

# **Assessing the contribution of information technology to socio-economic development: A case study from rural South Africa**

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## **Abstract**

This paper addresses the challenge of assessing an ICT for development (ICT4D) project's contribution to the socio-economic development of the broader community where it is implemented. It argues for using a systems approach to deal with this challenge, since systems thinking is concerned with the performance of the total system. Systems thinking is seldom used in ICT4D, and is lacking in existing ICT4D impact assessment frameworks. In this paper, the authors apply a social systems framework in an ICT4D case study. The framework is used to describe and assess the contribution of the ICT4D project to the socio-economic development of the larger community. Since Community Informatics (CI) embraces a broad socio-technical systems view, the work is relevant to a CI audience.

**Keywords:** ICT for development, Community Informatics, socio-economic development, social systems, systems thinking, structuration theory, autopoiesis

## **Introduction**

### **CI and ICT4D**

Community Informatics (CI) presents an overlap with, but also a critique of Information and Communications Technology for socio-economic development (ICT4D). Both approaches aim to utilise ICT for the development of communities. However, some ICT4D approaches have the application of technology as their departure point, whereas CI believes that the community itself should be the departure point of an intervention (Gurstein 2007: 63). This paper describes an ICT4D project that is compatible with the CI ideals of community-centered ICT enablement. The paper's central concern is to describe and assess the contribution of ICT4D to the communities it is meant to serve. While the ICT4D project in the case study followed a community-centered approach, this paper focuses not on the way an ICT intervention is conducted but on the contribution it makes to socio-economic

development. It proposes to be of value to CI, since it manages to describe a community in a way that the contribution of an ICT intervention in the community can be better assessed.

### **Problem statement**

One of the challenges faced by ICT4D and CI is that the contribution of ICT to the socio-economic development of a community is difficult to describe and assess. “Even though millions of dollars have been spent by donor and government agencies around the world on ICTs, we still do not have sufficient insight into appropriate methods for evaluating the effectiveness of these technologies on especially socioeconomic development” (Pather and Uys, 2010:2). Heeks (2010) indicates that ICT4D impact assessment has to date predominantly focused on ICT4D’s immediate impact, such as providing infrastructure, as opposed to the downstream impact on the socio-economic development of the community at large. In the CI domain, impact is often assessed by measures such as access to or usage of a telecenter (e.g. Kumar and Best, 2006). A few researchers have attempted to evaluate the contribution of ICT by means of broader frameworks, such as the sustainable livelihoods framework (Parkinson and Ramirez, 2006). However, such work appears to be limited.

### **A suggested way forward**

If one can find a way to describe the larger social system into which ICT is introduced, then one can start to investigate the impact of a new entrant into the system, namely ICT, on the existing social setting. This may be possible through a systems approach, which according to Ackoff (1999) is characterised by its concern for the performance of the total system, even where changes are only made to a part of the system. Systems thinking recognises that the performance of a subsystem relative to its own goals does not necessarily lead to increased performance of the larger system. In ICT for development, there is a need to indicate the effect of a technology intervention on the whole, or containing social system.

In the broader field of IS, the use of systems thinking is promoted by top scholars, all of whom conclude that it is too seldom used: According to Alter (2004), there is “surprisingly limited systems thinking in the IS discipline.” Mingers and White (2010) state that although most IS researchers view themselves as systems thinkers, very few of them are actually using systems theory. “The IS research community has not come to realise the significance” of systems thinking (Lee, 2004). Similarly, in the field of ICT4D, there is an overall lack of systems thinking. When the prominent ICT4D publications were searched for evidence of systems-related work, it was found that the use of systems thinking in ICT4D was extremely limited and fragmented (Turpin, 2012; Turpin and Alexander, 2013). In the current ICT4D impact assessment frameworks as reviewed by Heeks and Molla (2009), there is no explicit use of systems thinking.

However, some authors do explicitly address this issue. De Moor (2009) argues that while CI implicitly embraces a broad socio-technical systems view, the systems way of thinking is often not formalised in a manner that can support research. Petkova et al (2005) suggest that systems thinking should be added to Bieber and Gurstein’s (2002, cited in Petkova et al) list of fields related to CI, and argue for increased use of systems thinking in CI. Since a distinguishing feature of CI research is its “wholistic” approach, “paying special attention to and being explicit concerning the particularities of the social context in which CI systems are to be implemented” (Gurstein 2007: 32), CI is well positioned to champion the use of systems thinking in the ICT for development domain, and to benefit from system thinking’s holistic approach when dealing with communities.

