Adapting & Responding to ICTs – a Study of Two Municipalities in Rural South Africa

A Masters dissertation prepared by

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ABSTRACT

The post-apartheid restructuring of South Africa's water sector has left the responsibility of planning, access and provision of water with local government. Local municipalities, which lack the "financial and human resources to deliver on their constitutional and legal mandate and on citizen expectations" (Department of Co-operative Governance and Traditional Affairs [CoGTA], 2009), constitute 71% of South Africa's local government. This means that a large proportion of South Africa's local government does not possess sufficient capacity to fulfil their legal responsibilities.

Information and Communication Technologies (ICTs) and the potential for improved capacity they provide is not a new concept, especially to the fields of education, health and governance. For instance, South Africa's Local Government Association (SALGA) developed a guide and roadmap for successful ICT governance in local municipalities. They recognised the importance of aligning governance and ICTs to improve the role of local municipalities, and while many examples of ICTs successfully improving capacity do exist, there are also many other examples where they failed to do so. Literature identifies the reasons for failure and suggests ways to address them so that ICTs have the maximum possible impact on improving capacity, however, many ICTs still fail, especially in developing contexts. This is because most studies in the field of ICTs focus on the impact they have on capacity and not vice versa. Not many studies research the impact that existing capacities have on ICTs, and especially not when the ICTs have already been designed to overcome those challenges usually associated with failure in developing contexts.

In view of this, the purpose of this study was to assess what impact rural local municipalities' existing conditions and capacities have on the implementation and use of ICTs and hence the change in capacity ICTs seek to bring about in the first instance. Additionally, the study assessed whether ICTs bring about any measurable change in low-capacity environments.

Two local municipalities in rural Eastern Cape of South Africa, which were looking to improve their capacities to resolve issues of water and sanitation service delivery and maintain customer relations, were identified as the study sites. An ICT system, which sought to address and improve upon the challenges associated with each municipality's customer relations and management of complaints, was co-designed and implemented using best practices, so as to overcome the challenges usually associated with ICT failure in developing contexts.

Using the Adaptive Capacity Wheel (Gupta, Termeer, Klostermann, Meijerink, van den Brink, Jong, Nooteboom, & Bergsma, 2010), a comprehensive comparative analysis between the pre- and post-ICT implementation capacities of each municipality was undertaken (both to resolve issues of water and sanitation service delivery, maintain customer relations, and to adapt and respond to the change the ICT system sought to bring about).

The results showed that the existing conditions and capacities of each municipality did impact the implementation and use of the ICT system. Despite the ICT system being co-designed with the municipalities and their communities to best suit their current conditions, financial and human resource challenges still resulted in each municipality adapting the use of the system to their particular environment. While the adaptations in use benefitted the municipalities, by improving their complaints management and resolution, it negated any benefits the system offered citizens and, as a result, impacted customer relations negatively. The results also showed that ICTs do result in measurable change in low-capacity environments. They are not always the changes expected or designed for, but can, from certain perspectives, end up being the most important.

Overall, it is hoped that this study contributes to the discourse of ICT4D implementations in low-capacity environments in relation to the assumption that ICTs inevitably improve capacity. It also highlights the importance of an ongoing debate to rethink the various definitions of ICT for development.

ACKNOWLEDGEMENTS & PLAGIARISM DECLARATION

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Person	Affiliation
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1 INTRODUCTION

1.1 BACKGROUND & RATIONALE

"Everyone has the right to have access to sufficient food and water."

(Constitution of South Africa, 1996, Section 27(1)(b))

The restructuring of South Africa's water sector, post the apartheid era, left local government with the responsibility of providing water, as per its constitution. In South Africa, 81% of local government consists of local municipalities. 87% of these local municipalities do not have adequate capacity and face serious challenges in fulfilling their obligations (Alexander, 2010; CoGTA, 2009; Department of Water Affairs [DWAF], 2012a, 2012b; Rivett, Taylor, Forlee, Mrwebi, & Chigona, 2013).

The field of ICTs is driven by the notion that they can improve the capacity of organisations (Ndou, 2004; Asgarkhani, 2005; Bertot, Jaeger, & Grimes, 2010; Heeks, 2003; Rouse, 2005; South African Local Government Association [SALGA], 2012). Examples of such successes exist (Anzaldi, 2014; Bobillier Chaumon, Michel, Tarpin Bernard, & Croisile, 2013; Dawson, Mcwilliam, & Tan, 2008; Ndou, 2004; Qiang, Yamamichi, Hausman, Miller, & Altman, 2012) but there are arguably an equal number of ICT interventions that failed (Best & Kumar, 2008; Jayasuriya, 1999; Madon, Reinhard, Roode, & Walsham, 2009; Pade, Mallinson, & Sewry, 2006; Robertson, 2003).

While reasons for ICTs being unsuccessful and ways to address the experienced shortcomings are given in literature, many ICT projects still fail to improve capacity, especially in developing and/or rural contexts (Clockwork, 2004; Cruickshank & Deakin, 2011; Gichoya, 2005; Heeks, 2003; Kimaro, 2006; Ndou, 2004).

The hypothesis of this research is that improved capacity through an ICT depends on an organisation's existing conditions and its inherent ability to adapt and respond to change (also known as adaptive capacity (Gupta et al., 2010)). It explores this idea by investigating the extent to which an ICT intervention improves capacity when introduced into institutions that have a low adaptive capacity to begin with. The perception is that if the existing conditions and adaptive capacity levels of institutions are not sufficient enough, the implementation and use of ICT interventions will be impacted, to the extent that the ICT results in little to no change in capacity at all.

Two local municipalities, in rural Eastern Cape of South Africa, were identified as study sites for this research. Both identified a need to improve and maintain their customer relations as well as better manage and resolve issues relating to water and sanitation service delivery. To do this, both municipalities wanted to implement an ICT intervention that streamlined and improved upon the processes already place.

1.2 RESEARCH QUESTIONS

The research questions are as follows:

1. How do the existing conditions of rural municipalities impact the implementation and use of ICTs and hence the change in capacity they (the ICTs) seek to bring about?
2. Do ICTs bring any measurable change in low-capacity environments?

1.3 RESEARCH OBJECTIVES

The objectives of the study are to:

1. Establish the status quo of two rural municipalities with regard to their capacities to resolve issues of water and sanitation service delivery and maintain customer relations.
2. Implement and monitor their use of a co-designed ICT intervention that addresses and improves upon the challenges associated with customer relations and managing complaints of water and sanitation service delivery.
3. Establish each municipality's capacity to resolve issues of water and sanitation service delivery and maintain customer relations post-ICT implementation.
4. Analyse if and how the capacity of each municipality changes as a result of the ICT intervention.
5. Provide answers to the research questions stated above, from these results.

1.4 ASSUMPTIONS, LIMITATIONS & ETHICAL CONSIDERATIONS

The assumptions and limitations of the study are described as part of the research methodology under Chapter 3. Aspects, such as the choice of municipality, which may be seen as a limitation, are clarified under the same chapter. It has also been highlighted in the text if and where other assumptions have been made.

Based on ethical approval for the study from the University of Cape Town, the municipalities had to be anonymised from Chapter 3 onwards. This is highlighted under Section 3.2. This included the quotation of participants. Interviewing people in powerful positions and potentially exposing them by revealing who they are was simply not an option in this study, especially considering that in these contexts, the relationships between the municipalities and citizens were already at a low point.

2 LITERATURE REVIEW

2.1 SOUTH AFRICA'S WATER SECTOR

South Africa's water sector has experienced a substantial restructuring post the apartheid era. This includes aspects such as "updated water acts, developed water policies, and restructured water resource management resulting in significant institutional changes" (Lindfors, Hudgson & Manus, as cited in Rivett et al., 2013, p. 10).

The Constitution of South Africa, adopted in 1996, states that "everyone has the right to have access to sufficient food and water" (Constitution of South Africa, 1996, Section 27(1)(b)) and requires the Government to "take reasonable legislative and other measures, within its available resources, to achieve the progressive realization of each of these rights" (Constitution of South Africa, 1996, Section 27(2)).

Figure 2-1 illustrates the roles and responsibilities of water service delivery in South Africa. It can be seen that while national government develops policies, legislation and guidelines and sets the standards that water quality must meet, it is the responsibility of local government to ensure that the planning, access and provision of drinking water is achieved.

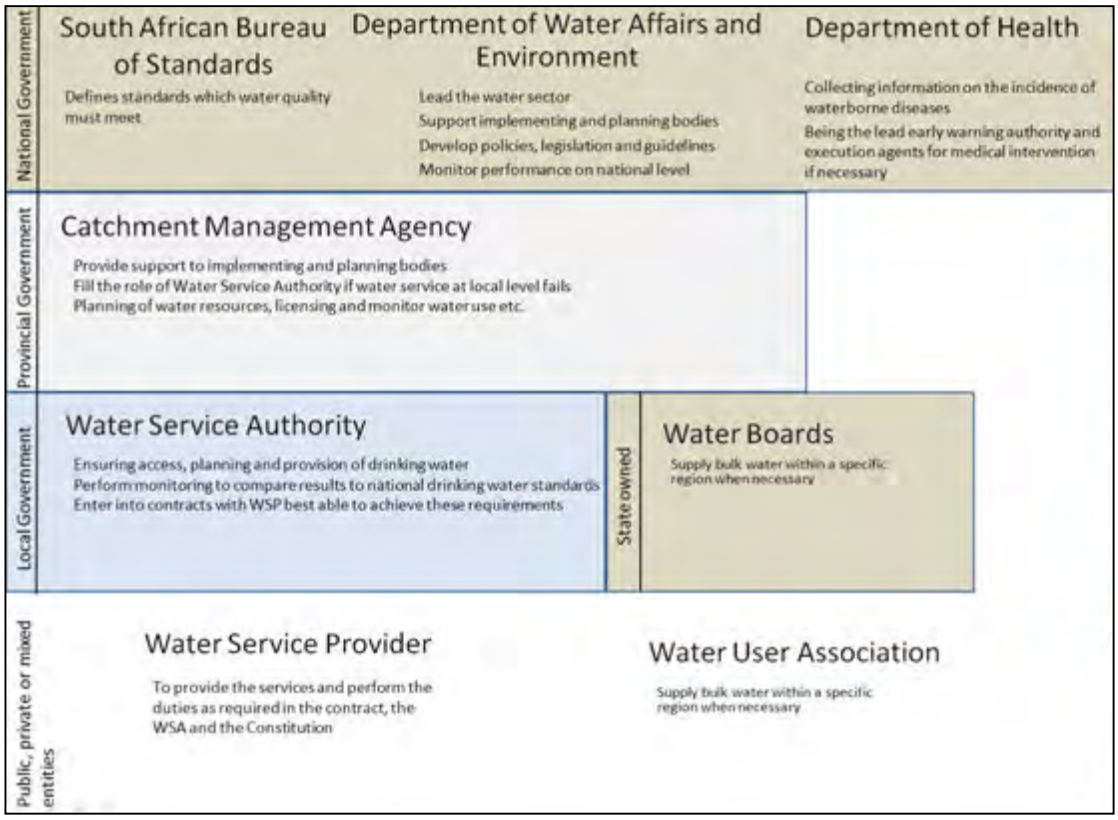

Figure 2-1: Roles and responsibilities of water service delivery in South Africa (Lindfors, as cited in Rivett et al., 2013)

In South Africa, local government is broken down into seven categories (CoGTA, 2009):

1. **Category A:** Metros – large urban complexes with populations over 1 million, accounting for 56% of all municipal expenditure in the country.
2. **Category B1:** Local Municipalities with large budgets and containing secondary cities.

3. **Category B2:** Local Municipalities with a large town as a core.
4. **Category B3:** Local Municipalities with small towns, with a relatively small population and a significant proportion of urban population but with no large town as a core.
5. **Category B4:** Local Municipalities that are mainly rural with communal tenure and with, at most, one or two small towns in their area.
6. **Category C1:** District Municipalities that are not water service authorities.
7. **Category C2:** District Municipalities that are water service authorities.

Local municipalities falling into Category B2, B3 or B4 make up 71% of South Africa's local government. Category B2 municipalities "face sustainability challenges due to urbanisation and in-migration that is accompanied with high levels of household poverty" and "require more sophisticated urban management capacity and skills to deal with spatial planning, land-use management and infrastructure life-cycle management" (CoGTA, 2009, p. 22). Category B3 and B4 municipalities (and to a certain extent Category B2 municipalities) "are very vulnerable both from a revenue generation and from institutional development perspective" (CoGTA, 2009, p. 22). Municipalities in these categories (B2, B3 and B4) are also often situated in economically depressed areas having "difficulty in attracting and retaining skilled managers, professionals, and technicians" (CoGTA, 2009, p. 22) and "generally lack the financial and human resources to deliver on their constitutional and legal mandate and on citizen expectations" (CoGTA, 2009, p. 33). Many of South Africa's local municipalities are, as CoGTA puts it, "seriously challenged to fulfil their obligations" (CoGTA, 2009, p. 22).

Not having the adequate capacity to fulfil their obligations results in additional challenges. These include (but are not limited to): little or no access to water for citizens; non-compliance with water quality standards, monitoring efficiency and credibility of water samples (increasing the likelihood of waterborne diseases); heightened levels of protests by citizens; an increased vulnerability to political control; and a deterioration of institutional management and compliance (Alexander, 2010; CoGTA, 2009; DWAF, 2012).

2.2 ICTS & CAPACITY

Rouse (2005) defines ICTs as an umbrella term for any communication devices or applications that can include (but are not limited to) radios, televisions, mobile phones, computer hardware, computer software, network hardware, network software and satellite systems (as well as the services and applications associated with these). Rouse (2005) further states that ICTs are usually spoken of in particular contexts such as ICTs in education, ICTs in health care, or ICTs in governance. As Ndou (2004) points out, ICTs offer governments the opportunity for increased capacity. Many countries in fact have organisations that promote the use of ICTs in governance (Rouse, 2005).

In South Africa, for example, SALGA developed a guide and roadmap for successful ICT governance for local municipalities in 2012. The purpose of this being to "foster innovation and implementation of ICT projects" (Rivett et al., 2013, p. 53).

As Rivett et al. (2013) point out, SALGA recognised the importance of aligning governance and ICTs to improve the role of local municipalities:

"ICT's can be better leveraged to improve effective administration, service delivery and socio-economic development and that ICTs should therefore be integral to the functioning of any well run municipality" (SALGA, as cited in Rivett et al., 2013, p. 54).

Put differently, SALGA recognised what Ndou (2004) highlighted: ICTs offer a potential means of enhancing the capacities of local municipalities.

While the definition of capacity varies according to the context in which it used, Oxford Dictionaries (2015) defines capacity in general terms as “the ability or power to do or understand something” (Oxford Dictionaries, 2015). If this definition of capacity is used in the context of local municipalities, one can say that ICTs offer a potential means for local municipalities to improve their ability or power for “effective administration, service delivery and socio-economic development” (SALGA, as cited in Rivett et al., 2013, p. 54) – an opportunity for increased capacity to fulfil their obligations as set out by national government.

Asgarkhani (2005) and Bertot et al. (2010) highlight that for ICTs to provide this potential for increased capacity (whether in education, healthcare or governance) their implementation must be based on sound policy that promotes their effective utilisation. Some examples of ICTs being utilised effectively to increase capacity are listed below:

- ICTs were introduced and used to increase the quality of life and physical, intellectual and social capacities of elderly persons living in residential home care units (Bobillier Chaumon et al., 2013).
- By analysing the data generated by ICTs in online education, the capacity of teachers to identify “at risk” students earlier on and reallocate resources to improve and optimise their patterns of learning behaviour was increased (Dawson et al., 2008).
- A combination of Service Oriented Architecture (SOA) with Multi-Agent System (MAS) was used to successfully integrate water supply and distribution management that had previously been limited to isolated, uncoordinated solutions (Anzaldi, 2014).
- In a World Bank Report compiled by Qiang et al. (2012) it was shown that the health sectors of three different countries (Haiti, India and Kenya) improved in access to information, speed of information delivery, patient registrations per day, percentage of missed appointments, and access to medicines through the use of mobile technologies.
- In Sao Paulo, Brazil, services such as vehicle registration, driver’s license, identification card, unemployment insurance etc. were traditionally separated. The Time Saver Center was established as a response to this and allows citizens “requiring a service” to “register in the computerized tracking system and receive an electronic ticket, which indicates the services desired and the estimated waiting time” (Ndou, 2004, p. 10). Citizens could now register for different services at the same time.

