foundation for advancing knowledge through identifying the current status, research gaps, and where more research is needed (Webster & Watson, 2002). Our selection process was guided by the suggestion made by Webster and Watson (2002). As shown in Table 1, articles were selected by using the ISI web of science library databases. In addition, to make our literature list more inclusive, we searched the literature by topic across all relevant journals (Heeks, 2010) instead of merely searching through some highly focused journals.

The search, based on the keywords presented in Table 1, resulted in literature from several disciplinary areas. This method generated a list of 177 references in total. Thereafter, we performed a backward and forward search of the five most cited articles. We further conducted an author-based search on the most cited authors, as a cross check to confirm that we had probably included most of the relevant articles. Although this search generated many redundant results, it extended our reference list to 202 references. The two authors independently read and shortlisted the titles and abstracts of the papers to identify a set of highly relevant articles. We excluded the papers oriented toward software development, development in general, and any that were not focused on Third World countries. Based on the most relevant articles, we finally selected the 80 papers that are included in this review.

All literature reviews are based on some kind of selection strategy; thus, running the risk of excluding potentially relevant articles and reports from sources that are not included. The inclusion of more material might have provided additional information regarding contemporary research in the ICT4D area. Despite these limitations, we believe the selected journal articles provide a good summary of the current status in the ICT4D area. There is an open opportunity to validate and elaborate on our findings by extending the literature list.

Table 1: Literature Review Process

Search Library	ISI web of knowledge, ICT4D journals
Keywords	ICT4D, information systems developing countries, information technology developing countries, ICT developing countries
Subject Areas	Computer science and information systems, information systems social science, computer science methods and theory, computer science and interdisciplinary areas and telecommunication
Total Search	202
Selected and Reviewed	80
Language	English
Inclusion/Exclusion	Cross checking: most cited paper, most cited authors, backward & forward search

3. MEANING OF “D” AND THE ROLE OF TECHNOLOGY

Development is a subject of discourse among academia and practice. There are different competing theories to characterize the notion of development. Development is generally defined as an organized intervention in collective affairs according to a standard of improvement that varies according to class, culture, historical context, and relations of power (Pieterse, 2001). Up to around 1940, development was a synonym of industrialization and colonization. In development thinking during the post-Second World War period, the core

meaning of development was economic growth. Later on, economic growth was combined with political and social changes and the meaning of development was broadened to encompass modernization. Modernization theory characterized development as a displacement of the values, beliefs, and actions of traditional societies. It advocates that national growth can be achieved through imitating the strategies and ideologies applied in developed countries, the so-called modern societies, into less developed countries to bridge the gap in the differences for them to become “modern.”

During the 1960s, dependency theory came into existence, which emphasizes national or auto-centric economic growth through dependent or national accumulation (Pieterse, 2001). Supporters of the dependency theory viewed modernization as a proponent of capitalism, and described it as a system of antagonistic relations between several social classes, including the capitalists, who owned the means of production and power to appropriate surplus, and the workers, who had no power, and had to sell their labor. They felt that capitalism had the potential to increase the productive capacities within society, bringing workers together in a form of socialized labor, and engaging them in production processes to generate wealth. Marx envisaged, in the long run, that capitalism might lead to a class struggle between the capitalists and the workers. Consequently, workers would overcome the capitalists and take over the productive capacities, and eventually form new political movements.

The concept of an alternative form of development arose during 1970. It was oriented toward community participation, grassroots politics, and human development. Alternative development theory argues against capitalism and envisions a post-capitalist world. The theory advocates that development should be informed by the value inherent in cultural identity, by self-reliance, social justice, and by ecological balance. The theory also envisions a post-capitalist world of continued modernization toward a socialist world order—an alternative to the Western model of development (Pieterse, 2001).

