

# The Role of ICT Education and Training in Poverty Reduction and Economic Empowerment: A Case Study of Jigawa State Government ICT4D Intervention

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**Abstract:** It has been widely accepted in Information and Communication Technology for Development (ICT4D) literature that Information and Communication Technology (ICT) can foster socio-economic development, however, the process through which this occurs remains unclear. Historically, there has only been a limited focus on evaluating the impact of ICT projects vis-a-vis development, and little concrete analysis of these initiatives in terms of their long-term effects. In this paper, we evaluate the role ICT education and training play in poverty reduction and economic empowerment using an ICT4D Case study of Jigawa State Government, Nigeria. The State Government funded an initiative aimed to develop 500 ICT professionals annually between the year 2001 to 2012. This was to be attained through local and overseas training, as well as the activation of computerisation within certain government operations, such as financial management, procurement and payroll. In our research, we employed Richard Heek's Design-Reality Gap model and Sen's Capability Approach (CA) framework as a theoretical lens to inform the study and furthermore as an evaluative space for ICT4D impact assessment. A broadly interpretative approach was adopted within the Case Study context. Data collection was conducted using multiple sources including surveys, document analysis, and interviews with project beneficiaries and key policy makers. The primary contribution of this paper is in providing greater insights into the role of ICT Education and Training towards poverty reduction and economic empowerment. Furthermore, it aims to exhibit a unique and novel combination of Sen's Capability Approach and Heek's Design-Reality Gap Model in examining ICT4D policy outcome, which will provide significant insights on how the gap between policy objectives and the outcome might be eliminated.

**Keywords:** ICT4D, Capability Approach, Design-reality gap, ICT4D evaluation, ICT4D champion, Jigawa ICT, economic empowerment

## 1. Introduction

Information and communication technology (ICT) is the application and usage of computers, which has become essential in modern societies. This technology helps to efficiently process data and produce information that helps in making a strategic decision and save time. Hatakka et al., (2014) argue that ICT service availability in a community can contribute to generating employment and income by providing a service platform through which the community can access public or commercial services and also render their services too to the prospective buyer. ICTs are widely adopted as a platform for development which is usually called ICT4D. However, considering the nature of ICT project implementation, the impact level, although significant, is still at a threshold level due to the disconnection between ICT formulators, public sector reformers and governance specialist (Hanna, 2010). This was as a result of high level of ICT intervention failure to deliver values to the broad group of its stakeholders; to this end, many of the ICT4D intervention are synonymous to failure due to the significant gap that exists between design and the reality of the interventions (Heeks, 2003).

### 1.1 Motivation and background of the study

Jigawa State lies between latitudes 11°N and 13°N and longitudes 8°E and 10°35'E and covers a total land area of about 22,410 square kilometres. The state is bordered on the east by Bauchi and Yobe states, on the west by Kano and the north by Katsina and Yobe states and by the Republic of Niger. Jigawa State was created from Kano State on Tuesday, August 27, 1991. The state has a total population of 4,361,002 as at 2006 Census (Nigeria Population Commission, 2014), with GDP of \$2,988 Million, and per capita income of at \$673 (National Bureau of Statistics, 2016). The State has a reasonable number of natural resources, and vast arable land, which is still yet to be explored. Farming is the major occupation accounting for about 80% employment in

the State. Jigawa has a low literacy level of about 53.6% and is among the poorest States in Nigeria (NBS, 2014). In view of this, the State has come up with different strategic action plans to attract investors locally and internationally (Directorate of Budget, 2009). Part of the State government strategy includes the introduction of attractive package and incentives to potential investors. These incentives include the free supply of infrastructure, tax relief, preferential approval of certificates of occupancy in any industrial estate, among others (Directorate of Budget, 2009).

Over the last one and a half decades, Jigawa State Government employed many ICT intervention packages and policies for aiding development in the area of education, poverty reduction, economic empowerment, reducing maternal mortality and public service reform. The policy was perceived to offer unprecedented opportunities for economic, political and socio-cultural growth and broad-based development (Directorate of Budget, 2009). The State ICT4D intervention packages include the creation of a community computer centre for ICT literacy, deployment of IP network and computer applications for government data processing, as well as an overseas scholarship for ICT studies. Also, the Directorate of Budget (2009) highlighted the following as the State ICT objectives:

- To produce an average of 500 ICT Professionals annually from 2010 to 2012 through scholarship of State Indigenes in local and overseas training institutes
- To establish indigenous software and hardware companies
- To achieve 100% computer literacy rate in the State civil service and 25% of the adult population of the State by the year 2012.
- To computerise 100% strategic Government operations such as procurement, payroll, Integrated Financial Management Information Systems (IFMIS), managing all aspects of Government expenditure and financial management by the end of the year 2012

To date, the Jigawa State ICT4D interventions are centred towards five major interventions, as listed below:

- 27 Community Computer training centres in each of the local Governments
- Informatics Institute Kazaure: for training and developing mid-level ICT Skills
- International ICT Scholarship: for high-level ICT skills
- Computerisation of Government operations: for efficient service delivery
- Broadband internet services: for connecting Government offices, Communities

This research focuses on the evaluation of objective number one, which was planned to produce an average of 500 ICT Professionals annually from 2010 to 2012 through scholarships in local and overseas institutes. The local training was conducted at Informatics Kazaure, while the majority of the overseas training was carried out at Informatics Singapore (details in section 4.1.1 and 4.1.2).

## **2. Conceptual Framework**

### **2.1 Capability Approach (CA)**

Sen's Capability Approach (Sen, 1999 and 2004) is a broad normative framework for the evaluation and assessment of individuals' well-being and social arrangements, as well as the design of policies, and proposals about social change in society. CA, as discussed by Robeyns (2005), has been widely used in different fields, most prominently in development studies, applied and empirical studies, welfare economics, academia, social policy and political philosophy. Furthermore, Robeyns stated that CA could also be used as an alternative evaluative tool for social cost-benefit analysis or as a framework for designing and evaluating policies, ranging from welfare state design in affluent societies to development policies by governments and non-governmental organisations in developing countries.

CA has also been widely used in evaluating ICT4D intervention (for example in Dasuki and Abbott 2015; Hatakka and Lagsten, 2012; Kleine, 2010; Van Den Hoven and Rooksby, 2008) and also in Sen (2010) in evaluating the use of mobiles phones within society, in which he discusses the positive impact of mobile phones in expanding human capabilities. Also, the operationalisation of CA by Hataka and De (2011) focused on the difference between potential and achieved functioning and the important of context in the evaluation and added the role of technology in the framework as presented in Figure 1. In this research, the context of CA

as explained by Hatakka and De (2011) is illustrated in Figure 1 and Table 1 and will be further expanded in the discussion section.

