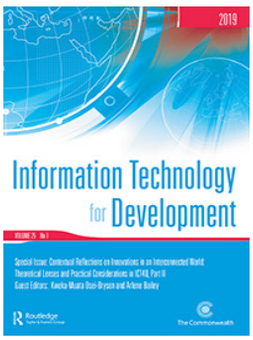

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A holistic perspective on the theoretical foundations for ICT4D research

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ABSTRACT

While many theories have guided research Information and Communication Technologies for Development (ICT4D), we are yet to construct a clear and coherent narrative that would help us answer the question of how ICT fosters development in underdeveloped communities. In this paper, we argue that one of the main reasons for this is that our holistic understanding of ICT4D is seldom grounded in theories to understand the core areas that define the field, namely, ICT, Development, and, '4' which are the transformative processes that link the two. Through a brief literature review, we list theories that have informed ICT4D research in each of these areas. We present examples of theories, namely, Capability Approach, Affordances, and Actor-Network Theory together with Social Capital and illustrate how we have used them in our research. Building on this holistic perspective on theoretical foundation, we propose five agendas for ICT4D research.

KEYWORDS

ICT4D; development; capability approach; actor-network theory; social capital; affordances

1. Introduction

The role of Information and Communication Technologies (ICT) in fostering development of underdeveloped countries is still being debated (Walsham, 2017). Some scholars question whether ICT do lead to development and is that development always 'good' (Krauss, 2016). For others though, the debate is not on whether this happens, but rather on how it happens (De' & Ratan, 2009; Heeks, 2010; Sein & Harindranath, 2004; Walsham, Robey, & Sahay, 2007). In either case, this is a challenge with which research in ICT4D has been grappling over the years. As a community, we can be reasonably satisfied that while there are areas for improvement, we are doing relevant research and we have a healthy relationship with practice through involvement in ICT-led development projects.

The research community has come a long way from simply reporting cases and anecdotes to attempts at gaining a more nuanced understanding of ICT4D based on theories. This was succinctly captured by Avgerou (2017) in her keynote address at the biennial conference of IFIP W.G. 9.4 where she discussed the theoretical framing of ICT4D research. In a similar vein, Walsham (2017) views the field as multi-faceted requiring a more holistic view of development and how ICT can foster development. The picture that emerges is that ICT4D researchers have adopted many theories to interpret the findings of their case studies of ICT4D projects around the world. Some of these theories are what

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Avgerou (2017) designates as 'foundational' (at a high level of abstraction, e.g. Affordances). Other theories are 'mid-range' which are 'more limited in their abstraction and relevance and their aim is to explain specific kinds of phenomena.' (Avgerou, 2017, p. 19). Yet, the plethora of theories has not helped us to create a clear picture and a coherent narrative. There is a knowledge gap in the link between ICT intervention and development in the context of developing countries. We are still trying to understand and explain the development process that specifically emerges from ICT interventions (Thapa & Sæbø, 2014; Zheng, Hatakka, Sahay, & Andersson, 2018). We illustrate the search for this elusive link in simple terms in Figure 1.

There have been attempts to articulate and elaborate this link (Avgerou, 2017; Kleine, 2010; Roztocki & Weistroffer, 2016; Sein & Harindranath, 2004; Zheng et al., 2018). While they take different premises, all of them can be depicted by Figure 1. However, the role given to theory has varied. Roztocki and Weistroffer's (2016) do not explicitly ground their framework on theory. Other frameworks, such as Kleine (2010), do examine the development perspective, but are relatively short on conceptualizing ICT and the theories that link ICT to D. A framework that explicitly address ICT (Sein & Harindranath, 2004), use a conceptualization of ICT that was derived from prior work in the mainstream IS literature (Orlikowski & Iacono, 2001), and not premised on theory. This conceptualization was also used by Zheng et al. (2018).

Hence, on one hand we have case studies that have employed myriad theories; on the other hand, we have integrative frameworks that essentially have not built upon these theories. As a result, we are yet to build cumulative knowledge on ICT4D. The research community needs theories to discover the link between ICT and development which can inform research and be the basis for guiding practice.

In this paper, we propose that a clear understanding of three groups of theories is needed to have a holistic perspective of the theoretical foundations of ICT4D. The three groups emerge from the three concepts that lie at the root of the definition of the area of ICT4D: *ICT, D* and the catchall term '4' or 'for' (depicted as the question mark in Figure 1). We name the third concept 'transformative processes'. Specifically, the three groups of theories are:

Group 1. Development theories: What is development (D)?
Group 2. Theories conceptualizing ICT: What is ICT in the context of development?
Group 3. Theories on transformative processes linking ICT to D: How does ICT make D happen?

In hermeneutic terms, the three groups are 'parts' that gives us an understanding of the 'whole', which is ICT4D. An increased understanding of the whole is achieved by iterating between the independent meaning of parts and the whole that they form. This tacking back and forth between parts and whole, termed the hermeneutic circle is the essence of human understanding (Gadamer, 1989). This is formalized as the fundamental principle of the hermeneutic circle by Klein and Myers (1999) in their seminal paper on conducting interpretive research in IS. It has been used in, amongst others, IS design and use (Boland, Newman, & Pentland, 2010) and in end user training (Sein & Nordheim, 2010). In essence, the conceptualization presented in this paper is not reductionist, but hermeneutic.

Figure 2 show the relationship between the three groups. While research can be conducted based on just one of the groups or a combination of any two groups, it is when all three groups are taken into account are we fully able to understand the ICT4D domain. For example, studies may simply examine ICT per se (e.g. conceptualization of the IT artifact as a sociomaterial phenomenon), or Development per se (e.g. Sen's conceptualization of development as freedom) or

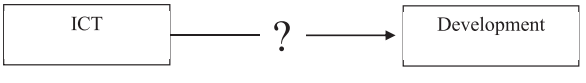

Figure 1. Elusive link between ICT and development.

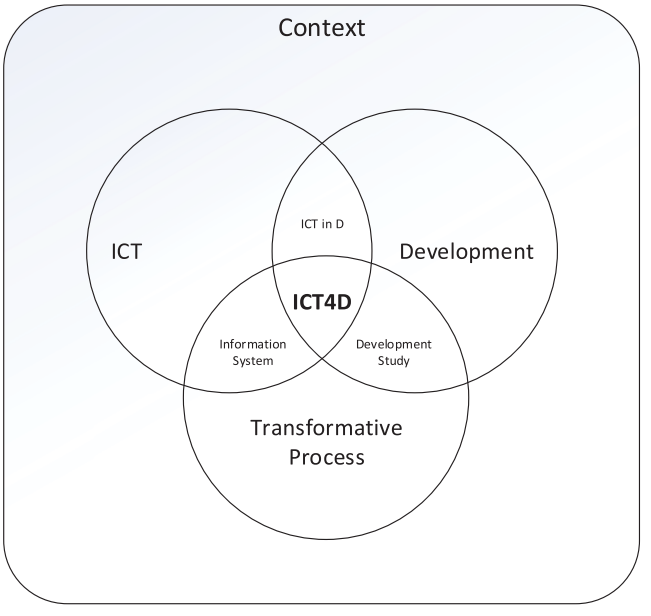

Figure 2. The domain of ICT4D.

transformative processes (e.g. any study of processes such as organizational efficiency in the organizational studies literature). Likewise, research can examine combination of two. Studies can focus on transformative processes and development. Such studies fall in the purview of Development studies. A combination of ICT and transformative processes are hallmarks of Information Systems (IS) or Computer science. Studies that address ICT and development are quite common in ICT4D but they primarily correlate ICT intervention (e.g. teledensity resulting from mobile phone penetration in a country) with development indices (e.g. GDP). While they show some link, we do not know whether there is any causality or the mechanism through which the indices are affected (Avgerou, 2017). There are also studies that examine use of ICTs in developing countries without explicitly linking use to development (often assuming naively that simply use of ICT in developing countries will somehow lead to development).