During the 1980s, two development theories appeared; namely, neoliberalism theory and human development theory (Pieterse, 2001). The concept of neoliberalism is that there are certain institutional constraints influencing market efficiency, and thus contributing to the lack of development. Neoliberalism advocates that self-regulated markets and motivated individual entrepreneurs can achieve development. It further argues that market capitalism could offer individuals more opportunities for entrepreneurship and specialization. Neoliberalism eliminates the notion that developing economies represent something different to other markets. Economic growth is to be achieved by allowing market forces to operate through structural reforms, liberalization, and privatization.

The notion of development, known as the post-development paradigm, criticizes the whole notion of development. The proponents of post-development argue that development can be a contradictory process that might generate both intended and unintended outcomes that are far removed from the promise of development (Escobar, 2011).

Technology, during this developmental transition period, played a crucial role in the form of instruments to achieve economic growth and development (Castells, 2000). As presented in Table 2, technology was initially seen as important for exploring new territories, to extend colonization, and to exploit natural resources. After the 1940s, the role of technology boosted industrialization and mass production. During modernization, the innovation of new technologies was for economic growth. Similarly, the role of technology kept on changing from a focus on economic growth to that of knowledge management. The alternative development paradigm advocated the use of appropriate technology. The purpose of appropriate technology was to preserve the local culture and to extract indigenous knowledge (Schumacher, 2009).

After the arrival of the Internet and ICT-based services in the 1990s, the role of technology changed from a view of technology as a tool, to a more holistic understanding of how technology could act as a central force in the discourse on economic and social development (Sein & Harindranath, 2004). The new technology allowed “the small and new to compete on equal terms with the large and the well-established, and permit leapfrogging to an ‘information economy’” (Heeks, 2002a).

All of the development theories have their own history and context. Even the perceptions of modernization are different in different nations and communities based on class, culture, historical context, and relations of power (Pieterse, 2001). The existing development theories have been extended largely into state-led (modernization and dependency), market-led (neoliberalism), and society-led (alternative) theories. A prominent definition of development in the contemporary ICT4D discourse is human-centered development based upon the theoretical foundation of Amartya Sen’s (2000) work on CA. In the context of an ICT4D project, particularly one that is focused on rural and remote communities, this is the human development approach (Pieterse, 2001). Like Sen’s CA, which could be argued to be more relevant, we view development as human development (Sen, 2000). Scholars have delved into human development to some extent (Avgerou, 2003; Heeks, 2008; Sein & Harindranath, 2004), but have only recently begun to adopt Sen’s ideas (Hatakka & Lagsten, 2012; Kleine et al., 2012). This is an encouraging trend, since Sen’s CA is seen as a suitable and appropriate lens through which to investigate how ICT may foster development (Thapa et al., 2012). One of the prominent journals, *Information Technology for Development (ITD)*, has published a special issue to promote the use of CA in ICT4D research (Andersson et al., 2012).

Table 2: Various Development Perspectives and the Role of Technology, adapted from (Pieterse, 2001)

Period	Perspectives	Meanings of Development	Role of Technology
1870>	Latecomers	Industrialization, catching up	Boost industrialization
1850>	Colonial Economics	Resource management, trusteeship	Exploration of new territories
1940>	Development Economics	Economic growth—industrialization	Innovation, mass production
1950>	Modernization Theory	Growth, political, and social modernization	Mass production Innovation and increased productivity
1960>	Dependency Theory	Accumulation—national, auto-centric	Creation of domestic product
1970>	Alternative Development	Human flourishing, participation	Enhancing local communities and cultures
1980>	Human Development	Capacitation, enlargement of people’s choices	Develop human capabilities
1980>	Neoliberalism	Economic growth—structural reform, deregulation, liberalization, privatization	Enhance market efficiency
1990>	Post-development	Authoritarian engineering, disaster	Strengthen localization, extract indigenous knowledge

The CA represents a broader and holistic view, focusing on the social dimension of development (Lehtonen, 2004). The CA proposes that capabilities give an individual the freedom to make decisions that can help in achieving the life that he or she values, and that she or he has a reason to value (Sen, 2000). The key to development from an ICT4D perspective is to build these capabilities through technologies (Oxoby, 2009). The approach emphasizes the development of individual capabilities, which has often been criticized as being overly individualistic (Ibrahim, 2006). Another challenge is in the operationalization of the CA, and an attempt has already been made in this area (Kleine, 2010). In fact, the critics of CA also admit that the CA is a powerful lens through which to study human development (Evans, 2002). The following section will discuss the CA in detail.