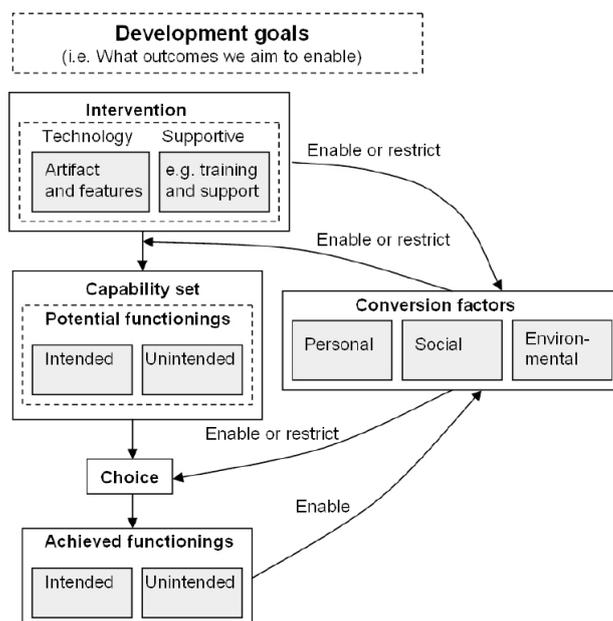


Figure 1: The capability approach framework adapted from (Hatakka and De, 2011)

Table 1: Summary of CA as applied to the research context adapted from (Hatakka and De, 2011)

Intervention	Jigawa State Government ICT4D intervention <ul style="list-style-type: none"> <li>Supply of hardware, software, network and support services</li> <li>Training of workforce on ICT literacy</li> </ul>
Capability set	<ul style="list-style-type: none"> <li>To achieve 100% and 25% computer literacy level in the State civil service and overall population respectively by 2012</li> <li>To Achieve 100% computerisation of the main Government operations such as payroll, and Integrated Financial Management Information Systems managing all aspects of public expenditure and financial management by the end of 2012</li> </ul>
Choices and Achieved functioning	<ul style="list-style-type: none"> <li>To improve access to quality education which will reduce poverty and provide economic empowerment</li> <li>To improve service delivery</li> <li>To reduce waste through effective utilisation of resources and lean workforce</li> <li>To generate revenue from the intervention</li> </ul>
Conversion Factors	<ul style="list-style-type: none"> <li>Lack of basic infrastructures, for example, power supply and the internet</li> <li>Lack of prerequisite ICT skills</li> <li>Lack of political will from Government official and the opposition</li> </ul>

## 2.2 The Design-reality gap

The design-reality gap is a broad model that is drawn from the literature on contingency in organisational change (Venkatraman, 1989) and social construction of technology (Suchman, 1987). The framework was developed by Heeks (2003) and is used to analyse organisational change and the risk associated with it. In the domain of ICT4D, the design-reality gap has been adopted as an assessment tool to measure the success of the ICT4D intervention. The model has helped to explain the mismatch (gap) between ICT4D designs expectation and the reality. This gap occurs because the contexts of the project beneficiaries and the ICT4D project designers are often distant in socio-economic and cultural dimensions. Hence, this then results in specific design assumptions, which do not fit the local realities (Heeks, 2002). ICT4D failure or success would then depend on a gap that is present in the design of the ICT4D project and the current realities. According to Heeks (2002), the design-reality gap exists around seven dimensions abbreviated as ITPOSMO: Information, Technology, Processes, Objectives and values, Staffing and skills, Management systems and structures, and Other resources such as time and money.

## 2.3 Dimensions of the Design-reality gap

The extended dimensions of the design-reality gap can also be summarised with the OPTIMISM mnemonic (Heeks, 2008):

- Objectives and values (both formal strategies and culture, and informal goals)
- Processes (from individual tasks up to broader business processes)
- Technology (not just ICTs but other relevant technologies)
- Information (data stores, data flows, etc.)
- Management structures and systems
- Financial Investment
- Staffing and skills
- Milieu (the external political, economic, socio-cultural, technological and legal environment)

The above dimensions have been adopted to form an enquiry into the success and failures issues relevant to this research as illustrated in Table 2. The dimension as shown in the table was used in creating themes that guide the type of questions asked during data collection and analysis.

**Table 2:** Interpretation of the design-reality gap in terms of research issues

Elements of the design-reality gap model	Interpretation of the framework in terms of the research issues
Objectives and values	<ul style="list-style-type: none"> <li>• What are the objectives of Jigawa State ICT4D intervention and how does the project meet the expectations of all the stakeholders?</li> <li>• What are the expected associated values of the intervention?</li> <li>• What are the unintended consequences of the intervention and how are they related to the overall objectives and values of the State?</li> <li>• How do the objectives and value of the project align with the overall development strategy of the State?</li> </ul>
Processes	<ul style="list-style-type: none"> <li>• What is the Government implementation strategy of the intervention as a whole?</li> <li>• What are the role and responsibility of each of the major stakeholders (Government, civil servant, citizens, opposition party, etc.)</li> </ul>
Technologies	<ul style="list-style-type: none"> <li>• What are the levels of basic infrastructure, e.g. power, connectivity, etc. are available to support the intervention? If there is no availability, what are the plans for sourcing them?</li> </ul>
Information	<ul style="list-style-type: none"> <li>• What is the level of engagement between all the project stakeholders in the State, for example, Government to citizens; citizens to citizens; Government to Business; Business to Business?</li> <li>• Is there proper information flow about the intervention amongst various government implementation MDA, for example, Education2Commerce, Agric2Technology, etc. ?</li> <li>• What are the levels of engagement with development agencies and international communities for best practice, benchmarking and collaboration?</li> </ul>
Management systems and structures	<ul style="list-style-type: none"> <li>• What is the preparedness level of all the stakeholders?</li> <li>• Is there a proper institutional framework within the MDAs, for example, legislation in taxation, labour and employment, budget and public finances?</li> <li>• What is the level of relationship between the three arms of Government (Executive, Legislative, and Judiciary) Does the project have the backing of the State house of assembly (legislation or act)?</li> </ul>
Investment resources	<ul style="list-style-type: none"> <li>• What investment has been made to support the implementation of the intervention?</li> <li>• Is their plan for sustaining the project beyond the political timescale?</li> </ul>
Staffing and skills	<ul style="list-style-type: none"> <li>• Does the State have skilled staff to manage the project?</li> <li>• If not, what development strategy is there to attract staff or to train the current workforce of the State to acquire the prerequisite skills to manage the project?</li> </ul>
Milieu	<ul style="list-style-type: none"> <li>• What are the legal issues surrounding the project (sustaining the project beyond the political tenure of the current government)?</li> <li>• What are the opposition perceptions regarding the project?</li> <li>• What are the perceptions and the fears of civil servants, citizens, and Businesses for reducing corruption, “sharp practices” and “man-to-man” through the intervention?</li> </ul>

## 2.4 Contributions of the two conceptual frameworks

The contribution of mixing the two frameworks in this research is in twofold: Firstly, it contributes to the debate of operationalising CA in investigating ICT intervention. Also, CA can also help to investigate what these ICT opportunities were good for, and the way someone can reap benefits from the opportunity exhibited by ICT interventions (Andersson, Grönlund, and Wicander, 2012; Qureshi, 2013a and 2013b). Secondly, for the design-reality gap model, it will help to investigate to what extent ICT implementation achieved or not achieved the expected target of the stakeholders. On this note, it is worth mentioning that Capability Approach and Design-reality gap will help in answering the “how and why” questions of ICTs in development practice, which may assist in reducing the gap between ICT4D policy design and implementation.