This study presents an example of how systems thinking can be used to give prominence to the social context. It presents a social systems framework for describing the communities where an ICT4D project is implemented, as well as the influence of the project on the socio-economic development of those communities, as systems served.

## **Research undertaken**

### **Case study context and aims**

The ICT4D case setting is a rural settlement in KwaZulu Natal, South Africa. Researchers from the University of Pretoria performed IT literacy training from 2009 to 2011 in Tugela Ferry, a geographically remote settlement in a Zulu tribal area. Their point of contact was a Christian mission, who invited the University to provide training to workers at the mission institutions that included a school, medical centre and orphan care centre. Training took place at the mission school. The two interdependent communities most closely involved and affected by the IT project were the traditional Zulu community with its centuries old set of cultural practices, including an ancestral belief system, and the Christian mission community, with Western and Zulu staff members as well as a predominantly Zulu congregation. The Zulu and mission communities served as the research focus of the study. The aim was to describe them in such a way that the influence of the ICT4D project on the communities could be assessed.

### **Research methodology**

A single longitudinal case study was performed in an interpretive manner (Oates, 2006). The study formed part of the first author's PhD, and she undertook the case study research by herself, although she was also part of the project team that performed IT literacy training. While the IT project was a practical intervention, this case study takes a descriptive and explanatory rather than an action research format. Data collection was done during five field trips over a period of two years. Data was collected by means of participant observation, the taking of daily field notes, collecting relevant documents where possible, numerous informal interviews and ten formally scheduled interviews. Data collection was guided by Klein and Myers' (1999) principles for interpretive field studies. An attempt was made to collect information representing different perspectives. However, the researcher was a guest of the Christian mission and had privileged access to people working at the mission. She could not speak Zulu and was dependent on mission workers to translate when she wanted to interact with the more traditional Zulus. As such, the mission's perspective may be better represented than other perspectives.

### **Theoretical framework**

The study aimed to describe and assess the influence of the IT training project on the community using a systems approach – that is, to describe the influence of the technology intervention on the containing social system. As a point of departure, Checkland and Holwell's (1998) definition of an information system was borrowed:

*An information system consists of two systems. The first is the system being served, consisting of people that take purposeful action and have information needs. The second is the serving system, which provides support by processing information that assists in the purposeful action of the people in the system served. The nature of the system served, and how this*

*system is understood, must inform what the serving system will look like (Checkland and Holwell, 1998: 111).*

In Tugela Ferry, there were two interrelated but distinct communities with whom the ICT4D project team interacted and whom they wanted to assist: the Christian mission and the broader Zulu community. These were both identified as “systems served”. The ICT4D project formed the “serving system”. The research challenge was to assess how the serving system assisted the systems served. Since the point of departure of the ICT4D study was that the serving system should contribute to the socio-economic development of the systems served, a manner was needed to describe and assess socio-economic development.

Roode et al’s (2004) notion of socio-economic development provides a human-centred view of development, in contrast with the economically centred notions which have been heavily criticised (e.g. Avgerou, 2003; Silva and Westrup, 2009). Roode et al’s (2004) definition builds on the work of Max-Neef et al. (1991) who view development as self-reliance, where self-reliance does not refer to isolated self-sufficiency, but includes horizontal interdependence and vertical integration. Roode et al. (2004) refers to “self-reliant human scale development which flows from the individual level to the local, regional and national levels, and which is horizontally interdependent and vertical complementary”. This definition contains two key concepts: *self-reliance*, and *interdependence* with other key social systems.

The research problem then becomes one of indicating the influence of the serving system on the self-reliance as well as interdependence relationships of the systems served. An appropriate systems framework was required with which these influences could be described. From a literature review on systems thinking applied in the social domain, the concept of social autopoiesis was identified as promising (Mingers, 2004; 2006; Turpin and Alexander, 2011). Autopoiesis is concerned with the self-production of living entities (Maturana and Varela, 1987). A living entity produces itself and is self-sustaining. Part of its successful self-production is due to the structural coupling between the living entity and key neighbouring systems. The autopoiesis concept of self-production is related to the development notion of self-reliance, and structural coupling to interdependence. Whereas autopoiesis is a biological theory, the notion of social autopoiesis uses Giddens’ (1984) structuration theory to describe the self-production dynamics of a social system:

*“Human social activities, like some self-reproducing items in nature, are recursive. That is to say, they are not brought into being by social actors but continually recreated by them via the very means whereby they express themselves as actors” (Giddens, 1984: 2).*

If structuration theory is used to define and describe social systems, then they are defined in terms of social and cultural practices, rather than by geography or demographics. This appears to be an appropriate way to describe a social system. Giddens’ structuration theory describes how a social system produces and reproduces itself by means of structures of signification (sense-making), domination (exercising of social power), and legitimation (application of norms). The researchers make the claim that if these self-production processes operate in such a way that the social system is strengthened and becomes more self-reliant as a result, then the system is in a positive cycle of development. Looking at how these processes function in the systems served, before and after the technology intervention, will give us an indication of whether the ICT4D project has contributed to the well-being of the systems served.