4. CAPABILITY APPROACH (CA)

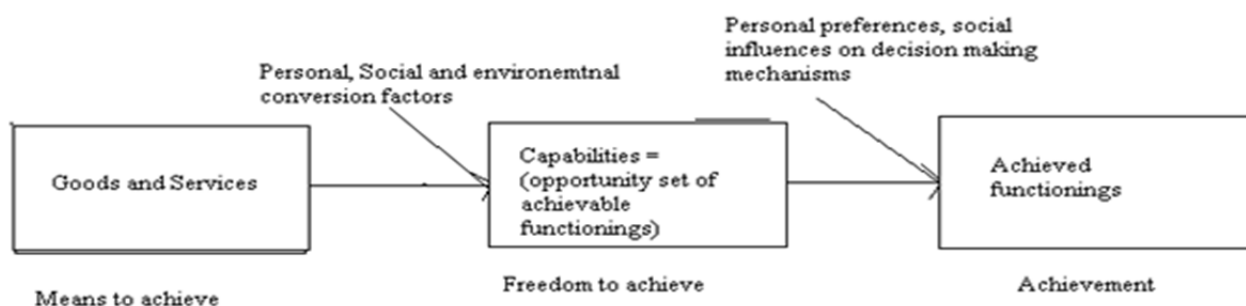
The CA is a broad framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change in society (Robeyns, 2005). The major constituents of CA are “functionings” (“beings” and “doings”) and “capabilities.” Functionings relate to well-being, whereas capabilities relate to the opportunities and the freedom to achieve such functionings (Sen, 2000). Sen criticized both individual and social evaluation based on such variables as primary goods, resources, or real income. He mentioned these variables as a means rather than an ends to freedom and argued that individual substantive freedom (capabilities) is the primary, end objective, and the principal means of development (Sen, 2000). The UN Development Program (UNDP) has adopted such basic insights from CA and has formulated statistical measures of human development based on the approach (Robeyns, 2005), for example, the human development index (HDI), gender development index (GDI), gender equity measure (GEM), and the human poverty index (HPI).

In terms of ICT4D research, the CA places the emphasis on the contribution that technologies may have in terms of increasing the capabilities of human beings to function in their societies. For example, in addition to providing ICT services, there is a need to create a social and institutional environment so that the poor and needy can access and assess information, build knowledge, and take decisions; in other words, enhance their basic capabilities. The CA calls for an alternative e-development beyond the space that centers on economic growth or modernization (Zheng, 2009). Alternative e-development should focus on the space of substantive freedom where ICT may add to development by influencing a change in the quality of life through the innovation and diffusion of human-oriented technologies. Thus, there is a need to add knowledge from other research disciplines besides welfare economics and development studies, such as from the information systems area, to understand how ICT relates to development through CA (Zheng, 2009).

This paper utilized Sen’s CA framework to analyze the selected articles and to understand the link between ICT and Development. As shown in Figure 1, CA makes a distinction between means, such as ICT artifacts and services, on the one hand, and functionings’ ends, such as education, healthcare, and social capital, and capabilities (freedoms and opportunities to achieve functionings), on the other. The basic importance of resources, such as ICT services, is that these resources are required to enable people to do and to be. Goods and services do not merely mean those things that are exchangeable for income or money, but the characteristics of such goods and services that interest people. For example, setting up a tele-center in a village does not make a difference if it cannot provide localized content to the local community, although tele-centers are essential as well.

