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How do technologists do "ICT for development"? A contextualised perspective on ICT4D in South Africa

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ABSTRACT

We take a layered approach to contextualise Information Communication Technology for Development (ICT4D) to understand digital technologists' motivations to implement technologies to address socio-economic issues based on their capabilities and kinship affiliations. We adopt an interpretive approach to conducting an inductive qualitative study of digital technologists based in South Africa. We propose three mechanisms (emotional connectedness, user-centred technologies, and symbiotic relations) through which digital technologists undertake ICT4D to exercise their agency and enhance the socio-economic well-being of disadvantaged members of society. Taking the kinship perspective and capability approach as underlying motivations for undertaking ICT4D projects allows us to contribute to the ICT4D literature.

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1. Introduction

Information Communication Technologies for Development (ICT4D) research highlights technology's role in deploying innovative processes, products, and services for society's good (Chipidza & Leidner, 2019). Scholars have underscored the significance of considering context in mainstream information systems (IS) research (Bjørn et al., 2009) and ICT4D research (Avgerou, 2001; Sahay et al., 2017). ICT4D digital technologists would have the capabilities and agency to partake in actions to improve the socio-economic conditions unique to their context (Andrade & Doolin, 2016).

In this paper, we develop a contextualised perspective of ICT4D by building on a field study conducted in the Gauteng region (Johannesburg and Pretoria) of South Africa. This context enables us to consider the situational and historical dynamics that affect local digital technologists' actions based on their social ties within the historical and cultural milieu of South Africa. In our case, we take context at the macro, i.e., societal and micro, i.e., individual levels. Like Avgerou (2019), socio-economic issues such as poverty and social ties, e.g., kinship affiliation, highlight macro-level conditions while digital technologists' capabilities and agency to undertake ICT4D highlight micro-level conditions. Hence, we take a layered approach, i.e., macro and micro-level analyses (Avgerou, 2019), to contextualise ICT4D to understand how digital technologists' motivations, based on kinship affiliation, implement digital technologies to address their communities' socio-economic issues. That way, like Hayes and Westrup (2012), we do not take a deterministic approach but a contextual approach (i.e., macro-micro level conditions), as we pay attention to the environment in which technology is implemented for ICT4D projects. Micro-level and macro-level analyses have not yet been adequately addressed in social theory (Avgerou, 2019). Therefore, exploring these contextual conditions for ICT4D is relevant to making meaningful theoretical contributions (Andoh-Baidoo, 2017; Davison & Martinsons, 2016).

This manuscript describes a case where digital technologists' capabilities and agency mediated through kinship affiliations were used to enact mechanisms to improve disadvantaged groups' socio-economic well-being in South Africa. Avgerou's (2019) categories of mechanisms: "functional relations", "behavioural influence", and "power-based influence" and the layered contextualist approach influence us to recognise the connections associated with the digital technologists' undertaking ICT4D projects. Functional relations highlight the contextual conditions that influence the digital technologists' ICT4D goals to meet the needs of their environment. Behavioural influence indicates the contextual conditions that shape the digital technologists' behaviour in ICT4D projects. Finally, power-based influence relates to how ICT4D is enacted in conditions of a systemic hierarchy of social collectives due to the asymmetric distribution of material resources and authority between benefactors and the disadvantaged.

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Much of the existing ICT4D literature presents a view of ICT4D as primarily driven by benefactors (e.g., Chipidza & Leidner, 2019; Lin et al., 2015). This view of ICT4D that focuses on benefactors as the only source of created value highlights a power imbalance between benefactors and the disadvantaged. This paper develops an alternative view of ICT4D that emerges from a contextualised perspective. Our analysis of ICT4D from a contextualised perspective by exploring the role of macro (e.g., kinship affiliation) and micro-level (capability/agency) conditions foregrounds the view that value creation can originate both from the benefactors and disadvantaged; thereby, reducing the paternalistic nature of ICT4D projects and the power imbalance between benefactors and the disadvantaged people.

Motivated by the concerns mentioned above, this study explores the influence of macro-micro level conditions on ICT4D projects in South Africa. To achieve the research aim, we propose the following research question: How do macro-micro level conditions influence the undertaking of digital technology-mediated contextualised ICT4D?

Drawing upon kinship affiliation gives attention to an indigenous value system in South Africa, formed with non-genealogical people whose origins can be traced to the same race, historical background, and hometown (Mangaliso, 2001). The concept of kinship affiliation is a collective institution in sub-Saharan Africa (and some Asian countries, e.g., Philippines and Vietnam), guiding social relationships and customs to represent a significant social capital component and provides a safety net for the unlucky (Di Falco & Bulte, 2011).

Kinship affiliations have been an effective indigenous system that has sustained South Africans through historical challenges such as colonialism and apartheid (Di Falco & Bulte, 2011). Kinship is part of the South African indigenous value system, especially amongst the blacks, people of colour, and Indians living in townships and rural dwellings due to the existing inequalities and poverty caused by apartheid. The ongoing disparities and poverty motivate an intense desire amongst the South African people to empathise with one another and be altruistic. The display of empathy and altruism provides unique evidence of communities and relationships conditional upon a highly fragmented and unequal society creating a cultural tradition in South Africa. This embedded indigenous cultural value system in South Africa shapes kinship manifestation in its daily societal activities and practices. Due to kinship's attention to societal customs and norms shaping moral obligations towards sharing and redistribution of resources to assist the disadvantaged, we see kinship as a suitable approach to developing a contextualised understanding of ICT4D.

Theoretically, this article is motivated by recognising the possible benefits of relationships between the kinship perspective and capability/agency perspective as underlying motivations for undertaking ICT4D projects. The capability perspective allows us to understand how digital technologists have the agency to undertake ICT4D projects, i.e., micro-level conditions. In contrast, the kinship perspective will enable us to understand why the digital technologists are motivated to apply their agency to undertake ICT4D projects for the disadvantaged, i.e., macro-level condition. We suggest that taking the kinship affiliation and capability/agency perspectives is beneficial to fulfiling the layered contextualist approach to ICT4D. The unique approach of combining the kinship affiliation concept with the capability approach helps to understand the mechanisms from the macro-micro levels that enable individuals to have agency to implement ICT4D projects for the disadvantaged people they share origins and emotional closeness. Therefore, we explain how the technologists and the beneficiaries' shared kinship and capabilities created a dyadic and reciprocal relationship – what we call symbiotic relations. We propose symbiotic relations as alternative contextual conditions of possibility to those commonly thought to be associated with ICT4D, i.e., those that assume unequal power relations.

We summarise the key terms, definitions, and the research focus of our study (see Table 1).

In subsequent sections, we first discuss the literature on ICT4D and discuss poverty dynamics and kinship affiliation as the macro-level conditions of the South African context. Subsequently, we review the digital technologists' capabilities and agency as the micro-level conditions. Then, we explain our research methods and present our findings. Afterwards, we discuss our findings and conclude with some closing remarks.

1.1. Information Communication Technology for Development

ICT4D is the attempt to use ICT tools to undertake socially embedded actions and transformative interventions (e.g., better lives for the disadvantaged) and exploit opportunities for societies (e.g., improved government services and economic activity) in developing countries (Avgerou, 2008; Walsham, 2017). In this regard, ICT4D may be a force for social change that promotes socio-economic development in deprived societies. Critical to ICT4D is the ability and willingness of humans to utilise technological resources for society's good.

ICT4D studies highlight the use of technology for social gains, such as transforming and improving civil society in developing countries (e.g., McGrath, 2016) and designing innovative solutions for disaster

Table 1. Summary of key terms.

