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Amplifying positive deviance with ICT enabling community development and interdependence

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Abstract.
Positive deviance is a social mechanism whereby a beneficial practice that is not considered as normal gets taken up and spread within a community. This enables a community to solve its own problems aided by mentorship and facilitation. Through two long term case studies, we have identified positive deviants and are now learning how to leverage the ICT inherent in our interventions to cultivate and amplify positive change. We find both ourselves and benefic iary communities developing through various stages of dependence, independence and interdependence. We consider the latter a strong form of development. We now look at ICT4D projects as opportunities to identify positive deviants, and to amplify positive deviance with ICT. We posit that affordable, accessible and generic ICTs offer a way to do so, and that explicitly aiming to mentor and faciliance with such ICT offers a path toward community development and interdependence.

1 Introduction

In the ICT for development (ICT4D) space, e.g. IFIP WG 9.4, we generally aim to empower a community to look out for its own best interests, leveraging ICT that we develop, often in collaboration with beneficiaries. Herein lies the tension of applying ICT for development with indigent and/or disadvantaged communities: power relations rise to the surface all too often. For example, technical researchers design and develop code for a given project based on their technical expertise, often employing a participatory design method. How do we deal with this? Obviously, there are many strategies. Tucker [28] describes a continuum of participatory design from weak to strong, because in reality, participation, engagement and indeed empowerment varies. As with partial success and failures described by Heeks [11], ICT4D efforts can be viewed along a continuum of 'weak' to 'strong'. This paper contends that we can also do this by understanding the stages of community dependence, independence and interdependence as described by Kaplan [14]. As often noted, ICT4D community members are also beneficiaries, and our 'community' goes through those same development stages.

Amongst many failures, examples of successful ICT4D projects exist. For example, Toyama [27] contends that Digital Green, a project meant to improve food production in India, was successful largely because local farmers featured in movies that conveyed best practise

farming information to farmers. This low-tech intervention worked because movies, rather than mobile apps or web-based information, fit within the communities' cultural milieu. The Digital Green process was bottom-up: farmers informing farmers; not experts instructing locals. For Toyama [27], the practitioner/researcher takes the role of mentor/facilitator. Thus, technology is seen as an amplifier of personal and social will, and a facilitator's role becomes that of encouraging people to change their behaviour while bettering oneself, and others, through that process. We believe what happened with Digital Green was that the project encouraged positive deviance, by showcasing the knowledge and experience of local farmers who learned to improve crop yield, and the medium of movies encouraged wider adoption of those practices.

We can agree that helping people, and ourselves, to change their/our own behaviour is preferable to being told what and how to change by outsiders. The first person to make a positive change may be the bravest, yet it is the second, third and so on, that can move a given community toward a 'tipping point' as termed by Gladwell [9]; where innovative, or deviant, becomes the new norm. This paper contends that 'positive deviance', a social mechanism described by Pascale *et al.* [18] and Spreitzer and Sonenshein [25], can be innovatively applied in the ICT4D space. We have identified unintentional vestiges of 'positive deviance' in two long running ICT4D case studies that we have conducted. We believe when done intentionally, ICT can amplify [27] this social mechanism; and further, that Kaplan's [14] stages of community dependence to independence to interdependence offer an intriguing way to view the process. The paper posits that for research problems such as bringing ICTs to bear on the socio-economic challenges faced by indigent and disadvantaged communities, represented by the two case studies presented herein, the "power of positive deviance" [18] can be amplified by ICT and help realise mutual community development and interdependence.

2 Key Concepts

The narrative follows Walsham [29], and this IFIP WG 9.4 conference's call for papers, and first defines what we mean by 'development', and then we clarify what we mean by positive deviance and ICT amplification.