Three groups of conversion factors—personal, social, and environmental—influence the relationship between commodities (goods and services) and the functionings to achieve certain beings and doings (Sen, 2000). Personal conversion factors denote personal

characteristics, such as the physical condition, sex, reading skills, and intelligence to convert commodities into a functionings. For example, an illiterate user cannot use a text-based user interface (Medhi et al., 2007).



**Figure 1: Core Elements of the Capability Approach
(adapted from Robeyns, 2005).**

Social conversion factors are features such as social norms, public policies, gender roles, caste systems, and power relations. For example, the priorities of the dominant caste groups may determine the information systems' design and implementation, which could lead to the exclusion of marginal and non-dominant castes (De & Ratan, 2009). Likewise, an environmental conversion factor means the geographical location, climate, and infrastructure. The achieved functionings are a combination of the means through which to achieve them, the freedom to achieve them, and the personal preferences and social influences regarding the decision-making mechanisms (Sen, 2000).

5. EMPIRICAL CASE STUDIES ON RURAL AND REMOTE COMMUNITIES

To explore how the CA may be used to analyze ICT4D projects, and to learn about the context of rural and remote areas in more depth, we examined ten of the research papers. We employed an evaluative lens based on Sen's theory of CA, and, as discussed earlier, the CA can be used as a common framework to relate ICT and D. The examination reveals the primary objectives of ICT4D projects, the opportunities (capabilities) they provide to the community, and the conversion factors that hinder the achieved functionings. As we can see, the concept of development was implicitly used; however, the CA can explain development context in detail, as shown in Table 3.

Through this analysis, we want to show that the notion of CA was implicitly present; however, the explicit use of this approach could help in understanding the nuances of the development context better. For example, the analyses identify how the ICT4D projects were initiated with the objectives of contributing to social, cultural, economic, human, and political problems, such as the reinforcement and extension of social ties and building human capital, providing computer education and e-government services, and reducing poverty. The projects, however, faced different obstacles (conversion factors), such as illiteracy, poverty, a lack of physical infrastructure, and political pressures that hindered the relationship between ICT (means) and capabilities (freedom to achieve).

Table 3: Research Focus Summarized in ICT4D Papers Focusing on Rural and Remote Communities

Papers	ICT4D Objectives	Conversion Factors	Capabilities (opportunities)	Achieved Functionings
Heeks & Kanashiro, 2009	To support cultural, economic, and social development	Lack of specific execution plan, lack of relevant information as well as assessment ability, lack of transportation and other resources, low self-efficacy in women and older people, lack of technical knowledge and skills, lack of local participation, lack of income-generating activities	Provide technical training Raise awareness Produce local content Promote tourism Sharing information Extend social network	(Face-to-face communication because of language barriers) Reinforced bonding of social ties Facilitated positive information flow
Andrade & Urquhart, 2009	To provide timely and useful information to local farmers, businessmen, and government agencies to build up capabilities for local development	Lack of physical infrastructure such as roads, electricity, telephones, water, etc., lack of educational opportunities, gender problem, lack of reading habit, lack of income-generating activities	Provide an opportunity to develop individuals' skill and knowledge Sharing information Extend social capital Strengthening institutions	(Priority given to farming rather than learning and using computers) Facilitated human capital building process Sharing information Extended social capital Institutional development, such as peasant organizations
Donner, 2006	To develop business and social contacts (micro-entrepreneurs)	Education, higher cost, telecommunication infrastructure, innovations	Extending and reinforcing existing business and social networks, flexibility of time and space	Micro-entrepreneurs reinforced their social ties and facilitated new contacts with business partners, suppliers, and customers
Jensen, 2007	To reduce price dispersion and waste (Fishermen)	Lack of information and transportation infrastructure	Improved functioning of markets	Increased earnings and purchasing power
Walsham & Sahay, 1999	To aid wasteland development using GIS technology	Cultural (e.g. lack of tradition for using maps), political (power dynamics), social (lack of education and technical skills), economic (cost)	Wasteland management, provide platform for analysis and action in the environmental arena	(Cultural ideology, social preferences and security issues in decision-making process)
Kumar &	To provide computer	Age, gender, religion, caste,	E-government services such as	(Social norms—women lack decision-