The systems framework below presents the way in which the concepts of autopoiesis as well as structuration theory were used to describe and assess the social systems of interest in the ICT4D case study. The framework was developed during an iterative process of theory development and data collection/analysis on the ICT4D case study:

<b>Step I: Preparatory work</b>	
<b>Background sketch</b> , including a <b>CATWOE description</b> of each system Stating of <b>assumptions and simplifications</b>	

<b>Step II: Concepts of structuration: description from within the systems</b>				
Giddens' dimension	Structure of signification	Structure of domination	Structure of domination	Structure of legitimation
Element of structure:	<b>Rules (interpretive)</b>	<b>Resources (allocative)</b>	<b>Resources (authoritative)</b>	<b>Rules (normative)</b>
Modality:	Interpretive schemes	Facility	Facility	Norms
Element of action:	Knowledgeability (of interpretive rules)	Capability (to apply allocative resources)	Capability (to apply authoritative resources)	Knowledgeability (of normative rules)
For a social system: <b>Rituals</b> (notion of temporality: everyday, lifetime and institutional time spans) <b>Social practices</b>				

<b>Step III: Concepts from autopoiesis theory: looking at the systems from outside</b>	
Use Giddens to describe:	<b>Organisation:</b> identifying characteristics, i.t.o. the social structure shown above Structure: social practices <b>Drift:</b> changes to social structure as well as social practices over time <b>Organisational closure:</b> degree of continued autonomous existence <b>Structural coupling:</b> interfacing with other social systems
Derived concept:	<b>Sustainability</b>

**Table 1: Elements of the social systems framework**

During the preparatory phase, a contextual study is performed of each of the systems of interest, as per Klein and Myers' (1999) principle of contextualisation. Soft systems aids, such as a rich picture and CATWOE description (Checkland, 1999), are used to provide a rich summary of each social system. The soft systems aids are used here in a reflective manner ("mode 2" use of the Soft Systems Methodology, see Checkland and Holwell (1998:164)) rather than as part of a systems design exercise. The second aspect of preparation involves stating assumptions. When moving from the real world to the conceptual and less

detailed systems world, some assumptions and simplifications need to be made. For example, based on demographic evidence, generalisations are made about the traditional Zulu lifestyle that may not be true for all Zulus in the community.

After the preparatory phase has been completed, descriptions of the social systems are performed. First, each social system of interest is described using the concepts of structuration theory indicated in Table 1 above. Structuration theory is used to capture the “social heart” of the system. The concepts in Step II’s columns resemble Giddens’ dimensions of the duality of structure (Giddens, 1984: 29; Mendelsohn and Gelderblom 2004: 93). The structure of domination is split into two, to give separate prominence to allocative and authoritative resources. Further, Giddens’ notion of a social system is made explicit by including the terms “rituals” and “social practices”.

The systems description done using structuration theory language is supplemented with the application of autopoiesis concepts. Part of this component is an assessment of whether the social system is successful in its self-production and structural coupling, and thus whether it is socio-economically sustainable. In developing Step III, a way was sought to describe a social system in autopoiesis language while also utilising the structuration concepts of Step II. No previous examples were available where autopoiesis and structuration theory were combined to describe a social system. Steps II and III were developed and refined in an iterative process of studying theory, applying the concepts and updating the framework.

Further details on the concepts of the framework in Table 1, and how each was derived, can be found in Turpin (2012).

## **Application of systems framework to case study**

### **Step I: Preparatory work**

A background sketch of each social community of interest in the case study is presented below, before these are modelled as social systems. The three communities described are the broader Zulu community, the Christian mission and the ICT4D project. They are described here using historical, demographic and other background information, while the social systems descriptions that follow rely more heavily on empirical data collected during community interaction. The contextual description of the Zulu community and the mission are concluded with a rich picture that provides a situational summary of the two communities served.