Key Term	Definition	Research Focus
The Digital Technologists	Local benefactors that have the digital capabilities to undertake ICT4D (Avgerou, 2008; Walsham, 2017).	South African digital technologists that implement technology to improve disadvantaged people's socio-economic well-being.
The Disadvantaged	The vulnerable people in society that benefit from ICT4D projects (Chipidza & Leidner, 2019; Walsham, 2010).	The disadvantaged people in Gauteng, South Africa, the digital technologists targeted.
ICT4D Mechanisms	The undertaking of ICT4D is based on contextual conditions, e.g., functional relations, behavioural & power-based influences (Avgerou, 2019).	The relationship between digital technologists and disadvantaged people that serves as a vehicle to undertake ICT4D in South Africa.
Kinship Affiliations	Membership of a collective institution underpinned by societal custom and norms with a moral obligation to assist members in need of help (Di Falco & Bulte, 2011; Mangaliso, 2001).	The bond between digital technologists and disadvantaged people that is based on the same socio-economic backgrounds, community, and belonging to the same black ethnic group.

response (Tim et al., 2017). Tim et al.'s (2017) highlight how social media's collaborative use between different actors effectively helped develop humanitarian assistance during the disaster. The various actors combined technological and human resources to create solutions to address natural disasters. ICT4D research also highlights how ICT-based initiatives can enable better lives for the disadvantaged. For instance, Holeman and Barrett (2017) highlight that IS can improve healthcare and human development by improving vaccination coordination at rural health facilities in Kenya. Similarly, in a study of urban slums in Brazil, Nemer (2016) asserted that school children in marginalised communities used social media to keep up with their social capital to improve their digital and general literacy levels, quality of education, and lives in the process. The above ICT4D studies providing insights from Kenya (improved healthcare) and Brazil (improved skills and education) emphasise the contextual socio-economic conditions in which ICTs are applied.

We acknowledge that not all ICT4D studies highlight transformative and empowering benefits for the disadvantaged (e.g., Madon et al., 2009). This may occur when culture clashes among benefactors and disadvantaged (Chipidza & Leidner, 2019), especially when the benefactors are foreign to the context they are trying to develop. Recent ICT4D literature (e.g., Chipidza & Leidner, 2019) shows that developing countries experiencing the organic implementation of ICT4D projects by populations without instigation from foreign groups have achieved greater success (e.g., Kenya's mobile payment system and Nepal's Wireless Networking Project).

Benefactors with their emancipatory attitude are sometimes paternalistic (Lin et al., 2015) and hold power (e.g., Chipidza & Leidner, 2019; Lin et al., 2015) due to their technological resources and capabilities. Hence, the benefactors are the stakeholders that would typically create the required value in ICT4D projects. In other words, value creation in ICT4D projects chartering and implementations are one-directional from benefactors to disadvantaged people. Nonetheless, digital technologies can coordinate diverse social innovators with different goals and capabilities to develop ground-breaking ideas jointly (Nambisan et al., 2018). For example, digital platforms provide an online space where producers and consumers can co-create innovation by interacting and sharing information (Barrett et al., 2016). This form of co-creation allows the freemium models that offer product bundle decomposition, giving users free products but charge for extra features (Rietveld, 2017).

2. Contextualising ICT4D in South Africa

2.1. Poverty in Gauteng, South Africa

Gauteng is the wealthiest province and has long been an epicentre of business in South Africa; however, like many other provinces, the region faces many challenges in the development sphere. The challenges include widespread poverty, unemployment, marked inequality, high rates of violence, and HIV-AIDS prevalence, especially in black-dominated societies. Approximately 38% of blacks and 20.7% of people of colour live in poverty compared to 2.5% and 0.6%, Indians/Asians and whites, respectively (Mushongera et al., 2018). The statistics show that race remains the overwhelming poverty marker in Gauteng, with the black-to-white poverty ratio at almost 40:1 (Mushongera et al., 2018). By race, it is clear that blacks remain the most disadvantaged group in welfare due to the unfortunate apartheid legacy. Poverty and inequality are legacies of apartheid that continue to plague South African societies despite the government's deliberate attempts to reverse this legacy (Mushongera et al., 2018).

Apartheid perpetuated highly fragmented policies that enforced white superiority and black inferiority (Cant, 2017). The poverty imbalance is very high, with 64% of blacks in poverty compared to 1% of whites, 41% of mixed or people of colour, and 6% of Indians (South African Human Rights Commission (SAHRC), 2018). The scale of socio-economic poverty in townships and rural areas resulting from the apartheid legacy is widely entrenched and shapes

South Africa's current socio-economic problems (Pomerantz, 2019). Hence, understanding the ICT4D phenomenon in South Africa may not be understood without emphasising poverty and inequality problems.

2.2. Kinship Affiliation in South Africa

Kinship is a concept that is rooted in the premise of emotional bonds and mutuality (Chiu et al., 2015; Di Falco & Bulte, 2011). However, there are two schools of thought on the nature of kinship mutuality or relatedness. On the one hand, scholars limit mutuality to genealogical unity such as bloodlines, marriage, adoption, and family ties (e.g., Di Falco & Bulte, 2011). On the other hand, scholars view kinship mutuality beyond bloodlines and family ties to include emotional closeness (Korchmaros & Kenny, 2001), shared origins (Chiu et al., 2015; Mangaliso, 2001), and caregiving and affirmative choices.

Our study adopts the kinship perspective of mutuality of shared origins, emotional closeness, and materiality (township, rural backgrounds, relatedness between humans, and things). This non-genealogical kinship affiliation perspective helps understand how kinship relationships beyond bloodline bonds fuel and propagate ICT4D within South Africa. The study of Korchmaros and Kenny (2001) provides evidence of emotional closeness as a motivation to help. They argue that individuals form relationships based on emotional intimacy and time spent together, making them interdependent, resulting in feeling concern and acting altruistically towards one another, especially in times of need.

While kinship highlights a social network, it is different from the social ties highlighted in network theory (Casper, 2007). Social relations in network theory highlight a social structure encouraging numerous informal links across professionals, such as engineers, scientists, and managers. The network is typically voluntary and based on reciprocity to enhance their innovative capacity and career. Hence, if a network member leaves, the tie is assumed not to last, undermining the network's sustainability (Casper, 2007). In contrast, kinship points to the role of indigenous values shared by members of a defined cultural tradition underpinning the social network's formation. Thus, the kinship network is enduring, and affiliation should have broader implications for society's vulnerable ones. Resonating with the kinship concept, Abubakre et al. (2021) adopt the Ubuntu concept, an indigenous values system, as the basis of a community orientation to digital entrepreneurship to explain how benevolent South African entrepreneurs help one and another in their resource constraint environment.

Like charitable acts, ICT4D projects are meant to provide social welfare – employment, health care, security to the disadvantaged and weak members of society, especially when government institutions fail to deliver them. Sahay et al. (2017) echo this by arguing that low-middle-income countries are characterised by weak socio-economic contexts, usually linked with a less open and relatively unpredictable political climate. That may be the case in African communities where governments rarely offer help and support for society at large due to the misappropriation of resources and corruption.