## 2.5 Summary of literature review and knowledge gap

While there is ICT4D literature available, the majority of the literature makes no or very little impact, with several epistemological shortcomings (Raiti, 2007). Although this is about a decade old now, ICT4D literature is still lacking the conceptual basis to prove its independence as a standalone domain like Information Systems, Development and Economics, with the majority of researchers coming from a diverse discipline like mass communication, development, economics, computer science, etc. This then provides a demand for rigorous and critical ICT4D research within the multi-level domain. Furthermore, Harris (2013) states that: researchers and policy-makers operate with different values, languages, time-frames, reward systems and professional ties to such an extent that they live in separate worlds. As a result of this, the research-based evidence is often only a minor factor when policies for development are formulated and practices shaped, and too often new public policies are rolled out nationally with little monitoring and evaluation (Harris, 2013). Moreover, University research reports structural barriers and disincentives to engaging in knowledge translation activities that might advise practice and policy formulation. Also, the ICT4D impact is regarded differently by each community, with researchers working over publications, citation counts and journal impact factors, while practitioners look for actionable advice that can be put to use for increasing the effectiveness of public services and policy (Harris, 2013).

The above theme clearly shows a higher level of disconnection between policy makers, practitioners and academia and has given rise to many inconclusive ICT4D types of research over the last three decades. These then bring the fundamental need for better analytical and empirical ICT4D research. Heeks (2007) proposed the need for ICT4D research to be drawn from pre-existing conceptual frameworks.

To address the above shortcomings, this research will operationalise the notion of Sen’s Capability approach in which the framework will be applied to enquire upon the impact level of the intervention packages, and Richard Heek’s design-reality gap will be used as an evaluative lens. This research is intended to develop and test a multi-level framework and proposed it for further ICT4D intervention evaluation as in Figure 2.

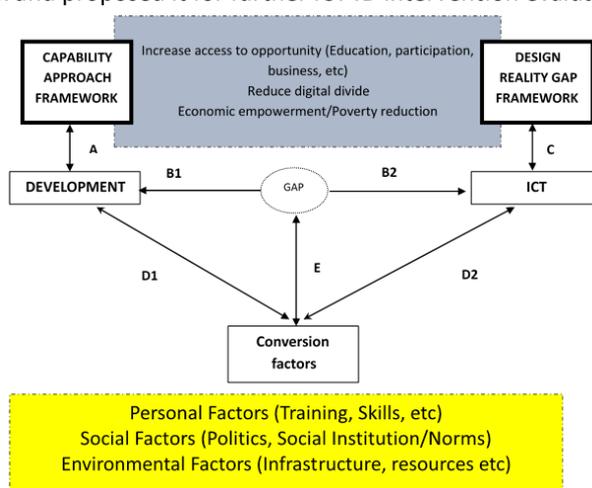


Figure 2: The proposed framework adapted from (Rislan, et al., 2015)

The proposed framework inherited the concept of development from Sen (1999) in which it builds the foundation of theoretical paradigm for human development. Sen suggested that individuals need a ‘capability’

to expand their freedom of living and in turn expand their welfare economy. This research found that there was a significant number of research projects which operationalised the concept of CA in investigating the impact of ICT on human development. However, very few were able to get it right (Tshivhase et al., 2016). This failure of many researchers to effectively operationalise CA in evaluating ICT4D intervention has coincided with the massive failure of ICT4D intervention as discussed in section 2.2. Kleine (2010) proposed that: to understand the contribution of ICTs to development efforts properly; it is necessary to firstly, define which development paradigm we are working with and secondly, to refine our understanding of development processes to recognise their systemic nature. The majority of ICT4D intervention failures are not limited to her argument. Usually, ICT interventions are not adequately defined within a clear development paradigm. To address that, Kleine (2010 and 2013) proposed a systematic mapping of the development process and design and planning of choice; this was also regarded as one of the effective approach, which has effectively, operationalised CA in ICT4D research as found in Tshivhase et al. (2016).

This research proposes that a developmental approach must be well grounded within Sen Capability Approach (A dimension), thus ICTs, as described by Kleine (2010), could be seen as useful tools in processes of empowerment, when proper conversion factors are properly in place (D, E and F dimensions). Taking a view of ICT as a tool for achieving capability for both institution and individual and the frequent number of ICT4D intervention failures, this research proposes that the design-reality gap framework (C dimension) can be used as an evaluative lens during pre-implementation, mid-implementation and post implementation of ICT4D project, as proposed by (Heeks, 2003). The conversion factors would be used as a catalyst to stimulate ICT project planning, implementation, and evaluation, which will address the gap associated with ICT application in development (B1 and B2 dimension). This will be further expanded in section 5.

In this research, the combination of the two conceptual frameworks DRG and CA have extended their limitations, for example, the individualistic view of CA has been extended by the strength of DRG in analysing organisational change. While the limitation of DRG, it lacks developmental focus will be strengthened with the major contribution of CA, which is its focus on human development.

### **3. Methodology**

A qualitative case study, particularly the broad interpretive approach was applied to the research problem. The philosophical basis of interpretive research is inherited from the ethnographic research tradition in anthropology, hermeneutic, and phenomenology (Klein & Myers, 1999; Walsham, 1995). The interpretive approach can better explain the complex socio-technical interaction process using ethnographic interviews, thick case description, and empirical observation (Thapa, 2012). The research approach adopted an interpretive case study as described in Yin (2013).

Data was collected through four open-ended interviews, observations, and surveys, from May 2014 to February 2015. The four open-ended interviews conducted were mainly centred towards capability approach with some context from the design-reality gap, as questions are primarily top level related to the policy as a whole and other high-level implementation issues of the policy. The following people were interviewed, also the code for the interviews are added in bracket which will be use in the sections to come:

- Former MD in the State (1999 to 2007) and Senior Consultant to the Current Government on ICT (INTERVIEW-1)
- Former Permanent Secretary and Director Scholarship Board (INTERVIEW-2)
- Director studies of Jigawa State Informatics Institute (INTERVIEW-3)
- Director entrepreneurship Jigawa State Informatics Institute (INTERVIEW-4)

The interviews lasted between 30 to 70 minutes; the first two interviews were conducted at Kano, Nigeria, while the third and fourth interviews have been carried out in Abuja, Nigeria. The justification of choosing the former MD and the former permanent secretary for the interview was to investigate the foundational process associated with the intervention which include the policy as whole and the initial implementation issues. Also, the two interviews with the directors is to investigate the current issues surrounding the intervention. All the four interviews are conducted in English, interview number three were later follow-up with a WhatsApp chat to clarify further issues. After the data from the four interviews had been analysed, a survey was designed based on the interview findings and administered to the beneficiaries of the intervention via SurveyMonkey.