As Figure 2 shows, ICT4D lies in the intersection between ICT, Development and the transformative process by which ICT may leads to Development. Any holistic understanding of ICT4D research needs to include understanding of the theoretical premise of each group. The figure also shows that the understanding is contextual. In line with Avgerou (2017), we see context in ICT4D as 'conditions and processes in the environment of an observed IS phenomenon' (p. 13). To understand the development impacts and the role of ICT in the transformative process, we need an understanding of the factors that affect the transformation. In other words we need to understand the context in which we apply the ICT. The context can also help us to determine which theories to use in our research since 'theory should also be appropriate to the context where it is applied if we are to reach an accurate understanding about the phenomenon investigated' (Davison & Díaz Andrade, 2018, p. 1). For instance if we were to study the effects of ICT investments on national economic growth, it would be ill advised to use the capability approach as the development theory, since it focuses on individuals and see economic growth as a means rather than an end. The perspectives of the theories must reflect the context in which they are applied (Davison & Díaz Andrade, 2018).

In the rest of the paper, we elaborate on these groups and present theories in each group that have been used in the literature. We then present three examples of published studies that we have carried out using in theories in each group: Capability Approach (CA) as an example of

Group 1, theory of Affordances as an example of Group 2 and Social Capital and Actor-Network theory (ANT) as examples of Group 3.While presenting them as examples of use of these theories, we also critique them for not using theories from all three groups. We then present a possible integrated view of our three example theories taken together and discuss it by revisiting Sein and Harindranath's (2004) conceptualization of the ICT artifact in ICT4D research. Next, we discuss our proposal in light of similar proposals, particularly Avgerou's (2017) recent elaboration on theoretical framing of ICT4D research. Based on this discussion, we offer guidelines for researchers in the ICT4D area on laying the theoretical foundation in their studies based on a synergestic reading of our paper with Avgerou (2017). We conclude the paper by suggesting agendas for research in ICT4D.

2. Theoretical premises of ICT4D research

2.1. Theories on development

The meaning of development has shifted over time (see Avgerou, 2017, for a parallel discussion on the meaning of development as envisaged in ICT4D research). Early development perspectives were characterized by a belief in the 'makeability' of societies, a homogeneous view of developing countries and the importance of nation states (Schuurman, 2000). The traditional development paradigm is often associated with the modernization theory, where developing countries are seen as not having the knowledge and resources to advance insufficient modes of production (Prakash & De', 2007). The West is seen as the role model and in order to develop, people and nations need to become more 'Western'. The idea was that developing countries can copy developed countries power over technology, methods and progress and leapfrog stages in the developmental process (Sein & Harindranath, 2004).

As a response to traditional development theories, various theories appeared that criticized the Western notion of development (Andersson, 2010). Instead of copying the west, the focus was on aspects such as small-scaleness and indigenous practices. The development critique also resulted in theories that blame the West for countries underdevelopment. According to dependency theory, 'poverty is not accidental, but is caused by the very processes that made developed countries rich' (Sein & Harindranath, 2004, p. 16). Another example is Escobar's notion of anti-development (Escobar, 1995) that blames the West for underdevelopment, claiming that it is responsible for the poverty experienced by many countries. According to Escobar, developing countries would be better off if the West did not interfere with their progress.

A number of other theories have also informed ICT4D research. Avgerou (2017) discusses a number of them starting with the most conventional and popular one with aid agencies and the UN, economic growth . An example from this stream in the ICT4D literature is Levendis and Lee (2013). In this multi-nation study of 29 countries in Asia the authors studied the relationship between the density of telecommunication and economic growth. The factor looked at are the rate of growth of GDP per capita in relation to the telephone penetration in the countries from 1981 to 2006. The study shows that telecommunication have a positive effect on the economic growth in the countries and that the level of telephone penetration increases the growth, i.e. 'more phones, even higher growth'.

A more recent perspective is 'Open Development' which focuses on information creation and sharing of e.g. open data, open healthcare and open education. Using this perspective, Berdou (2017) studied the dynamics that underline common-based peer production in materially poor settings in contrast to more rich settings. Berdou focused on three dimensions of openness and information co-creation, *participant motivations, process vs. product for the development of the commons, and, governance of localized public goods*. The lessons from the study include an increased understanding on the 'importance of power relations for understanding how technology, information co-creation, and community dynamics intersect.' (Berdou, 2017, p. 29).

A mid-range theory that has been widely used is Livelihood framework, or a version called Sustainable Livelihood framework (Walsham, 2017). Duncombe (2007) showed that greater benefits for the poor might 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 study identified ICTs as only one part of a much broader development picture 'context', and it avoided the overemphasis on technology that can beset some development informatics/ICT for development (ICT4D) research.

Despite the quest to link ICT and development, the development perspective is often not explicit in ICT4D research. In an extensive literature review on theories used in ICT4D, Andersson and Hatakka (2013) found that only 31 of 143 papers used a development theory to analyze the data. Thirteen papers used a theory to understand economic growth and 18 papers used development theories to understand human- and multidimensional development outcomes. A common theme in the economic growth papers is to use economic theories to explain economic growth based on the modernization of existing systems.

Clearly, there is no consensus on how development should be understood (Avgerou, 2017; Sein & Harindranath, 2004). However, there is a belief that if development is to take place, certain factors beyond economic growth need to be considered. Development should enlarge people's choices (Peet, 1999), nurture a culture of tolerance and peace (Albright, 2005) and expose social and political contradictions, thereby removing the power of oppressors (Freire, 1970). The paradigm is that of human development and the two most used theories for human development are the Capability Approach (Sen, 1999) and the sustainable livelihood framework (DFID, 1999). A major contributor to this shift in policy was the introduction of the human development index (HDI). HDI was championed by Mahbub ul Haq, who, together with other development economists (including the Nobel Laureate Amartya Sen) constructed the index which was launched in 1990. Sen is known for his work with the CA which has had an impact on both academia and policy making (Robeyns, 2006).

According to Sen (1999), development should be seen as the freedom for people to live the lives that they have a reason to value. He argues that poverty should be viewed as capability deprivation and not only as an economic factor. Thus, Sen expanded the information base of development to include a broader picture. CA differentiates between means to achieve, freedom to achieve and achievement (Zheng & Walsham, 2008). Means to achieve are commodities and other capability inputs that can increase an individual's opportunities. The freedom to achieve is the individual's capabilities and represents his or her opportunities. The achievement, when the opportunity is acted upon, is the functionings, the doings and beings, of an individual. Conversion of a commodity to a capability, as well as the choice to act on the opportunity, is influenced by a number of factors (Sen, 1992). In CA, there are three sets of conversion factors that can enable or inhibit the individuals from improving their lives. The conversion factors include personal factors such as age, gender and religion; social factors such as rules, regulations and cultural tradition; and environmental factors, e.g. the environment and the infrastructure of a country.

2.2. Theories on ICT in the ICT4D context

Somewhat surprisingly, theorizing on 'ICT' has been scarce in the ICT4D context. The much cited framework by Sein and Harindranath (2004) is not based on theory but on empirical IS literature. However, as Avgerou (2017) observed, a number of theories from the IS literature are relevant. Some, such as Socio-Technical approach has been implicitly used (see Avgerou, 2017, for examples). Theories that examine effect of ICTs on organizations and individuals, such as Structuration theory has also been used in ICT4D research (De' & Ratan, 2009).

One theory that has become popular recently to investigate how information technologies impact work at an organizational scale is information infrastructure, focusing on the elaboration, extension, and combination of existing computer networks within organizations (Hanseth, Monteiro, & Hatling, 1996). Information infrastructure focuses on how work is transformed for new technology to function,

advocating a relational and processual view to understand the dynamics and transformations of designing and developing infrastructures. This theoretical perspective was the premise for Aanestad, Jolliffe, Mukherjee, and Sahay's (2014) study of a Hospital Information System at district hospitals in India that provided insights on how to digitize public sector institutions in low- and medium- income countries.