2.3. Digital Technologists' Capabilities and Agency

Scholars have adopted the capability perspective to establish necessary daily life capabilities (Alkire, 2005; Bass et al., 2013). The practicality of the perspective helps distinguish among commodities, human functioning, capability, and utility – concepts that link with the definition of development goals (Bass et al., 2013). The capability approach recognises the individual conversion factors (e.g., social norms, other people's circumstances, environmental situations) and choices applied to the commodities and resources available that facilitate fulfiling people's aspirations. In this respect, there is a moral obligation towards sharing and redistribution in dealing with difficulties in societies. Therefore, digital technologists serving as benefactors may be motivated to improve societies' well-being. Sen (1985) argues that a person's well-being is the individual's ability to deliver relevant functionings. That way, benefactors, while primarily concerned with the well-being of members of their communities, their well-being can also be evaluated in terms of their "freedom to achieve well-being" (Sen, 1985, p. 201) for disadvantaged communities. This view of well-being interplays with agency (Sen, 1999), an individual's ability to pursue goals that they value (Alkire, 2005); in our case, the digital technologists' ability and freedom to exercise their intentions of doing good for society.

Kinship affiliation as a macro-level condition could influence capable individuals to empathise with disadvantaged people's socio-economic conditions because they share similar backgrounds. Kinship affiliation could create the possibility to motivate people with capabilities (freedom to achieve) to utilise

materials (technological infrastructure and services) and have the agency (take actions) to create opportunities and functionings for people (transformative and empowering benefits for the disadvantaged). By also taking the concept of kinship affiliations to understand ICT4D, we explore the macro-level conditions that provide possibilities that may motivate digital technologists to leverage their technical capabilities and have the agency (micro-level conditions) to undertake ICT4D projects.

3. Research methods

We adopted an interpretive approach (Klein & Myers, 1999) to conduct an inductive qualitative study of digital technologists based in the Gauteng region – Johannesburg and Pretoria of South Africa, to understand their actions undertaking ICT4D.

3.1. Research context and field data collection

The South African technologists utilised digital technology to develop and implement innovative products and services to address their communities' socio-economic problems. They were attempting to solve high unemployment, digital divide, and the lack of digital citizenship. We investigated the ICT4D projects of 30 technologists that strongly emphasise aiding the disadvantaged in their communities. The technologists employed various digital technologies, including digital platforms, open-source platforms, mobile applications, cloud technologies, social media, and artificial intelligence. The empirical material collected over four months of fieldwork (from March to July 2018) in Pretoria and Johannesburg primarily informed our research. After finding a small initial group of digital technologists through personal networks, we approached subsequent ones through a snowballing process. Table 2 details the digital technologists that we interviewed.

We began by conducting face-to-face audio-recorded interviews with the individuals, usually the founder, chief technical officer, and/or a key employee who reports to the founder who engages with various digital technologies to undertake ICT4D. The interviews with participants across multiple levels provided two benefits. First, it offered representativeness and agreement in participants' accounts of their ICT4D experiences. Second, it allowed data triangulation through the comparison of views expressed by the participants across different levels. We also did follow-ups on Skype conversations with some of our participants up until November 2019. For the interviews, we used a semi-structured format. We started with a list of questions to probe the technologists' ICT4D projects, how they conducted the projects, the technologies used, key challenges or issues they experienced, key insights or benefits gained from their social activities, and their motivations to undertake ICT4D projects. On average, interviews lasted approximately 55 minutes. Additionally, we collected secondary data regarding the participants' ICT4D projects, including website materials, documents, and interviews published in print and electronic media and social media posts. The collection of secondary data allowed construct validity and enhanced the findings (Yin, 2009).

4. Data analysis

Upon completing the interviews, we transcribed and imported the transcripts into the qualitative analysis software Atlas.ti 7 to aid our analysis. Following Lin et al.'s (2015) and Myer's (2013) procedure, we first used narrative analysis to organise similar statements the interviewees discussed regarding their experience of undertaking ICT4D projects to order the most significant events of the projects. We then followed Walsham and Sahay (1999) approach to generate relevant codes. To avoid coding bias, we independently performed the coding and reviewed the coding scheme; the authors discussed the reasonableness and logic of the transformed data. As we coded the data, one initial observation developed to inspire much of the digital technologists' thinking about ICT4D and how digital technology and the contextual issues played a role in their actions.

Next, we began to sift through participants' statements about their experience of utilising digital technologies to address social problems and their accounts relating to how the contextual issues influenced their motivations. We analysed the data in several iterations, giving specific attention to these ideas, ensuring that we identified and understood all aspects. That way, it included evaluating the degree of agreement among participants on their perceptions of ICT4D. Then, we merged the different codes that suggested similar ideas to various categories. We repeatedly examined and compared within categories and across categories to identify the most important. We conclude our analysis by organising the categories according to adopted relevant theoretical frameworks defined in the literature.

We drew on the kinship affiliation perspective (e.g., Chiu et al., 2015; Mangaliso, 2001) as the analytical lens to understand the digital technologists' kinship affiliation, i.e., the macro-level. For the micro-level, we adopted the capabilities/agency perspective (e.g., Sen, 1999) as the analytical lens to understand the digital

Table 2. Summary of Interviews.

Interviewee Tittle	No.	Description	Digital technology type				Location	
			Digital Platform	Open Source Platform	Mobile Application & Cloud Technology	Social Media Platform	Pretoria	Johannesburg
Founder & CTO	1	The provision of Wi-Fi hotspots to create social inclusion by connecting society's disadvantaged & retailers for free.	●					●
	2	Improve communication between citizens and the government through a free social digital platform.	●				●	
	3	Develops a customised enterprise system for small businesses, offers free support, and provides coding training to rural schools. Social aspect is: free skills, knowledge, and competences		●			●	
Founder	4	Create free social media marketing opportunities for restaurants. The social aspect is the creation of social interaction and networks.				●	●	
	5	Social media marketing. The social aspect is the creation of social interaction and networks.				●	●	
	6	A mobile application that connects suppliers to markets. The social aspect is providing free internet access to the society's disadvantaged and creating social interactions and networks.			●		●	
	7	A mobile application that connects suppliers to markets. The social aspect is providing free internet access to the society's disadvantaged and creating social interactions and networks.			●		●	
	8	Developed electric-powered drones to distribute health care products to rural and township areas. Social aspect is health and physical well-being.		●			●	
	9	Connects community of digital entrepreneurs in townships to provide visibility and bridge digital divide between traders in the same market.	●				●	
Co-founder	10	Uses Unstructured Supplementary Service Data to connect employers with rural and township job seekers who have no access to Wi-Fi or data for free. Social aspect is creating employment opportunities.			●		●	
	11	Connects different retailers to the township and rural markets through a free digital platform. The social aspect is creating social inclusion.			●		●	
Founder, CTO & Strategist	12	A code syncing system that improves efficiency and serves as a social platform for cross-fertilisation of knowledge skills & education.	●				●	
Founder, Designer, & Strategist	13	Creates social digital inclusion through free Wi-Fi connections on buses to the society's disadvantaged.	●					●
Founder & Technical Officer	14	Develops customised enterprise systems for small businesses to create social digital inclusion.		●				●
Founder & Creative Director	15	Allows commuters to undertake their journeys using buses efficiently through a free digital app. Social aspect is inclusion and access to services.			●			●
Founder & Strategist	16	Social media marketing. The social aspect is the creation of social interaction and networks.				●	●	
Co-Founder & Executive Director	17	Free digital platform for community mobiliser for governance. The social aspect is enhancing citizen participation and democracy.				●		●
General Manager	18							
Community Partnership Officer	19							
Community Partnership Officer	20							

(*Continued*)

Table 2. (Continued).