### **The Zulu community**

Msinga, the local municipality in which Tugela Ferry is located, consists of 96% Zulu speaking South Africans (Statistics South Africa, 2012). The homogeneity in population can be ascribed to land ownership regulations: Msinga is part of Zulu tribal area, according to the Traditional Leadership and Governance Framework Amendment Act of South Africa (41/2003). Tribal leaders have jurisdiction over land allocation and tribal matters, while the area is simultaneously governed by South Africa on local, provincial and national level.

The community is located in the KwaZulu Natal midlands, geographically isolated by the deep gorges of the Tugela and Buffalo rivers. Most people live on rocky outcrops that are unsuitable for crop farming. Therefore, their subsistence farming primarily consists of herding animals. The municipality is one of the poorest in the country, with an employment

rate of only 21% and very few formal sector opportunities. According to the Msinga Municipality's Integrated Development Plan (IDP), developers are discouraged from industrial investment since they cannot purchase land in the tribal area, and because there is a lack of infrastructure and skills. Roughly four in five households (the poorer 80%) live in traditional dwellings, do not have access to electricity, have to walk unknown distances to fetch water and do not have access to transport. People do however have access to mobile phones. Adults in the households of the poorer 80% are largely illiterate while children have to walk far to school. Subsistence livelihoods are not a sufficient means of support, and the only regular income of many is a social welfare grant in the extended family. The 20% of the community that are better off are those who live closer to the town, and have better access to infrastructure, services and a means to earn an income.

Health care is a concern in the Msinga community, in terms of HIV/AIDS, Tuberculosis (TB) and drug resistant TB. The HIV infection rate is just over 30% (Msinga Municipality, 2010) and there is a growing number of orphans and child-headed households.

While many residents in the community are in a destitute situation, the Zulu social culture places great value on caring and Ubuntu (a humanist philosophy). People willingly look after sick and hungry neighbours and orphans, even if their own resources are limited. It is the recognition of the importance of caring in the Zulu community that has enabled a local Christian mission to become influential in the area.

### **The Christian mission**

The second community of interest to the ICT4D project is a Christian mission based in Tugela Ferry. The mission is an offspring of the work of German missionaries who arrived in the vicinity in the 1850s. The Lutheran missionaries were joined by German farmers who were capable craftsman, had good business skills, and who had a strong work ethic (Greeff, 2003). The result was a thriving German farming community closely connected to a mission that was expanding through the KwaZulu Natal midlands. The current Tugela Ferry mission started as a satellite of the German mission, but became an independent ministry in 2000. Although there are few Germans left in Tugela Ferry, the mission still has German ties and something of the German work ethic has remained. The church currently has a Zulu leadership, assisted by a handful of Afrikaans speaking South Africans. The church maintains good relationships with the Zulu tribal leadership and is therefore allowed to have dwellings and to run various programmes in the tribal area. Among these initiatives are a mission school, a medical and social services centre and an orphan care centre.

The mission school promotes a Christian way of living as well as quality education. Children of congregation members are taught a Christian alternative to the ancestral belief system that is part of traditional Zulu culture. In terms of quality education, the school has consistently maintained a 100% matric pass rate, compared to the KwaZulu Natal provincial pass rate of 60-70% (Department of Basic Education, 2010). Children are assisted to gain university or college entrance, thus providing them with opportunities to break out of poverty and a subsistence livelihood.

The medical and social services centre focuses on the medical treatment and continued care of AIDS and TB patients, volunteer nursing as well as social welfare work in the broader community. Their philosophy is one of integrated care, promoting a strict medication regime combined with basic hygiene, well ventilated housing and regular meals. The mission hospice admits patients who have been discharged from the state hospital, where, due to a lack of

