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A Framework for Understanding the Link Between ICT and Development: How Affordances Influence Capabilities

Mathias Hatakka
Dalarna University

Devinder Thapa
University of Agder

Øystein Sæbø
University of Agder

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Mathias Hatakka
Department of Informatics
Dalarna University, Sweden

Devinder Thapa
Department of Information Systems
University of Agder, Norway

Øystein Sæbø
Department of Information Systems
University of Agder, Norway

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ABSTRACT

Understanding the role of ICT in development is at the core of the ICT4D field. However, while most agree that ICT do contribute to development, the question of how is still not fully explored. In this research-in-progress, we propose a framework that combines two theoretical lenses, the choice framework (that is based on the capability approach) and affordances, to increase our understanding of ICTs role in the development process. The capability approach considers development as freedoms for people to live the lives they have a reason to value. The affordance theory describes action possibilities allowed by material properties, thereby allowing the examination of how individuals explore material properties of information systems with the objective of enhancing their capabilities. We argue that, by combining the choice framework with affordances we can better explain the role of ICT in the development process, and explain how individuals' agency and social structures influence their ability to perceive affordances in their interaction with the ICT.

Keywords: capability approach, choice framework, affordances, framework, ICT4D

INTRODUCTION

The relationships between the design, delivery, use and impact of information technology in organizations and society (Elliot & Avison, 2005) have defined the information systems (IS) field since its inception. However, there is still a need to look more into ethical and critical issues

on how IS improve the world, who are benefiting, and who are left out. Motivated by such arguments we need to explore how information and communication technologies (ICT) can improve individuals´ lives. To do so, we need to explore issues related to questions such as: Why do the introduction of ICT add to improve some peoples´ lives, but fail in other similar situations? How do contextual factors influence on how ICT add to improvement for individuals? When ICT is introduced without apparently influencing peoples´ lives, what could be done to better succeed? Such questions are frequently addressed within the ICT for development (ICT4D) field; however the understanding of how ICT add to development is still a subject of much debate (Sein & Harindranth, 2004; Thapa & Sæbø, 2014). To be able to answer such questions we need appropriate theoretical lenses through which we can critically examine and evaluate our ICT interventions. Focusing issues such as the inclusion of marginalized groups (Lin et al., 2015), digital divide (Venkatesh & Sykes, 2013), sourcing (Madon & Sharanappa, 2013; Sandeep & Ravishankar, 2015) and health care services (Aanestad et al., 2014; Sahay et al., 2009) research within the ICT4D field tends to focus more on consequences in a broader sense, than to investigate in depth the role of technology (Mbarika et al., 2005).

In ICT4D research there is a need to have an understanding of both ICT and development. Independently both terms have been well defined. ICT is understood as digital technologies with certain properties, features and functionalities, while development can be understood as e.g. economic development or human development. In recent ICT4D literature the concept of development is often understood as human development (Andersson & Hatakka, 2013), and more specifically as development as freedom, where development is the result of an increase in individuals choices (Sen, 1999). The capability approach focuses on enabling or enhancing freedom of choice where commodities, like ICT, play an instrumental role. A challenge is to understand the process by which ICT develop or expand capabilities. Researches have attempted to unfold such mystery through applying various social and sociotechnical theories. However, in capability approach studies within our field, ICT is most often seen as something neutral (Zheng & Stahl, 2011). We argue that ICT4D is a sociotechnical system where both the technical and the social parts, and how they influence on each other, needs to be explored. Therefore, to understand the link between ICT and development, we need to understand how people identify certain usefulness of the technology in a particular context.

One theoretical lens that can enhance our understanding in this regard is affordances. In the context of IS research, affordances may be defined as "the possibilities for goal oriented action afforded to specified user groups by technical objects" (Markus & Silver, 2008, p.622). Action possibilities are dependent on the relationship between systems and users in the context in which the IS are used (Leonardi, 2011). Affordances allow us to examine how individuals explore material properties in IS with the objective of enhancing their capabilities.

In this paper we propose a framework that combines the capability approach and the affordance theory. More specifically we extend Kleine's operationalization of the capability approach (the choice framework) (Kleine, 2011, 2013) with Gaver's 4 categories of affordances (Gaver, 1991). We argue that our enhanced framework will complement the choice framework by better explaining the link between ICT and development (defined as the extension of people's choices), which will help us to unravel the often black boxed nature of ICT in ICT4D.