Interviewee Tittle	No.	Description	Digital technology type				Location	
			Digital Platform	Open Source Platform	Mobile Application & Cloud Technology	Social Media Platform	Pretoria	Johannesburg
Founder & CEO	21	A free mobile application for the retail market. The social aspect is the creation of social interactions and networks.			●			●
Chief Technical Officer (CTO)	22							
CTO	23							
Co-Founder & CTO	24	Aggregates information about different township suppliers and offers to community for free to create social inclusion.		●			●	
Co-Founder & Technical Officer	25							
Founder & CTO	26	Develops customised enterprise systems for small businesses for social digital inclusion.		●				●
Technical Officer	27							
Technical Officer	28							
Founder & CTO	29	Develop and support ICT risk, security, and compliance solutions for various organisational clients. Social aspect is privacy, safety, and security for the vulnerable in society.		●				●
Designer & Strategist	30							

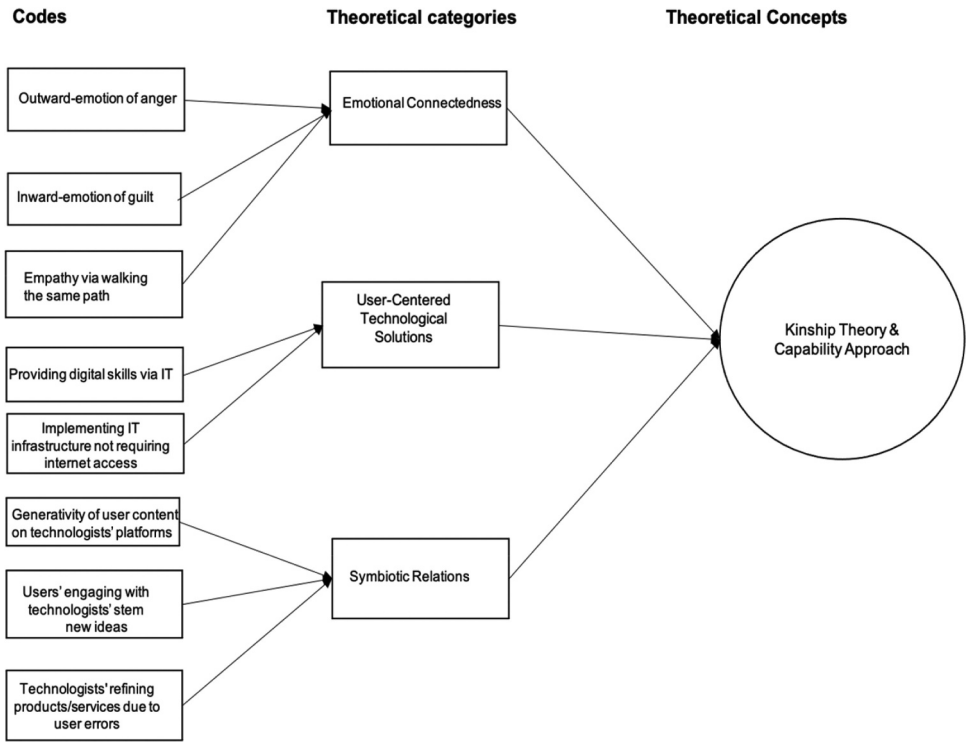

Figure 1. Research analysis mapped to theoretical concepts.

technologists' capabilities/agency. Figure 1 provides a summary of our analysis mapped to our theoretical frameworks.

5. Findings

In this section, we provide participants' quotes to show how socio-economic factors such as poverty and kinship affiliation (i.e., macro-level conditions) and digital technologists capabilities and agency (i.e., micro-level conditions) serve as contextual conditions to stimulate the mechanisms: emotional connectedness, user-centred technologies, and symbiotic relations for ICT4D.

Emotional connectedness describes how the digital technologists used hostility, empathy, and guilt to create social connection, igniting their desire to undertake ICT4D projects for disadvantaged people in society. The notion of user-centred technological solutions foregrounds the digital technologists' use of various digital resources and capabilities to create novel solutions to address the unique social issues in their operating context. The symbiotic relations mechanism highlights a dyadic relationship between the digital technologists and the disadvantaged group based on the latter's positive behaviours on the former's digital platform, resulting in both stakeholders benefitting from ICT4D.

As an indigenous value system, kinship plays a significant role in most South Africans' daily lives. We present non-genealogical kinship affiliation as an association of people sharing the same previously disadvantaged backgrounds, hometown or village, and the same black ethnic group. Our study shows disadvantaged communities as spaces with high unemployment, low income, a relative lack of basic amenities, and a lack of opportunities. The disadvantaged communities in South Africa are typically in townships or rural areas.

6. Emotional connectedness

Our participants highlighted strong emotional connections that function as links between them and their communities. Our data showed kinship as a core value in how the South African digital technologists saw their role in improving their people's well-being. The technologists stressed that they had kinship affiliations as they share the same previously disadvantaged background. The study findings showed that some black participants had an outward-focused emotion of anger-driven injustice and inequality from the apartheid era and corruption in present-day South Africa. Hence, they reported that they were motivated to undertake ICT4D projects for the disadvantaged in their

society. In this regard, they mentioned that an outward emotion of anger served as a bond between the technologists and the community and as a mechanism to uplift those disadvantaged. For example, the founder of a mobile technology company that encourages African prosperity by providing free Wi-Fi hot spots expressed this:

> *There are more significant issues (equality and racial issues) from the apartheid and ever-present corruption. I am very passionate and angry about it. So, if black people are excluded, I have to stand for my people the way I can; through my digital skills, I have to defend and help them [Participant #11].*

The continued inequalities and poverty, especially amongst the blacks due to the unfortunate apartheid legacy, highlight how it sparks kinship to be part of the South African indigenous value system. The people see the need to be altruistic, forming a cultural tradition in South Africa. Rather than only concentrating on their technological activities for economic purposes, they understood their technological activities could also be a means by which agency is distributed to the community. The technologists' capability to exercise agency through their IT implementations for the disadvantaged people's benefit may also address their anger and enhance their happiness or desires, improving their general well-being.

Also, an inward-focused emotion of guilt was highlighted from white participants against the past's injustice (i.e., apartheid). Hence, in-ward emotion is geared towards some-what compensating those impacted by the injustices of the past. They had the predisposition to use their technical capabilities and resources to help the disadvantaged in society. The technologists suggest that disadvantaged people can collectively engage and discuss addressing their social issues such as marginalisation, inequality, and disempowerment through mobile technology. A participant highlighted this:

> *We must give something back to the community [townships]. I guess it is what drives us to do it. Well, it is maybe a bit of guilt from the past. You know what our forefathers did. Hence, I use my mobile infrastructure and digital skills to try to empower people. Thousands of people use my digital resources for free. My digital platform permits me to connect to them and enable them to connect and interact with each other for free in ways that can alleviate their societal problems [Participant #9].*

The interaction on the digital platform would create network effects, generating a network of knowledge shared with all network members, which can help improve their unfortunate conditions. Further, free access to the technologies is crucial to avoiding digital exclusion for the disadvantaged who cannot afford it. Without free access, they may not participate in social and economic life because they are data-poor and cannot afford digital access.