2.1 Community Development

Community development as offered by Kaplan [14] resonates with Toyama's [27] advocacy of mentorship and facilitation in that a dynamic process between facilitator(s) and beneficiaries moves interrelationships, in a non-linear fashion, amongst stages of dependence, independence and interdependence. In our view, many ICT interventions also plot, again non-linearly, amongst a continuum of canonical action research stages: diagnosis, planning, implementation, evaluation and reflection (see Davison *et al.* [7]) whereby stakeholders move toward mutually defined goals to tackle mutually identified problems in a mutually beneficial way [16]. Ideal outcomes of action research can result in what we would call a 'stronger' stage of community development –interdependence– where

the practitioner/researcher community is in some way invited *to* and/or integrated *in* the beneficiary community. This could even happen after one party or the other was possibly side-lined during a stage of independence. Such independence may have followed on a dependent stage where locals may have thought they needed outsider expertise/intervention or the intervening practitioner/researcher tacitly felt that s/he knew better than the recipients. The challenge is to overcome such power relations that come about during these various stages, and manifest changes within communities of both beneficiaries and facilitators. This view of development is ostensibly compatible with the sentiment of Toyama [27] in that behavioural change can be mentored and facilitated. An attractive way to achieve this is with the "power of positive deviance".

2.2 Positive Deviance

Positive deviance is a social mechanism whereby a beneficial practice that is not considered normal gets taken up by a community [18, 25]. In other words, it is a mechanism for encouraging and enabling an abnormal behaviour, one that is positive and good, to spread within a community, effectively towards Gladwell's 'tipping point' [9]. Positive deviance is inherently bottom-up as community members take responsibility for their own solution to problems, guided by an invited mentor/facilitator. Pascale *et al.* [18] believe positive deviance is useful in situations where traditional top-down mechanisms, such as random control trials and the like, fail.

Pascale *et al.* [18] describe case studies with practical guidelines on how to perform the method and also how to measure its impact (see http://positivedeviance.org). A well-known case study involved child health in Cambodia. Local authorities were facing the problem of childhood malnutrition and invited the Sternins (a husband and wife team, co-authors with Pascale) based on their work with UNICEF. Most children in an area identified by authorities were consuming the same diet, and exhibited low body mass index (BMI) scores. The Sternins framed the problem differently, by asking 'reverse' questions, e.g. asking are there children with healthy BMI scores, as opposed to why do so many people exhibit low BMI? It emerged that some children did in fact have healthy BMI scores because it became revealed that some parents in the community were supplementing the 'normal' diet with tiny crustaceans that lived amongst the rice paddies. These 'positive deviants' were improving the nutrition of their offspring by breaking the norm and providing their children with additional protein. Once this positive deviance was identified, the challenge morphed to spreading this behavioural change throughout the community. Again, the Sternins turned to the community for answers, and the community itself devised hands-on methods for encouraging more parents to behave like the positive deviants. Subsequent measurement of BMI across the community showed that this process was indeed beneficial. Interestingly, Pascale *et al.* [18] included a sidebar on ICT and bottom-up open source software development as espoused by Raymond [19] that they feel is corollary to bottom-up positive deviance, in that an open source community provides itself with answers.

However, Pascale *et al.* [18] did not go so far as to suggest using ICT to amplify positive deviance.

2.3 ICT Amplification

ICT amplification is a view about the role of ICT in society. According to Toyama [27] this is the notion that ICT amplifies whatever human will is already present in a given scenario, e.g. if gender dynamics in a given community are balanced and equitable, ICT can only but help amplify this situation, and males and females alike are encouraged to participate in digital spaces. Conversely, if there are negative power relations, such as poor gender dynamics, the introduction of ICT can only but amplify those negative aspects such as keeping digital devices away from females. Thus, we can understand why in many situations where we intend ICT to be beneficial, it can lead to negative consequences. When positive, the view of amplification resonates with emancipatory ICT research associated with Buskens [4].

3 Case Studies

Now we apply these key concepts to two case studies. Both are long term ICT-oriented action research projects led by this paper's author. Each case description below has a brief overview of the project's current thrust, and explores it in terms of positive deviance, ICT amplification and community interdependence. Additional low level details of both projects can be found via citations. It should be noted that positive deviance was not explicitly pursued from the start for either project. In fact, the idea of employing positive deviance, and then leveraging ICT to amplify positive deviance, came about by viewing our ongoing projects with these lenses. Methodological concerns for each case study are provided in Sect. 4.