Another attempt at theorizing ICT within the ICT4D context is Heeks' (2010) work related to the ICT4D value chain where he argues for the importance of understanding how ICT may have different values within different stages of projects. Building on a maturity model of four phases of a project, namely, phases of readiness, availability, uptake and impact, he discusses how ICT4D have (and should have) different roles within the different phases. The main contribution from this work can be seen to be on project aspects and not on ICT per se.

A similar way of thinking is represented by the work of Leong, Pan, Newell, and Cui (2016) where ICT is conceptualized as part of a digital ecosystem. Based on a case study of e-commerce projects in two remote villages in China, their study elaborates on the role of ICT within the digital ecosystem phases of birth, expansion and self-renewal. Leong et al. (2016) discusses how the role of critical actors elevates by the introduction of the ICT in the various phases, and the implications of ICT use for critical actor and community.

In this brief review of the literature on theorizing ICT in the context of development, one gap stands out. While several theories have been used in ICT4D research, few studies have conceptualized what ICT means. As we stated earlier, the one notable attempt by Sein and Harindranath (2004) is based on Orlikowski and Iacono's (2001) descriptive review of how IT artifacts have been studied in the mainstream IS literature. It was not based on theory. Later, Zheng et al. (2018) also based their framework on Orlikowski and Iacono (2001). Consequently, the conceptualization of ICT by ICT4D researchers often lack theoretical underpinnings. To address this gap, we forward the theory of Affordances as an appropriate basis to understand the role of ICT in Development.

The concept of Affordance was first articulated by the ecological psychologist (see Gibson (1986) for a detailed discussion). Affordance is theorized as the interaction between a goal-oriented actor and the environment, including the properties of the actor and of the environment (Gibson, 1986; Markus & Silver, 2008; Thapa & Sein, 2017). Affordances was introduced into the field of technology to indicate how the materiality of objects favors, shapes, invites, and constrains specific use (Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007), and originates from the argument that people pick up information relevant to their needs from objects within their environment, representing the affordances of the object, not the properties (Markus & Silver, 2008). This implies that affordances are specific to one actor; hence, an affordance for one actor may be completely useless for another. The perception and actualization of affordances are dependent on the relationship between system and user in the context in which IS are used (Pozzi, Pigni, & Vitari, 2014).

The concept of Affordances has become popular within the area of Information Systems (IS) to explore adoption within organizational arrangements resulting from the combination of work practices and features offered by innovative use of ICT (Zammuto et al., 2007). Affordances describe the action possibilities allowed by material properties within IS (Markus & Silver, 2008), proposing a bridging concept to explain the intersection between IT systems and organizational systems. This allows for the examination of how goal-oriented individuals interpret material properties within IS to create changes in organizational practices, to be 'associated with achieving organizational-level immediate concrete outcomes in support of organizational level goals' (Strong et al., 2014, p. 69). Thus, affordances relate not only to the individual level, but also to the potential for action on a collective level within an organization and to the support they provide to reach the organization's goals (Pozzi et al., 2014).

Affordances involve a network of human, social, and technical objects, which in various combinations enable action at different levels of granularity (Bygstad, Munkvold, & Volkoff, 2016). Therefore, affordances emerge from social practices involving technology, and are related to the experience, skills, and cultural understanding of the user, which are relational and situated (Zheng & Yu, 2016).

Consequently, affordances are relevant for examining users with specific needs, goals, and practices (Zheng & Yu, 2016) in a particular historical, cultural, and social context (Fayard & Weeks, 2014). In the ICT4D context, mere existence and perception of affordances is not enough, it's also important to actualize those affordances to enhance individual capabilities. As Thapa and Sein (2017) argued, the actualization of affordances is not straight forward. Facilitating conditions are needed to realize the affordances. For example, in their study, Thapa and Sein (2017) identified various roles of volunteers and social network as facilitating condition while actualizing the affordances of a telemedicine project in mountain villages of Nepal.

We argue that bringing the theory of Affordances into the ICT4D field would help us to better understand the role of ICT. The technological components are often seen as a 'black-box' within ICT4D research, without really investigating how the process by which the ICT influences such projects. Technology is hence seen as commodity that more or less automatically would contribute to some form of development. We argue for a more broader and holistic conceptualization of ICT in line with, amongst others, Sein and Harindranath (2004).

2.3. Theories on transformative processes of how ICT can lead to development

A number of theories in this category are used in the literature to examine the transformative processes that may link ICT to development. Broadly speaking, the link can be framed as structures, i.e. mechanisms and facilitating conditions, and, action predicated upon human and material agency. A combination of theories can also be used where action is premised upon mechanisms and facilitating conditions. Avgerou (2017, p. 13) categorizes these theories under 'context' where she defines context as 'conditions and processes in the environment'. Her term 'conditions' is clearly referring to structures while her term 'processes' invokes action.

Amongst structure theories, researchers have used Structuration theory that we mentioned earlier. Another widely used theory is Institutional theory. An example is Bass, Nicholson, and Subhramanian (2013) who applied Institutional theory in conjunction with CA to understand the social drivers that may inhibit or enable individuals from taking full advantage of ICT resources for enhancement of their capabilities. The paper argued that social drivers could be overlooked when using either of the approaches in isolation. Studied together, there was a synergetic effect. They observed that enhanced capabilities could in turn strengthen and develop institutions.

The institutional approach has also been applied at middle-range level notably as an action theory. Specifically, the lens of institutional work and institutional logic shed light on how e-Government initiatives were successfully implemented in Indonesia (Wahid & Sein, 2013). Another mid-range theoretical perspective is gender empowerment. Chew, Ilavarasan, and Levy (2015) looked at the role of mobile phones in women empowerment in developing countries. Based on data from 335 female micro-entrepreneurs in India they focussed on the concept of mattering, i.e. the perception that one matters in that others are aware of, interested in and depended on the individual. In contrast to many other studies on entrepreneurship that focused on economic impacts, this study highlighted non-economic impacts and concluded that 'mobile phone use plays a significant role in contributing to female entrepreneurs' perception that they *matter*' (p. 523).

A widely used structure theory in the ICT4D literature to frame facilitating conditions and mechanisms is Social Capital (Díaz Andrade & Urquhart, 2009; Thapa, Sein, & Sæbø, 2012). A Social Capital perspective that focuses on resources embedded in social networks for the mutual benefit of parties within them (Putnam, 2000) has occasionally been used to explore the effects of ICT intervention in communities (Urquhart, Liyanage, & Kah, 2008). Social Capital in the form of bonding (e.g. ties between family and keens), bridging (e.g. between different communities) and linking (e.g. between different power and status groups) can be built through social interaction among individuals and groups within a social unit (Portes, 1998; Putnam, 2000; Woolcock & Narayan, 2000). Social Capital has been put forward as an approach that can be used to explore the ICT-

enabled development process (Díaz Andrade & Urquhart, 2009; Urquhart et al., 2008). ICT can play an instrumental role in facilitating social interaction. It can also enhance civic engagement within and beyond remote communities, and foster the socioeconomic development of these communities (Díaz Andrade & Urquhart, 2009; Huysman & Wulf, 2004; Thapa, 2012). For example, studies conducted in the mountain region of Peru demonstrated that ICT could be instrumental in overcoming remoteness and social exclusion problems through extending Social Capital (Heeks & Kanashiro, 2009).