Another example of emotional connectedness emerging from the findings is that of empathy. The digital technologists reported that they educate and create job opportunities for people from previously disadvantaged areas such as townships and rural areas. They argued that their compassion is triggered by poverty in rural areas and graduates' lack of practical knowledge. Our participants stressed that they experienced similar impoverishment before pulling out of poverty, highlighting the same backgrounds prompting the kinship affiliation. This emphasis on kinship was integral to the technologists' thinking of using their digital capabilities and the agency to implement technology to improve the conditions of their people. For example, a digital technologist who developed a platform to provide technical training that can upskill and expand graduates' capabilities stated this:

> *Most people from universities and technikons are not necessarily trained to be good problem solvers. I know because I received the education they received. You find somebody saying that I have a computer science degree, but you give them a simple, practical problem; he finds it challenging to find a solution [Participant #1].*

7. User-centred technological solutions

We found that the benefactors took advantage of digital technologies' ubiquity and boundaryless nature and the inherent properties of connectivity and association to implement user-centred technologies to create novel solutions for social issues, i.e., the macro-level problems in their societies. For example, the digital technology – open-source platform allowed knowledge-creating and sharing between the technologists and the disadvantaged communities. A participant who is part of a three-person team that runs an ICT security company that uses open-source platforms to manage ICT risk, security, and compliance for various organisational clients explained their capabilities to implement open-source platforms to address the social ills in their macro environments. Their capabilities gave them the agency to implement the resources required to provide digital skills to disadvantaged people who lack and want technical skills. They use open-source platforms to teach community members how to learn computer coding and let them engage and learn from each other. The digital skills that people can attain from the computer coding training can be essential for transitioning people towards getting jobs and the new ways of working

in the current and developing digital environment of the 4th Industrial Revolution. The technologist noted:

> *The open-source platform creates a community of engagement and also enables knowledge sharing. We can scale the teaching of code writing to allow people to be employable in the fourth industrial innovation. The platform allows people to learn from us, learn from each other, and learn best practices [Participant #12].*

The digital technologists discussed utilising the open-source platform to cross-implement a traditional practice (contact teaching) into online education. They argued that the cross-appropriation allowed them to train people at scale due to the open-source platform's convenience, time, and location flexibility. Regardless of the spatial distance between the digital technologists and the people requiring help, the technologists emphasised that they develop numerous disadvantaged people's skills and knowledge so that the latter can be productive participants in the wider community. This paucity of technical skills is a reminder of the resource challenges faced in disadvantaged settings. Hence, the technologists desire to mobilise their resources to build the impoverished people's technical capability and agency through their capability and agency. The provisions of digital skills can be a lasting and robust means by which disadvantaged people's lives can be bettered and for bridging the digital divide.

The South African technologists explained that the motivation to implement user-centred technology was not based only on their capabilities to implement digital technology but also on their emotional and empathetic approach due to their macro societal conditions (i.e., poverty caused by apartheid). Many black South Africans still bear the scars of apartheid's brutal system, although the transition to democracy in 1994 should represent hope, prospect, and opportunities. Unfortunately, the wave of optimism across South Africa post-apartheid has not translated into substantial socio-economic transformation for many black South Africans. Hence, based on kinship affiliation – the same previously disadvantaged backgrounds, black South African digital technologists saw the need to bond and help the vulnerable. The preceding participant noted:

> *"We are very conscious that we have one common ground [apartheid]. Thus, we share knowledge with black people across the many poor societies to have jobs to take them out of poverty. Our technological skills allow us to use open-source platforms to achieve this" [Participant #11].*

The South African digital technologists' opinions that they saw the need to bond and work together due to the "common ground – apartheid" echoes kinship as a fundamental indigenous point that emphasises caring for each other. The digital technologists could embed the kinship value system in their ICT4D projects, which shows humanity to society's disadvantaged members. This attitude allowed these technologists to be more responsive to the social ills in their environment.

Because internet access in South Africa is beyond many, the digital divide was rife, inhibiting job seekers' access to and applying for jobs posted on the internet. Some digital technologists explained that they respond to the unemployment and lack of internet access by adopting the principle of unstructured supplementary service data (USSD) and bulk short message service (SMS) to develop their digital platform as an ICT4D project to provide employment opportunities to job seekers. They created a digital platform that does not require an internet connection and allows the unemployed to engage with potential employers. The finding presents development priorities in which USSD and bulk messages bridge the internet access divide in South Africa. When an employment opportunity is available, the USSD and SMS interconnected system communicates opportunities between employers and job seekers. One participant who built a digital employment platform that uses USSD to connect employers with rural and township job seekers who have no internet access articulates this:

> *There is a digital gap in our rural areas. We said, okay, what can we do for these jobseekers because they do not have internet access? We came up with a concept where we developed a digital platform that does not require internet access. The platform enables the unemployed to engage with prospective employers for job opportunities. The channel we used to develop the digital platform is the USSD and the bulk SMS. [Participant #6].*

The digital technologists discussed that they provided information on job opportunities to people from rural areas. The former sees the latter as their kin due to the innovators also experiencing poverty themselves. Hence, they argued that they are designing solutions that allow people to overcome poverty. A participant highlighted this:

> *Because we have also been poor and unemployed, we have walked the same path as these young unemployed people in rural areas and townships. They spend over 800 Rands a month for job search, paying for internet access, scanning and emailing CVs, cover letters to apply for jobs. With our digital platform, they engage with job seekers. We advise them when to come to our office with their CVs, cover letters. We then upload their CVs and required documents on our platform for free, then direct them to recruiting companies [Participant #7].*

Due to the data-intensive nature of documents, the platform developers highlighted that they digitise the process by using their platform to communicate with the unemployed, advising them to bring their

curriculum vitae (CV), either printed or electronic copies, to their offices. The developers can then use their technological resources, i.e., infrastructure (e.g., scanners, internet, and digital platform) and capabilities (e.g., computing skills) to disseminate the CVs to potential recruiting organisations to overcome the inadequacies in technological resources existing in the communities. The technologists' capabilities to combine different technologies allow them to blend modern-day and legacy technologies. Information transfer between recruiting companies and job seekers highlights unique ways the local digital technologists undertake ICT4D in their context. Many job seekers are unemployed because they do not have the digital resources to search and apply for jobs dictated by our current increasing digital world.

Because the digital technologists host the unemployed CV and other job application materials through their platform, job seekers can be visible to job providers from all over the country. Hence, it enhances job seekers' chances of getting employment, potentially gaining the income to meet living expenses, contributing to enhanced livelihoods and capabilities, which serve as routes to development and getting out of poverty.

Another group of technologists undertook ICT4D projects to enhance digital citizenship. Based on USSD and SMS principles, they had the software proficiency in developing a social media platform where user access is free and does not require a smartphone or internet connection but a standard mobile phone. This is crucial to alleviating the existing digital divide in the disadvantaged communities and enhancing the digital inclusion needed to address the social issues they face. While many disadvantaged had the knowledge and skills to use mobile technologies, they did not have the means to leverage digital technologies (e.g., ICT, social media, and mobile technologies) to foster citizen engagement and participation. The platform is used to give voice to the deprived communities neglected by corrupt government officials. We also observed that the platform's communication and engagement allow community members to vote anonymously and organise campaigns addressing their socio-economic issues; thus, the platform can enhance civic life participation. This finding supports how technology further bridges the digital divide and acts as an interconnected system, facilitating communication in "data poor" communities. The explanation by one of the technologists who provides a social platform to improve communication between community members to enable community organising and local efforts to address social issues stated this

> *The community mobilizes itself in cases where the corrupt local government has not responded to them. They use the app to call meetings and gather themselves. If they need to vote on a particular issue within the community, they also use the app. Our social media platform enables a community leader in the townships to call a meeting to address their issues and to do it in a way that does not require a smartphone [Participant #27].*

The technologists providing the social media platform in the disadvantaged communities provide examples of how the platform's features (e.g., no need for a smartphone and internet access) can significantly change citizen engagement and society's participation in dealing with social issues. Before introducing the platform, the digital technologists highlighted that the disadvantaged community members disseminated information, organised community meetings, and mobilised each other using traditional means such as whistles and megaphones. Not requiring a smartphone and internet access, the social media platform provided a substitute for the traditional means of communication and interaction. A different participant from the group of technologists involved with the ICT4D projects to enhance digital citizenship noted:

> *Before introducing our innovation, people would get on the back of a pick-up truck with a megaphone or walk around the community telling everybody there is a meeting at 2 pm; not everybody gets the information. Maybe they are not around when the town criers shout out at messages or have missed their areas. So that is not effective [Participant #28].*

8. Symbiotic relations

The symbiotic relations opportunities contributed to the technologists' agency to act and benefit economically by helping the disadvantaged, which provided an opportunity to co-create value. The digital technologists helping the disadvantaged allowed the unexpected possibilities from leveraging digital platforms' ability to generate valuable content and information from users. The free internet access through digital platforms enabled the disadvantaged people to generate content by users' interconnection and interactions similar to social media platforms. The digital technologists realised that they could benefit economically from the ICT4D projects due to the opportunities the disadvantaged people created when using their digital infrastructure. For example, the digital technologists offering free Wi-Fi to community members through their platforms connect many disadvantaged individuals to the world of economic opportunities. These individuals provide product information to people who can afford to pay for digital technologists' products and services. This

helps increase the digital technologists' market reach and potentially generates revenue from third parties such as retailers who market their products and services. The technologists took advantage of the platform's affordances of network effects – the increased number of users. The users also took advantage of free internet access through the platform, which co-created the economic opportunity for the technologists to benefit from third parties. A technologist who leverages the distance-bridging potential of digital platforms to provide Wi-Fi hotspots to connect consumers and retailers offers this perspective:

> *We get some unplanned value out of it through advertising. We give people access to free internet in rural communities through our platform because we believe access to the internet can provide information that can empower them. Nonetheless, when they are logged on, they can see our ads and help forward them to people who want and can afford our services. As we help by providing free internet, they also help us advertise to the people we did not think of [Participant #26].*

The digital technologists highlighted that the free internet provided on their digital platforms enabled the disadvantaged to undertake economic and social activities through internet access. Thus, digital technologies are promoted as a democratised and decentralised means to solve development challenges and provide opportunities to co-create value. The distribution of free internet access, which offers access to online platforms in rural areas, proves efficient co-creation of economic opportunities, albeit serendipitous and unplanned reciprocity. The disadvantaged members' platform use co-created the digital technologists' chance to refine their ideas and expand their sales. A technologist who offers free internet access to disadvantaged communities expressed this:

> *We thought we were creating something for the poor, but we are breaking a paradigm because now we see that technology equalizes everyone. We use our platform to provide free internet access to users in poor communities. So, unexpectedly, you start realising that there is a bigger game at play. You learn more about the space because it is now a 'give and take situation'. We are getting new ideas from the content generated by the users. This helps us refine our ideas and solutions. For example, we assumed that most people would use the internet for social media activities, but we realise that was not the case, but they visit job sites. This allowed us to push advertisements to job sites [Participant #21].*

Another participant who improved a digital platform's performance by following users' critics of the app also echoed the views that providing free access on their infrastructure led to product refinement and/or igniting new innovative ideas and opportunities that were also created by the disadvantaged people engaging on their platform

> *We have seen an impact on people, and we have seen interactions with people, specifically about the app, which means that we are not just helping people. We are also engaging with people who spark new thoughts and ideas on how to improve our innovation after users find faults from our earlier releases. [Participant #22].*

Another participant provides more insights into how the disadvantaged also reciprocally help them ignite their ideas and refine their products. The unexpected refinement appears as a requirement and/or reaction to a specific feature or new functionality in the initial design. One participant improved his mobile application system by adding the auto-correct feature following the inquiry from one of the users based in rural areas:

> *As they use our app to communicate, they sometimes type wrong spellings or respond inappropriately. For example, one day, a young person wrote lonely, instead of single, under marital status. The discovery made us realise that we needed to add more value to the app. We collected data of such instances and improved the functionality, so we developed a language assistant feature that checks the texts and suggests the correct words/terms for the context in question [Participant #25].*

8.1. Discussion

This paper develops an understanding of ICT4D consistent with Avgerou (2008) and Walsham (2017) notion that digital technologists use ICT tools to undertake socially embedded actions to better people's lives in developing countries. Our view on ICT4D also emphasises human agency and emancipation, consistent with the capability approach (Sen, 1985). This view highlights that people can have the agency to participate in society fully and manage their destinies through digital technology (Andrade & Doolin, 2016). Hence, our study considers the digital, human, and social resources required to understand the empowerment and agency of the actors involved in ICT4D projects and their voluntariness and enthusiasm for undertaking such projects. South African digital technologists undertook ICT4D projects based on their capabilities/agency and kinship affiliations to improve disadvantaged people's socio-economic well-being.

Avgerou (2019) and Walsham (2017) emphasise the importance of context in ICT4D research. Holmen and Barrett (2017) identified the emergence of contextual socio-material practices when implementing ICT to improve Kenya's improved healthcare. Similarly, Lin et al. (2015) explored how postcolonial contextual factors (e.g., hegemonic discourse, paternalism, ambivalence, and de-voiced) led to contradictory interpretations of an implemented ICT4D project's success between the Taiwanese government and a Taiwanese aboriginal community. Our

study uses "context" through a macro-micro level approach to explaining how and why technology-mediated kinship actions were enabled for ICT4D projects triggered by the digital technologists' capabilities and agency to help address poverty in disadvantaged communities. Our layered approach identifies three related mechanisms: emotional connectedness, user-centred technologies, and symbiotic relations, highlighting how ICT4D projects were implemented in South Africa.

9. Emotional connectedness

The South African technologists used digital technologies and their shared kinship to enable emotional connectedness to undertake their ICT4D projects to improve the disadvantaged's socio-economic well-being. We highlight the contextual conditions – macro (e.g., poverty, kinship affiliations) and micro (e.g., technologists' capabilities/agency) that served as functional relations and behavioural influence mechanisms (Avgerou, 2019), driving the undertaking of ICT4D to meet the needs of disadvantaged people. The technologists' emotional connection with their communities through their kinship affiliation enabled their technical capabilities and agency to undertake ICT4D in their communities. Our findings resonate with Shin and Kim (2018), who emphasise that members with positive emotions show prosociality and altruism regarding designing and implementing technologies to improve social life. Emotional closeness is a trait of kinship affiliation; hence, the South African technologists' willingness to help the disadvantaged people in their communities. Like Korchmaros and Kenny (2001), we provide evidence that kinship created an emotional closeness, making them feel concerned and undertaking context-sensitive ICT4D projects to act altruistically towards the disadvantaged. The display of empathy presents unique evidence of communities and relationships caused by a highly fragmented and unequal society, creating the kinship tradition in South Africa. We show that kinship is part of indigenous values beyond the understood hunt of self-interest and is fundamental to how digital technologists think of and establish their ICT4D projects supported by their digital knowledge and expertise, i.e., capabilities.

10. User-centred technological solutions

The South African technologists' implemented user-centred technology to solve society members' problems and enhance their quality of life. For example, we found that digital technologists utilised mobile technologies and digital platforms to interact with the underdeveloped environment characterised by limited ICT infrastructure and internet poverty. Consistent with Chipidza and Leidner (2019), the technologists' software proficiency enabled them to have the capabilities and agency to apply the USSD principle and bulk SMS to develop a digital platform to address the social problems in society. The platform highlights a socio-technical system that allows the necessary work of a change agent (digital technologists) to initiate and organise attempts to address a social issue. The implementation of the USSD and the SMS links required the platform's ecosystem to consider societal conditions. Hence, through platform owners' choices – regarding both the technical designs and the dynamics of the external environment, the job seekers were required to physically take their CVs (soft or hard) to the platform owners' office. Then the CVs are digitised and transferred to employers. Our findings are consistent with Bjørn et al. (2009), who emphasise the importance of adapting IT implementations to local contexts for the technology to achieve its intended purpose. The technological adaptations to a local context to implement user-centred technologies can increase job seekers' chances of getting employed, helping them achieve self-development capabilities and improved well-being (Sen, 1999).