However, there are also challenges associated with the successful and sustainable implementation and use of ICTs and as a result, many ICT interventions have failed to increase capacity:

- In his journal article on rethinking the failure of ICTs in transforming American schools, Robertson (2003) points out that while originally seen as the panacea to improving teaching and learning, ICTs have in fact been “an unambiguous failure” (President’s Committee, as citied in Robertson, 2003, p. 323).
- The Sustainable Access in Rural India (SARI) Project provided information and communication services through computers and Internet kiosks in rural communities and aimed to enhance rural social, economic, and political development. Although initially successful, it failed in the longer term due to financial, technological, informational, managerial, information, technical, cultural, structural, process, and strategic factors (Best & Kumar, 2008).
- In the Philippines, a public health services information system seeking to standardise data collection and reporting, improve data reporting times, maintain databases for future utilisation, reduce the time taken to prepare statistical reports, and improve the flow of information to provincial government and the Department of Health was implemented. The design however incorrectly assumed that sufficient skills and adequate technological infrastructure existed and that information outputs similar to Western health care organisations were required and, as a result, failed (Jayasuriya, 1999).
- The Dwesa Project looked to improve the capacity for tourism development in Dwesa (located in the Eastern Cape of South Africa) by promoting e-commerce in tourism (for example booking

accommodation online and acquiring historical information from citizens of the area). Two factors that hampered its sustainability were the needs of the community not being understood and an inappropriate approach to the training of the "rural teachers" (Pade et al., 2006, p. 105).

- The Sustainable Development Initiative (SDI) of South Africa (an expansion of the Siyabuswa Educational Improvement and Development Trust) aimed to build human capacity in rural communities through careful and planned use of ICTs. It failed due to the notion of 'for and by the community' never being established, citizens being suspicious of the project initiators' and trainers' motives, and poor support from the provincial Department of Social Development (Roode et al. & Phahlamohlaka et al., as cited in Madon et al., 2009).

Factors that have an influence on ICTs being unsuccessful in their implementation and/or sustainability thus include (but are not limited to) infrastructure, finance, data systems, compatibility, skills, human resources, politics, leadership styles, bureaucracy, culture, coordination, ICT policy and legislation, work practices, and responsibilities (Gichoya, 2005; Kimaro, 2006; Ndou, 2004).

For an ICT to have the maximum possible impact, the above-mentioned factors need to be minimised. Heeks (2003) suggests using the ITPOSMO Model to reduce the so-called gaps between the design of the ICT and the reality or context into which it will be implemented. But as Gichoya (2005) points out, this model assumes that the ICT's designers are from or have been trained in developed countries and that their knowledge of the local reality is insufficient. After reviewing several successful applications of ICTs, Clockwork established a set of best practices for implementing ICTs in developing countries:

- "Do not underestimate the complex environment in which ICT programs evolve. ICT projects are too often believed to have a technology focus.
- Be sure to select a project that is expected to demonstrate the greatest benefit for your target group.
- Government staff should be 're-skilled' to anticipate the changes that accompany an ICT structure and new roles.
- Identify the right technologies.
- Make a decision on how an organizational process fits your technology.
- Strong program and project management is essential to develop and implement successful ICT solutions.
- Do not underestimate the total cost of ownership of an ICT project." (Clockwork, as cited in Gichoya, 2005, p. 180)

Co-design, as an approach to ICT design, offers a means of addressing the factors of failure and achieving the best practices suggested by Clockwork. This is because it creates a so-called road map that allows all stakeholders, interests, goals and/or perspectives to be involved and make constructive contributions towards the development of a particular service (Cruickshank & Deakin, 2011).

Cruickshank and Deakin (2011) define co-design as "engagement by those responsible for delivery of a service or product with stakeholders in general, and with the end user/customer/citizen in particular" (Cruickshank & Deakin, 2011, p. 6). For the private sector, co-design is usually driven by product development and requires relationships to be set up between companies and their customers and maintained long-term. For the public sector, and specifically governments, co-design is often driven by the need to empower citizens and employs strategies that are neither provider nor customer focused – instead, collaboration is based on the notion of a citizen participating in the design from the outset (Cruickshank & Deakin, 2011). Gupta et al. (2010) agree with this, stating that organisations and institutions, although similar, are not equivalent. There are four key aspects to co-design (Cruickshank & Deakin, 2011):

1. **Participation:** Co-design is collaborative.
2. **Development:** Co-design is a developmental process.
3. **Ownership and power:** Co-design shifts power to the process.

4. **Outcomes and intent:** Co-design activities are outcome-based.

These four aspects of co-design, along with the best practices suggested by Clockwork, speak to and offer a means of addressing the issues (highlighted earlier) that surround ICT projects in developing contexts. In the context of South Africa's water sector and local governance, local municipalities are "those responsible for delivery of a service" and the communities they serve are the "the end user/customer/citizen in particular" (Cruickshank & Deakin, 2011, p. 6).

2.3 LOCAL MUNICIPALITIES AS INSTITUTIONS & ADAPTIVE CAPACITY

The literature above highlights that ICTs provide the potential to increase the capacity of local municipalities, in order to fulfil their responsibilities. It is also highlighted that the ICTs' design and implementation have to be based on sound decisions.

However, local municipalities as institutions are systems "of rules, decision-making procedures, and programs that define social practices, assign roles to the participants in such practices, and govern the interactions among the occupants of those roles" (Young, Agrawal, King, Sand, Underdal, & Wasson, 1999, p. 437). These rules and roles can exist as formal governmental policies and informal social patterns of engagement and can be either visible or latent (Young et al., 1999). Gupta et al. (2010) add to this, referring to institutions as social patterns based on cultural practices, deep-rooted lifestyles, ideological premises and norms. Gupta et al. (2010) further state that because institutions are based on the bias of previous interactions, views and/or power relations, they are inherently resistant to change. This is not to say they cannot change, but it depends on their ability to adapt and respond to that which introduces the change in the first instance.

They refer to this ability to adapt and respond as adaptive capacity. According to Gupta et al. (2010) there are no definitions of institutions that promote the concept of adaptive capacity but based on literature from Holling (1986), the Millennium Ecosystem Assessment (2006) and the IPCC (2001) Gupta et al. (2010) define adaptive capacity as "the ability of a system to adjust to … change … to moderate potential damages, to take advantage of opportunities and/or to cope with the consequences" (Gupta et al., 2010, p. 4) and further state that it should not be confused with adaptation.

When specifically applied to institutions, Gupta et al. (2010) define adaptive capacity as "the inherent characteristics of institutions that empower social actors to respond to short and long-term impacts either through planned measures or through allowing and encouraging creative responses from society both ex ante and ex post" (Gupta et al., 2010, p. 4).

Planned measures include the formal and informal characteristics, rules, norms and beliefs of institutions that enable society (individuals, organisations and networks) to cope with change, while *allowing and encouraging creative responses from society* refers to the extent to which these institutions allow and encourage themselves to be changed by actors in order to cope with change (Gupta et al., 2010).

The Adaptive Capacity Wheel or ACW (developed by Gupta et al. (2010)) represents, visually, the criteria and dimensions of institutions that may influence their ability to adapt and respond to change, i.e. the characteristics constituting institutions' adaptive capacities. It includes the factors of failure highlighted earlier by Gichoya (2005), Kimaro (2006) and Ndou (2004), which are usually associated with ICTs being unsuccessful and introduces other factors, key in determining institutions' ability to adapt and respond to change. In doing so, it provides a more holistic means of assessing the impact an institution, such as a local municipality, may have on the change in capacity an ICT seeks to bring about (refer to Chapter 3 for more details on the ACW).

Hypothetically speaking, if an institution, such as a local municipality, were conservative and resistant to change, it would have no ability to adapt and respond to the change in capacity an ICT sought to bring about and, as a result, the ICT would have a higher likelihood of failing to enhance the municipality's capacity.

Looking at the opposite extreme, if a local municipality had no measure of robustness or no resistance to change it would be equally challenged by the introduction of an ICT with a high likelihood of failing to improve capacity.

The assumption this thesis is based on is that somewhere between these two extremes lies an optimal point of institutional adaptive capacity - a point where the balance between resistance to change and openness to change allow an ICT the best possible chance of enhancing the capacity of an institution. Institutions either side of this optimal point will arguably have an impact on an ICT's implementation and sustained use, perhaps even to the extent that it brings about little to no change at all.

3 RESEARCH METHODOLOGIES

3.1 INTRODUCTION

This chapter describes the research methodologies in the following sequence:

1. Description of the study sites
2. Methodology for the design, development, implementation and evaluation of an ICT system
3. Methodology for analysing the capacity of municipalities

3.2 STUDY SITES

As mentioned before, two local municipalities, located in rural Eastern Cape of South Africa, were identified as study sites for this research**.** These were selected based on a set of rurality criteria and an assessment of their preparedness to participate. Details of this process can be found in a separate report (K5/2114) presented to the Water Research Commission that can be downloaded from the WRC Knowledge Hub (to be published in July 2016).

Figure 3-1 shows the Eastern Cape in relation to the other eight provinces of South Africa. Figure 3-2 illustrates how the Eastern Cape is subdivided into two metropolitan municipalities (Nelson Mandela Bay and Buffalo City) and six district municipalities (Alfred Nzo, Joe Gqabi, OR Tambo, Chris Hani, Amathole and Cacadu). The district municipalities are further subdivided into 37 local municipalities. The two selected for this research were Kou-Kamma Local Municipality (LM) and Ndlambe Local Municipality (LM), both situated in the Cacadu District (Figure 3-3). Each municipality indicated which towns were able to cope with research projects of this nature, since it required the municipalities to make resources, such as staff, available.

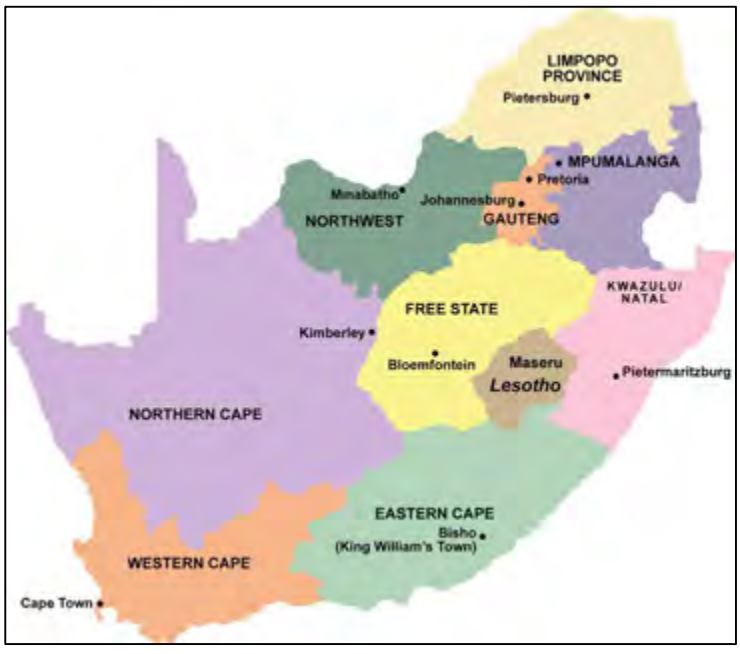

Figure 3-1: South Africa and its nine provinces (Elite Excursions, 2009)

Figure 3-2: Municipalities of the Eastern Cape (Local Government, 2012a)

Figure 3-3: Map of Cacadu District (Local Government, 2012b)

The following two sections provide a brief overview of each local municipality. Details pertaining to the current challenges faced and why there was a hope that the ICT intervention would bring about a change in each municipality are discussed under Chapter 4: Pre-ICT Implementation Capacity Analysis and Chapter 5: The ICT System. It must be noted that in order to comply with ethics, the municipalities were kept anonymous during the analysis and findings sections. As mentioned under Section 1.4, this included the quotation of participants under Chapters 4 and 6. Interviewing people in powerful positions and potentially exposing them by revealing who they are was not an option in this study, especially considering that in these contexts, the relationships between the municipalities and citizens were already at a low point.

3.2.1 Kou-Kamma Local Municipality

Kou-Kamma LM is a Category B2 municipality, covering an area of 12,570km^2 and houses a population of approximately 41,000 people. According to Stats SA (2011a) the population is made up of 60% Coloured, 31% Black, 9% White people and less than 1% people of Indian or Asian decent. 1.1% of the population is classified as Other.

Afrikaans is the predominant language in Kou-Kamma (with 74% of the population speaking it), followed by Xhosa (at 20%) and then English (at 2.5%) (Stats SA, 2011a).

Kou-Kamma's unemployment rate is 15%, with 17.6% of Kou-Kamma's population having completed matric while 3.9% have some form of higher education (Stats SA, 2011a).

Kou-Kamma LM is both the Water Service Authority (WSA) and Water Service provider (WSP) for its area (see Figure 2-1). As illustrated in Figure 3-4, 64.7% of Kou-Kamma's households receive their water from a municipal water scheme, with the second largest water source being boreholes (for 14.6% of households), followed by dams, pools and/or stagnant water (for 10.7% of households).

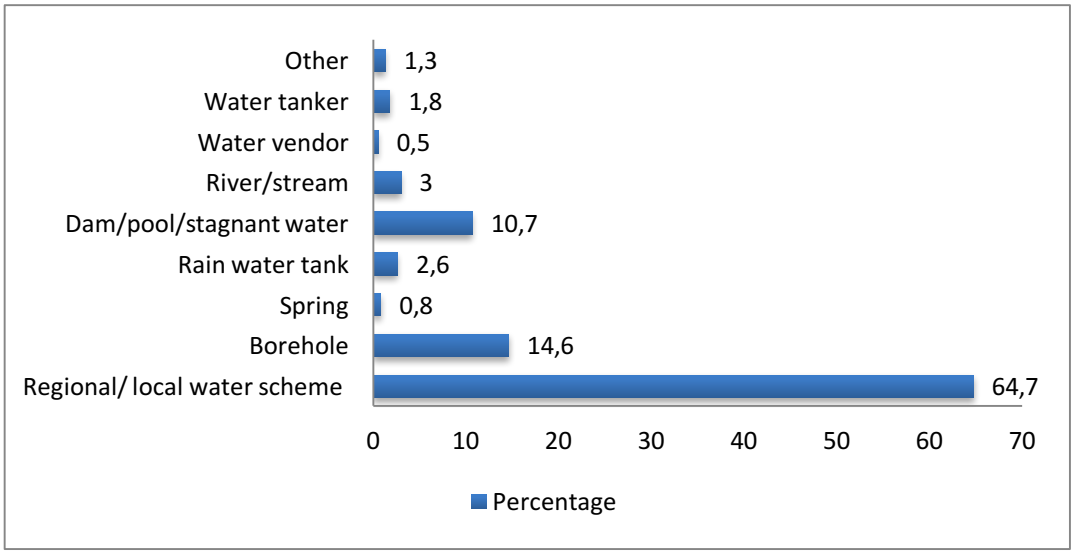

Figure 3-4: Water sources for Kou-Kamma (Stats SA, 2011a)

Referring to Figure 3-5, in terms of access to sanitation, 68% of the population have a flush toilet connected to a sewerage system. However, a major service delivery challenge facing Kou-Kamma LM is the geographical distances that exist between its communities. This places a high demand on their limited resources. The towns (or communities) selected as part of the study were Kareedouw, Joubertina and Storms River.

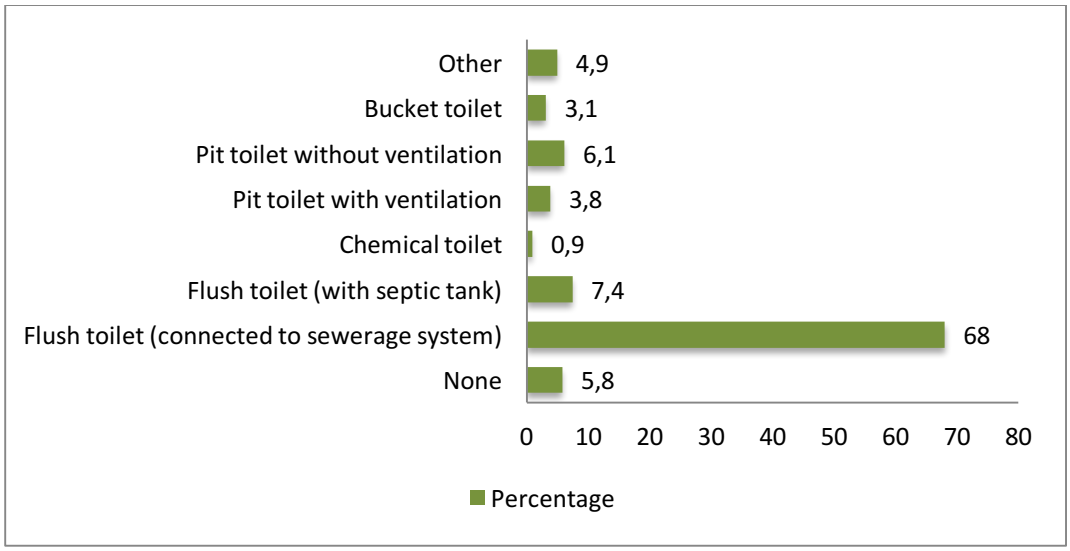

Figure 3-5: Sanitation facilities for Kou-Kamma (Stats SA, 2011a)

3.2.2 Ndlambe Local Municipality

Ndlambe LM is a Category B2 municipality serving a population of approximately 61,000 people. According to Stats SA (2011b) the population is made up of 78% Black, 14% White, 7% Coloured people and less than 1% people of Indian or Asian descent. The dominant language spoken is Xhosa (77.7%), followed by English (12.2%) and Afrikaans (11.7%) (Stats SA, 2011b).