THEORETICAL FOUNDATION

The Capability Approach

Amartya Sen introduced the capability approach (Sen, 1992, 1999) as an alternative and response to other development approaches, such as the utilitarian, welfare or income and resource approaches. Instead of only seeing poverty as the lack of income, poverty should rather be seen as the deprivation of the capability of individuals to live the kind of life that they have a reason to value (Zheng & Walsham, 2008). In some ICT4D research, having a technology deterministic view of development, technology is seen as an end in itself, and we see more or better technology as positive for people's lives (Kleine et al., 2012). However, in the capability approach, technology is seen as a means to something else rather than an end in itself. Viewing technology as a mean instead of an end implies that the evaluative spaces are shifted to the opportunities that the technologies enable (freedom to achieve) and the resulting impact when the opportunity is acted upon (realised achievement). The process from the means (the technology introduction) to the ends (the resulting impacts of the technology) differ between individuals, and something that lead to positive effects for one individuals could lead to no, or even negative, effects of another. Freedoms, hence, involve both the process of development and the opportunities that people have based on their local conditions.

Freedom is defined as the individuals' capability to choose the life they have a reason to value (Sen, 1999). This can be done either by enabling freedoms or by removing unfreedoms. Related to ICT, we can say that ICT can provide individuals with an opportunity to communicate and participate in political discourses (enabling freedoms). However, if the communication is monitored and information is censored, the removal of such limiting mechanisms are needed (removing unfreedoms).

The main concepts in the capability approach are capabilities and functionings. A functioning is a person's doings and beings, for example, to participate in a political discourse or to be educated. Functionings represent a person´s realized achievements and include various aspects of how individuals live their lives (Gasper, 2002). A capability is a person's freedom to achieve and represent "[t]he various combinations of functionings (beings and doings) that the person can achieve. Capability is thus a set of vectors of functionings, reflecting the person's freedom to lead one type of life or another" (Sen, 1992, p.40). Capabilities are the main constructs in the capability approach through which freedoms are enabled (Gasper, 2002). By expanding individual´s capabilities, she gets more choices and, more opportunities to choose to live a life that she has a reason to value (Sen, 1989). In the capability approach the aim is, therefore, to enable *valued* opportunities for individuals. Enabling opportunities is one thing and enabling valued opportunities (that individuals actually want and need) is another. This means that we, as researchers, have to be aware of the will of individuals. We should not evaluate opportunities made available by ICT without including the identity of the chooser. One of the strengths of the capability approach is that it allows for individual diversity, and different factors (referred to as conversion factors by Sen, 1992) that are relevant to the individuals' contexts, needs to be included in the analysis.

In ICT4D studies that bring in the capability approach, technology is often seen as a commodity that automatically will contribute to an individual's capability set. This view has been criticized by e.g., Zheng and Stahl (2011) who argue that seeing technology as neutral is too simplistic and they call for a more "sophisticated and critical view of technology" (p.70).

The Choice Framework

The capability approach is said to be "philosophically profound but methodologically somewhat vague" (Zheng & Walsham, 2008, p.224). Some scholars in ICT4D have operationalized and

applied the approach and included ICT in the development process (see e.g., Alampay, 2006; Hatakka & De', 2011; Madon, 2004; Zheng & Walsham, 2008). The most used operationalization of the capability approach in ICT4D is the choice framework developed by Dorothea Kleine (Kleine, 2009, 2010, 2013) (see figure 1). The choice framework is a broad framework that builds on, and extends, the capability approach by integrating it with concepts from Alsop and Heinsohn's empowerment framework (Alsop & Heinsohn, 2005) and the sustainable livelihood framework (DFID, 1999). The reason for choosing the choice framework as the starting point is the applicability of the choice framework for empirical evaluation of ICT interventions. Most other ICT4D operationalisations of the capability approach give little guidance in how to apply it to empirical data. The choice framework, on the other hand, extends the approach and gives us better guidance by providing us with more details on the constructs in the approach. By including ICT in the social structures and as a resource for an actor the approach increases our understanding of the role of ICT in the development process.