Best, 2006	education, e-government services, and health services	income, ownership of household assets, educational level, political and institutional support	birth certificates and old-age pensions, computer education	making powers, community perception) Information sharing
Duncombe, 2006	To reduce poverty	Social, human, geographical, financial, political, physical, natural, public and private institutions	Improve information and communication, such as access to training/new knowledge, information about finance, information about technologies, and information about natural resources	Information sharing
Kanungo, 2004	To enable social and economic emancipation	Political and social factors, poor information infrastructure, women's literacy,	Provide access to capital and support services, foster group action, access to vital information, participation, training opportunity	(Social constraints on women's participation) Extended information channel, value-added information, local commerce opportunities, informed about government programs, enhanced participation
Medhi et al., 2007	To design a text-free user interface for illiterate and semi-literate users	Illiteracy, low income level, language	Job search for domestic laborers, generic map of the city	(Cultural, religious, and psychological factors) Job-search information Provide geographic information
De & Ratan 2009	To improve field-level microfinance operations	Political issues, technology, human actors	Efficiency enhancements and transparency	(User self-interest and social context influenced the achieved functions) Reduced transaction costs

Individual preferences, such as a priority being given to farming rather than to learning about computers, and social and cultural ideologies, such as the role of women in the decision-making process, may also affect the achieved functionings. The summary shows that the social, cultural, religious, political, and economic contexts are important and need to be taken into account while designing ICT4D projects. The common achieved functioning in all of the projects was access to information and communication services, which can be helpful in creating social and human capital in remote communities.

6. GAPS IN EXISTING RESEARCH AND FUTURE RESEARCH DIRECTIONS

Based on our analysis, we identified six research gaps, and, accordingly, six future research directions, as summarized in Table 4. First, there is clearly still a need for more knowledge on the link between ICT and development. Even though several researchers have emphasized the need to understand this connection (Avgerou, 2003; Nair, 2002; Urquhart et al., 2008; Walsham, 2013), little has been done to address this aspect. One of the main reasons why this has not yet been addressed is due to the difficulty in identifying and isolating the factors that explain how ICT contributes to development, since there is an ongoing interplay between ICT and other factors, such as the social, cultural, political, and economic-related issues. Therefore, future research is needed to identify the challenges and potential benefits of introducing ICT for development. We argue that a stepwise approach is needed to address this requirement. First, there is a need to understand the interaction processes taking place between ICT and the social, organizational, and economic factors. The understanding of ongoing processes and interactions could be a first step toward a better understanding of the outcome of implementing ICT in a developing context. Several research strands and approaches may be introduced to understand the interaction and interplay between the various factors. For example, by combining social capital (Urquhart et al., 2008) and the CA (Ibrahim, 2006; Zheng & Walsham, 2008) with actor network theories (Walsham, 1997; Walsham & Sahay, 1999), we may increase our understanding of the social changes, and of the role of various stakeholders and technologies.

Second, there is a need to clarify and explore the concept of development in the ICT4D research area. We argue that there are two major reasons as to why this is important. To be able to understand the differences and similarities across several research projects, we need to know to what extent these projects share their objectives and aims. So far, the magic development part is sometimes introduced like a black box, without considering how various objectives influence project design, implementation, use, or effects (Prakash & De, 2007). Thus, it is difficult to compare and learn from one study to another, which is essential for building a cumulative tradition in the research area. Moreover, more research is needed to identify how various views on development influence projects. Future research should also investigate stakeholders' views on development; hence, to what extent they share objectives and visions. For instance, future research could investigate the views of different stakeholders such as donors, project owners, developers, and project users, as this might increase our understanding of how various views on development influence project outcomes.

Third, social-cultural issues such as de-politicization, corruption, caste structures, and context-dependent power structures are currently less investigated in the ICT4D field. Such social-cultural factors may help to explain the failure and successes of such projects.