While previous studies have highlighted the benefits of using digital platforms for ICT4D (e.g., Tim et al., 2017), the application and extension of digital technologies as depicted in our study offers fresh insight into how they can provide opportunities to the disadvantaged. Our research context's situational characteristics, i.e., kinship affiliations and material living conditions, i.e., poverty, interplaying with the South African digital technologists' technical capabilities, e.g., writing programming languages, contextual and emotional intelligence, allow us to highlight the material/technological aspects of ICT4D (Avgerou, 2017). This macro-level condition interplaying with the micro-level condition contributed to their ability to exercise agency to improve the disadvantaged's well-being.

11. Symbiotic relations

The opportunity to have a symbiotic relationship was borne, for example, by the digital technologists offering free internet access and providing digital platforms to job seekers, who generated economic opportunities for the former through the latter's generation of content on the digital platforms. The digital infrastructure's free services led to the marketing of products/services to the disadvantaged group sparked complementary innovative ideas and product refinement. Therefore, the digital technologists also benefited economically, e.g., refining products and expanding sales, from their socially driven initiatives embedded in

digital technology. That way, the digital technologists also enhanced their capabilities and agency to improve their well-being while improving the disadvantaged's capabilities and agency.

The disadvantaged people's optional and unexpected extra-role behaviour is unlike when users are required and expected to contribute to value co-creation. The reported positive user behaviours exhibited by the disadvantaged people were beneficial for the benefactors. The former contributes to product/service improvement and the opportunity to capture sales without increasing the sales force. Consistent with Barrett et al. (2016), our study highlights that the increased blurring of boundaries between digital platforms' owners and the platforms' users plays an increased role for users to have symbiotic relations and provide the opportunities to create value. The opportunities to co-create value are through digital technology's capability to link multi-parties, develop relationships and exchanges (Nambisan et al., 2018; Van Alstyne et al., 2016) to get valuable insights about product refinement, new innovative ideas, and expansion of sales.

Our findings concur with Tim et al.'s (2017) study, highlighting that cooperation among different actors utilising technological and human resources was vital to creating solutions to the flood disaster in Thailand. Our findings on symbiotic relations and the opportunities to co-create value indicate that value can come from an unexpected stakeholder (i.e., the disadvantaged society members), unlike in the traditional value chain system that highlights organisations' suppliers, customers, or staff as the primary conduits of value. The co-creation through symbiotic relations expands the freemium model's perspective beyond value creation and capture through direct product bundle and transactions decomposition (Rietveld, 2017) to include value in terms of co-creation of economic goals based on serendipity.

Hence, our study foregrounds the directionalities of ICT4D projects – i.e., how digital technologists' capabilities and agency to enact ICT4D projects trigger the disadvantaged people's actions for the digital technologists' benefit due to a shared kinship between the two parties. A dyadic and reciprocal relationship evolved between digital technologists and disadvantaged people. The digital technologists' orientation towards addressing the socio-economic issues in their environment made them also benefit. The symbiotic relations were a contextual basis for the digital technologists, and disadvantaged people have a two-way relationship that is reciprocal and mutually beneficial for both parties during ICT4D. This demonstrates an alternative narrative that shows the one-way imposition of benefactors exercising agency through digital technology use in ways that benefit only the disadvantaged (Chipidza & Leidner, 2019; Lin et al., 2015). Thus, symbiotic relations reflect a category of emerging mechanism that emphasises ICT4D actors' interconnectedness and contributing to each other through the conduits of kinship affiliations and digital capabilities.

11.1. Theoretical implications

This paper provides essential theoretical contributions to the ICT4D literature. First, by exploring the macro-micro level conditions, we develop a layered contextualisation of the social mechanisms (Avgerou, 2019) through which appropriating digital technologies contribute to ICT4D in developing countries. That way, our study answers IS scholars' call for more ICT4D research to take a layered contextualisation perspective (e.g., Avgerou, 2019) to understand the digital technology-mediated contextualised mechanisms (emotional connectedness, user-centred technologies, and symbiotic relations) of ICT4D. We also develop an analytical basis by considering disadvantaged communities historically formed in developing countries with the concept of kinship affiliations and capabilities, and agency.

Furthermore, the ICT4D mechanisms stress the significance and the compatibility of socio-economic issues such as poverty with the theoretical relationship

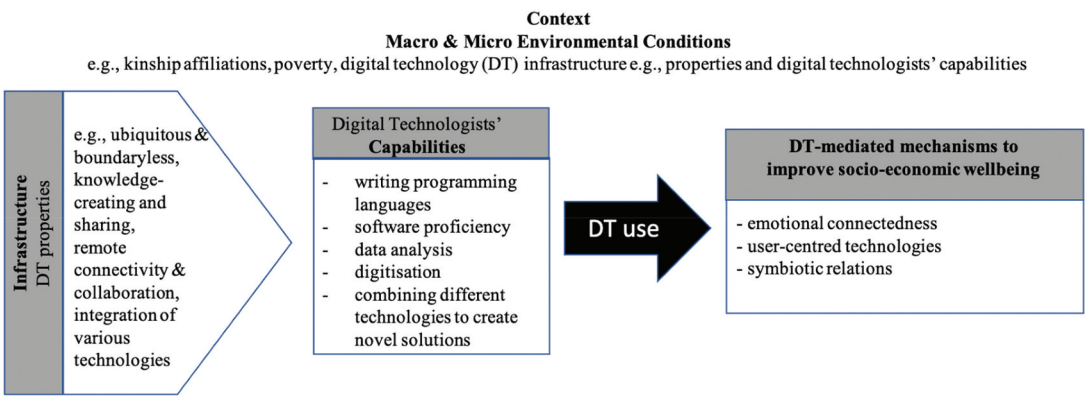

Figure 2. Contextualised perspective of ICT4D.

between kinship and capability/agency, contributing to the attempts to achieve positive change, i.e., improved socio-economic well-being in disadvantaged societies. Our contextual analysis identifying the three mechanisms highlights the digital technologists' situated actions associated with disadvantaged communities' socio-economic development (see Figure 2). It is thus contained at the level of the macro-micro domain of South Africa's marginalised communities.

Through digital technology implementations, the technologists' capabilities reinforce the technologists' agency to contribute to the disadvantaged's socio-economic well-being and their well-being. Our analysis of digital technologist implementations of technologies dwells on the conceptually different but strongly linked notions of agency and well-being (see Andrade & Doolin, 2016; Nussbaum, 2011). Like Andrade and Doolin (2016), whether the digital technologists realised the ICT4D objectives or not is an indication of agency. The evidence presented in the paper demonstrates specific implementations of digital technologies that actively pursue the goals they value in their context. The micro-level conditions, e.g., the digital technologists' capabilities and agency, enable the opportunities offered by digital technologies. The mechanisms produced through the macro-level conditions (e.g., poverty and kinship affiliation) highlight a contextualised perspective to ICT4D. That way, we address the macro-micro level conditions that influence ICT4D; the macro-micro level perspective has not yet been adequately addressed in social theory (Avgerou, 2019).