The survey link was shared in four Facebook groups: <https://www.facebook.com/groups/347582702018747/>, <https://www.facebook.com/groups/32605486410/>, <https://www.facebook.com/groups/397768236948740/> and <https://www.facebook.com/groups/414185758602688/> and three WhatsApp group (Informatics ReUnion, Informatics Institute Kasaure, Informatics Students) created by various beneficiaries of the intervention and through sending links to some of the beneficiaries known to the researcher having been one of the beneficiary of the intervention. The survey questions were conceptualised using the theme adopted from CA as found in Sen (1999) in total 101 responses was received from the beneficiaries of the intervention. The justification for conducting the survey is to validate findings from the four interviews conducted and to evaluate the impact of the intervention from beneficiaries perspective.

All data collected was analysed using the set of principles of thematic analysis (Braun and Clarke, 2006). To interpret the findings, eight themes were generated using the OPTIMISM dimension as adopted from the design-reality gap (Heeks, 2003) and five themes were equally generated using CA framework as adopted from (Hatakka and De, 2011). The questions were designed using the construct of CA framework: background of the participant, intervention they have benefitted, conversion factors (i.e. which enable or restrict them), potentials and achieved functioning as found in (Hatakka and Lagsten, 2012).

#### **4. Case study findings and analysis**

##### **4.1 Jigawa ICT4D educational interventions**

The educational indicator of Jigawa State is very low; the National Bureau of Statistics website indicated that only about 25.08% of the State populations are literate (National Bureau of Statistics, 2016). This may not be unconnected to the State lowest GDP and per capita income and has placed the State to be among the poorest in the country. According to the 2012 Nigerian Poverty Assessment Report, the incidence of poverty in Jigawa State is 79.0% which is among the highest in the Country (National Bureau of Statistics, 2012). Also the Nigeria Socio-Economic Indicators report of November 2012 and National Bureau of Statistics (National Bureau of Statistics, 2016) indicated that 50.70% of the State population live below \$1 a day and 57.3% of the total population are extremely poor, further statistics Stated that Jigawa has GDP (PPP) of \$3.0 billion, with \$673 GDP Per Capita. Looking at these poor indicators in the State, the Governor of the State between 1999 and 2007 came with ICT intervention policy to fast track development in the area of public service reform, increase in access to quality education; reduce poverty among the youth through application and usage of ICT. The initial plan for the reform was to train the indigenous people of the State in various ICT skills, to realised that the Informatics Institute and International ICT scholarship intervention was conceptualised (section 4.1.1 and 4.1.2 will discuss the two intervention) also in Rislana et al., (2015). The ICT workforce development is also incorporated into the Jigawa developmental framework that aims to achieve 100% computer literacy rate in the State civil service, and 25% of the adult population by the year 2012. This was also aimed at providing empowerment, and to help in alleviating poverty (Directorate of Budget, 2009).

The project is now fourteen years old. However, no assessment has been carried out to evaluate the success or failure of the intervention and to what extend the intervention has achieved its major aims and objectives. This research is crucial, considering that many State Governments in Nigeria like Kano, Zamfara, Yobe, Rivers among others are joining Jigawa in studying their ICT4D intervention policy, and the majority of those States are replicating similar in their States. To date, no proper research has been conducted to evaluate the viability of the intervention, as such this research provides empirical findings that examined and identified issues associated with the project and provides policy guidelines for future implementation.

##### **4.1.1 Jigawa Informatics Institute**

In the initial conceptualisation process of Jigawa State ICT4D policy, the ICT4D strategic team headed by the State Governor discovered that Jigawa State is having dearth of ICT skills set, this hinted the creation of Jigawa State Informatics as described by Governor Turaki as found in Taiwo (2008): *"To prepare the citizenry, the government bought a master franchise from Informatics Holdings, Singapore and established Informatics Institute in Kazaure. This Institute, which is the first of its kind in Africa."* Also, the former Institute Director, Mr George Kong stated that *"The main aim of the institute origin is to produce ICT professionals that would head Jigawa ICT revolution targeted to launch the State's new economy into the 21st century"* (Taiwo, 2008).

In his maiden speech on his first visit to the Institute, the former Governor of the State (2007 to 2015) Alhaji Lamido describing his predecessor who is the initiator of the institute Governor Turaki (1999 to 2007) said that *"I must say here that my predecessor's decision to invest in the development of IT as a way of creating wealth*

was a right one. In particular, the establishment of Informatics Institute as the hub of the IT development was a good investment which would yield many dividends for the State." (Taiwo, 2008).

The institution has evolved through three major regions of a political time scale from 1999 to 2007, 2007 to 2015, and from 2015 to date these findings reveal that the first political cycle of the intervention: "has witnessed a massive physical infrastructural development, aggressive campaign to sensitise general public to embrace the intervention and building franchising, linkage and international collaboration with institutions like informatics, C-tech among others" (INTERVIEW-2).

However, the second cycle of the policy encompassed "Localisation, indigenisation of the institution through transferring the management of the institution to the indigenes, passing an act by the State legislature to recognise the institution as a State-owned institute, and getting accreditation from the National Board of Technical Education." (INTERVIEW-4). Further findings reveal that there is a consistent continuation of the institute within the two political loop however the quality and quantity of the graduate produce, the reputation, and the national acceptance of the institute has significantly reduced within the second political loop.

*"..You can't localise ICT knowledge transfer, previously we had students from every State in Nigeria, we have more than 15 expatriates Lectures and instructors from South East Asian countries who are proven to be qualified and up-to-date in the area they are teaching, the level of teaching facilities we had then are not up to what is obtainable in the institution now" (INTERVIEW-1).*

The above fact has been validated by an ethnographical visit to the institution in which we confirmed that the enrolment has significantly reduced as in Table 1. A participant of this research interviewed who work with the institute stated out the following as a major constraint of the institution:

*"Failure of our product to get admission into Domestic tertiary institutions due to the incompatibility of our system to Nigeria educational system. This has resulted in many our students after Advanced Diploma could not go further especially if they are not financially sound to go to private or foreign universities, the same apply to securing employment in both public and private sectors. Also "lack of intervention funding because we are monotechnic, we do not enjoy Tertiary Education Fund or any funding which militate against the conduct of research and lack of State government's effort in providing funds for staff development since they are aware of the institute's problem of lack of access funding" (INTERVIEW-4).*