Ndlambe's unemployment rate is 30%, with a large portion (approximately 42%) of female-headed households. Literacy rates are estimated to be 54%, which is below the provincial average of 60.2%. 20.1% of the population have completed matric and 9.9% have some form of higher education (Stats SA, 2011b)

Ndlambe LM is also a WSA and a WSP with the Amatola Water Board (see Figure 2-1). 83.2% of Ndlambe's households receive their water from a municipal water scheme (see Figure 3-6). The second largest water source, for 8.1% of households, is rainwater tanks, followed by boreholes (for 3.8% of households).

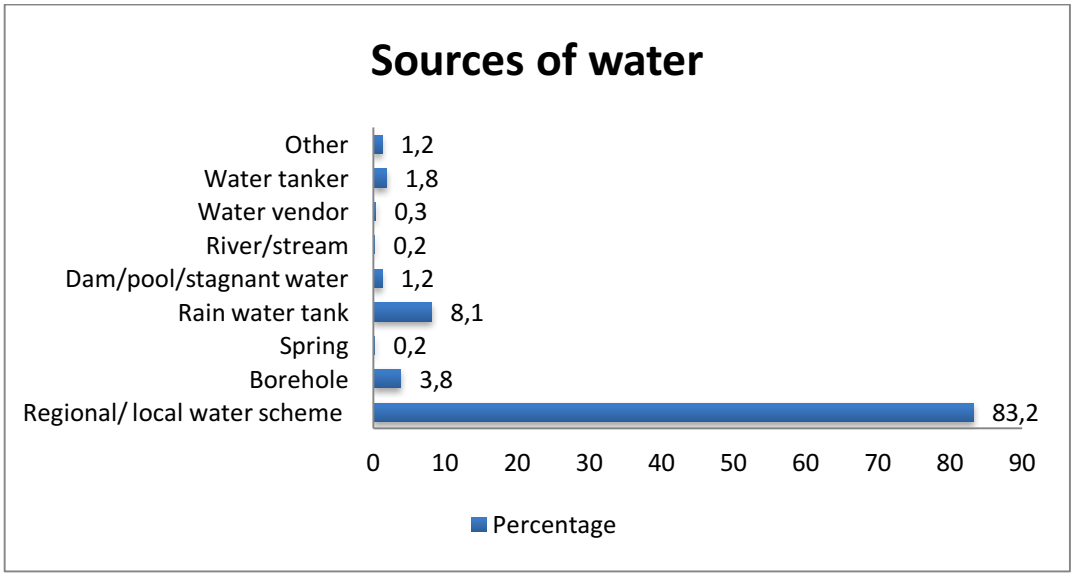

Figure 3-6: Water sources for Ndlambe (Stats SA, 2011b)

In terms of access to sanitation, 35.6% of the population have a flush toilet connected to a sewerage system, 25.1% have access to a flush toilet connected to a septic tank and 20.6% of households have access to a pit toilet without ventilation (see Figure 3-7), the last one of which is currently the minimum requirement for dignified sanitation in South Africa. (Stats SA, 2011b; Tissington, 2011) The communities selected as part of the study were Port Alfred, Alexandria and Bathurst.

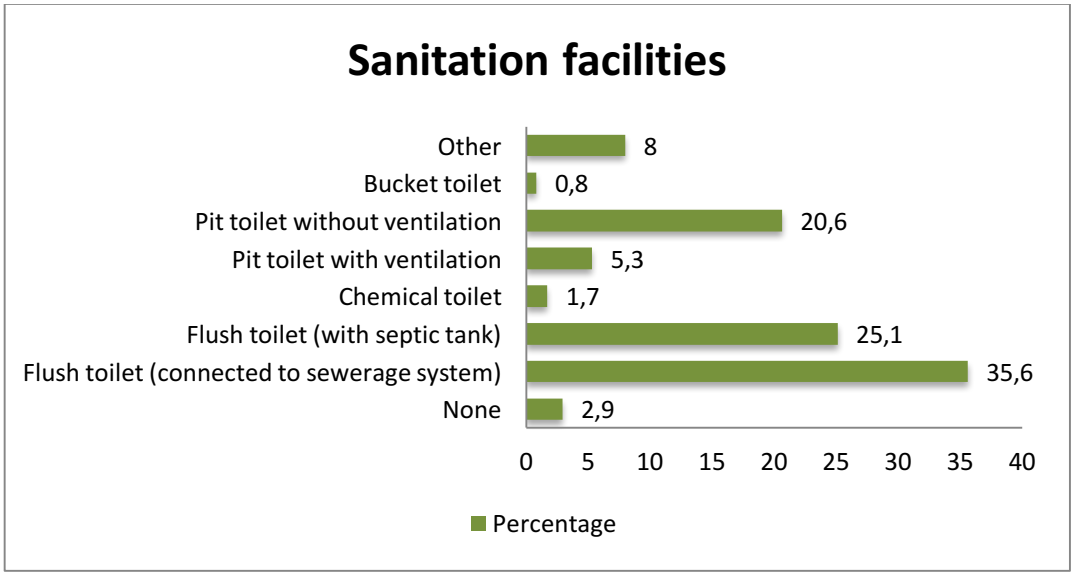

Figure 3-7: Sanitation facilities for Ndlambe (Stats SA, 2011b)

3.3 METHODOLOGY FOR THE DESIGN, DEVELOPMENT & IMPLEMENTATION OF AN ICT SYSTEM

This section provides a brief overview of the methodologies used for the design, development and implementation of the ICT system. Although designed and implemented using a co-design approach (to overcome the challenges usually associated with ICTs in rural contexts and to follow the best practices proposed by Clockwork), the ICT is not the focus of this thesis. Chapter 5 covers details on its design, development, implementation and use, but the ICT system itself is not evaluated in this document. A detailed and more comprehensive review of the ICT system was presented to the Water Research Commission as a separate report (K5/2114) and can be downloaded from the WRC Knowledge Hub (to be published in July 2016). The intention of the research presented in this thesis was to implement an ICT system and study the change it brought about versus the change it sought to bring about, without necessarily determining upfront if an ICT system itself was part of the requirements for the municipalities, i.e. the requirement analysis focused mainly on the design components of the ICT system rather than questioning if an ICT solution would be the most appropriate.

3.3.1 Methodology for the Design & Development of the System

The co-design approach, as described by Cruickshank and Deakin (2011), was used for the design of the ICT system. This approach meant that the communities, municipalities, researchers and developers were all co-designers of the system. Doing so also avoided the paternalistic notions usually associated with development (Rivett et al., 2013).

Semi-structured interviews were held with the municipalities between March 30th 2014 and April 4th 2014. The number of interviews (and number of people present during each interview) was determined largely by the availability of municipal staff members. Staff members present during these interviews included municipal

managers, water and sanitation managers, IT managers, infrastructure officers and/or public coordination officers. The number of people per interview varied between a minimum of 3 (researchers included) and a maximum of 15. The semi-structured nature of the interviews gave insight into details surrounding the municipal structures, current practices, workflow processes, community engagement practices and the overall enablers and barriers to implementing an ICT system.

To gain insight into the views held by citizens (and establish whether they matched those of the municipalities) meetings with communities were held in May 2014. In Kou-Kamma LM the communities of Stormsriver, Joubertina and Kareedouw were interviewed and in NIdambe LM the communities of Bathurst, Port Alfred and Alexandria were interviewed.

For both sets of interviews (municipal and communal) five topics were covered:

1. Municipal Structure
2. Water and Sanitation Services
3. Service Delivery
4. Customer Relations
5. Existing Information Systems

A Water Research Commission seminar was held in Port Elizabeth, South Africa, on the July 17th 2014. The research and findings from the interviews were presented to a group of stakeholders from the municipalities as well as members from the research community. The feedback provided after these presentations was integrated into the final conceptual design of the system (see Figure 5-1).

3.3.2 Methodology for the Implementation of the System

The ICT system was introduced to the municipalities and their communities between October 27th and October 30th 2014.

Communities were informed through public meetings and pamphlets, which described the new system and the revised processes for engaging with the municipalities. The same pamphlets were also distributed at central locations within each community such as libraries, shops and post offices. Community members who attended the meetings were also given additional pamphlets to hand out to fellow community members.

Training workshops were held with those municipal staff members that would be using the system. They were also given a test login earlier in October 2014 to test the system prior to any training. This was to understand the level of self-evidence the system offered.

3.4 METHODOLOGY FOR ANALYSING THE CAPACITY OF MUNICIPALITIES

3.4.1 Introduction

The Adaptive Capacity Wheel (ACW) (Gupta et al., 2010) was used to assess two aspects of each municipality:

1. Their conditions and capacities to resolve issues of water and sanitation service delivery and maintain customer relations.
2. Their inherent capacities to adapt and respond to change, i.e. their adaptive capacities.

In order to measure a change in the capacity to resolve issues of water and sanitation service delivery and maintain customer relations (a change that the ICT sought to bring about), and determine the impact that existing conditions had on the ICT's ability to do this, each municipality was assessed both before and after the ICT system's implementation.

3.4.2 The Adaptive Capacity Wheel

Developed by Gupta et al. (2010), the ACW was originally designed to provide a means of assessing and visually communicating an institution's adaptive capacity to show its strengths, weaknesses and opportunities for improvement in adapting and responding to climate and/or environmental changes.

As an assessment tool the ACW is new. At the time of writing, it had only been used for the assessment of 23 law and policy documents and 2 urbanised Dutch municipalities (all in terms of their abilities to adapt and respond to drastic changes in climate and/or environment) (Gupta et al., 2010; Klostermann, Bergsma, Gupta, & Jong, 2010). Gigler (2015) points out in his book, *Development as Freedom in a Digital Age*, that most studies in the field of ICTs have only ever assessed ICTs and their impact on increasing capacity (Gigler, 2015). Very few studies have looked at the reverse scenario: the impact that existing capacities and/or conditions may have on the ICTs themselves. Given that the ACW already includes the factors of failure usually associated with ICTs being unsuccessful (Gichoya, 2005; Kimaro, 2006; Ndou, 2004), introduces new ideas (Gupta et al., 2010; Klostermann et al., 2010) that may influence ICTs' abilities to improve capacities, and allows itself to be adapted depending on the institution being assessed (documents versus municipalities), it provides a good means of determining how rural municipalities adapt and respond to the change ICTs introduce and how their (the rural municipalities) existing conditions may impact the overall success of ICTs.

The ACW consists of six dimensions, with each dimension subdivided into criteria (with 22 in total). Figure 3-8 shows the ACW with its dimensions and criteria.

Figure 3-8: The Adaptive Capacity Wheel (Klostermann et al., 2010)

The inner circle shows adaptive capacity as a whole, the middle circle the dimensions, and the outer-circle the criteria for each dimension. With reference to Figure 3-8, these dimensions are described in further detail below:

Variety

An institution is said to embed variety when it allows for a variety of problem frames and solutions. It should also allow for a variety of actors (multi-actor), levels (multi-level) and stakeholders (multi-sector) during the solution formulation process. It should also promote diversity to reach context-relevant, tailor-made policies and to allow for redundancy in the short term to promote the best long-term solutions.

Learning Capacity

An institution is said to demonstrate learning capacity when a presence of institutional patterns that promote mutual respect and trust exists. An ability of institutional patterns to learn from past experiences and improve their routines (single-loop learning) is also important, as well as evidence of changes in assumptions underlying institutional patterns (double-loop learning). Openness towards doubts and uncertainties and providing processes for monitoring and evaluating policy experiences are important for a good learning capacity.

Room for Autonomous Change
An institution is said to provide room for autonomous change when an accessibility of data (information) within institutional memory and early warning systems to individuals exist. Providing plans and scripts for action (especially in the case of disasters) that increase the ability of individuals to act, self-organise and innovate is also necessary to promote room for autonomous change.

Leadership
An institution is said to embed leadership when it encourages the rise of visionary, entrepreneurial and collaborative leadership. Visionary leadership (which includes elements of reformist, intellectual and sticks-and-carrots leadership) allows room for long-term visions and reformist leaders. Entrepreneurial leadership (which includes elements of leadership by example, designing tools to engage the market, unilateral and directional leadership) allows room for leaders that stimulate actions and undertakings. Collaborative leadership (which is also referred to as instrumental leadership) allows room for leaders that encourage collaboration between different actors (adaptive co-management).

Resources
An institution is said to be resourceful when there is provision of accepted or legitimate forms of power and the institutional rules are embedded in constitutional laws (authority), availability of expertise, knowledge and human labour (human resources), and availability of financial resources to support policy measures and financial incentives (financial resources).

Fair Governance
An institution is said to have fair governance when it promotes legitimacy, equity, responsiveness and accountability. Legitimacy is defined as public support for a specific institution, i.e. legitimate policy making that is accepted by members of society. Equity is defined by institutional rules that are fair and policy processes and outcomes that account for unequal circumstances in society. Responsiveness is defined as institutional patterns that show response to society and responsive processes that show a high degree of transparency and are able to respond to different voices in society. Accountability is defined by institutional patterns that assign responsibilities to different parties and provide clear accountability procedures.

If an institution meets all the criteria described above, it promotes a high degree of adaptive capacity (Gupta et al., 2010). The ACW is applied subjectively to each municipality, using normative judgments when scoring the different criteria. To remain scientifically relevant, it is important that the ACW be transparent and that similar results (for the same institution) be obtained when used by different researchers (Gupta et al., 2010; Klostermann et al., 2010). For this reason, a structured methodology was followed. The following section describes the steps of this methodology and how the ACW was used to assess the capacity of each municipality to resolve issues of water and sanitation service delivery and maintain customer relations both before and after the implementation of the ICT system.

3.4.3 Applying the Adaptive Capacity Wheel

The methodology for using the ACW consists of five steps:

1. Preparing for the research
2. Collecting the data
3. Analysing the data
4. Interpreting the data
5. Presenting the data

How these five steps were followed for this study is described below:

Preparing for the research
It is important to know the institution or institutional context that is to be the focus of attention for the study, for how long it will be the focus and why it will be the focus (Gupta et al., 2010). Each municipality's Water and Sanitation Department, how they manage their complaints, go about resolving issues and maintain customer relations was the focus of attention for this study.

Collecting the data
While most examples demonstrate the ACW only being used to assess an institution once (Gupta et al., 2010; Klostermann et al., 2010), it was decided that for this study the wheel would be used twice for each municipality, both before and after the ICT system's implementation. This was because the change in capacity that needed to be measured was based on the change introduced by the ICT system (see Section 3.4.1). This resulted in two rounds of data collection for each municipality.

Additionally, the pre-ICT implementation data collection required multiple information sets:

- To gain insight into details on the municipal structure, current practices, workflow processes, community engagement practices and the overall enablers and barriers to implementing an ICT system.
- To gain insight into the views held by citizens (and whether these views matched those of the municipality).
- To collect data for the ACW pre-ICT implementation assessments.

For this reason, the pre-ICT implementation interview questions, although grouped, did not mirror the dimensions of the ACW, as is prescribed by Gupta et al. (2010). The questions were instead grouped under the following six topics:

- Municipal Structure
- Water and Sanitation
- Service Delivery
- Customer Relations
- Current Information Systems
- General Information

While this meant that the questions asked during the pre- and post-ICT implementation interviews differed, the information set collected during the pre-ICT implementation interviews was still assessed using the same criteria and questions as the post-ICT implementation information set.