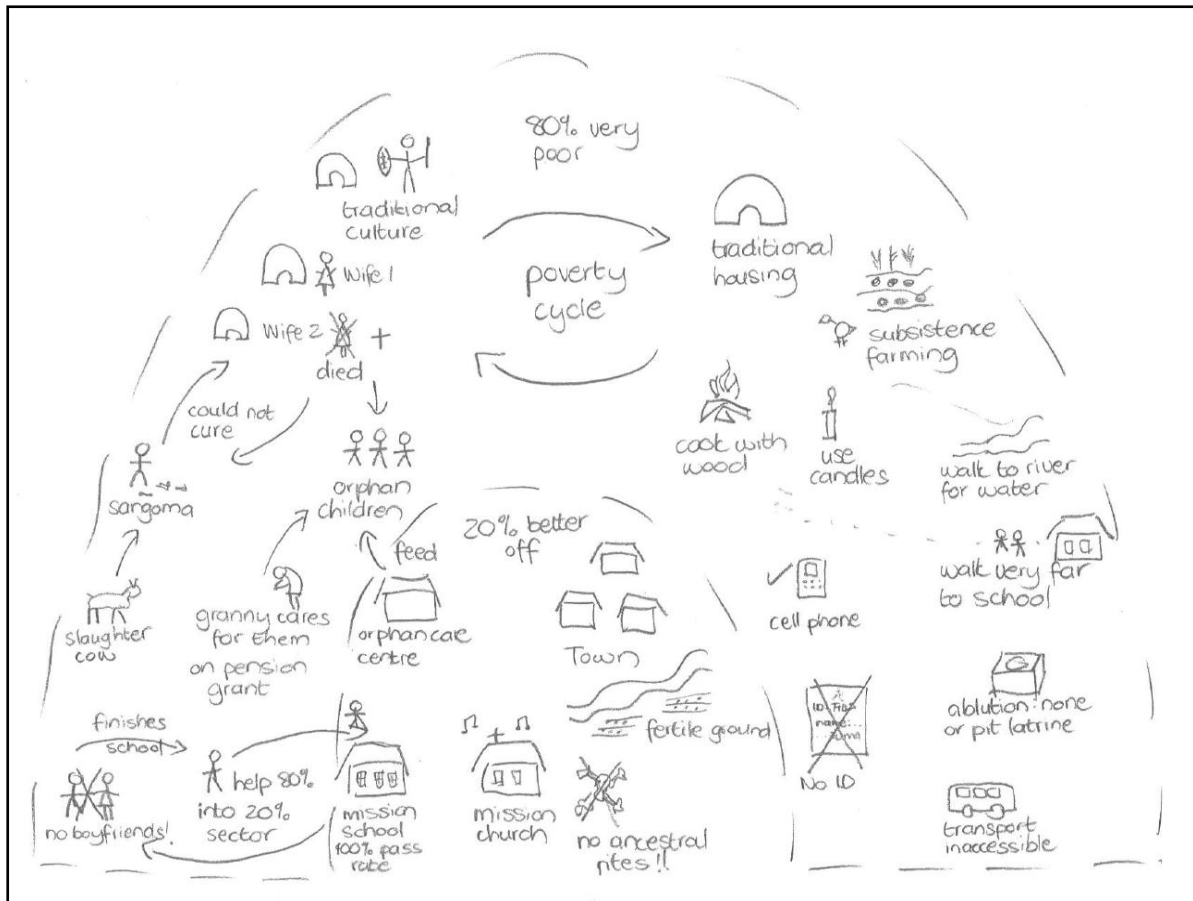
resources, they cannot keep patients diagnosed as terminally ill. The hospice is renowned for its ability to discharge 80% of these patients back into the community to continue with their lives, provided that they continue to follow the strict medication regime and lifestyle taught at the hospice. Associated with the medical centre is a social worker who assists with social welfare matters where the greatest perceived need is. She tries to help in areas where the government's Department of Social Welfare, who also has limited resources, does not reach.

The orphan care centre focuses on the large number of orphans and vulnerable children in the community. Their programmes include a day crèche, a residence, assistance with the placement of children in foster care, as well as a feeding programme that aims to reduce the care-giving burden of foster families. The orphan care centre takes pride in the fact that there are no "street children" in the town of Tugela Ferry.

Whereas the mission school focuses on families in the congregation as their client base, the medical and social services centre as well as the orphan care centre is open to assist any member of the broader Zulu community. The mission is uncompromising on the value system that it promotes and that it expects its converts to abide by. However, while they reject the ancestral belief system, they respect the Zulu culture and social practices that do not clash with Biblical values. The percentage of the Zulu community that belong to the Tugela Ferry mission is small. It appears that their real influence is not in the number of converts, but rather in their education, health care and outreach programmes.

Figure 1 below provides a visual summary of the two communities described above, as well as the interaction between them. The sketch outline is in the shape of a traditional Zulu hut. The wall circumscribes the poorest, deeply rural segment of the Zulu community. The door contains the activities centred around the Tugela Ferry town, where the mission is located.





**Figure 1: Rich picture of Zulu and mission communities in Tugela Ferry**

### The ICT4D project

The third community of interest in the study is the group of people involved in the ICT4D project. They bring with them a set of attributes that need to be noted if one wants to consider the way in which the ICT4D team influence the communities they mean to serve. This group are all very familiar with ICT and believe that it can be a useful tool in some work processes and some aspects of education. They generally originate from a highly educated urban environment.