#### 4.1.2 International ICT Scholarship

The second initiative of Jigawa State, in widening the skill set of the indigenously trained ICT graduate of Informatics, was to sponsor them to further their education abroad. To this end, Jigawa has sponsored about 500 indigenous students to study ICT courses in foreign schools. This research reveals that quite a large number of beneficiaries of the scholarship are the major stakeholders of Jigawa ICT sector and beyond, other have found a placement in private sector, however a greater number of beneficiaries are stranded as they are yet to complete their studies considering the nature of the scholarship which was attached to years not completion of a programme. Further findings indicate that there is a mismatch between the skill set required by Jigawa eGovernment and the skill set obtained by the majority of the graduates. For example the State-owned official website ([www.jigawa.gov.ng](http://www.jigawa.gov.ng)) which has been offline for over 6 months was outsourced to a third party, and the majority of other ICT services like basic computer literacy training for Government employee are also outsourced. A graduate from the interventions reveals that:

*"Government does not value our skills and capability; we are very much underrated, most of the consultants they are engaging as service providers are not well experienced and qualified like what we have in the State."*

Another graduate stated that:

*"what we studied is not what we are doing for the State, I studied Software Engineering, and what I do now does not go beyond typing for my bosses."*

An ethnographical visit to Jigawa State Ministry of Education reveals that more than 100 graduates were employed and are posted to teach ICT at Secondary Schools, but have found it very difficult to do that as the majority of the schools have no functional computer laboratories or there is no power supply to power the computers. A further visit to one of the schools in which one of the graduates was interviewed revealed that “I was employed as a computer teacher, but ever since I came here I have never taught anything related to computer, I am now teaching Geography and Mathematics”. Another encounter with a graduate who operates Computer centre in one of the Local Government called for a Government intervention to create linkage between ICT graduate and the business, like in the area of outsourcing.

The level of ICT4D in Jigawa is still at threshold level, even though the availability of basic infrastructure is commensurable, however, the primary objectives of Jigawa State ICT4D in generating 2 billion Naira (About \$5 million) beginning from 2013 fiscal year (now 3 years ahead of the target) was not feasible, considering that all the strategic action plan are not properly implemented. The second objective of producing about 500 ICT professionals is realisable considering the number of indigenous professionals graduated from the Institute which is now major key stakeholders in the public-sector reform as presented in Table 3.

**Table 3:** Summary of student enrolment (Source: Jigawa State Institute of Information Technology, 2015)

Year	MALE	FEMALE	TOTAL	MALE (%)	FEMALE (%)
2006	2964	328	3292	90	10
2007	3183	263	3446	92	8
2008	3470	211	3681	94	6
2009	1873	134	2007	93	7
2010	1984	220	2204	90	10
2011	1415	85	1500	94	6
2012	1292	68	1360	95	5
2013	1704	143	1847	92	8
2014	1531	155	1686	91	9
Total	19416	1607	21023	92	8

## 5. Discussions

### 4.2 The project capability perspective and background

The two ICT4D interventions discussed above are mutually exclusive Informatics was established with an aim to offer foundational to mid-range courses in ICT. While the international ICT scholarship was aimed at widening the skill set of the indigenous student trained and graduated from Informatics to be a sponsor to further their education abroad. The main cardinal point of these two interventions, as adapted from JSIIT website ([www.jsiit.edu.ng](http://www.jsiit.edu.ng)) was:

*“To articulately pursue and promote Information and Communications Technology (ICT) professionalism that meets local and universal applicability of the present and future generations and to provide requisite education and training in Information and Communications Technology (ICT) with a touch of excellence and consistent global relevance.”*

The Informatics Institute has another stream of a certification program in Networking and Telecommunication which three major programs: Integrated Systems: Voice and messaging, Copper and Fibre based networking. Further findings discovered that the international ICT scholarship is mainly for MSc, MBA and B.Sc. programs. The B.Sc. scholarship is primarily for students of Informatics who excel very well and pass international Diploma and Advance Diploma, while the MSc and MBA are mainly for students who completed their B.Sc programs. The international ICT scholarship training was administered mainly at Informatics Academy Singapore who has a partnership to offer a degree for three various UK universities (University of Portsmouth, Wales, and Oxford Brookes) among other universities.

### 4.3 Operationalising Capability Approach to investigate design-reality gap within ICT4D intervention

Sen's Capability Approach (Sen, 1999 and 2004) has been widely used in evaluating ICT4D intervention (Van Den Hoven and Rooksby 2008; Kleine, 2010; Hatakka and Lagsten, 2012) and Sen (2010) himself, in evaluating the use of mobiles within society, in which the study discussed the positive impact of mobile phones in expanding human capabilities. Also, the operationalising of CA by Hatakka and De (2011) focuses on the difference between potential and achieved functioning and the importance of context in the evaluation, and has added the role of technology in the framework. For this research the context of CA as explained by Hatakka and De (2011) was adopted in creating five themes (intervention, capability set, choices, Achieved functioning and conversion factors) together with the OPTIMISM dimension adopted from Heeks (2003) which is used as guide for the interviews and designing the instrument for the survey. The following section will expand on that.

#### 4.3.1 Intervention

The intervention as discussed in the background and findings section was aimed at developing ICT skills set for the State development framework. To this end, these findings indicated that informatics had trained more than 20,000 graduates of various training programs. Furthermore, about 500 have benefitted from the international ICT scholarship. The data analysed in Table 4 presented clear insight on the nature of the intervention process from the beneficiaries' perspective.

**Table 4:** Intervention process (adopted from Hatakka and De, 2011)

Questions	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
It was clear to me what I was supposed to impact from the intervention(s).	4%	1%	10%	46%	39%
We were provided with adequate choice over which of the intervention(s) to choose from	7%	16%	16%	41%	20%
The intervention(s) are relevant to my intended personal development	6%	6%	14%	36%	40%
The intended benefits of the intervention(s) are clearly stated to me.	4%	5%	16%	55%	19%
The intervention(s) process is well organised	8%	8%	21%	43%	21%
The impact of the intervention matched the intervention's intentions	3%	15%	16%	53%	14%
I was encouraged to look for links between the various intervention(s) and others	8%	18%	27%	39%	8%
The Government official supported us and tried to give help when it was needed during the intervention(s)	7%	15%	19%	47%	11%
Talking with other beneficiaries helped me to develop my understanding and impact of the intervention(s).	7%	3%	8%	57%	25%
I was provided with support after benefiting the intervention(s)	11%	22%	23%	31%	14%
We were still in touch with the intervention(s) stakeholders (Official, Co-beneficiary).	5%	26%	15%	46%	8%
My views, opinion, and needs were valued during the intervention(s) process.	11%	16%	24%	38%	11%

#### 4.3.2 Capability set and choices

Findings from the intervention beneficiaries indicated that the intervention had presented a lot of capabilities and choices to them as presented in Table 5. Question four and seven were asked to see if there is any disconnect between the intervention and their intended capabilities and choices.