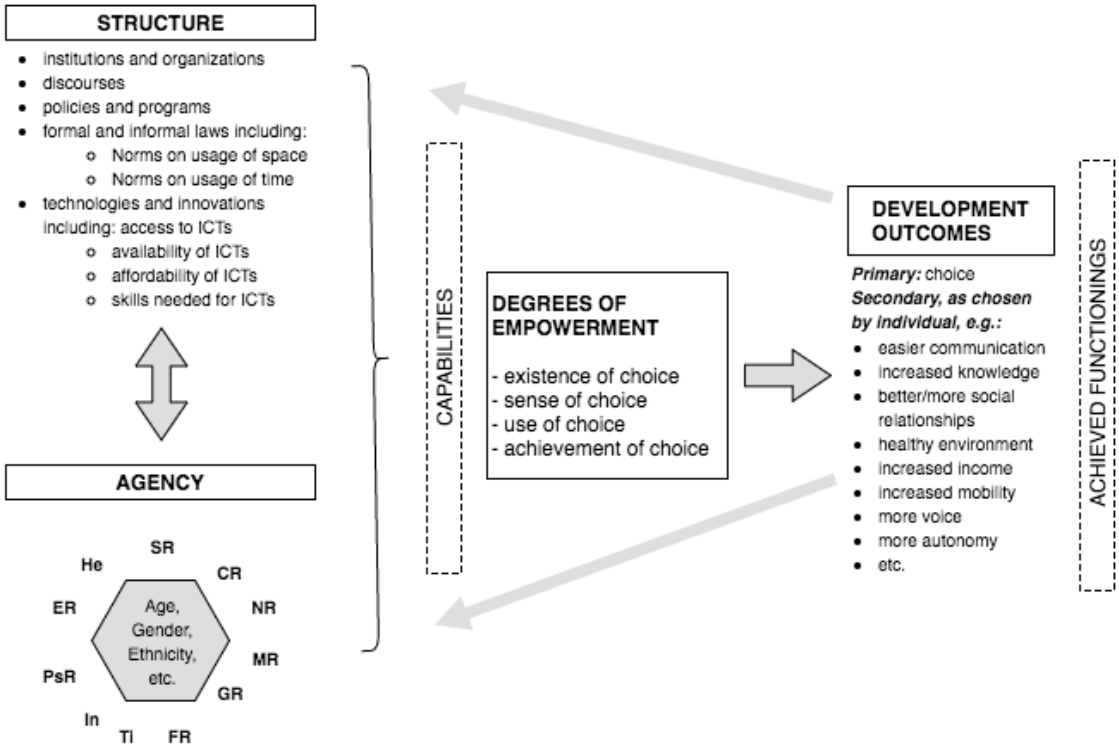

Figure 1: The choice framework (Kleine, 2013)

The choice framework follows Sen's reasoning and sees choices as the extent of people's freedoms and functionings as the outcomes results of individual's choices. The main contribution

to the capability approach is the addition of an individual's resource portfolios which constitutes her agency, the social structure and degrees of empowerment. Agency is seen as "agency-based capability inputs" and is an individual's resource portfolio (e.g., material resources, financial resources and information), but it also includes an individual's characteristics such as gender and age. Agency, together with "structure-based capability inputs" – seen as the structures which aid or constrain the individual's agency – determine how resources can be converted into capacities.

The degrees of empowerment include the existence of choice (whether the choice exist or not), the sense of choice (whether the individual is aware of the choice), use of choice (if the individual act on a choice or not) and achievement of choice (if the outcomes results from a choice match the individual's expectation). When applying the approach, Kleine suggest starting from the end of the development process (in accordance with e.g., Robeyns, 2003) and using the functionings as a proxy for finding the capabilities, and then looking at the context (e.g., agency and structure) so as to find if the resources are enabling and just.

Affordances

The concept of affordances goes back to the work of Gibson, who propose that "[t]he affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill" (Gibson, 1986, p.127). An affordance can be defined as the interaction between an actor (the individual or organization involved) and the environment (the surroundings of the actor), including the properties of the actor and of the environment (Gibson, 1986). Affordances are neither the properties of the environment nor the characteristics of the individuals (Stoffregen, 2003), but relative to the characteristics of individual (such as their physical dimensions and abilities, social needs and personal intentions), and the features of the environment (Chemero, 2003). Hence, affordances are relational and emerge through interaction between the actor and the artefact (Van Osch & Mendelson, 2011), and exists relative to the action capabilities of a particular actor (McGrenere & Ho, 2000).