As stated under Section 3.3.1, the first round of interviews was held between March 31st and April 4th 2014 (for the municipalities) and May 26th to May 30th 2014 (for the communities). The follow up interviews were held between March 15th and March 19th 2015 (for the municipalities and their communities). The questions used for the pre- and post-ICT implementation interviews can be found under Appendix A and B respectively.

A software program called *Nvivo*, which allows for coding of qualitative data, was used to sort the data from all the interviews according to the criteria of the ACW. For certain criteria, such as authority, document analysis accompanied the interviews. This coincides with that prescribed by Gupta et al. (2010), who say that there are different means of collecting data (depending on the institutional context being researched) and that the means of collecting data dictate the style and types of questions.

Analysing, Interpreting and Presenting the Data

The question/s for each criterion were applied to the collected data. Each criterion was scored according to Table 3-1. To address objectivity and transparency, an explanation for each scoring was kept. The explanations and scoring form part of the findings that appear in Chapters 4 and 6. This also forms part of interpreting the data – translating the information collected into "a story that communicates the strengths and weaknesses of a specific institution or institutional context in terms of adaptive capacity" (Gupta et al., 2010). It should be clarified that statements, such as 'IT skills were also lacking' (see paragraph 3 on p. 24), made by participants during interviews were not necessarily further interpreted but rather taken at face value.

Table 3-1: Scoring the criteria of the Adaptive Capacity Wheel (Klostermann et al., 2010)

green	*lime*	*light yellow*	*light orange*	*red*
Institutional structure enhances adaptive capacity for adaptation	The structure exists, and could but is not (yet fully) applied to adaptation	Neutral score (positive nor negative effect expected)	Gap that needs to be filled to counteract negative effect on adaptive capacity	Institutional structure obstructs adaptive capacity for adaptation
Score 2	Score 1	Score 0	Score -1	Score -2

Once all criteria for a particular dimension were scored, an aggregate score for that dimension was calculated (by adding the scores and dividing by the number of criterion for that particular dimension). The aggregated scores were colour coded according to Table 3-2.

Table 3-2: Explanation of aggregated scores (Klostermann et al., 2010)

Effect on adaptive capacity	**Score**	**Aggregated scores for dimensions and adaptive capacity**
Positive effect	2	1,01 to 2,00
Slightly positive effect	1	0,01 to 1,00
Neutral or no effect	0	0
Slightly negative effect	-1	-0,01 to -1,00
Negative effect	-2	-1,01 to -2,00

The values in Table 3-2 were also the values used when scoring the overall adaptive capacity (aggregated from the scores of each dimension). Klostermann et al. (2010) argue that using a numerical scale has an advantage in that it allows for an aggregated analysis of the final content (provided a justified explanation for each criterion's score is given). This was repeated for each municipality both before and after the ICT's implementation, resulting in a total of four wheels: a pre- and post-ICT implementation ACW for each municipality. The colours in Table 3-1 and Table 3-2 were used to colour code these wheels. The pre-ICT implementation wheels can be found under Sections 4.2 and 4.3 and the post-ICT implementation wheels under Sections 6.2 and 6.3. The following chapters cover the Pre-ICT Implementation Capacity Analysis (Chapter 4), the ICT System (Chapter 5), the Post-ICT Implementation Capacity Analysis and Findings (Chapter 6) and the Conclusions and Recommendations (Chapter 7).

4 PRE-ICT IMPLEMENTATION CAPACITY ANALYSIS

4.1 INTRODUCTION

This chapter covers the assessment of each municipality's adaptive capacity as well as their capacities to resolve issues of water and sanitation service delivery and maintain customer relations before the implementation of the ICT system (described later in Chapter 5) using the ACW as described under Section 3.4.3. The information provided here forms part of 'Interpreting the data', as per the ACW methodology, i.e. it is the data from the pre-ICT interviews, translated into "a story that communicates the strengths and weaknesses of a specific institution or institutional context in terms of adaptive capacity" (Gupta et al., 2010). Section 4.2 deals with Municipality A and Section 4.3 Municipality B. As mentioned before, the municipalities were kept anonymous for ethical purposes.

4.2 MUNICIPALITY A

Figure 4-1: Pre-ICT Implementation ACW for Municipality A

Referring to Figure 4-1, before the implementation of the ICT system Municipality A's capacity to effectively resolve issues of water and sanitation service delivery and maintain customer relations was affected by three main dimensions: *Resources* (red, -2), *Room for Autonomous Change* (red, -1.67) and *Fair Governance* (red, -1.25). *Variety* (orange, -0.25) also played a role but to a lesser extent. *Learning Capacity* was slightly positive overall (lime, +0.4). *Leadership* scored the highest with each of its criteria attaining the maximum

value of positive 2 (green). Overall, Municipality A's pre-ICT conditions left it in a position where it could not adequately resolve issues of water and sanitation service delivery and maintain customer relations. The inherent capacity for Municipality A to adapt and respond to the change the ICT system sought to bring about was also found to be low (-0.46).

In terms of authority, it was found that the municipality's water and sanitation department was not effectively complying with constitutional laws. According to the Blue Drop Report of 2012 (the latest version available to the public at the time of writing), the municipality "shows no dedication to water quality management" (DWAF, 2012a, para. 1) and their performance was marked as "dismal … during the Blue Drop audit" (DWAF, 2012a, para. 1). There was no commitment to safeguarding citizens against the risks of supplying poor quality water. The Department of Water Affairs issued a warning to all residents and visitors of the area "not to consume the tap water without taking appropriate measures to improve the drinking water quality" (DWAF, 2012a, para. 1).

In terms of human resources, the municipality stated during the interviews that they often required the skills of external service providers to resolve issues. In-house skills were lacking or insufficient. Although water controllers were properly trained, there were not enough of them to cope with the current workload, i.e. the municipality was understaffed. A lack of funding was given as a reason for this. The municipality suggested that the "aging human resource teams need to retire" and be replaced by "new energetic people" (Municipal staff member, 2014) but at the same time admitted that municipal positions in rural areas were not as attractive. Potential employees did thus not see the potential for growth and opted to look for work in the bigger metros.

As Municipality A indicated during the interviews, resources were severely limited and there was a substantial reliance on external funding. Funding not being readily available compromised their access to resources and hence their ability to respond to citizens' requirements. This was repeatedly brought up during all the interview sessions.

The municipality's *Room for Autonomous Change* (red, -1.67) was largely affected by its lack of continuous access to information and ability to act according to planned actions, especially in the case of a water and/or sanitation emergency. The failure to comply with the Blue Drop standards meant that the municipality had little or no institutional memory upon which to build early warning systems to citizens and/or provide plans and scripts for action. The Blue Drop reports were only made available to the public via the municipal website and the majority of citizens only had access to the Internet via the municipal libraries. More appropriate methods, such as making hard copies available in community centres, were not used. Citizens were informed of issues using formal structures such as ward councillors and ward committee members to act as "conduits of information" (Municipal staff member, 2014) between communities and the municipality. The use of loud hailers was also a popular method for making public announcements. Notice boards, community radio stations and local newspapers existed but were underutilized. This affected citizens' ability to improvise when faced with issues of water and/or sanitation and their ability to be involved in issue resolution.

Linked to the lack of *Resources* (red, -2) and *Room for Autonomous Change* (red, -1.67) was the ability for *Fair Governance* (red, -1.25). The pre-ICT conditions did not leave the municipality in a position where it was able to effectively respond to all voices of society. Even though a first-come-first-serve policy was said to exist, the severity of an issue and its impact on the community as a whole often determined its priority and hence when it would be resolved. As highlighted by the municipality, certain areas had become more prone to developing issues and the municipality admittedly spread its resources in such a way that a "greater part of that slice" (Municipal staff member, 2014) was allocated to them. Certain citizens also felt that preferential treatment occurred with regard to the feedback they received (or did not receive). Additionally, there was no evidence of the municipality being held accountable or suffering consequences when failing to resolve issues relating to water and sanitation. The municipality had experienced no protests. Whether this was a sign of

support from citizens for the decisions being made, and hence a sign of legitimacy for the municipality, was not clear.

Variety (orange, -0.25) played less of a role in the municipality's ability to resolve issues of water and sanitation and maintain customer relations, but still had an impact. The municipality provided various means for citizens to lay complaints but most preferred to walk into offices and speak to municipal employees directly. Citizens walked into the main office or the satellite offices to lay complaints. Some called in. The municipality had phone numbers for both after hours and during the day. These were, however, not zero-rated and incurred a cost to citizens. A standby team was available to resolve issues after hours. Complaints were recorded on job cards without being transferred into a database or log book. Job cards were handed over to the technical teams in person. Technical teams tried to resolve issues within 24 hours but due to the lack of resources and/or expertise, this was generally not possible. It was reported that occasional communication between the Finance and Water Department existed. This was mainly in connection with broken water meters running high bills. Feedback to citizens was not consistent and usually only occurred if citizens followed up themselves. That said, Municipality A were in the process of building a disaster communication centre where they were hoping to have a 24-hour dedicated telephone line.

Municipality A's *Learning Capacity* was positive overall (lime, +0.4) but, as mentioned earlier, the institutional memory was low. Reference numbers were not used and hence feedback to citizens could not be given. A communications officer had been recently appointed to relay information to communities but as stated before, feedback on complaints was a problem. While the municipality did admit to experiencing challenges, it said that it did its best to solve issues and felt there was no animosity between themselves and citizens. In the event that citizens "felt alienated" or got "angry" (Municipal staff member, 2014) the municipality stated they were quick to apologise, explain the situation and, if resourcefully possible, resolved the issue immediately. Citizens did not agree with this. They felt that preferential treatment occurred.

In terms of the municipality's ability for single-loop learning, it made concerted efforts to "make a plan" (Municipal staff member, 2014) and/or change techniques of issue resolution to mitigate challenges in achieving its vision, mission and values. That said, the vision, mission, and values could not be compared with those of previous Integrated Develop Plans (IDPs) as only revisions of the 2012 – 2017 IDP were available for download from the municipality's website. The vision, mission, and values had remained unchanged throughout each revision and this indicated a lack of double-loop learning.

All those interviewed repeatedly agreed that visionary, entrepreneurial, and collaborative leadership existed within the municipality. There was an overall feeling that the current leadership did their job well and effectively, especially considering the challenges the municipality faced.

4.3 MUNICIPALITY B

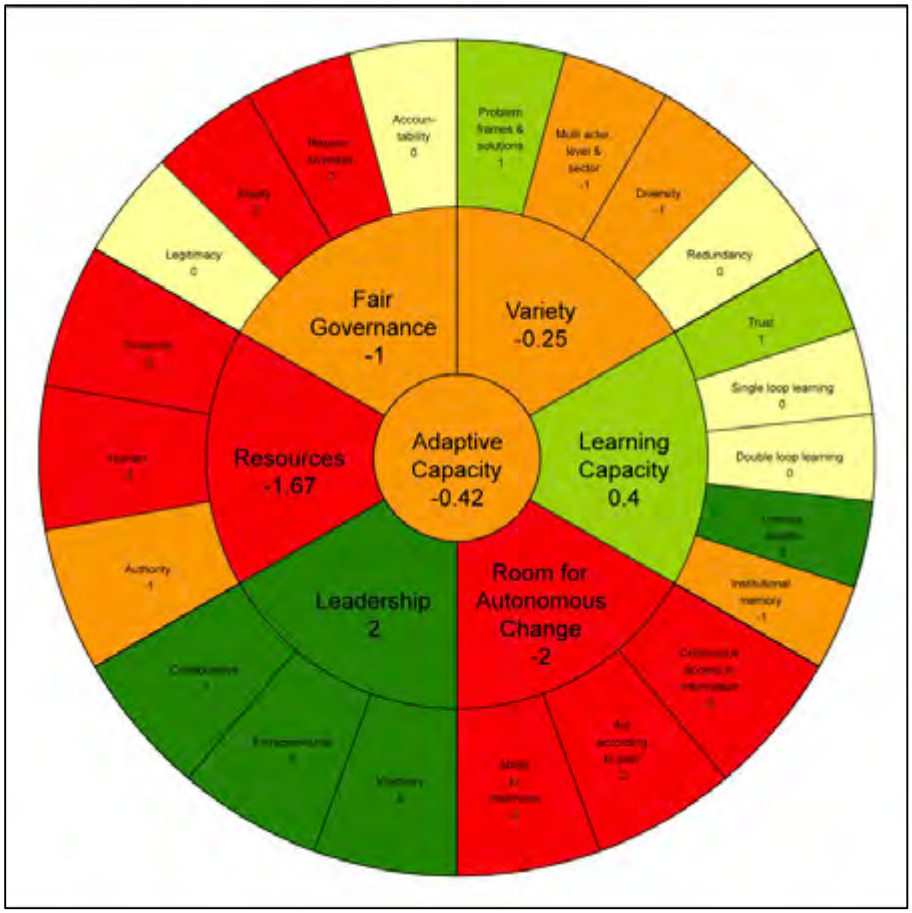

Figure 4-2: Pre-ICT Implementation ACW for Municipality B

Referring to Figure 4-2, before the implementation of the ICT system, Municipality B's capacity to effectively resolve issues of water and sanitation service delivery and maintain customer relations was affected by two main dimensions: *Room for Autonomous Change* (red, -2) and *Resources* (red, -1.67). *Fair Governance* (orange, -1) and *Variety* (orange, -0.25) also played a role but to lesser extents. *Learning Capacity* was slightly positive overall (lime, +0.4). *Leadership* scored the highest with each of its criteria attaining the maximum value of positive 2 (green). Overall, Municipality B's pre-ICT conditions left it in a position where it could not adequately resolve issues of water and sanitation service delivery and maintain customer relations. The inherent capacity for Municipality B to adapt and respond to the change the ICT system sought to bring about was also found to be low (-0.42).

Looking at authority, it was found that the municipality's water and sanitation department was not effectively complying with constitutional laws. According to the Blue Drop Report of 2012 the municipality was "not one of the easiest audit cases" (DWAF, 2012b, para. 1). Obtaining information proved difficult and "none of the water treatment works are classified in terms of the legislative requirements" (DWAF, 2012b, para. 1). Despite this, Municipality B was said to be "satisfactory in comparison with other similar sized municipalities" (DWAF, 2012b, para. 1) but that "improvement is required" (DWAF, 2012b, para. 1).

In terms of human resources, the municipality stated they experienced challenges with technical staff. Some were not qualified and did not know how to correctly treat water. A high turnaround of mid-level employees also existed, which resulted in an ongoing loss of organisational memory and retraining of new staff. IT skills were also lacking and consultants had to be brought in when issues occurred. There were also no facilities in place (both externally and internally) to teach or equip municipal staff members with the necessary skills. The

municipality rated itself as “low” (Municipal staff member, 2014) with regard to skills levels. Certain staff members also felt the skills shortage was not being taken seriously enough by the rest of the municipality.

Funding was repeatedly brought up during the interviews as the major challenge facing Municipality B. The lack of funding translated into a scarcity of readily-available resources required to fulfil their obligations to citizens.

The municipality’s *Room for Autonomous Change* (red, -2) was affected equally by its lack of continuous access to information, ability to act according to plan, and ability to improvise. Interdepartmental communication breakdown led to little or no information (regarding issues of water and sanitation) being made available to communities via the municipal website. This was despite various other platforms (such as Facebook, radio, notice boards) being available. In the case of water samples failing critical tests (such as total coliform and/or e-coli) communities were not immediately informed. Instead, consumption of water continued. Only after water had been resampled and retested, and the new results obtained did the municipality inform its communities and this only if the samples had failed again. This was, however, not entirely the fault of the municipality. In South Africa, The Department of Water Affairs requires that failed water samples be resampled and retested. However, obtaining the new results takes longer in rural areas than in cities. This is because water samples from rural areas often have to be sent to testing labs that only exist in the nearest larger city. The communities could only improvise in response to more serious issues of water and sanitation when they were informed, i.e. only after the retesting of water samples.

Linked to the lack of *Resources* (red, -1.67) and *Room for Autonomous Change* (red, -2) was the ability for *Fair Governance* (orange, -1). The pre-ICT conditions of Municipality B did not leave the municipality in a position where it was able to effectively respond to all voices of society. According to the municipality, citizens living in more urban environments (such as the main towns) had “better access to information” and this made them “easier to deal with” (Municipal staff member, 2014). The municipality stated that these communities were given preference. Citizens also stated they felt that the current reporting system was not equitable and preferential treatment occurred. Although the municipality said they submit a number of monthly and annual reports to various higher-level institutions for review, there was no evidence of the municipality being held accountable or suffering consequences when failing to resolve issues relating to water and sanitation. Municipality B had also experienced no protests but whether this could be taken as a sign of support from citizens for the decisions being made was not clear.