3.1 Case Study: Zenzeleni, A Rural Community-Owned and Run ISP

Many rural areas of South Africa experience the unfortunate situation of having almost ubiquitous mobile phone coverage where the majority of residents struggle to afford even basic ICT services [24]. Since 2003, we have explored various forms of rural wireless networks in the remote Eastern Cape province of South Africa. Since 2012, we have concentrated on Zenzeleni, a not-for-profit cooperative who have installed and now maintain a rural mesh network (see zenzeleni.net). Their solar powered wireless network provides free internal calls and 'breakout' calls to land-lines and mobile phones at a fraction of incumbent costs. Zenzeleni Mankosi currently covers 30 km^2 with 'mesh potato' stations, each with its own handset. We are busy installing broadband backhaul from a nearby university approximately 60 km away, and intend to share the connectivity to numerous secondary schools in the area. Zenzeleni generates income by charging mobile phone batteries, and offers prepaid 'breakout' calls and internet connectivity via low cost WiFi hotspots. In 2014, Zenzeleni obtained license exemption from ICASA, the national

regulatory authority, to operate telecommunications infrastructure, setting a precedent for other South African communities to do so, too [23].

Positive deviance can be identified amongst people associated with Zenzeleni. Following on an earlier project that used solar power to charge phone batteries [1], many more people are now charging phones at a dozen charging stations located around the community. The people who have the mesh potato stations in their homes are transparently providing the revenue back to the community, and that money is being used for loans within the community (and the interest ploughed back into the cooperative). There is also a local team providing technical support instead of relying on external technical skills. For example, the team replaced mesh potato antennae without our help, and also sorts out wiring and fuse issues on a regular basis. It is clear that the project is creating jobs in the midst of massive unemployment, and also imparts the opportunity to acquire financial and technical skills. The presence of accessible and affordable ICT has enabled almost a dozen female high school students to find scholarships online, and all of them are currently studying at tertiary colleges. The reality on the ground is a mix of positives and negatives. The cooperative earns revenue primarily from charging mobile phone batteries and not from (breakout) phone calls as originally envisaged. We believe the latter is largely due to people resisting change, all the while paying double the price of a Zenzeleni 'breakout' call. We also recognise that in order to make a Zenzeleni call, inhabitants must use a 'public' call station. While we feel that supporting WiFi-based calls from personal handsets will address the 'public phone' issue, we must keep in mind the "geek heresy" that a purely technical solution cannot solve this problem [27]. Enabling positive deviance with respect to call behaviour will entail the identification of people who are already using the Zenzeleni network to make calls, to figure out with them how it may be possible to get other people to change their call behaviour, too; saving money on telecommunications that could otherwise be used for food. We also must devise ways to get more women more involved because women can also be excluded from Zenzeleni processes [12]. We are hopeful that connecting secondary schools will offer more women the opportunity to participate in digital spaces and that the use of technology will spread through the youth, both male and female.

ICT amplification has occurred in various ways. Many community residents appear to think that the network 'belongs' to the tribal authority; that only its headman and sub-headmen, or members of the Zenzeleni cooperative, are allowed to use the 'public' phones [22]. Thus, Zenzeleni acts as yet another conduit for existing power relations within the community to continue. Another view is that many inhabitants may simply not understand that the stations in the community are more than just phone charging points, because the community had earlier been exposed to the aforementioned charging efforts and this may be how people view the Zenzeleni infrastructure [12, 22]. On a more positive note, recall the dozen female high school students that are now busy with tertiary studies. Clearly,

the ICT provided by Zenzeleni has amplified those girls' abilities to pursue their own aspirations.