Structure theories deal with mechanisms and can help us understand the facilitating conditions needed for transformative processes. However, to understand the action that is needed to drive these processes, we need theories of action and human/material agency. To illustrate this point, let us take the case of a structure theory, namely Social Capital: It does explain who the central actors are and how they build social networks. Clearly, there is a need for a theory to understand the role of various actors in the process of building Social capital. An example of such a theory is Actor-Network Theory (ANT) (Latour, 2005). ANT can enhance our understanding of the interplay between various actors and the social network formation process (Stanforth, 2007; Thapa, 2011; Walsham & Sahay, 1999). Particularly relevant to the ICT4D context, are the processes through which focal actor(s) enroll other actors to form a network, and mobilize the members of the network to achieve shared objectives. The enrollment process follows four translation moments: *problematization, interassement, enrollment and mobilization* (Callon, 1986). These moments can describe how structures such as Social Capital are leveraged into action to achieve a desirable goal such as development objective.

Using Social Capital and ANT in combination gives us a sharper theoretical lens where action (understood by ANT) is premised upon mechanisms and facilitating conditions (understood by Social Capital). Complementarily, Social Capital can provide a lens to understand how the participation among actors happen. Increased social interaction can promote the trust, acceptance, and alignment that are necessary for action in a community (Ostrom, 2000; Syrjänen & Kuutti, 2004). These contingent characteristics are the inherent elements of Social Capital (Ostrom & Ahn, 2003). ANT analyses how the processes, controversies and negotiations leading to the formation of a Social Capital progresses. On the other hand, Social Capital takes into account the role of social structures that influence the actors' enrollment decisions.

3. Illustrative examples of studies based on the three theoretical groups

3.1. Study based on capability approach as theory of development: Kwale County in Kenya

The example involves a project in which one of the authors was involved. The CA was used to evaluate the use of ICT in rural study circles in Kwale County on the south coast of Kenya (Hatakka, Ater, Obura, & Mibei, 2014). Kwale County has high poverty and low literacy levels as well as high drop-out rates from schools. The infrastructure is poorly developed and access to reliable Internet connections is rare outside the main cities. The study circles were initiated by CORDIO East Africa to promote adult education, use of ICT and to support income generating activities. Through using ICT, the project aimed to enhance the well-being for the study circle participants by supporting the education with learning content, providing the communities access to technology, and increasing their ICT literacy.

The rational for choosing the CA was that the ICT use varied between the study circles, and therefore the impacts could vary greatly between them. Thus, a theory was needed that was broad enough to capture several aspects of human development. The choice was also informed by the approach focus on individuals and the need to evaluate, not only the outcome results, but also whether the condition for the individuals were enabling and just. Moreover, the researchers wanted to move away from a technology deterministic view of development. In the CA, ICTs are seen as a mean to an end, rather than an end in itself (Zheng & Walsham, 2008).

The study was interpretative and based on group interviews with different actors (study circle groups, government officials, project management, public access providers and support staff). The data was analyzed and categorized based on the main constructs in the CA, ICT used (means to achieve), capabilities the ICT had enabled (freedom to achieve), functionings (realized achievement) and conversion factors (factors that affect the development process). The researchers also looked for pattern within each construct, and how the conversion factors affected development for the individuals.

The study showed that capabilities were enabled on several different levels. The introduction of ICT had an effect on their ability to make an income, e.g. by starting small internet cafes or by promoting their products. The availability of information and learning content had improved their learning capabilities, improved their literacy, their ability to use electronic services, and their self-confidence. Furthermore, ICT had not only an effect on the individuals in the study circles, the whole communities benefited as they now had access to computers with Internet (Hatakka et al., 2014). Further analysis indicated that, while many of the groups had similar objectives with the ICT use, the outcome varied greatly due to different conversion factors. For example, cultural traditions in one community restricted the use of Internet for women, limiting the potential outcomes enabled by communication and access to information.

While CA provided an overall development perspective, the analysis lacked insights on the ICT part. In ICT4D operationalizations of CA, technology is most often conceptualized as a neutral commodity (Zheng & Stahl, 2011). Viewing ICT as just another commodity meant that the researchers missed the opportunity of understanding the properties and functions of the ICT that leads to development. Since the development outcomes for the groups varied, dwelling deeper into this understanding would have potentially aided in explaining why the ICT implementation worked for some groups and not for others. In addition, the study, like most ICT4D studies using the approach, focused on the enabled capabilities resulting from an ICT implementation. With the exception of the conversion factors that, to a degree, can explain what enables or inhibits the conversion of an ICT into a development outcome, the analysis also lacked in explaining *how* the ICT was linked to the capabilities. There are some insights about the action possibilities afforded by ICT in the data. For example, the study circle members perceived that the ICT afforded them income making possibilities and to promote their products. This implicitly points towards affordances of ICT. However, the researchers did not use Affordance theory explicitly. Consequently, the theoretical premise of ICT did not inform the study.

3.2. Study based on affordances as the theory of ICT: social media and LAPOR system in Bandung, Indonesia

The example is use of the theory of Affordances by another of the authors to investigate an eParticipation projects from Bandung, Indonesia (Wahid & Sæbø, 2015). Indonesia is among the top users of social media in the world, with more than 70 million Facebook users, many of them young citizens accessing such services through their mobile phones. In the city of Bandung, social media was introduced to encourage direct participation in political processes, for the municipality to communicate with external stakeholders and to coordinate internal processes, despite the lack of widespread inclusion of ICT in most governmental services. Since computers are expensive and in general not available for employess within the municipality, Bandung decided to organize a major part of their activities around the use of social media such as Facebook, Twitter and WhatsApp. Moreover, Bandung adopted a national complaint-handling system called LAPOR (Layanan Aspirasi dan Pengaduan Online Rakyat), allowing citizens to report and discuss issues of concerns through various channels including visits, sms, e-mail, web-site and social media (Dini, Sæbø, & Wahid, 2018).

The Affordance lens contributed to an increased understanding of the role that technology plays in relation to goal-oriented actors. The aim was to better understand how social media was being used, by whom, the consequences of contextual factors, and the consequences of use and adoption

of such services. The case study was based on an interpretive approach. Interviews with key actors, archival data, reports, social media contributions, and researcherś notes from on-site visits were analyzed based on the Affordances perspective. The researchers looked for empirically observable outcomes and events by investigating the data to identify actual events that allowed them to identify the existence of affordances

Guided by the work of Pozzi et al. (2014), the study identified actualized affordances, that is, situations where actors such as politicians, employees within the municipality, and members of the local citizen-groups (being responsible for neighborhood descisions) understood the usefulness of the technology being introduced, and, at the same time were able to use the technology to achieve their objectives (Wahid & Sæbø, 2015). One example of such an affordance is the facilitation of direct communication between citizens and the municipality. When the government decided to include social media within their administrative processes of the government, the citizens immediately got the chance to communicate directly with the municipalitýs officers. Another example include the facilitation of internal coordination, where meetings and other activities within the municipality could be announced through WhatsApp and Facebook. Further, the study identified and discussed the outcomes of actualization of these affordances. For instance, one of the identified affordances was direct communicatibility through Twitter. The mayor enforced a rule that the technical department should report their activities to him through Twitter which enabled interested persons to track their record. This resulted in a more responsive municipality. Enabling factors for actualization of affordances included the presence of political goodwill and commitment (with the mayor being the key champion) and the presence of a reward systems to encourage use of social media. Inhibiting factors included issues such as lack of competence and knowledge readiness, as well as challenges related to a lack of culture for openness and transparency within the municipality. The findings indicate that affordance perception plays a role in identifying the action possibilities provided by social media when they interact with the specific contexts of eParticipation. The identification of affordance perception, actualization, effects, and enabling and inhibiting factors help to make sense of the consequences of introducing ICT for the purpose of eParticipation in a developing country.