In terms of *Variety* (orange, -0.25), Municipality B allowed citizens to lay complaints in one of three ways: Walk-ins, phone calls or email. Phone calls were however not zero-rated and incurred a cost to citizens. Complaints were written down on paper and then logged digitally in a Microsoft Excel spreadsheet. Complaints were sometimes lost before being logged digitally and, because there was no reference number, they could not be tracked. Logged complaints were transferred to the respective responsible person, either by phone or in person. Complaints were not seen to on a first-come-first-serve basis. Their turnaround time was not set and feedback was only given if and when an issue had been resolved. The municipality’s Department of Water & Sanitation relied on some other departments. These included the Finance Department (which picked up on broken water meters via high bills) and the Fire Department (to which calls were diverted for emergencies during weekends and public holidays). A technical team was on standby during these periods and they were informed by the Fire Department of any complaints and/or issues relating to water and sanitation that needed to be resolved. However, as mentioned earlier, interdepartmental communication breakdown was a problem and the information flow between these departments was only efficient when done in person.

Municipality *B’s Learning* Capacity was positive overall (lime, +0.4). While complaints were stored locally on Microsoft Excel spreadsheets (i.e. a level of institutional memory existed), no reference number system was used and hence no feedback was given. The municipality acknowledged its challenges and shortcomings and was quick to admit any fault on their part. Despite the challenges associated with interdepartmental

communication, the municipality stated that the trust and mutual respect between municipal staff members was healthy. Municipal staff members stated that most citizens knew the capabilities of the municipality because those who enquired were informed and made aware of the municipality's limitations. The rest (of citizens) had incorrect expectations of the municipality and could at times become "aggressive" (Municipal staff member, 2014). Citizens, however, felt that the reporting system was not equitable and that preferential treatment occurred.

In terms of Municipality B's ability for single-loop learning, although the municipality had suggested and recommended a few ways to improve the status quo, there were more instances where the municipality had not yet thought of and/or implemented any strategies or techniques to improve on current situations. This indicated a lack of single-loop learning. In terms of double-loop learning, the vision, mission, and values of Municipality B could not be compared with previous IDPs, as only revisions of the 2012 – 2017 IDP were available. The vision, mission, and values had remained unchanged throughout each revision thus indicating a lack of double-loop learning.

All those interviewed from Municipality B agreed that visionary, entrepreneurial, and collaborative leadership existed within the municipality. The same overall feeling that the current leadership did their job well and effectively, especially considering the challenges the municipality faced, was evident.

5 THE ICT SYSTEM

5.1 INTRODUCTION

This chapter provides a brief overview of the ICT system's design, development, implementation, changes it sought to bring about, and use. It does not cover any analysis of the ICT system. A detailed and more comprehensive review of the ICT system itself was presented to the Water Research Commission as a separate report (K5/2114) and can be downloaded from the WRC Knowledge Hub (to be published in July 2016). As stated under Section 3.3, the intention of the research presented in this thesis was to implement an ICT system and study the change it brought versus the change it sought to bring about, without necessarily determining upfront if an ICT system itself was part of the requirements for the municipalities, i.e. the requirement analysis focused mainly on the design components of the ICT system rather than questioning if an ICT solution would be the most appropriate.

5.2 ICT SYSTEM DESIGN

ICT systems are implemented into specific contexts. Literature shows that the sustainability and success of an ICT system's implementation depends strongly on its design responding to the context by being relevant to the local environment (Best & Kumar, 2008; Gichoya, 2005; Jayasuriya, 1999; Kimaro, 2006; Madon et al., 2009; Ndou, 2004; Pade et al., 2006; Robertson, 2003). In order for the research team to design an ICT system that was context relevant, it was important to understand the status quo of each municipality with regard to their capacities to resolve issues of water and sanitation, capacities to maintain customer relations, municipal structures, current practices, workflow processes, and community engagement practices. In doing so, the enablers to implementing an ICT system were maximised and the barriers minimised.

5.2.1 ICT Context Analysis

The pre-ICT interviews held between March 31st and April 4th 2014 (for the municipalities) and May 26th to May 30th 2014 (for the communities) established some common barriers facing both municipalities:

- Both municipalities suffered from a lack of funding and human resources.
- Distances existed between the main and satellite offices of each municipality.
- Some citizens did not know who to report to and often reported to the incorrect departments and/or municipal staff members.
- Citizens were deterred by the financial costs associated with logging a complaint with their municipality.
- Citizens expressed a lack of feedback from municipalities and felt that preferential treatment existed in the management of complaints.

Some enablers to implementing an ICT system were also identified:

- Both municipalities had existing IT infrastructures in place.
- Technical teams, dedicated to resolving issues of water and sanitation, were available.
- Both municipalities displayed a strong willingness to be part of the research project and a definite interest in taking ownership of the system existed.

Taking these into consideration, as well as the stakeholder inputs from the Water Research Commission seminar held in Port Elizabeth (see Section 3.3.1), a conceptual design of the system was developed. To keep the system low cost and low maintenance, it was decided that an off-the-shelf system would not be used. These are expensive when compared to open-source equivalents and require customisation and technical skill to operate.

5.2.2 ICT System Layout

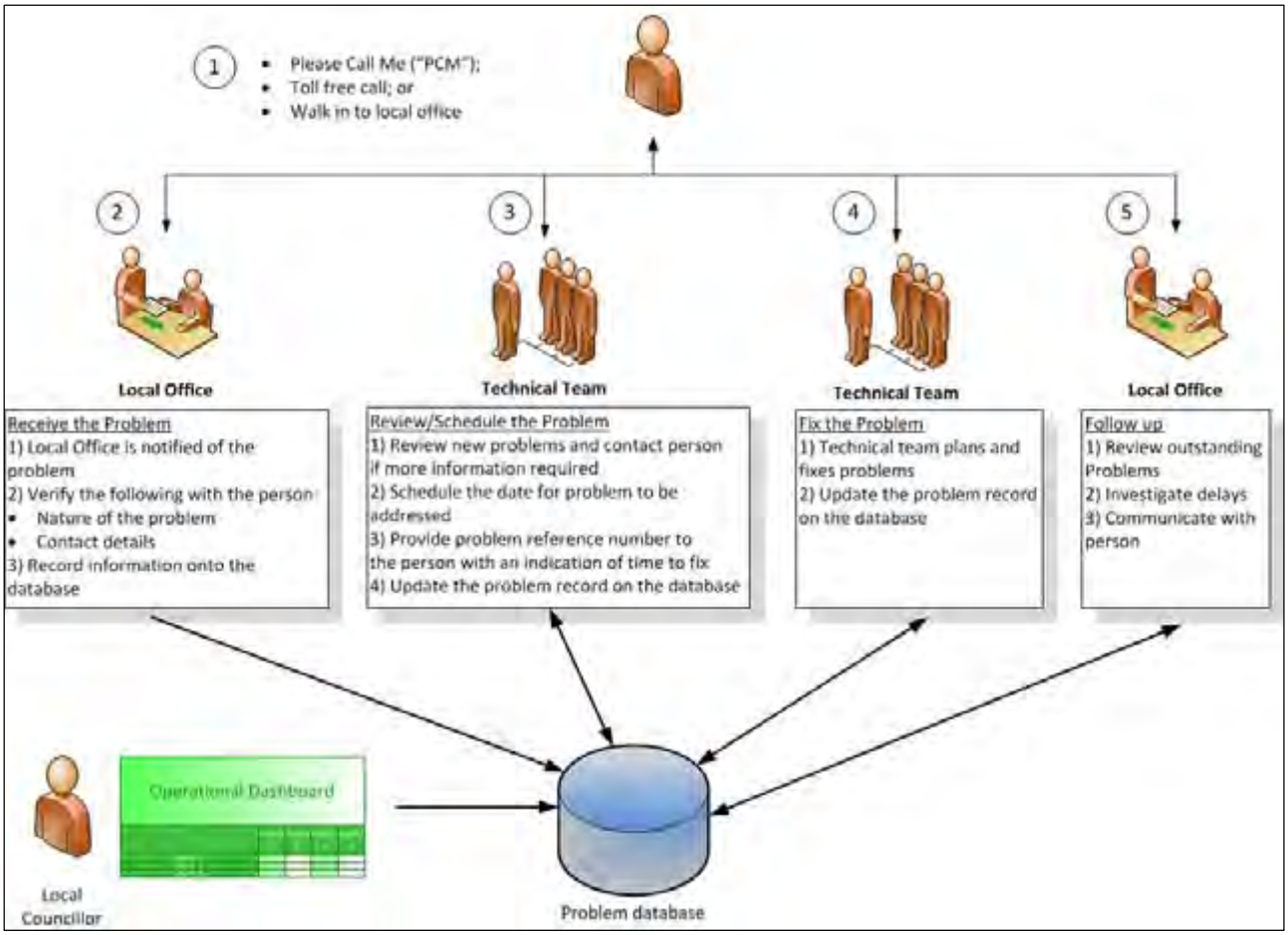

Figure 5-1 ICT System Conceptual Design & Layout

The conceptualised ICT system structure is illustrated in Figure 5-1 and its intended use described below:

1. Citizens are able to use either a Please-Call-Me (PCM) system, a toll-free call or walk into an office to log their complaints. This ensures that there is no cost to citizens when logging complaints.
2. The local office (which can also be a satellite office) receives the complaint and records the problem as well as the contact details of the citizen. This information is then recorded on the database.
3. The technical team logs into the database on a daily basis to review any new problems. The team then schedules a date for the problem to be addressed by and the system creates a unique reference number that is sent to the citizen via SMS.
4. The technical team resolves the problem and updates the record on the database.
5. If the problem is still outstanding within a set time period, the local office reviews the problem, investigates the delays and provides feedback to the citizen.

5.3 ICT SYSTEM DEVELOPMENT

The ICT system was developed using Microsoft Dot Net Framework (Microsoft Visual Studio 2012) and DevExpress (Developer Express) for the front end of the database. The database itself was developed using MYSQL Database Management System (client version 5.1.11). MYSQL-Visual Studio Dot Net Connector (version 6.6.5) was used to interconnect between MYSQL and Visual Studio 2012. Crystal Reports Software (version 13.0.5) was embedded into Visual Studio in order to generate and export reports to PDF, Microsoft Word and Microsoft Excel formats. Scalability was ensured through the system being web based and supporting several different hardware formats, i.e. computers, tablets and smartphones.

A central database with user logins for each municipality was created and hosted on servers at the University of Cape Town. The servers were supported 24 hours, which ensured that there was no database failure for the duration of the research. Regular database backups ensured that system data recovery was possible even in the event of a system failure. The logins ensured authentication and authorisation was required before accessing the system.

In summary, the system was simple, easy to use, low cost, web based and spoke to the needs of each municipality, hence overcoming and addressing the barriers highlighted under Section 5.2.1.

5.4 EXPECTED CHANGES

Whilst the system was designed and implemented using best practices such as co-design and ongoing engagement with all stakeholders, it was not expected to change existing resources or circumstances. For example, the system was not going to increase either municipality's financial or human resources or improve leadership per se.

Where it was expected to bring about measureable change was in each municipality's *Variety* (via changes in diversity and redundancy), *Learning Capacity* (via changes in institutional memory, trust and discussing doubts), *Fair Governance* (via changes in accountability, equity and responsiveness) and of course, the overall *Adaptive Capacity* – 12 changes in total.

The introduction of two new methods for logging complaints would increase the diversity and redundancy of each municipality. It would also now be free to citizens to log these complaints. The ability to store complaints data would increase institutional memory. This would in turn benefit the accountability of each municipality and their ability to be more open about the limitations they faced. The use of reference numbers would mean citizens could follow up on their complaints, be kept informed on their issues or even allow them to make a plan in the interim. The reference numbers would also allow the municipalities to treat citizens' issues with more equity and be more responsive to their needs. This, along with an improved ability to discuss limitations, was thought to lead to an improved experience of trust between citizens and municipalities.

5.5 USE OF THE ICT SYSTEM

The use of the system was monitored between November 1st 2014 and June 10th 2015. A record of the number of complaints recorded to the online database per month, the percentage of complaints completed, and the percentage of complaints for which a feedback SMS was sent were kept. As highlighted in Chapter 4, prior to the ICT system's implementation both municipalities had little to no institutional memory in terms of their complaints relating to water and sanitation service delivery. While the system sought to improve this, it meant any comparisons, so as to establish changes in the number of complaints recorded and/or resolved, could not be made.

5.5.1 Municipality A

Referring to Figure 5-2, Municipality A logged a total of 429 complaints. After the first month of usage, the number of complaints dropped substantially. It was confirmed by the municipality that this was largely due to the December-January holiday season. The system was not used because staff members were on leave. It is not necessarily the case that the actual number of complaints dropped during the holiday season but more likely that they were not recorded to the online database. No other record of complaints was available. The municipality indicated that due to citizens going on holiday, the number of complaints usually did reduce over the holiday season. This could not be confirmed. The number of recorded complaints increased again in February 2015, but only after an inquiry into why no new complaints had been recorded since the end of January had been made. The number of complaints remained relatively consistent for March, April and May 2015. The last report was created from the system on June 10th, at which stage 14 complaints had been registered for June 2015. The system continues to be used by Municipality A.

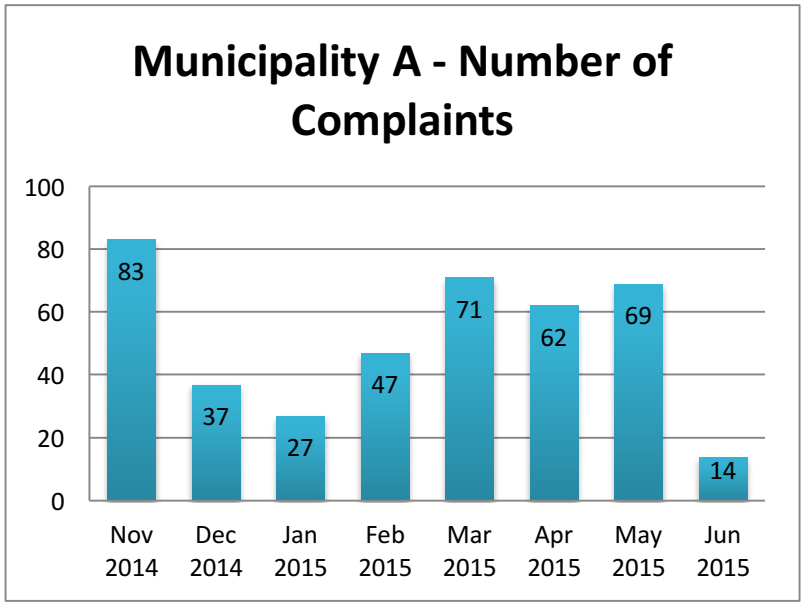

Figure 5-2: Number of complaints for Municipality A

When the municipality started using the system, many of the complaints did not have a full set of contact details recorded to the system. The main dataset missing was the contact number. This defeated one of the key purposes of the system – providing citizens with feedback and a reference number with which they could follow up. An investigation with the municipality and its users showed that the system usage had changed due to a process change in the municipality. This process change was developed after the implementation in order to use the system in the most efficient way within the municipality. Complaints were not uploaded, when a citizen raised the issue, but rather once the issue had been resolved. This resulted in a batch-upload to the online database every Monday morning. The technical teams were out in the field resolving complaints during the week based on information given to them by the various offices. The teams did not return to the main office between complaints (due to the distances between towns) and did not keep the main office informed of any progress.

Therefore, complaints were only uploaded post completion. This was confirmed by the low percentage (7% of the 429) of feedback sent to citizens. That said, the municipality recorded 90% of its 429 complaints as completed. The system's use had been adapted post-design to suit the municipality's need for a database or storage system, rather than a real-time complaints management system that would provide feedback to citizens. Whilst this adaptation suited the municipality, it potentially ignored the need of feedback to its citizens. Furthermore, engagement with the municipality showed that their human resources for complaint management was so limited that three different people became responsible for uploading complaints to the

database during the period of monitoring. Because the training workshops were only held once off (see Section 3.3.2), the second two responsible persons were not properly trained for their position.