The concept of affordance has become popular in the area of IS to explore how work practices within organization arrangements adopt to innovative use of IT (Leonardi, 2011; Zammuto et al., 2007). For example, Zammuto et al. (2007) used the affordances lens to capture the interplay between ICT and the organization. Affordances are suggested to offer a way of moving forward in developing conceptualizations of organizations in an era with high focus on ICT. The

relational perspective was retained when the IS community adopted the concept of affordances. In the IS context, a technology affordance is defined as an action potential created by the use of technology, whereas a technology constraint is an obstacle caused by the technology (Majchrzak & Markus, 2012; Markus & Silver, 2008). Leonardi (2011) argues that actualization of affordances may also result it functional constraints. Therefore, the impact of the actualization is not a one-stop phenomenon, but a continuous process of appropriation of material properties and organizational/human routines to meet the desired outcome.

Affordances need to be perceived by an actor before being actualized (Bernhard et al., 2013; Strong et al., 2014; Volkoff & Strong, 2013). However, perceiving an affordance does not necessarily mean that the human must realize the offered action possibility (Stoffregen, 2003). The perception and actualization of the affordances are dependent on the relationship between system and user in the context in which information systems are used (Bernhard et al., 2013; Leonardi, 2011; Pozzi et al., 2014). The actualization of affordances in turn can lead to identification of new affordances vis-à-vis enhanced capabilities.

In the IS context, there are various views on affordances (Stendal et al., 2016), the different views focuses on if affordances exist independent of users or if they (only) emerge from practice. We argue that both stances are tenable. To reconcile these two stances, we follow the ontological stance suggested by Volkoff and Strong (2013), defining affordances as the potential for behaviours associated with achieving an immediate concrete outcome and arising from the relation between the object (e.g. IT artefact) and goal-oriented actors. While an affordance itself is an ever-present potential for action, the details of its actualization in a specific instance are contingent on aspects of the techno-organizational context and thus the outcome is indeterminate (Volkoff & Strong, 2013). Bernhard et al. (2013) argue that the emergence of affordances depends on the relation between the object and its users, the perception of the affordances are determined by information. Therefore, wrong interpretation of information or lack of information about existing affordances can make the affordances false or hidden (Gaver, 1991).

Four Categories of Affordances

Gaver (1991) argues that affordances may exists independently disregarding of whether actors perceived or not, therefore designers should provide perceptual information to draw attention to potential affordances. Such external information could influence users' perceptions of affordances in

several ways. Based on the availability of information and affordances Gaver (1991) categorized affordances as perceptible, hidden, false, and correct rejection. For example: *Perceptible affordances*, in which there is perceptual information available for an existing affordance. *Hidden affordances*, if there is no information available for an existing affordance, it is hidden and must be inferred from other evidence. *False affordances*, if information suggests a non-existent affordance, a false affordance exists upon which people may mistakenly try to act. *Correct rejection*, people will usually not think of a given action when there is no affordance for it or any perceptual information suggesting it. In the context of developing countries, we cannot assume that users will always identify the perceptible affordances. Based on the existence of affordances and the goal oriented actor's access to perceptible information, the framework can provide us with an understanding of how actors` interaction with material properties can take different paths. Because of the Gaver's (1991) multi-fold explanation of affordances - based on information and affordances - as perceptible, false and hidden in relation to information availability, we adopted the framework for our data analysis (see figure 2).