Fourth, current research in the ICT4D area is mainly conducted in sub-Saharan countries, India, and Latin America. More research is also certainly needed in these regions. Since huge areas in the developing world have not been investigated, the common understanding of concepts, challenges, and opportunities in the ICT4D area might be based purely on a few areas, without considering the contextual differences between these regions and others, such as, for instance, the developing Arabic countries, and other countries in Asia,

such as Nepal. More research is needed to understand the challenges, opportunities, and contextual issues from a wider variety of countries in the developing world. Similarly, mountain regions, where one third of the world population resides, are under-researched (Heeks & Kanashiro, 2009).

Fifth, there is a need for more research on the digital divide to introduce a broader understanding of the digital divide. Current research mainly focuses on issues related to the literacy rate, education, and the economy. By investigating issues related to, for example, gender and rural versus urban areas, researchers in ICT4D could gain a more coherent understanding of digital-divide-related issues; hence, resulting in increased opportunities to design, implement, and organize ICT systems that are able to overcome such barriers.

Finally, the ICT4D research literature is thus far dominated by qualitative- and quantitative-based case studies. Such studies are clearly needed to explore and explain the complexity involved in ICT4D projects. The above discussion on the research gaps and the areas identified for further research do actually call for the use of qualitative research methodologies to gain a broader and wider understanding of related issues such as the digital divide, the social-cultural aspect, and various views on development. Likewise, quantitative research is needed to ascribe a causal relationship between ICT and D, and to enable the generalization and comparison of the results to develop a cumulative tradition. However, the question arises as to what comes after understanding. In the context of ICT4D research in particular, the role of researchers should not be confined to understanding the problem, but should also involve trying to introduce changes as well. Therefore, ICT4D can be further studied by applying research methods such as action-design research (M. Sein et al., 2011). This method conceptualizes the research process as containing the inseparable and inherently interwoven activities of IT artifact building, intervening in the organization (communities), and evaluating the use of the artifact concurrently.

For a research field to progress, it is essential to develop a broad understanding of the phenomena studied, and to introduce methods, and a common concept to extend the cumulative tradition. Our analyses, the identified research gaps, and suggested areas for further research are a step toward guiding future research opportunities based on a synthesis of current knowledge.

Table 4: Research Gaps and Future Research Directions

Identified Research Gaps	Suggested Areas for Future Research
Missing understanding of the relationship between ICT and development “D”	Investigate the interaction between these components before focusing on outcomes The theoretical lens of social capital can be a good interpretive lens
The view on development is only implicitly stated, missing knowledge on how various views influence projects	Clearly state the development perspective, explore views on development from various stakeholders in ICT4D-related projects
Socio-cultural issues less emphasized	Explore the influence of issues such as corruption, de-politicization, and caste systems
Part of the developing world and mountain regions are not included	More research focus on other parts of the developing world and on mountain regions
Only some characteristics related to the digital divide are investigated	Broaden the concept of the digital divide by including issues such as remoteness and gender
Missing diversity concerning the research method, theories, and frameworks used	Diversify selection of methods, including action research; deploy theories and a framework to understand the causal process of socio-technical

	interaction and its consequences on human development
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7. CONCLUSIONS

Until the 1990s, researchers tended to focus more on development, and ignored ICT or isolated the ICT from mainstream development into separate policies and ministries. However, it is apparent in contemporary society that there is a strong interplay between ICT and society, and this interplay influences development. There is a gap in the existing literature on the ICT4D domain to denote these issues. Therefore, in this literature review, we aimed to identify the role of ICT in the socioeconomic development of developing countries. We reviewed 80 research articles and found that linking ICT to development is a common topic of discussion among development organizations and academia. We propose that Sen's CA may be a common approach for both practitioners and researchers to understand such relationship. To illustrate the relationship, we selected ten papers that discussed empirical case studies, and we analyzed their development context based on Sen's model. Finally, based on the overall literature review, we identified six gaps in the current research and, accordingly, suggested six areas for future research.

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