5.5.2 Municipality B

Referring to Figure 5-3, Municipality B recorded 405 complaints. Enthusiasm for the system was initially high and a relatively high number of complaints were recorded in November 2014. During December 2014 and January 2015 usage and recording of complaints dropped. This was surprising since the municipality had indicated during the design phase that in previous years, the number of complaints increased during the holiday season, due to holidaymakers logging complaints. One potential explanation for the drop in number of complaints was staff members taking leave. The number of recorded complaints increased again in February 2015, once the full staff compliment had returned from leave. It remained constant for March 2015 and dipped slightly in April and May 2015. A total of five complaints had been recorded for June 2015 at the time of creating the last report from the system. The system is still used by Municipality B.

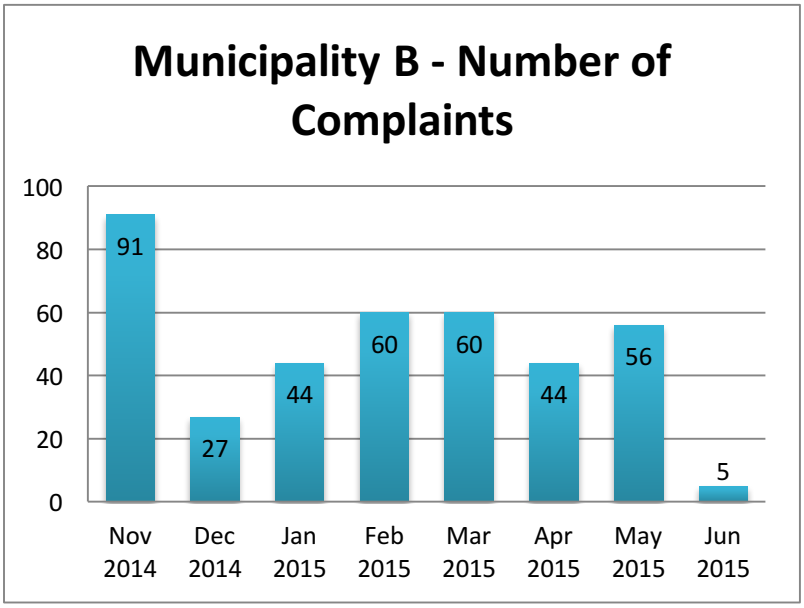

Figure 5-3: Number of complaints for Municipality B

Municipality B adopted the system more closely to its original intention – as a complaints management system. For the majority of complaints recorded, feedback and a reference number were sent via SMS (80% of the 405). Citizens who did not receive feedback had either not provided a contact number or had provided a landline number, which had not been accommodated as a feedback line for the SMS. Municipality B had more complaints recorded as unresolved than resolved or complete (59% of the 405). The municipality attributed this to neglecting to update the status of complaints on the system rather than the complaints not having been resolved. The assessment of the usage of the system showed that Municipality B was able to adopt the system in a more coherent way due to having a single, dedicated person responsible for complaints registration and management.

6 POST-ICT IMPLEMENTATION CAPACITY ANALYSIS & FINDINGS

6.1 INTRODUCTION

This chapter covers the assessment of each municipality's capacity to resolve issues of water and sanitation service delivery and maintain customer relations after the implementation of the ICT complaints management system (described previously in Chapter 5) using the ACW as described under Section 3.4.3. As in Chapter 4, the information provided here forms part of 'Interpreting the data', as per the ACW methodology. In this instance, it is the data from the post-ICT interviews, translated into "a story that communicates the strengths and weaknesses of a specific institution or institutional context in terms of adaptive capacity" (Gupta et al., 2010). Section 6.2 deals with Municipality A and Section 6.3 Municipality B. Section 6.4 looks at the changes common to both municipalities. As mentioned before, the municipalities were kept anonymous for ethical purposes.

6.2 MUNICIPALITY A

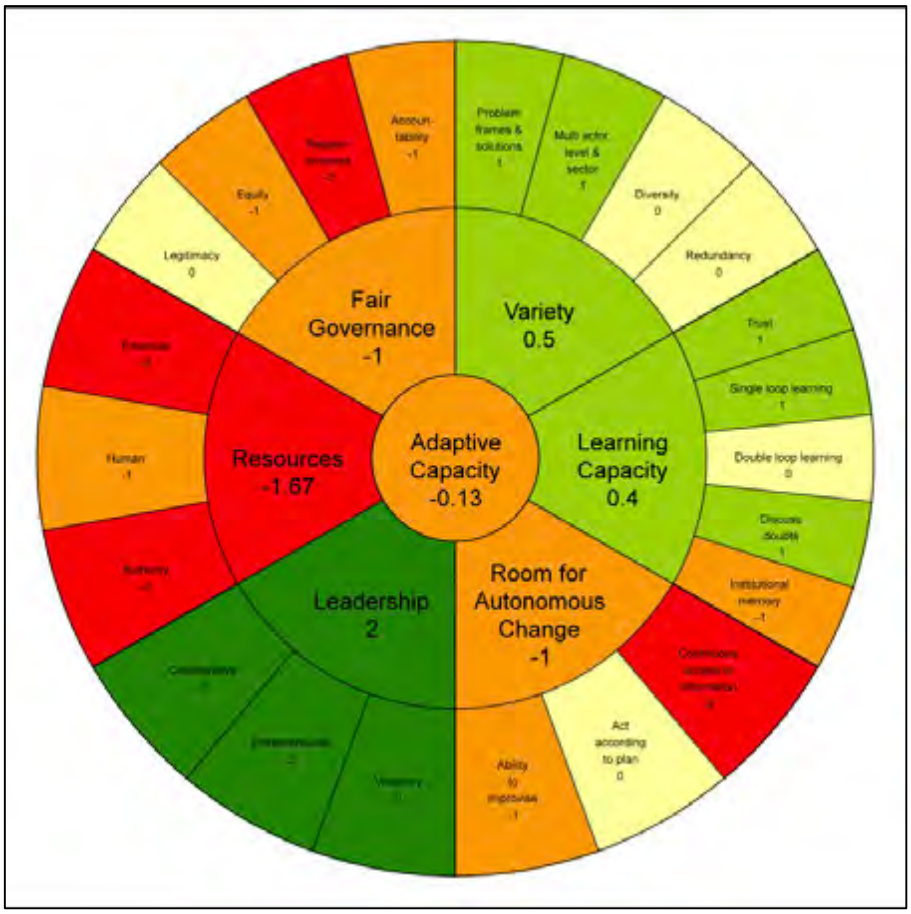

Figure 6-1: Post-ICT Implementation ACW for Municipality A

Referring to Figure 6-1, after the implementation of the ICT system, Municipality A's capacity to effectively resolve issues of water and sanitation service delivery and maintain customer relations, although slightly improved, was still low. This was still affected by three main dimensions: *Resources* (red, -1.67), *Room for*

Autonomous Change (orange, -1) and *Fair Governance* (orange, -1). *Variety* increased from having a negative effect to having an overall positive effect (lime, +0.5). *Learning Capacity* remained unchanged overall (lime, +0.4), as did *Leadership* (green, +2). As stated under Section 4.2, the inherent capacity for Municipality A to adapt and respond to the change the ICT system sought to bring about was low to begin with (-0.46) and this too impacted on the ICT's ability to change the capacity to resolve issues of water and sanitation service delivery and maintain customer relations. The adaptive capacity increased but remained low (-0.13). The numerical changes (green indicating a positive change and red a negative change) for the dimensions and criteria are highlighted in Table 6-1 below:

Table 6-1: Changes between pre- and post-ICT implementation for Municipality A

Dimensions & Criteria	Pre-ICT Score	Post-ICT Score	Change
Variety	- 0,25	0,5	+ 0,75
Problem frames & solutions	1	1	0
Multi actor, level & sector	- 1	1	+ 2
Diversity	- 1	0	+ 1
Redundancy	0	0	0
Learning Capacity	0,4	0,4	0
Trust	1	1	0
Single-loop learning	1	1	0
Double-loop learning	0	0	0
Discuss doubts	2	1	- 1
Institutional Memory	- 2	- 1	+1
Room for Autonomous Change	- 1,67	- 1	+ 0,67
Continuous access to information	- 2	- 2	0
Act according to plan	- 2	0	+ 2
Ability to improvise	- 1	- 1	0
Leadership	2	2	0
Visionary	2	2	0
Entrepreneurial	2	2	0
Collaborative	2	2	0
Resources	- 2	- 1,67	+ 0,33
Authority	- 2	- 2	0
Human	- 2	- 1	+ 1
Financial	- 2	- 2	0
Fair Governance	- 1,25	- 1	+ 0,25
Legitimacy	0	0	0
Equity	- 2	- 1	+ 1
Responsiveness	- 2	- 2	0
Accountability	- 1	- 1	0

Figure 6-2 displays the changes in criteria, dimensions and overall adaptive capacity of Municipality A visually.

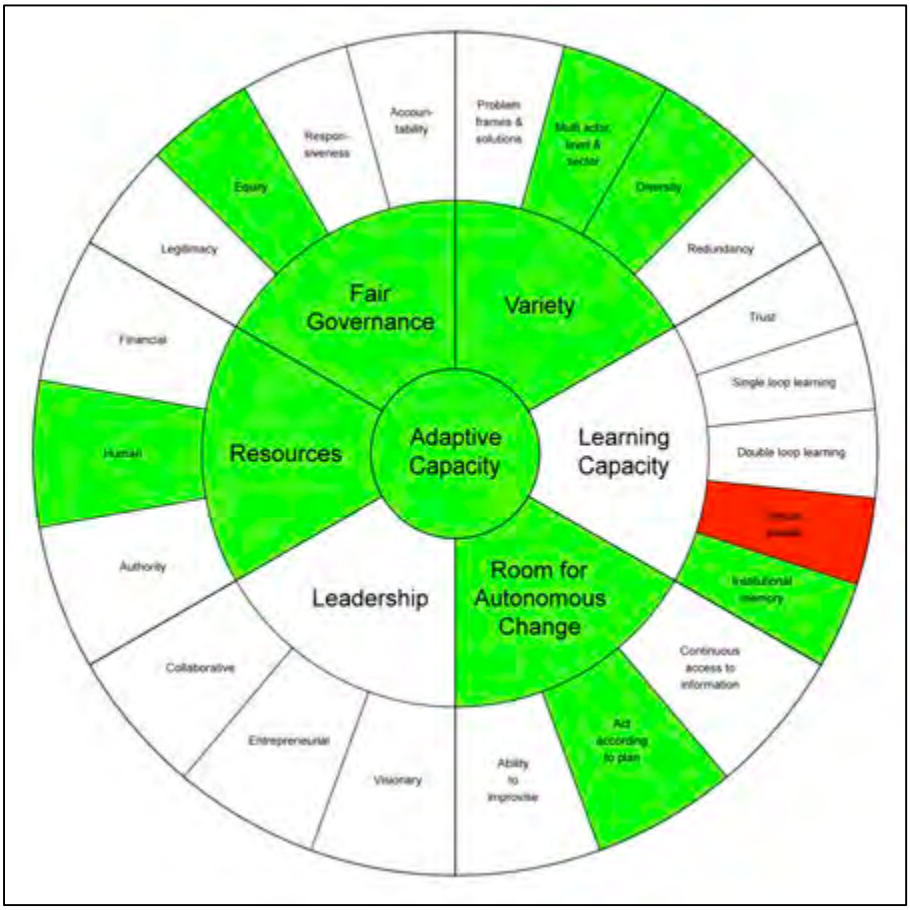

Figure 6-2: Changes experienced in Municipality A post-ICT Implementation

Overall, 7 of the 22 criteria (and 4 of the 6 dimensions) changed after the implementation of the ICT system. With reference to Section 5.4, the ICT brought about certain of the expected changes.

The introduction of the ICT system brought about new, free methods for citizens to log complaints with their municipality (i.e. the toll free line and PCM service). That said, it was found that, although they did not find the ICT system unhelpful, most citizens were used to and still preferred the traditional methods of logging complaints (see Section 4.2). This was particularly true for elderly citizens who preferred talking to someone in person. The ICT system introduced the use of reference numbers (automatically generated by the system and sent to the citizen via SMS) in order to allow for easy follow up by citizens. Municipality A undermined this design somewhat by adapted the use of the ICT system to a storage database (rather than a real-time complaints management system). This resulted in complaints being uploaded only after they had been resolved and often without a contact number of the complainant. Although not in line with the original design, this adaptation meant that reference numbers became obsolete, as they could only be sent once an issue had already been resolved and thus negated the need for a reference number in the first instance.

Another expected change was that the *Learning Capacity* of the municipality would increase, but this did not occur. While the ICT system provided an online database where all complaints data could be digitally stored

and hence increased the municipality's institutional memory, the ability to discuss doubts openly scored lower post-ICT implementation. The municipality disclosed and discussed its challenges openly with the research team during both the pre- and post-ICT implementation interviews but citizens, when interviewed post-ICT implementation, said that the limitations of the municipality were discussed openly "to an extent" and that the main challenges, as experienced by them, included "insufficient staff and not giving feedback" (Citizens during one of the focus group meetings, 2015). Municipality A's adaptation in their use of the system added to this perception held by citizens. This deterioration in the ability to discuss doubts openly and/or disclose challenges with citizens could however not be attributed to the implementation of the ICT system. The ICT system had also not brought about any change to the trust experienced between municipal staff members themselves nor between the municipality and its citizens. The municipality's ability for single- and double-loop learning did not change with the implementation of the ICT system either.

Looking at *Room for Autonomous* Change, it was found that post implementation, citizens were better informed of what to do during a water and/or sanitation emergency. For example, if there was a break in water supply, the municipality informed citizens and told them to "be on the look-out for the water truck" (Municipal staff member, 2015) via loud hailers. In the case of drinking water being contaminated, the municipality issued boiling water notices as soon as possible, again via loud hailers. This change was directly linked to the planned implementation of an emergency disaster centre in the municipality rather than the ICT system itself. The ability for citizens to improvise was restricted to those that could afford to do so. This included the erection of *Jo-Jo* tanks (water storage tanks) and/or fixing issues themselves and claiming the expenses from the municipality at a later stage. This had a postive impact on the ability of citizens to be involved in issue resolution. However, the data did not indicate a direct relation between these actions and the ICT's implementation.

Access to information did not change with the introduction of the ICT system either. Citizens remained informed through the methods described under Section 4.2 and if they required any additional information, they had to contact the municipality through the traditional means.

With regard to *Leadership*, all municipal staff members agreed that visionary, entrepreneurial, and collaborative leadership still existed within the municipality post-ICT implementation.

Looking at *Resources*, the ICT system made no change to the municipality's water and sanitation department not effectively complying with constitutional laws nor its substantial reliance on external funding to function properly. It was not possible to verify their compliance independently either as no new Blue Drop Reports had been made available by DWAF to the public since 2012. Changes to the municipality's *Resources* were never expected with the introduction of the ICT system and hence the above was not surprising. That said, a very interesting, unexpected change occurred with regard to Municipality A's human resources. While understaffing and a lack of skills remained a challenge facing Municipality A, the municipal staff felt that with the ICT system in place, they were able to manage more successfully with the existing set of skills. The ICT's implementation thus resulted in an unexpected, improved change in staff members' perceptions towards their work even though it could not increase the human resource capacity of the municipality as such.

As mentioned under Section 4.2, linked to the lack of *Resources* and *Room for Autonomous Change* is the ability for *Fair Governance*. Only a change in equity was experienced here. The municipality stated that since the introduction of the ICT system, they were able to stick to a first-come-first-serve basis (when resolving issues) more strictly. The storage of data that the system provided (i.e. the increase in institutional memory) also allowed them to more accurately explain to citizens that there were issues in the queue waiting to be resolved before the could attend to their issue. The municipality staff felt this allowed them to treat citizens' problems more equally. That said, citizens complained they often had to call several times before receiving an explanation or response to their complaints. Responsiveness was expected to change with the introduction of the ICT system but the conditions post-implementation still did not leave the municipality in a

position where it was effectively responding to all voices of society. There was also no evidence of the municipality being held accountable or suffering consequences when failing to resolve issues relating to water and sanitation. In terms of support for decisions, citizens that had heard of the system liked it and were appreciative of the fact that their concerns of cost and ease of use had been taken into consideration but were skeptical as to whether it would actually "change the fact that currently their problems are not being attended to" (Citizen during a focus group meeting, 2015), and hence legitimacy for Municipality A remained unclear.