While the Affordance lens helped the researchers understand why the actors such as politicians used LAPOR, Facebook and Twitter, we do not get a clear idea about the development outcomes that were achieved through such services in Bandung. In the absence of an explicitly stated development theory in the study, we can only speculate about the importance of transparency, participation and access to information for the enlargement of choices for various actors. However, if we consider increased eParticipation as enlargement of choices, then implicitly, development is framed as capability approach. The capabilities of citizens to voice their opinions increase their freedom. Whether the politicians had development goals while introducing the use of LAPOR and social media is not clear. There is also no consideration of the transformative processes, even implicitly.

3.3. Study based on social capital and ANT as the theories informing the transformative processes linking ICT to development: NWNP in Nepal

ANT and Social Capital were used in conjunction as interpreting lens by three of the authors in their study of Nepal Wireless Networking Project (NWNP) (Thapa et al., 2012). The project was initiated in 1997 by educationist and social activist Mahabir Pun. Despite difficult circumstances, such as lack of government support, funding, technical knowledge, and an unstable political system (There was a civil war between the Nepali government and the Maoists when the project started), the project succeeded in providing internet service with minimal wireless technology, home-made antennas, and relay stations in trees at an altitude of 2700 meters. NWNP is working with Open Learning Exchange (OLE) Nepal, an NGO based in the US and Kathmandu, as a partner to develop educational contents for the school children.

Furthermore, to address the challenges of bringing specialist doctors into the mountain villages, NWNP has initiated telemedicine services in some villages of the Myagdi district. A variety of actors participated in the initiation, implementation and operation of this telemedicine initiative. They include the initiator of the project, Saroj Dhittal (chief surgeon of Kathmandu Model hospital and president of Nepal Telemedicine association), doctors from urban hospitals, local health workers and local societies such as mothers' society ('Amah samoh' In Nepali). Currently, NWNP has extended its network to more than 200 villages.

This study examined the questions: How does a main actor (Pun) create, maintain, and extend bonding, bridging, and linking Social Capital? How did Pun enroll other actors from OLE, Kathmandu Model Hospital, INGOs, NGOs and local groups such as 'Aama Samoh' through NWNP? How did he mobilize these actors to promote collective action? An integrated framework of Social Capital and ANT was an appropriate understanding lens to answer these questions.

The interpretive case study was carried out in ten villages of Myagdi district. Data was collected over three rounds in a three-year span. Data analysis focused on understanding the process of building Social Capital through ICT intervention, and its relation to collective action. The roles of various actors in Social Capital formation process was analyzed. The coding and categorization of the data were guided by ANT. The next phase was to relate Social Capital and collective action, by grouping codes into categories such as bonding, bridging, linking Social Capitals, and collective action. Finally, data were analyzed to examine how collective action led to enhanced capabilities. The categorization was done using open and axial coding.

The analysis showed that one social activist conceived and acted on his idea to form and extend a wireless project, leveraging the bonding, bridging and linking social. To do so, he enrolled and mobilized other relevant actors. The interaction between people in the community and NWNP enabled villagers to extend their Social Capital, which in turn assisted them in promoting collective action. The collective approach enhanced individual and collective capabilities such as access to telemedicine, e-business, and online teaching and learning services. The analysis also identified several challenges such as an over dependency on a single actor, a high illiteracy rate, poor physical infrastructure, and lack of participation, which may impede the capability building process.

While this study represents an example of Group 3 theories (transformative processes), it also explicitly used a theory from Group 1. It deduced development goals as building individual and collective capabilities in accordance with the Capability Approach. The missing thoretical group was Group 2, ICT theories. The ICT artefact was NWNP but it was treated more as a black box. A theory conceptualizing ICT, such as affordances of NWNP would have shed light on how the material agency of NWNP interacted with the human agency (captured through ANT) to enact transformative process. That would have helped us understand what was it about NWNP as an ICT artifact influenced the manner in which the transformative processes led to achievement of the development goals.

3.4. Taking the examples together

Table 1 summarizes the three example studies described below.

Table 1. Summary of example studies.

Study	Group 1: development theory	Group 2: ICT theory	Group 3: transformative process theory
Kwale County, Kenya	Capability approach	Not explicit, Affordances implicit	None
LAPOR in Bandung, Indonesia	Not explicit, Capability approach implicit	Affordances	None
NWNP in Nepal	Capability approach	None	Social Capital + ANT

In describing the examples of studies that illustrate use of each group of theories, specifically CA, Affordances and a combination of Social Capital and ANT, we also critiqued them because none of them were based on theoretical premises from all three groups. However, there were implicit recognition of a theory from a second group in all three studies as shown in Table 1. It is worth exploring how a holistic understanding based on the hermeneutic circle would have enriched our understanding of ICT4D. Let us consider the first case: Kwale County, Kenya.

As we presented in an earlier section, the understanding of the 'whole' of ICT4D was based on a firm rooting in one of the parts, Development with CA being the specific perspective. None of the other parts, ICT or transformative processes were explicitly considered. However, as we discussed, the case analysis did not explain *how* the ICT was linked to the capabilities. If we examine the data with a lens from another 'part', theory of affordances in ICT, a number of insights surface about the action possibilities afforded by ICT. We can now shift our analytic gaze from the whole 'ICT4D' to a part 'ICT' (specifically Affordances) and then back to the whole, and by doing so our understanding of ICT4D is increased. We begin to see how specific affordances of ICT – income making possibilities and promotion of their products – enhanced the capabilities of the villagers. This additional understanding can be achieved by going through the hermeneutic cycle.

We can continue this tacking back and forth by trying to understand the third part – transformative processes – and enhance our understanding of ICT4D. We can also try this thought experiment with the other two studies we presented in this paper.

None of the three studies included all three theoretical groups. Let us envisage what a study that considers explicitly all three groups together. Figure 3 captures such an integration based on the three examples. Although presented in linear fashion, it should not be interpreted as linear and deterministic, it should be interpreted holistically. In short, development is conceptualized as enlargement of freedoms based upon the CA. ICT is captured as its affordances; the transformative process is presented as using the affordances to attain human development through collective action, which is achieved through Social Capital marshaled by focal actors through processes explained by ANT.

4. Discussion

We argued at the outset that researchers in our field need to have a holistic understanding of the theoretical premises from the component parts that together define the area of the whole, i.e. ICT4D. Theories are important to help us reveal and understand phenomena under study, largely to be able to understand and/or predict (Gregor, 2006). Theories may facilitate systematic treatment of topics, through providing consistent concepts and principles to be compared with reality, thereby demonstrating patterns and potential relationships (Díaz Andrade & Urquhart, 2018). As argued by

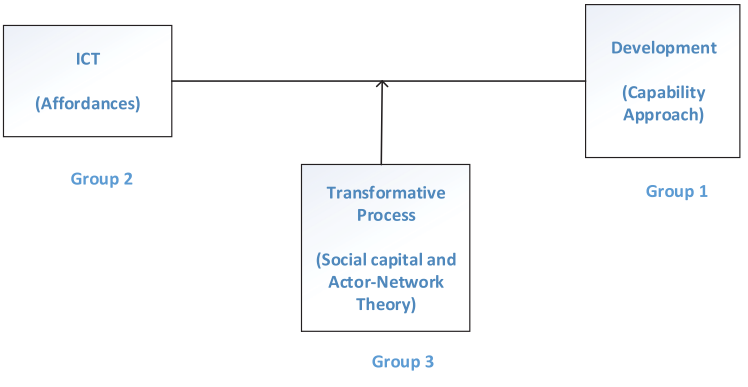

Figure 3. An integration based on example studies depicting three groups of theories for ICT4D research.

Van de Ven (1989, p. 486): 'Good theory is practical precisely because it advances knowledge in a scientific discipline, guides research toward crucial questions, and enlightens the profession of management'. Theorizing plays a critical role for valid knowledge production within research, and is the result of inferring and explaining mechanisms and empirical events. Going beyond purely descirptions of empirically observed patterns, good theorizing also attempts to explain what causes these patterns (Van de Ven, 1989), and should be appropriate to the context where it is applied to reach an accurate understanding about the phenomena investigated (Davison & Díaz Andrade, 2018).