The Department of Informatics at the University of Pretoria (UP) became involved in Tugela Ferry through a personal contact that a UP staff member had at the mission. According to the contact person, people at the mission required IT literacy training for a number of reasons: it would enable school leavers to get jobs, and it would assist teachers, administrators and nurses at the medical centre to better perform their jobs. During a fact-finding visit to Tugela Ferry in February 2009, the needs of the mission were confirmed. However, the establishment of a relationship with key stakeholders at the Tugela Ferry community was far from self-evident. The Informatics team were made aware that they should wait for an invitation from a Zulu stakeholder in a leadership position, for their project to be culturally acceptable. It took a few months of frequent communication with the community before such an invitation was received. It was agreed that the Informatics department would present basic

IT literacy courses at the newly established computer centre of the mission school, starting with school teachers and extending the training to other mission workers.

Since July 2009, a number of courses were presented during school holidays. Funding was obtained from UNESCO for the first round of training. During the first training course, the team leader identified course attendees who performed well and were interested in training their peers. These attendees received train-the-trainer coaching and soon after started presenting courses to their mission colleagues.

During a training visit in July 2010, a local community member and businessman was identified who had a vision to set up a computer training centre. Several months of planning and negotiations followed. A business site was identified and computers located. In April 2011, the first training took place at the newly established computer centre in the Tugela Ferry town. It was a train-the-trainer workshop. To date, the local centre has trained 58 people, compared to the 34 that the staff from the Informatics Department managed to train. However, business management problems were experienced and the computer centre is currently not operational. The Department of Informatics hopes to help revive the initiative.

### **Modelling assumptions**

Having developed a contextual description of the three communities of interest in the Tugela Ferry ICT4D case study, the systems modelling assumptions and simplifications need to be stated. One of these was the decision to describe the Zulu and mission communities as separate social systems, even though in reality they overlapped. The reason for this assumption was that although the mission is, strictly speaking, contained in the Zulu community, the social and cultural practices of the mission are very different from the traditional Zulu culture. The mission makes a great effort to differentiate their value system: they request new members to renounce the ancestral belief system and to take on family values that exclude male domination and polygamy. Since the social systems in this study are defined by their social and cultural practices, the Zulu and mission *social systems* can be specified as separate systems.

Another assumption concerns the homogeneity of the social systems. They will be described in terms of their distinguishing social characteristics even though we know that not all members of the social system will display those characteristics. The demographical analysis showed that about 80% of the Zulus in the area have a deeply rural traditional life style. The assumption will be made that we refer to the more rural, traditional Zulus when we refer to the Zulu social system.

The next section proceeds to a description of the social systems by means of the concepts in the systems framework.

### **Steps II and III: Describing the social systems and their influences on each other**

In Step II of the systems framework, each social system (the two social systems served, and the serving system) is described in terms of the concepts in Giddens' (1984) dimensions of the duality of structure. Because of space limitations, a selection of concepts will be discussed to illustrate how the framework is applied.

### *Social system influences in terms of authoritative resources*

The first example is the concept of authoritative resources, which helps to describe Giddens' structure of domination. According to Giddens, resources have to do with people's capacity to perform tasks (Mendelsohn and Gelderblom, 2004; Turpin, 2012). Allocative resources refer to material things which help to command the natural world. Authoritative resources refer to the capability to command people.

In the Zulu social system, sources of authority are the ancestral belief system (i.e. the assumed power of the ancestors), the hierarchy of traditional leaders, and patriarchy in the household. Some of these, such as the patriarchal system where females have very little power, do not contribute to the self-production of the Zulu system or its successful coupling with the outside world. The mission social system has the authoritative resource of the Bible as distinct alternative to the ancestral belief system. Further, knowledge is regarded as a source of authority, such as the high value ascribed to education at the mission school, and to medical knowledge at the mission's medical centre. The general principles of the Bible as they are applied at the mission (e.g. mutual respect between the genders rather than total male domination), as well as the regard for education, are seen as conducive to the self-production of a social system. The mission aims to develop the authoritative resource base of the Zulu community in a way that promotes self-production and interfacing with the outside world. The ICT4D social system regards IT-related knowledge (apart from education in general) as a source of authority. They aim to develop the authoritative resource base of the mission by providing them with IT-related knowledge. From this description, it can be seen that the mission is concerned with strengthening the Zulu social system by growing their authoritative resource base in a certain way, while the ICT4D project aims to build particular authoritative resources at the mission.