6.3 MUNICIPALITY B

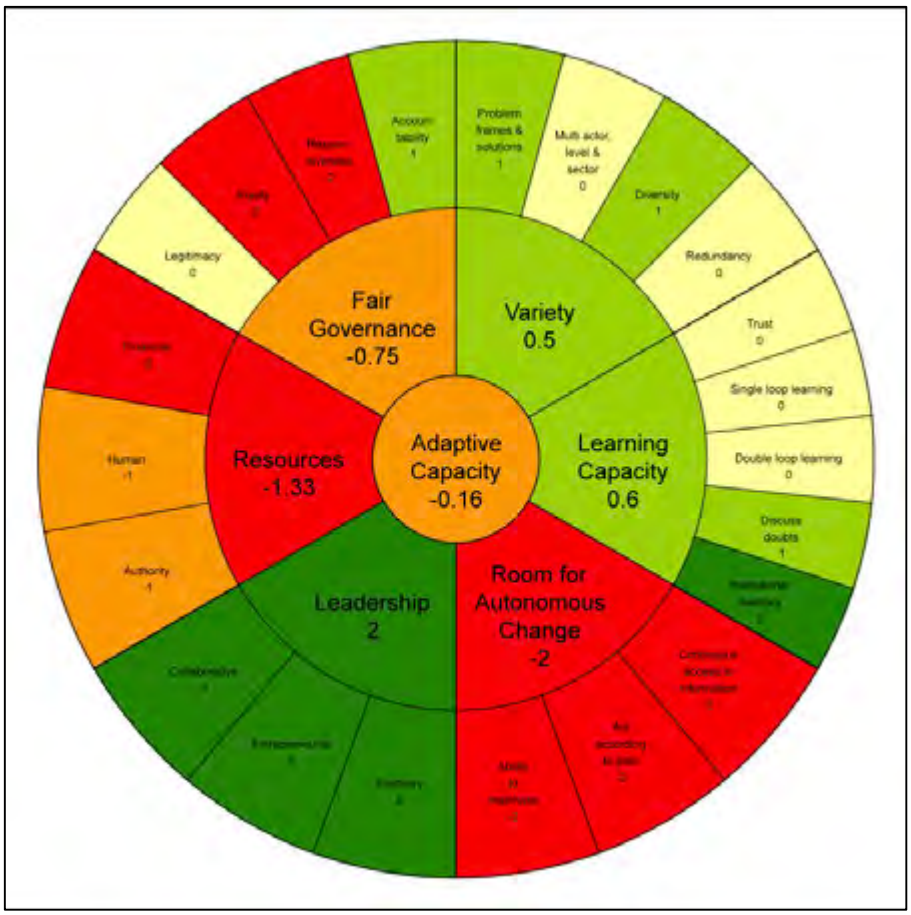

Figure 6-3: Post-ICT Implementation ACW for Municipality B

With reference to Figure 6-3, although slightly improved after the implementation of the ICT system, Municipality B's capacity to effectively resolve issues of water and sanitation service delivery and maintain customer relations remained low. Two dimensions affected this: *Room for Autonomous Change* (red, -2) and *Resources* (red, -1.33). *Fair Governance* increased from -1 to -0.75 but still remained negative (orange). *Variety* increased from having a negative effect to having an overall positive effect (lime, +0.5). *Learning Capacity* also increased to an overall value of +0.6 (lime). *Leadership* remained unchanged (green, +2). As stated under Section 4.3, the inherent capacity for Municipality B to adapt and respond to the change the ICT system sought to bring about was low to begin with (-0.42) and thus impacted the ICT's ability to change the capacity to resolve issues of water and sanitation service delivery and maintain customer relations. The adaptive capacity did increase but remained low (-0.16) The numerical changes (green indicating a positive change and red a negative change) for the dimensions and criteria are highlighted in Table 6-2.

Table 6-2: Changes between pre- and post-ICT implementation for Municipality B

Dimensions & Criteria	Pre-ICT Score	Post-ICT Score	Change
Variety	- 0,25	0,5	+ 0,75
Problem frames & solutions	1	1	0
Multi actor, level & sector	- 1	0	+ 1
Diversity	- 1	1	+ 2
Redundancy	0	0	0
Learning Capacity	0,4	0,6	+ 0,20
Trust	1	0	- 1
Single-loop learning	0	0	0
Double-loop learning	0	0	0
Discuss doubts	2	1	- 1
Institutional Memory	- 1	2	+ 3
Room for Autonomous Change	- 2	- 2	0
Continuous access to information	- 2	- 2	0
Act according to plan	- 2	- 2	0
Ability to improvise	- 2	- 2	0
Leadership	2	2	0
Visionary	2	2	0
Entrepreneurial	2	2	0
Collaborative	2	2	0
Resources	- 1,67	- 1,33	+ 0,33
Authority	- 1	- 1	0
Human	- 2	- 1	+ 1
Financial	- 2	- 2	0
Fair Governance	- 1	- 0,75	+ 0,25
Legitimacy	0	0	0
Equity	- 2	- 2	0
Responsiveness	- 2	- 2	0
Accountability	0	1	+ 1

Figure 6-4 displays the changes in criteria, dimensions and overall adaptive capacity of Municipality B visually.

Figure 6-4: Changes experienced in Municipality B post-ICT Implementation

Overall, 7 of the 22 criteria (and 4 of the 6 dimensions) experienced a change after the implementation of the ICT system. Some of these changes were expected (Section 5.4). .

The *Variety* of Municipality B changed, as expected, due to the new, free methods available to citizens for logging complaints with their municipality (i.e. the toll free line and PCM service). As mentioned in the previous section, the ICT system also introduced the use of reference numbers. However, it was found that citizens still preferred walking into the municipal offices. It was also not clear if all citizens were aware of the new system and whether those who had heard of the system, and preferred calling in, were using the new toll free number. The municipality's standby team (for weekends and public holidays) had not recorded complaints received during these periods to the new system either.

As mentioned, Municipality B's capacity to learn increased slightly with negative changes experienced in trust and the ability to discuss doubts openly and a positive change in institutional memory. Municipality B disclosed and discussed its challenges openly with the research team during the pre- and post-ICT implementation interviews. However, during the post-ICT implementation interviews, citizens from satellite (outlying) towns expressed feelings that the "problems of the municipality are not" as "openly discussed" with them as they were with communities located in the same town as the municipality's main office (Citizen during a focus group meeting, 2015). This decrease could not be attributed to the ICT's implementation. In addition, before the ICT's introduction, the municipality stated that trust existed between municipal staff members and that most citizens knew and understood the capabilities of the municipality (see Section 4.3).

This remained true for the municipal staff after the implementation but citizens interviewed could not comment if the system had increased their experience of trust. This was because many had not used it and/or were unsure of what it would actually change. It seemed rather that, post-ICT implementation, citizens' opinions on their experience of trust with the municipality were more conflicted than before. This increased confliction was not expected but could also not be attributed to the implementation of the ICT system.

The municipality's ability for single- and double-loop learning did not change with the implementation of the ICT system but this had been expected.

Access to information did not change either. Citizens were informed of certain items, such as public meetings and mayoral imbizos (gatherings with citizens) through the methods described under Section 4.3. If they required any additional information they had to contact the municipality themselves. This was also true for water and/or sanitation emergencies, such as water contaminations and droughts. The lack of change in access to information meant that no change was experienced in citizens' ability to act according to a plan and/or follow prescribed steps for safety during a water and sanitation emergency. The ability for citizens to improvise remained restricted to those that could afford to do so. Thus, *Room for Autonomous Change* did not change but again, this had been expected.

In terms of *Leadership*, all municipal staff members agreed that visionary, entrepreneurial, and collaborative leadership still existed within the municipality post-ICT implementation.

Looking at *Resources,* the ICT system made no change to the municipality's water and sanitation department not effectively complying with constitutional laws nor the fact that financial resources remained a major challenge facing the municipality. Furthermore, it was not possible to verify their compliance independently, as no new Blue Drop Reports had been made available by DWAF to the public since 2012. As with Municipality A, changes to *Resources* were never expected with the introduction of the ICT system and hence, no changes in authority and financial resources was not surprising. However, similar to Municipality A, a change in Municipality B's staff members' perception towards work occurred post-ICT implementation. Staff members felt that the new system allowed them to get by more easily with the resources they had, even though they admitted they still required improvement in their skills and needed "to learn new things" (Municipal staff member, 2015).

For *Fair Governance*, change was only experienced in the municipality's accountability. During the post-ICT implementation interviews, it was mentioned that South Africa's Treasury had retracted the municipality's equitable share because they (the municipality) "did not do things correctly" (Municipal staff member, 2015). Since the pre-ICT implementation interviews, groups such as CoGTA (Cooperative Governance and Traditional Affairs) had also audited the municipality in terms of their water services, waste removal and public participation. Before, there was no evidence of the municipality being held accountable or suffering consequences when failures relating to water and sanitation occur existed. The expected changes in equity and responsiveness did not occur. The post-ICT implementation conditions did not leave the municipality in a position where it was able to effectively respond to all voices of society, and citizens living in more urban environments (such as the main towns) still had better access to information. They were "easier to deal with" (Municipal staff member, 2014) and were given preference. Citizens had expressed similar feelings of preferential treatment after the system's implementation. The municipality had received no comments on the new system from their communities. Many citizens had not heard of it or, if they had, had not used it and were not sure of what it would change. Support for the system was thus not clear. Despite their apathy towards using the new system, citizens felt their local knowledge had been valued and incorporated into the design of the system and were very appreciative of that fact.

6.4 OVERALL

Figure 6-5: Common changes for both municipalities post-ICT Implementation

Figure 6-5 shows those criteria and dimensions that changed for both municipalities, i.e. the changes common between both municipalities. If and how these changes were related to the ICT's implementation are discussed below.

The changes to diversity and institutional memory were expected and were both as a direct result of the ICT's implementation. Figure 6-5 shows that while institutional memory increased for both municipalities it did not guarantee an increase in the overall *Learning Capacity*. A deterioration of the trust experienced between citizens and the municipalities (in the case of Municipality B) and the municipalities' abilities to discuss doubts openly with their citizens (in the case of both municipalities) were reasons for this. The ICT system was introduced as providing new, free methods of logging complaints, with reference numbers for following up on complaints. Citizens would be treated with more equity and the municipalities would be more responsive to their needs. However, as highlighted under Sections 5.5, 6.2, and 6.3, each municipality, due to resource challenges and/or geographical distances between communities, adapted their uses of the ICT system in ways that seemed to exacerbate the distrust and preferential treatment already felt by citizens.

The criteria multi actor, level & sector and human resources were unexpected changes. For the former it was due to a change in citizen behaviour by resolving issues themselves but was unrelated to the ICT system. For the latter, the ICT system brought about an improved change in staff members' perception towards their work, even though it could not increase the actual human resource capacity of each municipality. Although not measurable with the ACW, these experiences of being more efficient and/or performing better could,

over time, lead to greater job satisfaction. This is a very important change for rural municipalities, where staff turnover “is a problem in terms of” people “moving in and out” (Municipal staff member, 2014).

Although *Fair Governance* experienced a change in both municipalities post-ICT implementation, it was due to changes in differing criteria. For Municipality A it was due to a change in equity. The ICT system allowed Municipality A to implement and maintain a first-come-first-serve basis more strictly. For Municipality B fair governance was increased was due to a change in accountability unrelated to the ICT system. In the time between the pre- and post-ICT implementation interviews Municipality B had been audited by CoGTA and had had its portion of South Africa’s equitable share retracted for not complying with the terms and conditions.

The other expected changes that did not occur were a change in redundancy and a change in responsiveness. With regard to redundancy, while the introduction of the ICT system increased the diversity with which to lay complaints, it did not guarantee use of the new methods available. Additionally, it was not clear whether all citizens knew about the methods for logging complaints. With regard to responsiveness, despite the best intentions to improve responsiveness through the ICT system, the financial, technical, and geographical challenges faced by both municipalities left them in positions where they were unable to effectively respond to all voices of their communities.

In summary then, of all the criteria changes expected as a result of the ICT’s implementation (Section 5.4), only three occurred (diversity, discussing doubts openly and institutional memory), of which one (discussing doubts openly) actually scored lower post-ICT implementation. The improvements in diversity and institutional memory were as a result of the ICT system, while the deterioration of discussing doubts an unintended consequence of adapted use. The changes in human resources and multi actor, level & sector were unexpected. The former was an unintended result of the ICT system and the latter due to a change in citizens’ behaviour towards self-sufficiency.

At a dimensional level, this resulted in the expected changes occurring in *Variety* and *Fair Governance.* It, however, did not guarantee a change to *Learning Capacity*. The change to human resources resulted in an unexpected but important change to *Resources*. The overall adaptive capacity of each municipality although improved, remained low.

If the wheel in Figure 6-5 were simplified to include only the common improvements experienced in both municipalities as a result of the ICT’s implementation (whether expected or not), only three criteria would remain – diversity, institutional memory and human resources.

In other words, the only common *improvements* brought about to both municipalities as a result of implementing an ICT complaints management system were:

- The introduction of new, free methods for logging a complaint relating to water and sanitation service delivery.
- The introduction of reference numbers to help the municipality keep track of complaints and for citizens to follow up on their complaints (which in the case of Municipality A became irrelevant).
- The ability for each municipality to digitally store their complaints data and retrieve it at a later stage, if need be.
- A change in municipal staff members’ perceptions towards their work.

That said, the introduction of the ICT also brought about the unexpected deterioration of the criteria trust and discussing doubts openly with citizens. While the ICT system offered a means of improving each municipality’s capacity to resolve issues of water and sanitation service delivery, it could not address all the existing challenges faced by each municipality. Not wanting to abandon the system entirely, the

municipalities adapted their use to better suit the prevailing conditions. However, these adaptations resulted in the unintended deterioration of their customer relations.

7 CONCLUSIONS & RECOMMENDATIONS

The research questions for this study were:

1. How do the existing conditions of rural municipalities impact the implementation and use of ICTs and hence the change in capacity they (the ICTs) seek to bring about?
2. Do ICTs bring any measurable change in low-capacity environments?

The objectives of this study were to:

1. Establish the status quo of two rural municipalities with regard to their capacities to resolve issues of water and sanitation service delivery and maintain customer relations.
2. Implement and monitor their use of a co-designed ICT intervention that addresses and improves upon the challenges associated with customer relations and managing complaints of water and sanitation service delivery.
3. Establish each municipality's capacity to resolve issues of water and sanitation service delivery and maintain customer relations post-ICT implementation.
4. Analyse if and how the capacity of each municipality changes as a result of the ICT intervention.
5. Provide answers to the research questions stated above, from these results.

The remainder of this chapter discusses each objective and answers the research questions.

7.1 OBJECTIVE 1: ESTABLISHING THE PRE-ICT CAPACITIES

Establishing the pre-ICT capacity of each municipality involved the collection of data through semi-structured interviews and the assessment of this data using the Adaptive Capacity Wheel. The interviews were held with key staff members from both Municipality A and B, as well as members from their communities. The following topics were covered:

- Municipal Structure
- Water and Sanitation
- Service Delivery
- Customer Relations
- Current Information Systems
- General Information

The ACW analysis showed that for both municipalities, resolving issues of water and sanitation service delivery and maintaining customer relations were problems. The inherent capacity to adapt and respond to the change the ICT system sought to bring about was also found to be low for both municipalities. This was largely due to a lack of resources (both financially and in terms of staffing), which in turn affected many of the other criteria and dimensions making up each municipality. The lack of institutional memory and access to continuous information meant that the ability for citizens and/or either of the municipalities to act according to any sort of plan during an emergency was compromised. The ability to improvise was compromised too. Because resources were limited, they were allocated to issues deemed as top priorities by the municipalities and this left citizens with feelings of preferential treatment. This compromised their support for decisions and impacted their trust in their municipality. There was also no evidence of either municipality being held accountable when failing to resolve issues of water and sanitation service delivery. Whilst various methods of logging a complaint were available, they incurred costs to citizens. No reference numbers were used and feedback was essentially non-existent (unless a citizen followed up themselves). While the municipalities openly discussed their challenges and problems with the research team, it was not clear that this information

was made available to their communities. Where they could, both municipalities had made efforts to mitigate problems for the short term but due to the compromised resources, this was not always possible.

In addition to collecting data for the ACW assessment, the pre-ICT interviews gave insight into each municipality's structure, current practices, workflow processes, community engagement practices, and the overall enablers and barriers to implementing an ICT system, and whether the views of the citizens matched those of their municipalities. These insights were used, along with other input from the municipalities, citizens and experts from the field, to design and develop an ICT complaints management system that addressed and improved upon the challenges associated with managing customer relations and resolving issues of water and sanitation service delivery. This system was implemented and monitored over a six-month period. See Chapter 5 for more information on the ICT system.

7.2 OBJECTIVE 2: IMPLEMENTING & MONITORING THE ICT'S USAGE

The ICT System was implemented between October 27th and October 30th 2014. Citizens were informed through public meetings and pamphlets. The pamphlets described the new system and the revised processes for engaging with the municipalities.