Community interdependence can be viewed on several levels. Within the Mankosi community itself, inhabitants already enjoy financial benefits of supporting their community-owned and run business because its revenues are ploughed back into the community in the form of micro-lending. However, it must be noted that the cooperative is not installing more solar mesh stations or paying for network maintenance. Those costs are still handled by the research team, and thus a form of financial dependence still exists. We are more interested, though, in the interdependence that has emerged between Mankosi community and the researcher community. Dearden and Tucker [8] would contend that this beneficial inter-relationship exists due to the continued series of ICT projects, in spite of many of them having failed, partially or fully. Relationships have been forged, maintained and strengthened over time. The project appears to have thus far avoided a catastrophic independence phase, e.g. the researchers were never asked to leave. One sign of independence includes the revenues being transparently utilised according to the cooperative's wishes. Some of the research team have lived in the community for an extended period and others have continually 'bungee researched' for almost 15 years. Over time, some of us have become accepted as part of an 'expanded' sense of community. In a reciprocal fashion, a community research assistant has co-authored research with us and even travelled internationally (a first for him) twice to report on the project and network with an international community. Through these exchanges, we move towards a more interdependent relationship.

3.2 Case Study: SignSupport, Assistive Technology for Deaf People

Many Deaf people in South Africa primarily communicate in sign language and communication with hearing people who cannot sign is a daily struggle. This problem is compounded when Deaf people require information and communication regarding health. Such priorities led to the development of SignSupport (www.signsupport.org), a mobile assistive technology for Deaf people. Since 2001, we have designed a variety assistive technologies with and for a marginalized and under-employed Deaf people in the Cape Town area. These people are proficient and fluent in sign language, yet due to poverty and under-education exhibit limited functional literacy with written and spoken language when interacting with a hearing majority. A multi-disciplinary and trans-university team, together with a collection of Deaf People's Organisations (DPOs) is currently busy with iterative and incremental design and evaluation of a mobile tool suite that bridges information and communication gaps between Deaf and hearing people, in the language that these Deaf people understand: South African Sign Language (SASL). We are generalizing this tool to handle multiple limited interaction scenarios [3]. There are several scenarios in prototype: a visit to a pharmacy [5], international computer driver license (ICDL) training [17], and a diabetes information scenario [6].

Positive deviance is easy to spot within one DPO in particular, called Deaf Community of Cape Town (DCCT). Its entire staff has come to embrace technology due largely to a continuous ICT research presence. Several DCCT staff are certified with International Computer Driving License (ICDL), one of them manages the network and another helps to maintain the computer lab. These positive deviants are now role models for the thousands of Deaf people served by the DPO. Due to a spate of independence (see below), the research team only recently began to establish ties with other Deaf organisations in the area, with the hope of identifying and mentoring more positive deviants, especially amongst the youth. As we interact with more Deaf communities, we continually learn about new apps that Deaf people use to communicate. In other words, ICT literacy is 'catchy', and spreads, thus paving the way for positive deviance to spread.

ICT amplification is clearly enabled by SignSupport, a mobile app meant to increase the reach of official healthcare information to Deaf people in SASL, e.g. for diabetes [6]. It must be noted that the initial idea for SignSupport came from Deaf people who had who had participated with us after years of ICT research projects. We believe it was their increased familiarity with ICT in general that empowered them to frame their community's priority for understandable healthcare information via an app like SignSupport through drawings [5]. Positive deviants at DCCT also utilise ICT to amplify their own tasks, e.g. several staff members are trained HIV/AIDS community health workers and they leverage ICT to do that job better. However, their main dissemination of health information is via enacted dramas. The SignSupport project aims to incorporate videos of such info-dramas conducted on a stage, into the mobile app in yet another form of amplification. We are hoping that SignSupport provides a vehicle for positive deviance to spread by featuring well-known members of the community in those videos, a la Digital Green.

Community interdependence is emerging by learning how to better use the community-based co-design model [2]. It has not always gone easily. We are entirely dependent on sign language interpreters to conduct almost all aspects of the research. Of course, our students take sign language courses, but then they graduate and leave! And there are not only linguistic challenges; they can be cultural and interpersonal as well. Via reading between the lines of personal communication, it emerged that beneath the relatively benign suggestion by one Deaf community who asked researchers to include other Deaf communities, there was actually a 'push' indicating that they themselves felt 'pushed'; perhaps research fatigue or perhaps they felt they were not benefiting enough from the intervention? Kaplan [14] would say this is natural, and subsequent re-engagement with the 'pushing' community appears to be on track. Now, several more DPOs are now part of the universities' research programme, gifting us more perspectives on our work. One especially promising development is that we learned of a small group of Deaf students involved in a mobile programming course in another province. At some point, it would be wonderful to get Deaf programmers involved in the SignSupport project, and develop an even deeper sense of interdependence in the technical space.