**Table 5:** The capability and their choices (adopted from Hatakka and De, 2011)

Questions	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Agree
It was clear to me what intended capability(s) I will benefit from the intervention(s)	2%	5%	18%	52%	24%
I was encouraged to think and reflect about the intended capability(s) of the intervention	4%	4%	16%	63%	12%
I have developed set of capability(s) from the intervention(s)	3%	3%	6%	57%	31%
I have not developed any set of capability(s) from the intervention(s)	31%	45%	12%	6%	6%
The set of capability(s) that I have benefited suit well with my personal and development goals	3%	3%	12%	49%	33%
The set of capability(s) I have benefited help in achieving/acquiring other set of intervention (s) unintended capability(s)	2%	6%	22%	57%	13%
The set of capability(s) that I have benefited stopped me from achieving/acquiring another set of capability(s)	22%	41%	19%	15%	3%
I have received proper guidance throughout the capability dev. process	6%	10%	19%	53%	12%
Talking with other beneficiaries helped me to develop my understanding and impact of the intervention(s).	7%	3%	8%	57%	25%
I was provided with support after benefiting the intervention (s)	11%	22%	23%	31%	14%
We were still in touch with the intervention(s) stakeholders (Official, Co-beneficiary).	5%	26%	15%	46%	8%
My views, opinion, and needs were valued during the intervention(s) process.	11%	16%	24%	38%	11%

#### 4.3.3 Achieved functioning

Kleine (2010) argues that, the outcome component will map or measure the achieved functioning resulting from an individual's choices as a proxy for the capabilities, from the findings in Table 5, it is clear to see that the intervention has met or partially met up with the expectations of the beneficiaries even though the core objectives of the government in achieving 100% computerisation of its core public services operation and 25% of its revenue through the intervention are not achieved.

**Table 5:** Achieved functioning (adopted from Hatakka and De, 2011)

	Very little	Not much	Not sure	Quite a lot	A lot
Knowledge and understanding about the intervention as whole	12%	17%	12%	26%	32%
Knowledge and understanding about the intervention choices	15%	26%	12%	24%	23%
Knowledge and understanding about the intended functioning(s) of the intervention	11%	22%	14%	28%	26%
Knowledge and understanding about the unintended functioning(s) of the intervention	20%	28%	26%	12%	14%
Ability to think about ideas or to solve problems related to my development	5%	6%	5%	38%	47%
Achieved skills or technical procedures specific to my development	6%	12%	2%	41%	39%
Ability to be economically sufficient from the achieved functions of the intervention	8%	8%	15%	30%	39%
Ability to communicate and use ICT effectively for personal & economic development	2%	6%	3%	29%	61%

#### 4.3.4 Conversion factors

Robeyns (2005) and Hatakka and De (2011) argue that intervention can enable a potential functioning but conversion factors may hinder the choices of the people to utilise it. This when deepened into the case findings we could see that the beneficiaries of the intervention have not been hindered much with some of the conversion factors associated with the intervention. From Table 6 we could see that their literacy level; personal and economic reasons have not hindered them much from achieving functioning and capabilities of the intervention. Although during the first cycle of the intervention there was much politicking about the intervention from the opposition party, that still didn't reduce the adoption level of the intervention and its impact.

Also from the final rating of the interventions by the beneficiaries we could see that the intervention is well about average in terms of their personal interaction with it, even though they claimed that more support in the area of creating enabling environment for them to secure job, and be part of the overall ICT4D intervention in the area of patronising their competency is not well sought by the government.

**Table 6:** Conversion Factors (adopted from Hatakka and De, 2011)

Questions	Strongly Disagree	Disagree	Neither Agree Nor Disagree	Agree	Strongly Disagree
Do you think your literacy level has stopped you from benefiting from the intervention impact?	34%	44%	15%	3%	3%
Do you think politicising the intervention has stopped you from benefiting from the intervention impact?	12%	27%	17%	32%	13%
Do you think your personal issues have stopped you from benefiting from the intervention impact?	28%	43%	17%	8%	3%
Do you think your social and economic status has stopped you from benefiting from the intervention impact?	28%	43%	13%	13%	2%
Do you think insufficient access to other technologies has stopped you from benefiting the intervention impact?	17%	33%	17%	18%	15%
Do you think insufficient access to other resources has stopped you from benefiting from the intervention impact?	8%	28%	13%	34%	16%
<b>Overall Rating</b>					
	Rather Badly	Not so well	About average	Quite well	Very well
Finally, how well do you think this intervention is doing as a whole?	2%	16%	32%	37%	14%

## 4.4 The Design reality gap dimension

### 4.4.1 Objectives and Value

#### **Design Expectations**

The objectives of the projects as found in Jigawa State Institute of Information Technology Website are "To articulately pursue and promote Information and Communications Technology (ICT) professionalism that meets local and universal applicability of the present and future generations. Moreover, to provide requisite education and training in ICT with a touch of excellence and consistent global relevance." ([www.jsiit.edu.ng](http://www.jsiit.edu.ng)).

#### **Reality**

From the empirical findings of the study, it was evident to see that the main objectives and value of the project was achieved, due to a high number of indigenous people graduated from the two programs. These findings discovered that more than 20,000 and 500 people have benefited from the Informatics Training and International Scholarship program respectively.

#### **Design-Reality Gap**

From these findings, it clears to note that there is no gap between design and reality of the interventions.

#### *4.4.2 Process*

##### ***Design Expectations***

The intervention was designed to be managed by Informatics Institute for offering the training, Ministry of Education, Science and Technology to give the regulatory framework, while Scholarship Board to ensure that bursary and tuition were effectively awarded to Jigawa State citizens.

##### ***Reality***

Informatics managed the process of the intervention in collaboration with Scholarship Board and Ministry of Education, Science and Technology and this has remained unchanged since inception.

##### ***Design-Reality Gap***

There is no much-designed reality gap here.

#### *4.4.3 Technology*

##### ***Design Expectations***

The intervention was designed to have all the technological platforms; Informatics was planned to be the centre of Excellence for learning and training. The Institution was planned to have effective connectivity to the National Power Grid and Backup, High-Speed Internet Connectivity, among others.

##### ***Reality***

During the first phase (1999 to 2007) the Institution was adequately equipped with all the necessary technology and teaching tools ranging from Desktop, Laptops, Servers, Printers, Internet Connectivity, and Standby Generator. However, this was not effectively sustained during the second cycle (2007 to 2015) and beyond.

##### ***Design-Reality Gap***

The gap here is not much even though there has been a declined in the supply of technological equipment to the intervention; this may not be unconnected due to the massive penetration of smartphone, personal ownership of computers, and availability of GSM services.

#### *4.4.4 Information*

##### ***Design Expectations***

The intervention was designed to be transparent as issues related to admission, job vacancy, registration, and scholarship was planned to be shared among all the stakeholders.

##### ***Reality***

The institution shared all its information effectively, issues related to admission, job vacancy, registration, and scholarship was well advertised through the institution's website, social media pages, State-owned community radio stations, etc. Also, in the first cycle of the intervention religious, traditional and the political institution was used to advertise admissions and other related issues.

##### ***Design-Reality Gap***

There is no much gap between Information and its related components.