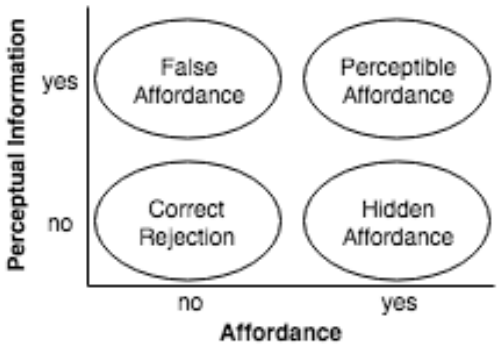

Figure 2: Categorization of affordances based on the (non)availability of information and affordances (Gaver, 1991, p.80)

THE PROPOSED FRAMEWORK

Introducing the concept of affordances within the choice framework originates from the contributions in the affordance literature focusing on the link between technology and people embedded in the concept of affordances (Leonardi 2011; Volkoff and Strong 2013). While the choice framework has many merits and adds to our understanding, and applicability, of the capability approach to empirical research we argue that it (just as Sen's own work) lack the

details in how the conversion takes place from material properties to a capability. To better understand the impact ICT can have for development, we need to look at the material properties and how they, in the interaction with actors in a specific context (defined as agency and structure in the choice framework), affect individuals. We argue that by adding the concept of affordances to the analysis, we will be able to better understand why technology may fail in one place but work in another, and we will be able to better explain *how* ICT can improve individuals' capabilities and choices. The integration of the two theoretical approaches is illustrated in figure 3.

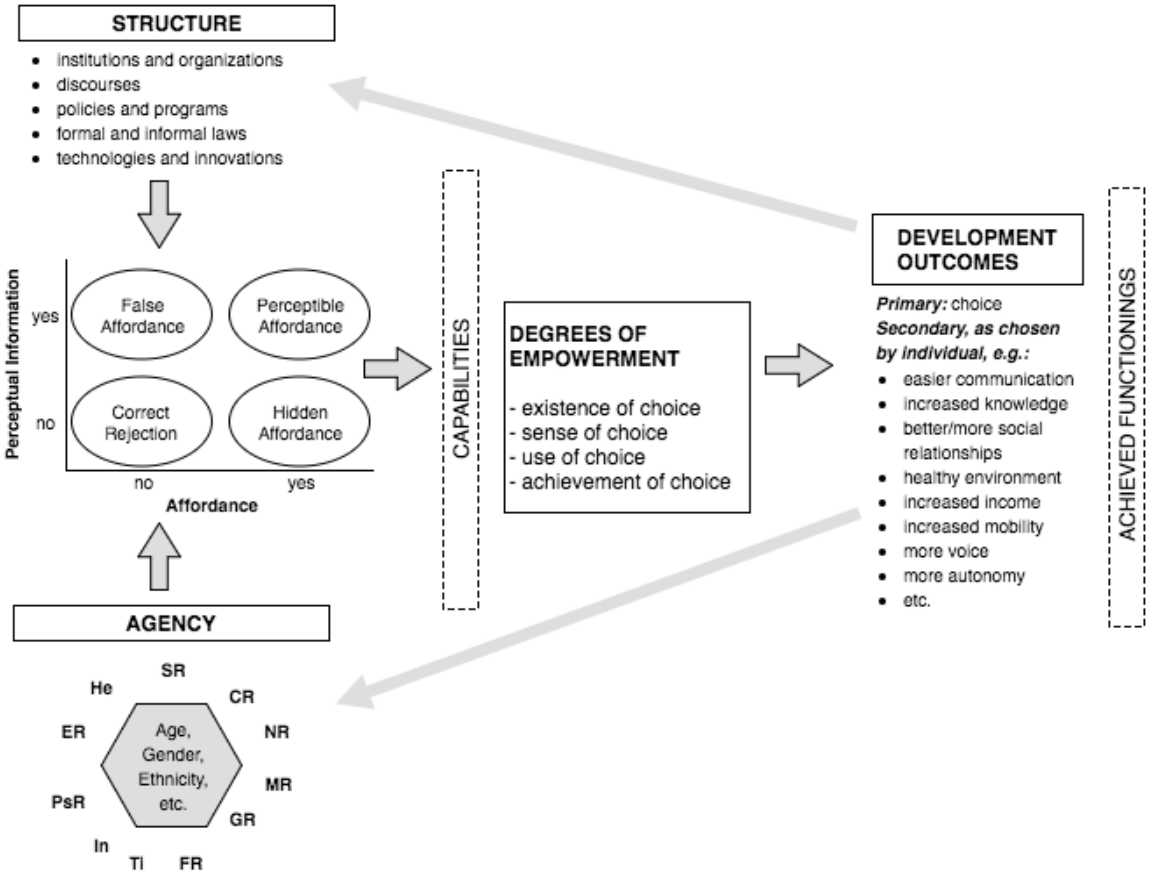

Figure 3: An extension of the choice framework (Kleine, 2013) including Gaver's 4 categories of affordances (Gaver, 1991)