4 Methodology

Both case studies operate under an action research umbrella [7, 10, 15, 16]. We view action research more as a paradigm than a specific methodology, and are most interested in generating new knowledge and ways to address social challenges. Given our background in experimental computer science, we produce computing artefacts, and aim to intervene with communities in such a way that their priorities drive our technology development agenda. This is one way to ensure that the technology we produce can help them drive their own social agenda. Then, together, we can reflect on the experience of using such a system. Overall methods for each project are explained below.

4.1 Zenzeleni Methodology

The data collection for the Zenzeleni project comprises a mix of quantitative and qualitative methods. In the Mankosi community, we work closely with the community's tribal authority (traditional leadership), a team of local research assistants (whose leader assumes the role of local champion) and also a co-located NGO. The thrust of a particular research project operates under a collective action research umbrella where we mutually define goals and mechanisms to achieve and evaluate them. Residents often collect data with us and also on our behalf; and at least one resident (most often the champion) helps to analyse and contextualise the results. Occasionally, we have a student from the area who speaks the local language and has a deeper personal experience of the local culture that can help interpret results beyond mere language translation.

An example of quantitative data collection on the project is a baseline study conducted to understand how residents use and spend on telecommunications. We used stratified sampling to survey households in the dozen villages that comprise Mankosi [24]. We used ODK (see opendatakit.org) on low end mobile phones to collect this data with the help of local research assistants who could translate the questionnaire questions and its answers. ODK also allowed us to record open-ended questions for subsequent translation. The questionnaire was adapted from the Household survey obtained from Research ICT Africa (RIA) (see [26] and www.researchictafrica.net). The tribal authority calculated the number of people in each village, and from there we determined how to sample. We conducted two surveys in 2012 and 2013 [24]. With baseline data in place, we can repeat this form of data collection in order to analyse changes in line with ICT interventions over time. We can also anonymously access call record details and network usage statistics to get fully instrumented usage metrics on the network. In order to achieve a deeper understanding of the context, we also collect ethnographic data based on long-term presence in the community. For example, we have had academic team members resident in the community from 6–15 months at a time. Long-term presence enables rich engagement via a variety of formal and informal conversations with community members. More often, however, we

conduct 2–3 week visits for a given purpose. Many of the younger generation speak basic English, yet the older generation prefers isiXhosa. We therefore employ local research assistants to conduct both structured interviews and focus group sessions. We use such techniques to enquire about a range of issues surrounding the project, e.g. designing the billing system [21], gender roles in the project [12] and the role of ICT in local schools (yet to be published).

4.2 SignSupport Methodology

Our take on action research with the SignSupport project has led us to what we call community-based co-design [2], with aspects of participatory action research [15] and co-design [13, 20]. 'Community-based' conveys the fact that we deal with groups of people rather than individuals, aligned with the African concept of 'ubuntu'. A group approach can be very different from engineering toward individual requirements, e.g. in Africa, phones are often shared devices and we must design accordingly. We must constantly remain sensitive to cultural differences and develop ways of entering into design conversations with people who may not have strong technical skills yet who are knowledgeable on their own needs, and especially how their own communities operate. We collaborate with industrial design engineers who work with Deaf people as co-designers, and together identify the problems that needs to be addressed, the means of tackling the issues and then together decide on measures of success. We employ techniques such as cultural probes and generative sessions. Then we provide mock-up designs, conduct training with Deaf participants and provide exercises for end-users who then get together afterwards for a focus group discussion. This is very similar to early stage co-design [20]. From a practical standpoint, it is important to hold follow up feedback sessions to keep the community in the loop after we take the data back to the lab, e.g. to develop a mock-up into a proper mobile app. Then we return to the community with the app in a series of incremental feedback and iterative development cycles. We also conduct workshops to brainstorm how to move these research-driven apps out of the lab and into Deaf people's hands. We also take a wider view of community, and also involve, in the case of SignSupport for diabetes, health professionals in all phases of the action research. This is because the health professionals, who cannot sign, are just as interested in providing health care information to Deaf people as Deaf people are interested in gaining access to health information in sign language.