#### *4.4.5 Management structures and systems*

##### ***Design Expectations***

The intervention was designed with the aim to develop mid to high-level cadre of ICT personnel for the State eGovernment initiatives; this was very well captured in the entire policy pronouncement document and on various occasions by different executives of the State. Informatics was given the role in managing all the training issues, Ministry of Education, Science and Technology to manage the regulatory issues, funding provision, effective deployment of graduates into State's eGovernment initiatives among other issues, while Scholarship Board to manage award of Bursary.

**Reality**

The Informatics has effectively conducted all the prescribed training. However, weak legislation was experienced from regulatory ministries as they failed to ensure good Governance and proper coordination and utilisation of the graduates. It was equally discovered that many non-indigenes were awarded various bursary.

**Design-Reality Gap**

There are many Gap issues with the management of the interventions, the Ministries as clearly stated above have failed to support the institution with the regulatory framework, which leads the institution to lose its focus, and there is a weakness in the management and award of the scholarship by the Scholarship Board.

*4.4.6 Financial Investment*

**Design Expectations**

The Two Interventions are designed to receive full funding from the State Government.

**Reality**

During the first cycle of the intervention (1999 to 2007), the two interventions have experienced steady flow of funding from the Government, this has enabled the Informatics to promptly pay for all tuition to its partner Institutions (Informatics Singapore, purple train, C-Tech Academy, USA, etc.), develop physical infrastructure and staff welfare. However, during the second cycle (2007 to 2015) the Institutions witnessed a very low allocation of funding, this has crippled the intervention not to function effectively.

**Design-Reality Gap**

There is much gap here, which occurred due to the failure of the State to allocate a reasonable funding for the interventions. This research discovered that about 80% of the beneficiaries of the intervention have failed to complete their education (up to the first-degree level) due to limited grants as the majority of the beneficiaries terminated their education after Advance Diploma. It was also discovered that the Informatics is no longer providing free tuition to the male students as it was before for all gender, this has made the Institution inaccessible to citizens from a low-income family which defeats its purpose for inclusive enrolment for all indigenes.

*4.4.7 Staffing and skills*

**Design Expectations**

The intervention was designed to be handled within the first five years by international staff with little support from the locals, while the Local staffs are expected to take over full teaching and management of the institution.

**Reality**

The above has been achieved particularly through recruitment of about 20 staff from Asian countries and two from America. These findings reveal that currently, the institution has two international staff from Singapore and India who only come on an ad-hoc basis to help in Admission, Registration, and Examination Governance.

**Design-Reality Gap**

There is no much gap here as a proper transition in staffing between International, and the Local staff was experienced.

*4.4.8 Milieu*

**Design Expectations**

The intervention was designed to be in conformity with the available legal and Institutional framework related to Ministry of Education, Science and Technology, Labour and Productivity among others. It was also designed to accommodate every citizen irrespective of Gender, Ethnicity, Religion and Political inclination.

**Reality**

It was discovered that even though, the intervention provides an enabling environment to all irrespective of Ethnicity, Gender, and Religion. However, an issue related to Political inclination was used in the first cycle (1999 to 2007). During this era, a lot of 'man-know-man' issues was witnessed, for example of all the, about 200 International scholarships awarded only five are based on partial merit. In the second cycle (2007 to 2015)

this barrier was addressed as only students who successfully passed Diploma, and Advanced Diploma from Informatics are qualified to be awarded the International Scholarship to study Bachelor Degree and Masters. Also, Female was marginalised in the intervention even though these findings discovered that it is not deliberate this may not be unconnected to local norm, culture, and religion inclination.

### **Design-Reality Gap**

There is partial Gap in the award of the Scholarship even though this has been addressed.

## **6. Conclusion and recommendations**

This paper presented an insight on the role of ICT Education and Trainings in poverty reduction and economic empowerment in Jigawa State, Nigeria. The research also presented implementation gap, challenges, and impact of the intervention. The intervention could be described as a success due to the number of students graduated as conceptualised in the policy documents “*Produce 3000 professional graduates annually by 2007 towards the establishment of a virile indigenous software and hardware industry*” (Kanya, et al., 2016). This objective was achieved from 2006 to 2007. However, there is a sharp decline of about 30% in the enrolment in 2008 and 2009, and a further decline of about 50% was witnessed to date in the enrolment. This decline could not be disconnected to the issues discussed in section five. Furthermore, from the impact assessment of the intervention beneficiaries, the capability and choices were very well derived from the intervention. This has resulted in matching the realities and design expectation of the intervention as found in (Heeks, 2008).

This research engagement with graduates found that a lot of them are now well placed in the Nigeria ICT space; however the notion of Jigawa State being the regional hub for software production and for assembling hardware by 2015 and to achieve 25% of the State's Internally Generated Revenue (IGR) from the ICT sector by 2007 is not feasible. An analysis of the State Accounts from 2003 to date indicates that the State is not able to internally generate up to 10% of its revenue and is wholly dependent on the Federal Allocation. This could not be disconnected from the failure of the government to take the ICT intervention seriously and its inability to integrate the intervention into its key economic and development activities like agriculture, education and mining. This research found a lot of unopened ICT equipment containers, which may not be unconnected with the planned ICT Park. Also, the ICT Park established in 2005 is no longer operational as Informatics Institute staff has now occupied it as their official quarters.

The design-reality gap identified above could only be addressed if the Government can go back to the drawing board and reformulate its new ICT4D strategy, as the current one is about two decades without having a proper revisit. Furthermore, the State needs to accommodate the pressing change in the economic climate in Nigeria that is witnessing dwindling inflow of revenue coupled with its increasing population, which overstressed its income. If that could be done with its over 20,000 well-trained ICT graduates, the State could achieve competitive advantages in the area of advancing education, health, agriculture, tourism among others through sectoral integration with ICT.

The findings presented in this paper and the practical application of combining Capability Approach Framework and Design-Reality Gap model was aimed to contribute to the literature of ICT4D and in building a novel process of people-centred ICT4D intervention. Furthermore, this finding intends to help in the promotion and understanding of ICT4D project champion, which is now very well-articulated in the post-2015 development agenda (See Renken and Heeks 2013 and Heeks 2014).