In the sections above, we presented examples of studies that used theories from each of the component parts that together define ICT4D, namely, CA, Affordances and Social Capital in conjunction with ANT. It should be emphasized that these are examples only meant to illustrate and concretize our argument. Other theories may be equally relevant.

The question remains about how we measure the impact of ICT interventions. Arguably, the development theory adopted provides these measures. Our set of three studies explicitly or implicitly framed development as enhancement of capabilities. The human development index (HDI) gives tangible measures of development. This was also the stance of Sein and Harindranath (2004). They also provide an additional measure by conceptualizing impacts in terms of the three order effects (first order being replacement, the second order being increase in the phenomenon enabled by the artifact and the third order being emergence of structures and structural changes). In short, our deliberations complement their framework and thus aim at building a cumulative tradition in ICT4D research.

Our example studies also demonstrate that since the three group of studies are parts of a whole, ICT4D, choices made in one group may well influence which theories in the other groups would be appropriate in a research project. Conceptualizing development through CA requires theories of transformative processes that are most appropriate to build capabilities. Social capital, as a basis for collective action, is particularly suited to facilitate collective action. Social capital can also help in perceiving and actualizing the affordances of ICT.

5. Implications for ICT4D researchers

While the thrust of our arguments is on the need for a holistic understanding of the theoretical premises of ICT4D, our paper has methodological implications. A research project should explicitly be informed by theories from each of the three groups. Seen in light of this, a researcher is better served by starting with a clear conceptualization of development goals. In essence research in ICT4D is trying to find out if and how ICT can lead to development. In order to do so, we need to know what is it that we are trying to achieve. While taking an explicit position on development theory may not be essential, a clear conceptualization of development is vital. This will help a researcher in deducing development goals, which Avgerou (2017) aptly states are essential for a researcher to be aware. Next, since the quest is to achieve development through ICT, we need to understand what ICT means. Here a clear conceptualization of the ICT artefact, what it means in the development context is crucial. A theory from this group will help us in this understanding. Once we know what we are aiming at and that ICT has the potential to reach that objective, we need theories that will help us find how ICT can foster development. The theories from the third group will help the researcher in this. We hasten to add that we are not advocating a liner or sequential research process. Rather, we re-emphasize that the process is hermeneutic with constant tacking back and forth between parts, the theory groups, and the whole, ICT4D. This process is iterative.

We would like to stress that we are not calling for researchers to explicitly include theories from each group in every study on ICT4D. There are frameworks that incorporate implicitly or explicitly premises from more than one theory. One good example is DFID which is based on sustainable livelihood framework and includes premises of both development and the transformation process.[1] However it still does not undermine our point that researchers need to be aware of and include

understanding from the three groups of theories to gain a holistic perspective of ICT4D. Our conceptualization thus serves as a guideline at the fundamental level. There are many other aspects and nuances in the link between ICT and Development. Our ideas are a start in this direction. To build on the start we have proposed here, articulations such as Avgerou's (2017) is very useful. We point out a number of similarities between her grouping of theories and ours. Her conceptualization of development theories (she uses the term 'socio-economic development') is similar to ours. Her views on context are in line with our conceptualization of the transformative processes. While there are similarities between her characterization of 'ICT' and ours, there are nuanced differences. Some theories she mention, such as 'socio-technical systems perspective' are more related to how ICT is enacted rather than the ICT artifact per se. Perhaps her focus on IS rather than the artifact explains this seeming divergence. In essence though, her views and conceptualizations and ours are complementary. Our paper enhances and sharpens the understanding provided by Avgerou (2017) by explicitly arguing for specific theoretical groups that taken together provides a holistic perspective of ICT4D. We therefore suggest that researchers read our paper together with Avgerou's paper to get a fuller picture and richer guideline and build their research.

6. Proposed research agendas

Even a cursory glance at the multitude of theories used in the literature that we have presented in this paper, reveals that ICT4D research has matured and is becoming more theory-ingrained and theory-informed. The field has come a long way since the early days of focusing on bridging the digital divide (see Walsham, 2017 and Sahay, Sein, & Urquhart, 2017, for a critical analyses). Historically, the focus has followed the global development agenda (see Heeks, 2008, for a chronology of this alignment). The next phase in ICT4D is still to be determined, but we assume that the new Sustainable Development Goals (UNDP, 2015) will have an impact. The challenge for ICT4D researchers is to keep their focus aligned with the global development agenda. It is time we build on our vast conceptual and empirical base to move forward. A natural progression is to aim for greater impact on practice through intervention studies where the theoretical knowledge base can be leveraged to design development initiatives. We elaborate in the rest of this section and propose five research agendas.

6.1. Agenda 1: theorizing ICT4D

This agenda captures the crux of the overarching question we raised at the beginning of the paper: the search for understanding the elusive link between ICT to development. We have suggested exemplar theories and empirical studies to illustrate them. We do not have examples of studies that illustrate the use of all the three groups together. We have presented a possible integration of a study based on all three groups. Hence an obvious avenue for future research is to empirically examine ICT initiatives using all three groups. However, Avgerou (2017) observed that implicitly almost all ICT4D research is premised on these theories, but there is a need to be explicit and clear. Our suggestions allow ICT4D researchers to more precisely state their contribution to the literature (i.e. to which group are they contributing). More research is needed on the specific theoretical streams we have proposed. For example, we need to understand the interplay between various social and technical actors that contributes to the process of building Social Capital (Lin, 1999). While the instrumental role of ICT as an enabler to promote Social Capital is illustrated (Huysman & Wulf, 2004), more research is needed to understand the process of building Social Capital and its implications for development (Urquhart et al., 2008). At the same time, we agree with Avgerou (2017), that it is important to be informed by, and develop, mid-range theories. These theories enable us to understand specific phenomena which may have more influence on how ICT can lead to specific aspects of development. Moreover, our reflections in this paper may provide the grounding and the impetus for building theory specific on ICT4D, the importance of which has been articulated by Tibben (2015).

6.2. Agenda 2: multiple levels of analysis

Whose development do we study? We need to examine how theoretical premises can, and should, be used to inform ICT4D research at different level- and unit of analysis. A good basis for this is the typology developed by Qureshi (2015), where the level of analysis can be individual, organization, country, region or world, and based on that different indicators can be used, and the role played by ICT can be analyzed. For example, at the individual level of analysis, the indicators can be capabilities and personal freedom or indices such as human development or gender development. The typology helps us in determining the type of questions we should ask based on the development perspective and level of analysis. This perspective also helps us in developing mid-range theories. Avgerou (2017) discusses persuasively how such mid-range theories can explain how effects of ICT interventions can be observed at some level and not others thus helping us understand what 'success' of the intervention means. As we stated in the previous agenda, the ICT4D-specific theory is more useful at the mid-range level.

6.3. Agenda 3: moving from understanding to intervention studies

The vast majority of ICT4D research has concentrated on understanding the process and impact of initiatives. What is needed now is to use the learning from these studies to guide ICT interventions for development. There are several examples of 'doing ICT4D', the foremost being the HISP program under the auspices of the University of Oslo (http://www.hisp.org/). This has proved to be a fertile ground to link to 'researching ICT4D'. Leveraging development projects to create knowledge is an opportunity for researchers. We need to conduct more Action Research and Action Design Research studies to create knowledge while solving development problems. It is important to stress that such intervention studies are informed by theories and aim at creating theories. A refreshing perspective is moving on from 'designing for needs' to 'designing for aspirations' (Toyama, 2017). Needs-based design gets rooted on 'what we need now' or 'what we may need in the future'. By contrast, aspiration-based design makes us think on 'what do we aspire to'. Aspirations have a long-term perspective while needs have a much shorter perspective.