Kleine's choice framework has paved the way for further enquiry to increase our understanding of the mechanism by which ICT can enable capabilities and functionings. As Kleine mentioned, the framework is a 'living tool' and should be improved further. To contribute to the framework, we propose to add Gaver's 4 categories of affordances as an explanatory lens on how material

properties, an individual's agency and the social structures can improve an individual's capability sets and choices. By so doing, we provide a better explanation on how ICT enable capabilities. In the existing choice framework, ICT is mainly analysed for its affordability, accessibility and availability (Kleine, 2013). These preconditions are necessary to trigger the possibilities of action or 'Affordances'. However the enablement of the capabilities depends on the perception of the existing affordances (Bernhard et al., 2013; Stoffregen, 2003). The four categories of affordances that Gaver suggest (1991) can arise based on the available affordances and the actors information about the affordances: perceptible (that can be actualized), hidden (we would say latent, that can be perceived provided more information or through social interaction), false (where material properties do not support the perceived affordances), and correct rejection (when an actor does not see any affordances or information about existing affordances). Therefore, making ICT available will not automatically leads to capabilities. Kleine implicitly mentioned human skills, however; the affordances elaborate more on skills *for what*. Furthermore, we argue, based on the affordances lens, that ICT enabled capabilities can only be converted into a functioning if the perceptible affordances are actualized. By adding affordances lens into the choice framework, the framework will provide better explanation (not just description) of the link between ICT and development. Further, by adding the aspect of affordances and goal oriented actors, the link between a material property (e.g., the communicative abilities of mobile phones) and an increase in individuals' choices can be made more explicit.

Exemplifying the suggested framework

To show how Gaver's categories of affordances may contribute to the choice framework we exemplify with four scenarios that are based on a real case (being empirically investigated by a team of researchers including one of the authors of this paper) studying the use of mobile phones among SME's in Morogoro, Tanzania.

Setting

Morogoro is one of the administrative regions in Tanzania, which is among the poorest countries in the world. Morogoro is located at the base of the Uluguru Mountains, and is a centre of agriculture in the region. A number of Non-Governmental Organizations are based in the town, together with universities, schools and hospital services. The city is the commercial and

transportation centre in the region, producing sisal, sugar, coffee, livestock and tobacco. Most business are small and medium sized enterprises (SMEs). Mobile phones have changed how SMEs are conducting their work. For SMEs to adopt e-business and e-commerce strategies and tools, benefits must outweigh investment and maintenance costs of the ICT both in terms of knowledge and infrastructure. Business environment, commercial considerations and potential returns drive the ICT adoption by the SMEs. Primarily the mobile phone technology are catching up quickly in Africa. However, little is known about the impact of SMEs use of mobile phones, hence, the scenarios explored how the mobile phone usage could contribute to development of SMEs.

Scenario 1: Perceived and actualized

In the first scenario we show how a goal oriented actor can increase her choices resulting from the use of mobile phone services. We also show the development path for the individual. A perceptible affordance is defined as an existing affordance in which there is perceptual information available. In this scenario we imagine a women running a small manufacturing company, producing clothes to customers mainly from Dar es Salaam (the main city in Tanzania, a three hours drive from Morogoro). Our business owner has a large number of women working for her, producing clothes mainly from their own homes. She spends most of her working hours away from her office, visiting her sub-contractors in Morogoro or her customers in Dar es Salaam. Hence, a main difficulty for her is to keep in touch with her network. She needs to have a secretary to answer her land-line, which is both expensive and not very effective, since the secretary strives to get in touch with her while she travels. Our business owner is not too well-educated when it comes to technology and the use of mobile phones. But she is aware of the opportunity to keep in touch 24*7 through services provided on her new mobile phone, including calls and messaging services, but also accessing e-mails.