## **References**

- Andersson, A., Grönlund, Å., and Wicander, G., 2012. Development as freedom—how the capability approach can be used in ICT4D research and practice. *Information Technology for Development*, 18(1) pp.1-4. DOI: 10.1080/02681102.2011.632076
- Braun, V., and Clarke, V., 2006. Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), pp. 77-101.
- Dasuki, S., and Abbott, P., 2015. A socio-technical analysis of ICT investments in developing countries: A capability perspective. *The Electronic Journal of Information Systems in Developing Countries*, 67(6), pp.1-29
- Directorate of Budget, 2009. *Directorate of Budget, (SEEDS II Technical Committee)*. Dutse: Directorate of Budget
- Hanna, N. K., 2010. *Transforming government and building the information society: Challenges and opportunities for the developing world*. New York: Springer Science & Business Media.
- Harris R., 2013. The impact of research on development policy and practice: An introduction to a review of the literature. [online] <<http://www.researchtoaction.org/2013/07/the-impact-of-research-on-development-policy-and-practice/>> [Accessed 29 October 2013]

- Hatakka, M., and De, R., 2011. Development, capabilities and technology: an evaluative framework. In *Proceedings of the 11th International Conference on Social Implications of Computers in Developing Countries: Partners for Development-ICT Actors and Actions*.
- Hatakka, M., and Lagsten, J., 2012. The capability approach as a tool for development evaluation—analysing students' use of internet resources. *Information Technology for Development*, 18(1), pp.23-41
- Hatakka, M., Ater, S., Obura, D., and Mibei, B., 2014. Capability Outcomes from Educational and ICT Capability Inputs—An Analysis of ICT Use in Informal Education in Kenya. *The Electronic Journal of Information Systems in Developing Countries*, 61(1), pp. 1-17
- Heeks, R., 2002. Information systems and developing countries: Failure, success, and local improvisations. *The Information Society*, 18(2), pp. 101–112.
- Heeks, R., 2003. *Most e-government-for-development projects fail: how can risks be reduced?* Manchester: Institute for Development Policy and Management, University of Manchester.
- Heeks, R., 2007. Impact assessment of ICT4D projects: a partial review of frameworks. *Manchester: Institute for Development Policy and Management*.
- Heeks, R., 2008. Success and failure in e-government projects. *Success and Failure in eGovernment Projects*. [online] Available at: <<http://www.egov4dev.org/success/>> [Accessed 24 July 2016]
- Heeks, R., 2014. ICT4D 2016: New priorities for ICT4D policy, practice and WSIS in a post-2015 World. [online] Available at: <[http://hummedia.manchester.ac.uk/institutes/gdi/publications/workingpapers/di/di\\_wp59.pdf](http://hummedia.manchester.ac.uk/institutes/gdi/publications/workingpapers/di/di_wp59.pdf)> [Accessed 24 July 2016]
- Jigawa State Institute of Information Technology, 2016. Home page [online] Available at: <<http://jsiit.edu.ng/>> [Accessed 4 March 2016]
- Klein, H., and Myers, M., 1999. A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. *MIS Quarterly*, 23(1), pp. 67-93. Doi:10.2307/249410
- Kleine, D., 2010. ICT4WHAT?—Using the choice framework to operationalise the capability approach to development. *Journal of International Development*, 22(5), pp. 674–692. DOI: 10.1002/jid.1719
- Kleine, D., 2013. *Technologies of choice?: ICTs, development, and the capabilities approach*. Cambridge, MA: MIT Press.
- Ministry of Education, 2010. *Jigawa Annual education sector Performance report*. Dutse: Ministry of Education.
- National bureau of statistics, 2016. *National bureau of statistics census data*. [online] Available at: <<http://www.nigerianstat.gov.ng/>> [Accessed 7 December 2014].
- National bureau of statistics, 2012. *Nigerian Poverty Assessment report*. [online] Available at: <<http://www.nigerianstat.gov.ng/pdfuploads/Nigeria%20Poverty%20Profile%202010.pdf>> [Accessed 26 January 2016]
- Nigeria Population Commission, 2016. *National Census Result*. [online] Available at: <<http://www.population.gov.ng/files/nationafinal.pdf>> [Accessed 4 March 2016]
- Qureshi, S., 2013a. Information and Communication Technologies in the Midst of Global Change: How do we Know When Development Takes Place?, *Information Technology for Development Volume 19*(3), pp. 189–192. <http://dx.doi.org/10.1080/02681102.2013.818827>
- Qureshi, S., 2013b. In the Age of Popular Uprisings, what is the Role of Public Access Computing and Social Media on Development?, *Information Technology for Development Volume 19*(4), pp. 267–270. <http://dx.doi.org/10.1080/02681102.2013.840947>
- Raiti, G. C., 2007. The Lost Sheep of ICT4D Research. *Information Technologies & International Development*, 3(4), p.1.
- Renken, J., and Heeks, R., 2013. Conceptualising ICT4D project champions. In *Proceedings of the Sixth International Conference on Information and Communications Technologies and Development: Notes-Volume 2* (pp. 128-131). ACM.
- Rislana, K., Good, A., Adams, C., and Scott, P., 2015. Information and Communication Technologies for Development (ICT4D): A case study of Jigawa State Government in Nigeria. In *Proceedings of the 15th European Conference on eGovernment 2015: ECEG 2015* (p.427). Academic Conferences Limited.
- Rislana, K., Good, A., Adams, C. and Scott, P., 2016.. The Role of ICT Education and Trainings in Poverty Reduction and Economic Empowerment: A Case Study of Jigawa State Government ICT4D Intervention. In *ECEG2016-Proceedings of 16th European Conference on e-Government ECEG 2016* (p. 177). Academic Conferences Publishing Limited.
- Robeyns, I., 2005. The capability approach: a theoretical survey. *Journal of Human Development*, 6(1), pp. 93-117.
- Sen, A., 1999. *Development as freedom*. Oxford: Oxford University Press.
- Sen, A., 2004. Capabilities, lists, and public reason: continuing the conversation. *Feminist Economics*, 10(3), pp. 77-80.
- Sen, A., 2010. The mobile and the world. *Information Technologies & International Development*, 6(SE), pp. 1.
- Suchman, L. A., 1987. *Plans and situated actions: The problem of human-machine communication*. Cambridge: Cambridge University Press.
- Taiwo, O., 2008. *Jigawa Informatics - Base for Country's Silicon*. [online] Available at: <<http://allafrica.com/stories/200809050534.html>> [Accessed 8 March 2016]
- Thapa, D., 2012. *Exploring the link between ICT intervention and human development through a social capital lens: The case study of a wireless project in the mountain region of Nepal*. Kristiansand: Universitet i Agder/University of Agder.
- Tshivhase, M., Turpin, M., and Matthee, M., 2016. The use of Sen's capability approach in ICT4D: an exploratory review *CONF-IRM 2016 Proceedings*. [online] Available at <<http://aisel.aisnet.org/confirm2016/10>> [Accessed 25 October 2016]

- Walsham, G., 1995. Interpretive case studies in IS research: nature and method. *European Journal of information systems*, 4(2), pp. 74-81.
- Van den Hoven, J., and Rooksby, E., 2008. Distributive justice and the value of information: A (broadly) Rawlsian approach. *Information Technology and Moral Philosophy*. [online] Available at <[http://assets.cambridge.org/97805218/55495/frontmatter/9780521855495\\_frontmatter.pdf](http://assets.cambridge.org/97805218/55495/frontmatter/9780521855495_frontmatter.pdf)> [Accessed 17 June 2016]
- Venkatraman, N., 1989. The concept of fit in strategy research: Toward verbal and statistical correspondence. *Academy of management review*, 14(3), pp. 423-444.
- Yin, R. K., 2013. *Case study research: Design and methods*. London: Sage publications.