6.4. Agenda 4: the philosophical bases of ICT4D

We have described the ontological questions 'What is ICT?' and 'What is development?' as affordances and enlargement of capabilities in previous sections. The question concerning how ICT leads to development has also been explored by applying Social Capital and ANT. These theoretical lenses provide a plausible description of the phenomena of ICT4D. However, these lenses mainly focus on understanding 'what' and 'how': the explanation of 'why' is missing. Why does the same technology work in certain context and not in another? There is a need for methodological approach that can be applied to identify mechanism that may explain 'why' the phenomenon happens (Omland & Thapa, 2017). ICT4D researchers can gain inspiration from recent studies in IS that are based on the critical realist perspective to identify the mechanism (Bygstad et al., 2016).

6.5. Agenda 5: expanding ICT4D research to the developed world

Our last proposed agenda might appear perplexing. Isn't ICT4D research supposed to examine how ICT can foster development? At first glance, our research should be conducted in developing countries. However, conditions that characterize underdevelopment also exist in pockets of developed countries. The underprivileged who live in these pockets have the same challenges that the poor in the so-called third world countries face. A vivid illustration of this context is the work of Qureshi and her associates in the poorer neighborhoods around Omaha in USA (Qureshi, 2015). Their work demonstrates that the theories we discussed here, specifically the CA, is equally relevant.

We propose that ICT4D research can be carried out in both developed and underdeveloped countries. Development and underdevelopment are phenomena and the theoretical groupings we proposed apply equally in both contexts.

7. Concluding remarks

In concluding her paper, Avgerou (2017) relates

> Students often asks me what theory they should use for their research of so-and-so a topic. This is an impossible question to answer: it is not one theory that is needed in ICT4D research, but many; and nobody can prescribe the theories for study of a topic. (p. 19)

We empathize with this statement and our paper cannot answer the students' question or point to a specific theory. What we can do though, is to point to three specific groups of theories that can inform their research and they can use to build their research. A key message in this paper is that since there are many competing perspectives of development, we must 'define which development paradigm we are working with and secondly, to refine our understanding of development processes to recognize their systematic nature' (Kleine, 2010, p. 676). Irrespective of our development perspective, and our research agenda, it is necessary to investigate what role ICT can play to foster development. The 4D in ICT4D distinguishes us from mainstream IS research. At the same time, as Sahay et al. (2017) reminds us, we can at the same time inform mainstream IS research.

Note

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No potential conflict of interest was reported by the authors.

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References

Aanestad, M., Jolliffe, B., Mukherjee, A., & Sahay, S. (2014). Infrastructuring work: Building a state-wide hospital information infrastructure in India. *Information Systems Research*, *25*(4), 834–845.

Albright, P. (2005). Internet discussion forum: Open educational resources open content for higher education. Retrieved from http://www.unesco.org/iiep/virtualuniversity/media/forum/oer_forum_final_report.pdf

Andersson, A. (2010). *Learning to learn in e-learning - Constructive practices for development* (Doctoral thesis). Örebro University, Örebro. (Örebro Studies in Informatics 3).

Andersson, A., & Hatakka, M. (2013). *What are we doing? - Theories used in ICT4D research*. Paper presented at the 12th International Conference on Social Implications of Computers in Developing Countries, Ocho Rios, Jamaica.

Avgerou, C. (2017). Theoretical framing of ICT4D research. In J. Choudrie & S. Islam (Eds.), *Information and communication technologies for development* (pp. 10–23). New York: Springer.

Bass, J. M., Nicholson, B., & Subhramanian, E. (2013). A framework using institutional analysis and the capability approach in ICT4D. *Information Technologies & International Development*, *9*(1), 19–35.

Berdou, E. (2017). Open development in poor communities: Opportunities, tensions, and dilemmas. *Information Technologies & International Development*, *13*(1), 18–32.

Boland, R. J., Newman, M., & Pentland, B. T. (2010). Hermeneutical exegesis in information systems design and use. *Information and Organization*, *20*(1), 1–20.

Bygstad, B., Munkvold, B. E., & Volkoff, O. (2016). Identifying generative mechanisms through affordances: A framework for critical realist data analysis. *Journal of Information Technology*, *31*(1), 83–96.

Callon, M. (1986). Some elements of a sociology of translation: Domestication of the scallops and fisherman of St. Brieuc Bay. In J. Law (Ed.), *Power, action and belief: A new sociology of knowledge?* (pp. 196–233). London: Routledge.

Chew, H. E., Ilavarasan, V. P., & Levy, M. R. (2015). Mattering matters: Agency, empowerment, and mobile phone use by female microentrepreneurs. *Information Technology for Development*, *21*(4), 523–542.

Davison, R. M., & Díaz Andrade, A. (2018). Promoting indigenous theory. *Information Systems Journal*, *2018*, 1–6.

De', R., & Ratan, A. L. (2009). Whose gain is it anyway? Structurational perspectives on deploying icts for development in India's microfinance sector. *Information Technology for Development*, *15*(4), 259–282.

DFID. (1999). *Sustainable livelihoods guidance sheets*. Retrieved from http://www.ennonline.net/resources/667

Díaz Andrade, A., & Urquhart, C. (2009). The value of extended networks: Social capital in an ICT intervention in rural Peru. *Information Technology for Development*, *15*(2), 108–132.

Dini, A., Sæbø, Ø, & Wahid, F. (2018). Affordances and effects of introducing social media within eParticipation—Findings from government-initiated Indonesian project. *The Electronic Journal of Information Systems in Developing Countries*, *84*, e12035.

Duncombe, R. (2007). Using the livelihoods framework to analyze ICT applications for poverty reduction through microenterprise. *Information Technologies and International Development*, *3*(3), 81–100.

Escobar, A. (1995). *Encountering development: The making and unmaking of the third world*. Princeton: Princeton University Press.

Fayard, A. L., & Weeks, J. (2014). Affordances for practice. *Information and Organization*, *24*(4), 236–249.

Freire, P. (1970). *Pedagogy of the oppressed* (M. B. Ramos, Trans.). New York: Continuum.

Gadamer, H. G. (1989). *Truth and method* (2nd revised ed). Continuum: New York.

Gibson, J. J. (1986). *The ecological approach to visual perception*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Gregor, S. (2006). The nature of theory in information systems. *MIS Quarterly*, *30*(3), 611–642.

Hanseth, O., Monteiro, E., & Hatling, M. (1996). Developing information infrastructure: The tension between standardization and flexibility. *Science, Technology, & Human Values*, *21*(4), 407–426.

Hatakka, M., Ater, S., Obura, D., & Mibei, B. (2014). Capability outcomes from educational and ICT capability inputs – An analysis of ICT use in informal education in kenya. *The Electronic Journal of Information Systems in Developing Countries*, *61*(1), 1–17.

Heeks, R. (2008). ICT4D 2.0: The next phase of applying ict for international development. *Computer*, *41*(6), 26–33.

Heeks, R. (2010). Do information and communication technologies (ICTs) contribute to development? *Journal of International Development*, *22*(5), 625–640.

Heeks, R., & Kanashiro, L. (2009). Telecentres in mountain regions — A Peruvian case study of the impact of information and communication technologies on remoteness and exclusion. *Journal of Mountain Science*, *6*(4), 320–330.

Huysman, M., & Wulf, V. (2004). *Social capital and information technology*. Cambridge, MA: MIT Press.

Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, *23*(1), 67–93.

Kleine, D. (2010). ICT4WHAT?-Using the choice framework to operationalise the capability approach to development. *Journal of International Development*, *22*(5), 674–692.