The development path for the individual in our refined framework includes the business owner as a goal oriented actor (in this case her goal to stay in touch with her business associates), the individuals resource portfolio (agency) and the social structures. For her to be able to perceive the affordance of using mobile services she draws on her agency and available resources. For example, she needs to have the financial resources to be able to pay the fee for buying a smart phone conducting calls and accessing Internet, she needs to have the informational resources to

enquire knowledge about her options, and the basic knowledge of how to use the phone. However, the individual agency is not enough if the structures are not supportive. In this example, the introduction of mobile phones supporting such services provides the structure for the individuals as they now have access to mobile phones with Internet connectivity. Hence, the social structure supports her goal of staying in touch. The ICT is available to her, the fee to use it is affordable (not to be confused with affordances) and the skills needed to use it is not too challenging. The technology support a goal she has, she has the agency to act on it and the social structures support it. Hence, the mobile phones services is turned into a perceptible affordance for her that can expand her capabilities. By learning how to use such services, she is able to run her business much more efficient than before she got access to mobile phone services.

Scenario 2: Hidden affordance due to limited agency

In the second scenario we show how hidden affordances prevent the increase of individual choices. A hidden affordance is defined as an existing affordance, but where there is no information available, hence it is hidden and must be inferred from other evidences. In this scenario we imagine an old man that sustain his livelihood running a small business re-selling crops in Morogoro from farmers in his village outside the city. He has a small farm himself where he grows a variety of crops and he also have some livestock. To be able to buy items that he, or his neighbours, do not grow or can produce, he occasionally sells some of his own crops to a middleman. However, lately the middleman has lowered the price he pays for the crop with the argument that the market price has decreased. While the old man questions the argument, he has no choice but to continue to sell to the middleman if he wants to continue to make his income. He has very limited information on how to check the middlemen's claim that the market price has gone down. In this scenario we argue that the opportunity to check the market price is available by using Internet through the mobile phone services. Through various services he can find the current market price. However, the old man has no knowledge of this since he has never used the mobile phone to access Internet. He has a goal to find the information, and the social structure supports it. He could use mobile phones to search for the information, and he can get help on how to do it, but the information that it is an opportunity is not available to him, and the affordance remains hidden. Without the intervention from an outside source, the affordance will remain hidden. However, if he gains the information (e.g., by talking to other villagers, from

education or from information campaigns) the affordance can be converted into a perceptible affordance.

Scenario 3: False affordance due to limited structural conditions

In the third scenario we show how technology seemingly provide new affordances, while the affordances actually are false. False affordances exist if information suggests a non-existent affordance, a false affordance exists upon which people may mistakenly try to act. False affordances are typically exemplified by a gap between what the users expect to get from the introduction of ICT, and what the ICT actually allow the users to achieve. In this scenario we imagine a businessman who wish to video-chat with his sub-vendors. Our man is running an auto repair shop in Morogoro. Sometimes he gets his spare motor parts from the official car retailer in Dar es Salaam, but more often he gets what he need from welders all around Morogoro. Since the cars are old (and constantly adjusted) most parts are custom made. To succeed, his welders needs detailed information about what is needed, and quick and reliable communication opportunities to be able to produce correct pieces.

The businessman is not very skilled in ICT use and mobile phone services, but he is aware of the opportunity to conduct video-conferencing calls through the use of mobile phones. For him, this is a motivation for investing in a smart phone. Now, he will be able to send high-quality pictures to his sub-vendor, arrange video-conferencing calls (including live-pictures) to discuss and agree on what to produce, and stay in touch with his sub-contractors through the use of ICT. However, this turns out to be a false affordance for several reasons. First, even though the services are assumed to be available, the infrastructure is not. The connection speed and accessibility is far from reliable, so he always has to plan for alternative solutions. Second, his social structure is not ready for such a change. Only few of his sub-contractors are aware of the opportunity to use such services, and are not used to build parts based on pictures. They are not ready to pay the expenses of accessing such affordances by buying a smart phone and paying the fee for accessing the services needed. Hence, the services needed by our car repair shop owner turns out to be false. Several steps are needed to turn this into a perceptible affordance, including access to more reliable infrastructure and awareness and access to such services among the sub-contractors being involved.