While some previous research has taken the layered approach to study IS development and impact and offered significant contributions to our understanding of ICT4D initiatives (Madon, 1992; Walsham, 1993), the studies are based on meso (organisational) and macro (national) conditions. As a result, we know little about ICT4D projects that complement macro (national socio-economic) and micro (individual) conditions. Studying how ICT4D actions are enacted based on macro-micro conditions enables us to understand the specific ways that context comes to matter in particular cases – through the interplay of digital technologists' capabilities and motivations, implemented technologies, and the socio-economic conditions at play.

Second, our analysis emphasises that digital technologists continually shape their ICT4D initiatives based on the disadvantaged people's inputs, which leads to the opportunities of co-creating economic value that benefits the digital technologists. To some extent, the digital technologists did not plan or design these gained benefits; they form part of the local context that envelopes their ICT4D projects. Hence, similar to Holemen and Barrett (2017), we show that actions are enmeshed with their context, shaped by them, and concurrently enacting them. By reframing ICT4D interventions as beneficial to both the digital technologists and the disadvantaged people, we challenge the ICT4D research that often presents a power imbalance between digital technologists and the disadvantaged people as the former as the primary source of value (e.g., Chipidza & Leidner, 2019; Lin et al., 2015). Our findings on symbiotic relations highlight that the opportunity to create value for the disadvantaged is not a controlled linear series of activities (the classic value-chain model) or unidirectional from the digital technologists, but bidirectional because the disadvantaged people also contribute to value creation. That way, we present an alternative perspective to understanding ICT4D projects as paternalistic (Lin et al., 2015), showing a power imbalance between benefactors and the disadvantaged. Our study highlights that the South African digital technologists benefiting from their ICT4D projects reduce the paternalistic nature of ICT4D projects. Hence, the perceived power imbalance between benefactors and disadvantaged people can be reduced. We propose "symbiotic relations" as a mechanism that captures how digital technologists and the disadvantaged are influenced to undertake contextualised ICT4D in an increasingly digital world based on a relationship that may not be hierarchal and asymmetric. The symbiotic relations mechanism suggests alternative contextual conditions to conditions of unequal power relations during ICT4D. Therefore, our study departs from the actor-centricity focus of ICT4D studies, mainly highlights digital technologists' roles. Empowerment and agency affect both digital technologists and disadvantaged people; hence, the disadvantaged need to do ICT4D projects rather than only benefactors. Therefore, our study recognises the role of disadvantaged people and their agency in the enactment of ICT4D.

Third, beyond stimulating research on ICT4D, we conceptualise kinship in a digital setting as behaviours and actions engendered by the appropriation of technological resources/capabilities to address social problems based on social affiliations. Kinship literature is not explicit about technological resources' role in facilitating social values and actions (e.g., Di Falco & Bulte, 2011; Mangaliso, 2001). Kinship manifested in digital settings involves an interplay between technological resources/capabilities and social problems using digital technologies. The use of digital technologies increases the range of opportunities for affiliated kinship actions. Due to digital technologies' ubiquity and boundaryless nature and their inherent connectivity and collaboration capabilities (Barrett et al., 2016), kinship manifested in digital settings is dispersed in space but coordinated and close to the needy despite the spatial

distance. The remote nature of kinship actions revealed in digital settings such as open-source allowed the opportunity to help people in huge numbers. More importantly, the open-source's platformness – the ability to distribute learning content efficiently to people and empower them to generate content that can help each other. In comparison, traditional kinship is situated in limited space and time, which involves direct interaction between identifiable social actors. Hence traditional kinship is static and less interactive; therefore, it constrains the ability to help in huge numbers.

11.2. Practical implications

Practitioners, policymakers, and managers would benefit from our study by considering developing the overall context of human capabilities/agency and societal norms when implementing ICT4D projects. We highlight some practical implications. First, ICT4D practitioners continue to struggle with ensuring that initiatives have a sustained and long-term effect on the disadvantaged people for whom they have implemented their solutions (Chipidza & Leidner, 2019), thanks in no small part due to the expensive nature to physically implement developmental projects. ICT4D practitioners' can endeavour to alter their projects' implementation to include inputs from the disadvantaged people through the connective and collaborative features of new digital technologies, e.g., cloud computing technologies and digital platforms that can enable remote work and reduce operations costs to develop ICT4D projects collectively with limited investments. The digital technologists' agency can enhance the disadvantaged people's effective use of digital technologies in providing technical training to disadvantaged users. That way, ICT4D practitioners may be able to sustain the chartering and delivery of their ICT4D initiatives. Also, when the disadvantaged groups have enhanced their technical skills, they may be less dependent on ICT4D digital technologists. The disadvantaged groups may have also improved their capabilities to take transformative and emancipatory acts for themselves. This is consistent with the view that emancipation is done by people, not done for them (Andrade & Doolin, 2016), thereby further reducing the power imbalance between benefactors and the disadvantaged people.

Second, governments can also make crucial investments in ICT education, skills, and infrastructure development to improve public sector services through digital transformation programmes to improve public value (Goh & Arenas, 2020) and enable technical capabilities and agency for the disadvantaged to contribute to their empowerment.

A broader practical implication for South Africa is that similar to India, the enhancement of technical capabilities and agency of South Africans can create a vast "technology and project management skills" base (Avgerou, 2010, p. 10), making South Africa also a thriving global market competitor in digital technological innovations. Thus, we may generalise our study to other developing countries with similar contextual conditions by providing insights for ICT4D projects to be transformative and emancipatory. They do not always need to rely on foreign parties if local stakeholders' technical capabilities and agency are enriched.

Finally, our findings based on symbiotic relations and the opportunities to co-create value can guide enterprises on making economic gains when undertaking ICT4D projects by departing from paternalism to more inclusiveness in chartering ICT4D. Like Bowman and Hovorka's (2017) argument, digital technologists' actions might apply to innovation that involves redefining and refining problems. In today's world, ICT4D benefactors can match their strategies, policies, and procedures with local communities' values and beliefs to ensure that ICT4D projects and development outcomes are achieved.

12. Conclusion

In answering the research question "How do macro-micro level conditions influence the undertaking of digital technology-mediated contextualised ICT4D?", we have presented the undertaking of ICT4D as a multi-level and bidirectional phenomenon. We have showcased local digital technologists' layered level conditions in driving ICT4D. Consistent with Avgerou's (2001, 2010) recommendation, our paper contextualises ICT4D to offer in-depth insights into how local digital technologists interact with their macro-micro level conditions and how they influence them to undertake ICT4D projects. We argue that the digital technologists' kinship affiliations and their capabilities/agency served as means through which ICT4D can be enacted in such a context.

We suggest various opportunities for future research. First, our insights based on the symbiotic relations and the chance to co-create by the digital technologists and the disadvantaged group indicate that this can lead to unethical IT use. For instance, benefactors may subconsciously or unconsciously infringe on users' privacy. Future research could explore the possible negative consequences associated with co-creations during ICT4D. Second, while we have applied kinship

affiliation within the contextualised perspective of ICT4D, future studies could explore the applicability of the kinship affiliation within the deterministic view that is more common in ICT4D studies. That way, such studies can seek to identify the effects of ICT4D on kinship affiliation. Such research can attend to kinship's role in ICT4D to identify the mechanisms of using digital technologies to reshape how individuals and groups manifest their kinship values as they engage in ICT4D projects. Finally, future studies could explore different kinds of well-being according to the capability approach aside from "socio-economic" well-being, which could also be defined as development outcomes.

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