Krauss, K. (2016). *Moderator's comments on "is it really better to be "developed"?* Panel discussion at SiGGlobDev workshop, Dublin, Ireland, December.
Latour, B. (2005). *Reassembling the social, an introduction to actor-network theory*. Oxford: Oxford University Press.
Leong, C. M. L., Pan, S. L., Newell, S., & Cui, L. (2016). The emergence of self-organizing e-commerce ecosystems in remote villages of China: A tale of digital empowerment for rural development. *MIS Quarterly*, *40*(2), 475–484.
Levendis, J., & Lee, S. H. (2013). On the endogeneity of telecommunications and economic growth: Evidence from Asia. *Information Technology for Development*, *19*(1), 62–85.
Lin, N. (1999). Social networks and status attainment. *Annual Review of Sociology*, *25*(1), 467–487.
Markus, L. M., & Silver, M. S. (2008). A foundation for the study of IT effects: A new look at DeSanctis and poole's concepts of structural features and spirit. *Journal of the Association for Information Systems*, *9*(10-11), 609–632.
Omland, H. O., & Thapa, D. (2017). Methodological approach for identifying mechanisms in ICT4D: A critical realism perspective. In J. Choudrie & S. Islam (Eds.), *Information and communication technologies for development* (pp. 182–193). New York: Springer.
Orlikowski, W. J., & Iacono, C. S. (2001). Research commentary: Desperately seeking the "IT" in IT research—A call to theorizing the IT artifact. *Information Systems Research*, *12*(2), 121–134.
Ostrom, E. (2000). Collective action and the evolution of social norms. *Journal of Economic Perspectives*, *14*(3), 137–158.
Ostrom, E., & Ahn, T. K. (2003). *Foundations of social capital*. Massachusesetts: Edward Elgar Publishing, Inc.
Peet, R. (1999). *Theories of development*. New York: The Guilford Press.
Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, *24*(1), 1–24.
Pozzi, G., Pigni, F., & Vitari, C. (2014). *Affordance theory in the IS discipline: A review and synthesis of the literature*. Proceedings of the Twentieth Americas Conference on Information Systems, Savannah, US.
Prakash, A., & De', R. (2007). Importance of development context in ICT4D projects: A study of computerization of land records in India. *Information Technology & People*, *20*(3), 262–281.
Putnam, R. (2000). *Bowling alone - The collapse and revival of American community*. New York: Simon & Schuster.
Qureshi, S. (2015). Are we making a better world with information and communication technology for development (ICT4D) research? Findings from the field and theory building. *Information Technology for Development*, *21*(4), 511–522.
Robeyns, I. (2006). The capability approach in practice. *Journal of Political Philosophy*, *14*(3), 351–376.
Roztocki, N., & Weistroffer, H. R. (2016). Conceptualizing and researching the adoption of ICT and the impact on socio-economic development. *InformationTechnology for Development*, *22*(4), 541–549.
Sahay, S., Sein, M. K., & Urquhart, C. (2017). Flipping the context: ICT4D, the next grand challenge for IS research and practice. *Journal of the Association of Information Systems*, *18*(12), 837–847.
Schuurman, F. J. (2000). Paradigms lost, paradigms regained? Development studies in the twenty-first century. *Third World Quarterly*, *21*(1), 7–20.
Sein, M. K., & Harindranath, G. (2004). Conceptualizing the ICT artifact: Toward understanding the role of ICT in national development. *The Information Society*, *20*(1), 15–24.
Sein, M. K., & Nordheim, S. (2010). *Learning processes in user training: The case for Hermeneutics*. Proceedings of ACM SIGMIS CPR Conference, Vancouver, Canada.
Sen, A. (1992). *Inequality reexamined*. Oxford: Oxford University Press.
Sen, A. (1999). *Development as freedom*. New York: Anchor Books.
Stanforth, C. (2007). Using actor - Network theory to analyze e - Government implementation in developing countries. *Information Technologies and International Development*, *3*(3), 35–60.
Strong, D. M., Volkoff, O., Johnson, S. A., Pelletier, L. R., Tulu, B., Bar-On, I., … Garber, L. (2014). A theory of organization-EHR affordance actualization. *Journal of the Association for Information Systems*, *15*(2), 53–85.
Syrjänen, A.-L., & Kuutti, K. (2004). Trust, acceptance, and alignment: The role of IT in redirecting a community. In M. Huysman & V. Wulf (Eds.), *Social capital and information technology* (pp. 21–50). Cambridge, MA: MIT Press.
Thapa, D. (2011). The role of ICT actors and networks in development: The case study of a wireless project in Nepal. *The Electronic Journal of Information Systems in Developing Countries*, *49*(1), 1–16.
Thapa, D. (2012). *Exploring the link between ict intervention and human development through a social capital lens: The case study of a wireless project in the mountain region of Nepal* (Doctoral dissertation). University of Agder.
Thapa, D., & Sæbø, Ø. (2014). Exploring the link between ICT and development in the context of developing countries: A literature review. *The Electronic Journal of Information Systems in Developing Countries*, *64*(1), 1–15.
Thapa, D., & Sein, M. K. (2017). Trajectory of affordances: Insights from a case of telemedicine in Nepal. *Information Systems Journal*. Advance online publication. doi:10.1111/isj.12160
Thapa, D., Sein, M. K., & Sæbø, Ø. (2012). Building collective capabilities through ICT in a mountain region of Nepal: Where social capital leads to collective action. *Information Technology for Development*, *18*(1), 5–22.
Tibben, W. J. (2015). Theory building for ICT4D: Systemizing case study research using theory triangulation. *Information Technology for Development*, *21*(4), 628–652.
Toyama, K. (2017). Design, needs and aspirations. In J. Choudrie & S. Islam (Eds.), *Information and communication technologies for development* (pp. 24–32). New York: Springer.
UNDP. (2015). *Sustainable development goals*. Retrieved from http://www.undp.org/content/dam/undp/library/corporate/brochure/SDGs_Booklet_Web_En.pdf

Urquhart, C., Liyanage, S., & Kah, M. M. O. (2008). ICTs and poverty reduction: A social capital and knowledge perspective. *Journal of Information Technology*, *23*(3), 203–213.

Van de Ven, A. H. (1989). Nothing is quite so practical as a good theory. *Academy of Management Review*, *14*(4), 486–489.

Wahid, F., & Sæbø, Ø. (2015). *Affordances and effects of promoting e-participation through social media*. International Conference on Electronic Participation (3-14). Springer, Cham.

Wahid, F., & Sein, M. K. (2013). Institutional entrepreneurs: The driving force in institutionalization of public systems in developing countries. *Transforming Government: People, Process and Policy*, *7*(1), 76–92.

Walsham, G. (2017). ICT4D research: Reflections on history and future agenda. *Information Technology for Development*, *23*(1), 18–41.

Walsham, G., Robey, D., & Sahay, S. (2007). Foreword: Special issue on information systems in developing countries. *MIS Quarterly*, *31*(2), 317–327.

Walsham, G., & Sahay, S. (1999). GIS for district-level administration in India: Problems and opportunities. *MIS Quarterly*, *23*(1), 39–65.

Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank Research Observer*, *15*(2), 225–249.

Zammuto, R. F., Griffith, T. L., Majchrzak, A., Dougherty, D. J., & Faraj, S. (2007). Information technology and the changing fabric of organization. *Organization Science*, *18*(5), 749–762.

Zheng, Y., Hatakka, M., Sahay, S., & Andersson, A. (2018). Conceptualizing development in information and communication technology for development (ICT4D). *Information Technology for Development*, *24*(1), 1–14.

Zheng, Y., & Stahl, B. C. (2011). Technology, capabilities and critical perspectives: What can critical theory contribute to Sen's capability approach? *Ethics and Information Technology*, *13*(2), 69–80.

Zheng, Y., & Walsham, G. (2008). Inequality of what? Social exclusion in the e-society as capability deprivation. *Information Technology & People*, *21*(3), 222–243.

Zheng, Y., & Yu, A. (2016). Affordances of social media in collective action: The case of free lunch for children in China. *Information Systems Journal*, *26*(3), 289–313.