Scenario 4: Correct rejection/lack of relevant capability

The final scenario is correct rejection. Correct rejection occurs when there are no affordances available and when there is no perceptual information suggesting it. In this scenario we imagine an old man that are close to retirement. He has worked his whole life as a taxi-driver, and while his living condition are poor, he has managed to save up enough money for him and his wife to live of the savings. Many other taxi-drivers in the town have started to use different mobile services to attract more customers (like Uber). However, our old man is not aware of such services, nor do he has any need for them. For the younger taxi drivers such services will be rewarding if they manage to attract enough new business to compensate for the cost of the technology and services. Our old man has been driving the taxi his whole life and has a steady stream of returning customers. Being close to retirement, mobile services would not afford any new valued capabilities for him. He would rather lose money, since he would not have time to make up the cost before his retirement; hence, it is a correct rejection.

DISCUSSION

In this paper we have proposed a framework for understanding the role of ICT in ICT4D interventions by combining the choice framework with affordances. The motivation for so doing, is the need to unfold the black boxed nature of ICT. Our extension to the choice framework with affordances will help us to better explain the link between ICT and development (defined as an increase of individual's choices).

The capability approach is frequently being used in ICT4D studies and have, to a certain degree, changed the focus of ICT4D research from mainly looking at economic development to a more human-centred development. Affordances, on the other hand, are seldom used. The concept of affordances in ICT4D context has been used to derive design principles for technology (Wellman et al., 2001) or to understand how affordances emerge in practice (Zheng & Yu, 2016). However, it is rarely used to understand the interplay between ICT and goal-directed actors in fostering development. We argue that affordances allow us to examine how individuals interpret material properties of ICT with the objective of enhancing capabilities for their well-being. This distinction is important in the context of ICT4D because it allows the specification of how ICT contribute to changes in developmental practices which in turn constitute human development.

While the choice framework has successfully been used to evaluate ICT interventions, both by Kleine herself (see e.g., Kleine, 2013; Kleine et al., 2012) and others (see e.g., Hatakka et al.,

2013) we propose that the framework needs a supplement to better explain the development process between an ICT intervention, a goal oriented actor, the actor's agency and the social structures. By adding affordances, more specifically Gaver's concepts of perceptible-, hidden- and false affordances (Gaver, 1991), we are able to better explain how agency and social structures influence the development path. The scenarios presented above show how actors that can use their agency to navigate the social structures can perceive affordances, and how the lack of agency or insufficient social structures can make the affordances hidden or false. While our extended framework need further testing and validation, we argue that it will increase our understanding of the mechanism by which ICT leads to capabilities, thereby unravelling the black boxed nature of technology in ICT4D. By detailing the affordances as perceptible, hidden, and false we can further explain 1) what needs to be changed (in the individuals resource portfolios or in the social structures) to increase an individual's choices from a technical intervention where the resulting outcomes are not as expected; 2) explain why the same technology intervention result in different outcomes when implemented in different context or between different individuals; 3) explain where and how contextual factors can limit (or enable) the individual's ability to perceive affordances and expand their capability sets; and 4) explain why ICT4D interventions do not lead to any perceptible affordances and increase in individuals choices.

Since an affordance from ICT4D intervention needs to be perceptible to increase the capability set of individuals, ICT4D projects need to start with the development of people's basic skills so as to be able to perceive and actualize ICT affordances in their particular social context. When applying our approach to research, the starting point should be the individual's skill sets[1]. For example, for an individual to be able to perceive an affordance from getting access to Internet, she needs (among other things) a basic understanding of computers and/or mobile phones, she needs to be literate, and she needs to live in an enabling cultural context. The risk with starting from the functionings as a proxy for the capabilities (as suggested by e.g., Kleine and Robeyns) is that the potential opportunities are missed in the analysis (for one reason or another). By starting with the individual and exploring what affordances the individual (as a goal oriented

[1] Like Kleine, we use skills here instead of capabilities so as to not confuse it with Sen's definition of capabilities.

actor) see with material properties, we can capture not only the increase in choices, but also the affordances that were hidden (that potentially can increase the choices) and false (that potentially could result in changes in the intervention or a change in the user's perception).

Future work

More work is needed to conceptualize the relationship between the affordance and capabilities. In future work, we would like to further explore the link between the perception and actualization of affordances, and how they are affected by structure and agency. Our aim is to further test, validate and refine the suggested framework. Further work is needed to explain the different paths development processes can take (from the ICT introduction to human development), and what to do to increase the chances of successful ICT implementations. In our next iteration, we will use the framework to analyze data from a real case to guide the further elaboration of the suggested framework.

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