During the sessions described above, it is also critical that experts keep their own design decisions in abeyance, albeit temporarily, in order to allow for co-designers to find their own voice and participate meaningfully. With Deaf participants, we rely on sign language interpreters, and herein lie a subtle aspect of data collection with Deaf people. Sign language is an incredibly descriptive language and interpreters are tasked with explaining and describing concepts that may or may not have direct translation, in either direction. For example, finger spelling the name of a browser or a medical condition is often not enough. The interpreter often creates a story in order to characterise a technical term. Therefore, it

helps to have an interpreter that has been immersed in the ICT research programme for an extended amount of time, to be better at explaining such terms that dominate our discourse during semi-structured interviews, surveys, and focus groups. Note that we have also conducted a baseline survey on telecommunications use of Deaf people, also with ODK. We instrumented ODK to have a sign language interface, and also record sign language video for subsequent interpretation.

5 Discussion

Both case studies show that there is a difference between identifying a positive deviant, and then applying or leveraging ICT to achieve more positive deviance. The former has been realised by introducing the ICT research project to the community; and attaching it to the community to enable their input. However, the next stage is more important. Our goal has been to provide generic ICTs, primed for appropriation using the local language (SASL for SignSupport and isiXhosa for Zenzeleni voice communications). What happens is that communities at first discover such ICTs dependently, and that then acts as a springboard for subsequent discovery *without* (independence) or *with* (interdependent) 'us'. For example, perhaps a DPO wants to start its own video relay service. They could seek our advice for the underlying technical platform, even ask us to develop it, or co-develop it with Deaf programmers and technical support. However, once in place, the Deaf communities themselves can leverage that video relay service for their own purposes; again, with or without us. This is very similar to the voice and internet services provided to rural inhabitants by Zenzeleni. If a given cooperative decides they want to sell WiFi-enabled mobile phones to establish another revenue stream, there is no reason why the coop cannot do this independently, with or without our help and/or advice. Furthermore, they can leverage the voice calling and internet connectivity to put that, or any other community effort, into practice.

Positive deviance is therefore a social mechanism that can operate within and between communities; and can indeed by amplified by ICT. We can further this agenda by designing and providing generic ICTs that allow for adoption and appropriation by communities. This is attainable when the technologies are affordable and accessible, and especially when content is provided in the local language. Thus, as ICT4D researchers and practitioners, we can turn our attention to a) developing ICTs that fit these characteristics and b) figure out ways to use those ICTs to amplify positive deviance. In the process of doing so, the development aspects apply to these communities as well as to ourselves. As we mentor and facilitate positive deviance in marginalised communities, we also develop and grow ourselves.

6 Conclusion and Moving Forward

The two case studies have afforded us the opportunity to identify positive deviants in very different ICT scenarios, and contemplate how ICT can leverage positive deviance [18, 25]. We note that originally, our projects were not conceived with positive deviance in mind. Yet that does not stop us from explicitly pursuing it now. Affordable, accessible and generic ICT in

a local language, such as SignSupport's scenario-independent mobile app and Zenzeleni's voice calling and internet connectivity, provide a platform on which communities can amplify their own community-oriented priorities and aspirations. Reflecting on the social mechanism of positive deviance in connection with the principle of ICT amplification has led us to rethink what we mean by community development. We have found that the views of Toyama [27] and Kaplan [14] intertwine and resonate with how we have come to perceive relationships with our so-called 'beneficiary' communities. A key takeaway is that we are also beneficiaries, developing ourselves and our own capacities in ways that can be fed back to the communities with whom we work. From this, we learn our primary role is to be mentor and facilitator. As our case studies have evolved over the long-term, we have come to see positive deviance as a social mechanism that we should embrace and encourage mindfully, leveraging ICT to amplify this mechanism. We believe this can lead to community development, especially in terms of interdependence between the academic/practitioner community together with the communities we seek to assist. In our opinion, this serves to develop 'their' community as much as 'ours', and in many ways, as the communities overlap, we can realise a mutually beneficial interdependence.

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