### *Social system influences in terms of normative rules*

Another example is the concept of normative rules, which forms part of Giddens' structure of legitimation. Normative rules are "the sanctioning of modes of social conduct" (Giddens, 1984: 18). In order to participate in a social system, one has to be knowledgeable about the system's social rules and act accordingly. During research interviews and observations, the Zulu community was found to pride itself on three normative rules. The first is respect, in particular for one's elders and one's own parents. Respect is shown in the way people are addressed, and by using appropriate gestures. The second normative rule or value is that of mutual caring, or Ubuntu. People readily assist community members in need, even if their own means are limited. The third traditional value is chastity: females are expected to keep themselves chaste until they have agreed to become the wife of a particular suitor. The whole traditional courting process involves the acting out of well defined social rules. The mission social system upholds the same three normative values, although with different motivations and execution. Caring is viewed as a Christian value: "Christ loved the orphans and the widows" (interview respondent3, in Turpin, 2012). Chastity is regarded as a biblical value and is accompanied by strict rules of conduct, such as that girls from the mission school are not allowed to have boyfriends, and females from the congregation are expected to wear skirts. While the mission emphasises the value of respect, it does not imply the same degree of inequality between genders as in the Zulu system. The mission encourages a more equal treatment of females, and mutual respect between parents and children. Apart from the three values that have commonalities with the values of the Zulu system, the mission has other normative rules, such as that congregation members are expected to completely break away from ancestral practices and from any form of syncretism. The mission is widely respected in

the Zulu community, also among the non Christians. The mission's practical display of unconditional caring for orphans and the poor, and thus the effective translation of their own values into what is valued by the Zulu system, have significantly contributed to their acceptability.

Some of the key values that characterised the ICT4D team were their keenness to make a difference in the community by teaching IT skills, upholding academic integrity and a task-oriented approach, where value is placed on the timely and successful completion of a task. The ICT4D team's acceptance in the mission was largely facilitated by their keenness to make a practical difference. Their success in presenting training to Zulu members of the mission was dependent on the negotiation of their own values vis-à-vis Zulu values. There was a tension between their task-oriented approach and the local people's people-oriented approach. The ICT4D team had to slow their pace at the onset of each new training event, to spend time showing personal interest in the individuals involved and to make sure everyone was given a chance to talk. However, the ability to apply IT skills requires a task orientation, and the ICT4D team believed that the trainees benefited when they had to learn to be more task oriented. In terms of academic integrity, the IT literacy courses had to be of a certain standard because it was certified by the university. Some course attendants could not reach the required standard, even with extra tuition. In order to ensure that they did not lose face by exposing them as failing the course, all course attendants received certificates at the prize-giving ceremony. However, some certificates specified that the course was passed and others that the course was attended.

In the interaction between serving system and system served, cognisance by the serving system of the normative rules or values of the system served, contributes to the acceptability of the serving system and hence to the influence it will be allowed to have on the serving system.

#### *Empirical evidence of the contribution of the ICT4D social system*

Data was collected as part of the search for empirical evidence of how the social systems influenced each other in terms of the concepts in the framework, and also looking for unanticipated influences. The researchers were particularly interested to see how the ICT4D social system influenced the mission. From the empirical data, it could be shown that there were clear benefits to the mission institutions as well as to mission workers in their personal capacity. In the case of the teachers, some stated in follow-up interviews that they used computers for the first time to set up tests and process marks. More than one teacher started using a laptop to assist him or her in running his or her own business. At the orphan care centre, the ability to use spreadsheet software to track and manage donor funding was said to be useful. At the medical centre, nurses could do their record-keeping electronically, to assist with the strict medication regimes when recording patient data for HIV/AIDS and tuberculosis treatments. It was clear that the mission, as a social system, benefited from enhanced capability (in terms of allocative and authoritative resources), and this was reflected in their social practices. Using the concepts from autopoiesis in the framework (Step III), it was shown that as a result of the IT training project, the mission system was assisted to interface more successfully with other institutions and was hence strengthened, as a system, in terms of its self-producing ability.

An example of unanticipated influences was that of the Zulu and mission systems on the ICT4D social system. The two Afrikaans speaking ICT4D team members both witnessed how they were affected by the caring value system that they encountered; a factor common to

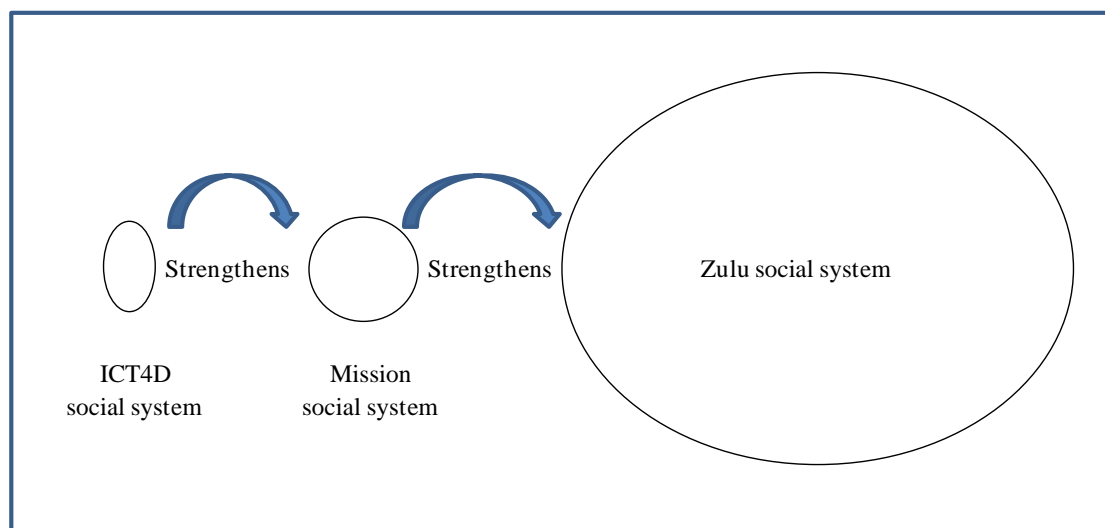
the mission and Zulu systems, and different from the impersonal, materialist value system that dominates their home environments. In this sense, their normative and sense-making schemes (to use the language of structuration theory) were affected and the ICT4D social system was enriched in the process.

## Reflection on results

### Impact of ICT4D project on the broader Zulu social system

A concern when only focussing on the mission, as a system served by the ICT4D project, is that the mission does not represent the most needy people in the broader Zulu community. What, if any, is the impact of the ICT4D project on the poorer 80% of the people in the Tugela Ferry community?

The ICT4D project team had no direct access to the broader Zulu community due to language and cultural barriers. However, the broader Zulu community is the client of the mission. Using the systems framework, the influence of the mission social system on the Zulu social system was described. It could be shown, as seen in the example of authoritative resources above, that the mission assisted in the strengthening of the Zulu social system in numerous respects, through various practical care programmes that were available to the entire community and not only to congregation members. It is then argued that in the way that the ICT4D project strengthened the mission social system, it enabled the mission to serve their clients better, and in this way the ICT4D project could indirectly contribute to the socio-economic development of the broader Zulu community.



**Figure 2: The strengthening influences among the social systems of interest**

## Conclusion

This study indicates how the communities of interest in an ICT4D case study can be described as social systems, using a systems framework that includes general system

principles, as well as concepts from Giddens' structuration theory and autopoiesis. Using Giddens, the systems can be described in terms of their social and cultural characteristics. By including autopoiesis notions of self-production, structural coupling and systemic sustainability, the self-producing ability of the systems served can be assessed, as well as the influence of the ICT4D project on this ability. In terms of Roode et al's (2004) definition of socio-economic development, the systems descriptions can be used to assess the influence of the ICT4D project on the socio-economic development of the social systems served by it.

This paper has shown how systems concepts can be applied to study the contribution of an ICT4D project to the larger community where it was introduced, something which is a challenge if one wants to move beyond counting people trained or connected and beyond the use of economic measures. The study also places the focus on the sustainability of the communities served, rather than the sustainability of the ICT initiatives. It attempts to move the attention of development practitioners using ICT to the community they are meant to serve.

From what has been learnt on the ICT4D case study, some suggestions can be made to ICT4D practitioners and policy makers. These suggestions are phrased in the language of the systems framework used:

- Make an effort to understand the social structure of the system served, in terms of its interpretive and normative rules, as well as authoritative resources;
- Use this understanding to effectively interface and communicate with the system served, and in the process establish structural coupling;
- Having achieved structural coupling, try to influence the processes of social structuration of the systems served from within their own frames of reference;
- Acknowledge and leverage capabilities and resources within the systems served that can help to further strengthen them;
- Facilitate structural coupling between the system served and other social systems that may assist in strengthening the system served; and
- Identify destructive practices that continue to be reproduced in the system served, and find ways to counter these.

In conclusion, the paper's aim to be of value to the CI community will be reassessed. The study has contributed to the CI field, by practically as well as theoretically executing the philosophy of making the community's well-being the focus of a development initiative.

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