The use of the system was monitored between November 1st 2014 and June 10th 2015 for each municipality. Municipality A recorded a total of 429 complaints to the system during this period and Municipality B 405. Initially, the system was used with great enthusiasm by both municipalities. The use dropped over the December-January holiday season but this was attributed to staff members taking leave and not to a decline in the actual number of complaints being logged with each municipality. Use of the system picked up again from February 2015 and remained fairly consistent through to June 2015.

Both municipalities adapted their use of the ICT system to better suit the prevailing conditions and existing capacity challenges they faced. While Municipality B's use of the system matched the intended use more closely (see Figure 5-1), Municipality A adapted its use quite substantially. It used the ICT system as a storage database (rather than a real-time complaints management system) by uploading complaints only after they were resolved and often without a contact number. Although not incorrect, this adaptation meant that reference numbers could only be sent (and only if a contact number had been recorded) after an issue had already been resolved and impacted on the trust and feelings of preferential treatment experienced by citizens.

Quantitatively, the results of this adaptation are seen in the percentage of complaints that did not receive feedback via SMS (93%). That said, Municipality A registered 90% of its complaints as completed (or resolved). Municipality B on the other hand had registered only 59% of its complaints as resolved. The municipality attributed this to neglecting to update the status of complaints on the system rather than not having resolved the issues. Municipality B had provided feedback to 80% of their recorded complaints.

7.3 OBJECTIVE 3: ESTABLISHING THE POST-ICT CAPACITIES

Interviews were conducted in order to establish the post-ICT capacity of each municipality to resolve issues of water and sanitation service delivery and maintain customer relations. Because these interviews had the sole intention of collecting data for the post-ICT ACW assessment, they did not follow the five topics described under Section 7.1. Instead, the questions were more structured and followed the 22 criteria of the ACW.

That said, the post-ICT ACW assessments showed that resolving issues relating to water and sanitation and maintaining customers relations remained problems for both municipalities. Although the ICT system resulted

in measurable changes, certain of these were unexpected and/or unrelated to the ICT's implementation. In addition, many of the expected changes (Section 5.4) did not occur. Section 7.4 describes the changes that occurred in more detail.

7.4 OBJECTIVE 4: CAPACITY CHANGES

7.4.1 Municipality A

After the implementation of the ICT system, changes occurred in seven of Municipality A's criteria, four of its dimensions and in its overall adaptive capacity. 5 of the 12 expected changes (Section 5.4) occurred, with 6 unexpected changes occurring too.

Expected changes
Variety changed due to a change in diversity (via the new, free methods for logging complaints the system introduced). As expected, institutional memory increased with the introduction of the ICT system (due to its ability to store complaints data). As mentioned under Section 5.5, both municipalities had little to no institutional memory to begin with, thus making pre- and post-ICT implementation comparisons in this regard difficult. That said, institutional memory, as an aspect of rural municipal life, is vitally important and the ability to start building this memory is a remarkable change, even if an improvement cannot necessarily be measured immediately. The ICT system helped the municipality address issues on a first-come-first-serve basis more strictly and hence improved the equity (and *Fair Governance*). Whether citizens felt the change in equity was debatable (see below). The overall adaptive capacity increased from -0.46 to -0.13 but remained low.

Unexpected changes
Adding to the increase in *Variety* was a change in citizens' involvement with regard to issue resolution. Post-ICT implementation they were taking it upon themselves to resolve issues and claim back from the municipality at a later stage. This change in behaviour could however not be attributed to the ICT system.

The views and opinions surrounding the doubts and limitations of the municipality being openly discussed with citizens were more conflicted post-ICT implementation and, rather than improving, it scored lower. As described under Sections 5.4, 6.2, and 6.4, Municipality A adapted its use of the system to better suit the conditions, compromised resources, and geographical distances between communities that existed. Complaint details were only uploaded to the database after completion and reference numbers were never sent to citizens. While not incorrect (because it allowed the municipality to still use the system, despite being resourcefully compromised), this adaptation exacerbated the existing feelings of preferential treatment that citizens felt, compromising the already problematic maintenance of customer relations.

Post-ICT implementation, citizens were better informed by the municipality of the steps to follow during water and/or sanitation emergencies. This was not due to the ICT system but rather the municipality's own planned implementation of an emergency disaster centre.

One of the most important, unexpected changes as a result of the ICT system was to the municipality's *Resources*. While the ICT system did not impact the actual human resources (i.e. the number of staff available to fulfil certain roles), it did change staff members' perception towards their work. Municipal staff members interviewed felt that, with the new system in place, they were able to resolve issues relating to water and sanitation service delivery more easily, with the compromised resources they had. As mentioned under Section 6.4, experiences of being more efficient and/or performing better could, over time, lead to greater job satisfaction, a very important change for rural municipalities, where staff turnover "is a problem in terms of" people "moving in and out" (Municipal staff member, 2014).

7.4.2 Municipality B

For Municipality B, changes also occurred in seven of its criteria, four of its dimensions and in its overall adaptive capacity. 6 of the 12 expected changes (Section 5.4) occurred, with 5 unexpected changes occurring too.

Expected changes
As with Municipality A, *Variety* changed due to changes in diversity (via the new, "free" methods for logging complaints the system introduced). Institutional memory also increased with the introduction of the ICT system (due it ability to store data digitally). As mentioned in the previous subsection 7.4.1, the ability to start building this memory is remarkable, even if improvement cannot be measured immediately. It resulted in a slight improvement to the overall *Learning Capacity* too. While a change in accountability was expected, the change occurred for reasons unrelated to the ICT system. During the post-ICT implementation interviews, it was mentioned that South Africa's Treasury had retracted the municipality's portion of the equitable share due to non-compliance and CoGTA (Cooperative Governance and Traditional Affairs) had audited the municipality in terms of their water services, waste removal and public participation. This changed the overall *Fair Governance* positively. The overall adaptive capacity increased from -0.42 to -0.16 but remained low.

Unexpected changes
A change in citizens' involvement with regard to issue resolution occurred by virtue of the fact that certain citizens had taken it upon themselves to install their own water storage tanks. This change in behaviour could however not be attributed to the ICT system. It contributed towards the increase in *Variety* regardless.

Although Municipality B did not adapt its use of the ICT system to the same extent as Municipality A, the views and opinions surrounding the criteria of trust and discussing doubts were more conflicted during the post-ICT interviews. The links between this deterioration and the municipality's adapted use of the system are less clear than with Municipality A. That said, the ICT system was introduced to citizens as providing new, free methods of logging complaints, with reference numbers for following up on complaints that in turn would mean they (the citizens) would be treated with more equity and the municipalities would be more responsive to them. The ICT system hence "promised" as many benefits to citizens as it did the municipalities. However, the realisation of these benefits depended largely on the municipality's own ability to adapt and respond to the change the ICT sought to bring about and this, as shown in Chapter 4, was low to begin with (-0.42). Citizens being unsure of what the introduction of a new system would actually change are thus not too surprising and may have led to the exacerbated feelings of trust and preferential treatment.

As with Municipality A, one of the most important, unexpected changes as a result of the ICT system was to Municipality B's *Resources*. As mentioned earlier, the ICT system had no way of changing the actual human resources (i.e. the number of staff available to fulfil certain roles). However, as with Municipality A, it changed staff members' perception towards their work. Municipal staff members interviewed felt that, with the new system in place, they were able to resolve issues relating to water and sanitation service delivery more easily. As mentioned, experiences of being more "efficient" and/or performing better could, over time, lead to greater job satisfaction, a very important change for rural municipalities, where high staff turnover is a problem.

7.4.3 Overall

Comparing the changes, as a result of ICT, show that the common *improvements* in each municipality were:

- The introduction of new, free methods for logging a complaint relating to water and sanitation service delivery.

- The introduction of reference numbers to help the municipality keep track of complaints and for citizens to follow up on their complaints.
- The ability for each municipality to digitally store their complaints data and retrieve it at a later stage if need be and thus start building their institutional memories.
- A change in municipal staff members' perceptions towards their work and hence improved job satisfaction.

While the ICT system did not result in all the expected changes, it certainly provided the potential for both municipalities to improve their capacities to resolve issues of water and sanitation service delivery. However, each municipality suffered from a low ability to adapt and respond to change to begin with, the largest contributor to this fact being each one's compromised resources, both financially and in terms of staffing, and the distances between their communities. In attempts to still make use of the ICT system despite the challenges they faced, both municipalities adapted their use of the system. In doing so, both municipalities were able to get by with the resources they had more easily. While this benefitted the municipalities and allowed them to better resolve issues of water and sanitation, it came at an unintended cost: exacerbated feelings of preferential treatment from citizens and a deterioration of the trust experienced between them. The ICT system was thus not successful in improving either municipality's capacity to maintain customer relations.

7.5 OBJECTIVE 5: ANSWERING THE RESEARCH QUESTIONS

7.5.1 Question 1: How do the existing conditions of rural municipalities impact the implementation and use of ICTs and hence the change in capacity they (the ICTs) seek to bring about?

In this case study, where an ICT sought to address and improve upon the challenges associated with the management of customer relations and resolution of complaints relating to water and sanitation service delivery of two rural municipalities, it was found that the existing conditions did impact the ICT's implementation and use. Despite being co-designed with the municipalities and their communities and implemented using best practices, the ICT simply could not account for the low adaptive capacities that existed prior to implementation. The existing financial, technical and human resource challenges faced by both municipalities lead them to adapt their use of the ICT system, so as to still benefit from the potential for improved capacity it offered. The result left both municipalities feeling optimistic with regard to their abilities to manage and resolve complaints; so much so that both felt the system allowed them to get by with the limited resources they had.

However, the ICT system also looked to improve upon the challenges associated with managing customer relations. For all intents and purposes, the ICT provided the means to achieve this improvement. It provided new, free methods for logging complaints with the municipalities, included reference numbers for citizens to follow up on their complaints and be treated with more equity, and would allow the municipalities to be more responsive to their needs. That said, achieving these benefits depended largely on the municipalities' use of the system. Unfortunately, the adapted use by each municipality, which arose out of necessity, unintentionally resulted in very little of these benefits being realised by citizens. In the case of Municipality A, for instance, its adapted use (to that of a storage database rather than a real-time complaints management system) meant reference numbers were never issued to citizens, leaving them with no way of following up on their complaints. These "empty promises" to citizens only exacerbated the already strong feelings of preferential treatment that existed and did nothing for the lack of trust experienced between citizens and the municipalities prior to the ICT's introduction.

The existing conditions thus forced the municipalities to adapt their use of the ICT system in ways that, although allowed them (the municipalities) to better manage and resolve complaints, negated the potential

benefits the system had to offer citizens and, as such, impacted the change in managing customer relations the ICT sought to bring about.

7.5.2 Question 2: Do ICTs bring any measurable change in low-capacity environments?

As this study shows, ICTs do bring measurable change in low-capacity environments. However, it may not always be the change one expects. Of the 12 expected changes (Section 5.4), only 5 occurred for Municipality A and 6 for Municipality B. Of the other changes that occurred, one was negative for Municipality A and two for Municipality B. As all the changes were anticipated to be improvements, i.e. positive changes, this was unexpected. Some other unexpected changes occurred but were unrelated to the ICT system. The one unexpected, yet very important change, as a result of the system was the change in staff members' perception towards their work, even though the ICT system provided no means of increasing human resource capacities. Although not necessarily measurable using the ACW, being more "efficient" at one's work could translate into greater job satisfaction, a very important change for rural municipalities, where staff turnover "is a problem" (Municipal staff member, 2014). While ICTs are not designed to change perception, it is sometimes the most important change they can bring about.

7.6 RECOMMENDATIONS

The findings and conclusions presented in this thesis are the results of a case study involving only two local municipalities located in rural Eastern Cape, South Africa. In order to answer the research questions more generally and begin building a guideline for the impact low-capacity environments have on ICTs' abilities to change capacity, it is recommended that the same assessment be carried out on more municipalities. The number of municipalities to be assessed will be determined by the number required to make confident generalisations.

As a tool for assessment, the Adaptive Capacity Wheel is fairly new and has, according to the literature found, only been used in 25 other examples, only 2 of which are urban municipalities (Gupta et al., 2010; Klostermann et al., 2010). It is thus recommended that further research into the Adaptive Capacity Wheel as a tool for measuring capacity change be undertaken to determine its contribution and/or relevance and to gain a better understanding of the interlinks that exist between the criteria and dimensions that constitute it.

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9 APPENDICES

APPENDIX A: Topic Guide Questionnaire

Questionnaire

- **Fill in informed consent form**
- **Short overview of project - Remind them of the points of assessment**

Municipal structure

Status quo **(municipal manager/ mayor)**

1. Could you provide us with an organogram, (Organogram)
2. How would you describe your organizational culture? What is the work attitude? Work Load? General job satisfaction? (HR)
3. Department interaction – Do you rely on other departments for information? What kind of information?
4. How often do you meet as a municipality?
5. Has the municipality approved and implemented it's own Turn Around Strategy?
6. Do you think the current communication strategy between departments is good?
7. In your view, what are the current challenges of the municipality?
8. Who is in charge of communicating with the community?

→ KPAs, missions and values

9. Do you have a mission and value statement?
10. Are municipal staff aware of them and are they seen as important?
11. How are KPAs of the IDP integrated in daily workflow of departments?
12. How are KPA targets assessed? How often are they assessed?
13. Do you feel that the KPAs are a reflection of your performance?

Workflow (generic)

1. Could you describe the workflow when someone from outside (community member) reports a problem?
2. How are faults/issues reported?
3. How do you confirm or acknowledge the issue? What tracking mechanisms are in place? (e.g. ref number system)
4. How are issues conveyed to the right person/department?
5. What are your preferred modes for receiving complaints?
6. How are complaints prioritized? How do you decide which is most important? First come, first serve?
7. What happens when an issue is resolved? (Does the customer receive feedback?)
8. What are the good and bad things about the current system? How else to you think it can be improved? What changes would you like to see?
9. How do you report to provincial and national government?

Water & Sanitation (team and EHO)

Technical

1. Describe level of infrastructure→ What is the main water distribution system? Reticulation system/ borehole and sanitation system
2. What are the current challenges in that system?
3. What are the backlog levels and how do you manage it? (Documentation)

Drinking Water and Blue Drop

1. Who is responsible for water supply within the municipality?
2. Do you publish the BD and GD reports and how? Is it accessible to the public/relevant communities?
3. Who tests the water? Consultant or municipal staff member?
4. Where are the samples sent off?

Sanitation

1. What are the current challenges?
2. What are backlog levels? (Possible documentation)
3. Which systems have been chosen to address the backlog?
4. Within the municipality who is responsible for sanitation service delivery?
5. Who conducts the public participation processes in sanitation service delivery projects?
6. Are ward committees and councilors involved in sanitation projects? How?
7. How is the decision made on the types of sanitation systems to be provided and how is the community the engaged in that decision making process?

Vulnerability (also for service delivery)

1. Who are the most vulnerable people in your community?
2. Where are they located? (Town/villages)
3. Do they have access to water and sanitation?

Service delivery (technical + mayor perspective) (generic)

Service delivery performance

1. How would you rate your service delivery performance on a scale or 1- 10?
2. Does the municipality experience service delivery protests? How often?
3. What do you think are the main reasons for these protests?

Community aspect of service delivery

4. What are the main concerns the community seems to have with the municipality if any?
5. What challenges do you face when dealing with community (e.g. are they passive, not keen to attend meetings, conflicting interests)?
6. Can you elaborate on your communities' expectations towards service delivery?
7. Has your municipality put in place any community consultation / participation strategies or forums? Are they working well? If not, why not?

Fault reporting (workflow and water)

1. What are the limitations to response time? Is there an information delay between departments? (water/ sanitation + workflow)
2. What is the acceptable time frame between the fault occurring and the problem being resolved? (document)
3. Geographically, which areas are reporting the most faults? (water)
4. What are the main faults reported? (water)
5. Most popular method of reporting? Sms/ telephone/ face to face/ other channel such as ward councilor or representative?
6. Is there a seasonal relationship of fault reporting? E.g. holiday periods (frequency between various seasons)

Customer relations

Generic

1. Could you describe the workflow when a community member reports a problem?

Process of engagement

1. How would you rate the community participation on scale of 1- 10? (What have been the positive things and negative things)
2. What platforms are available for community engagement with municipality?
3. Do you use the government's public participation guidelines, if not, how do you engage with the public?
4. How many phone calls/emails/smses does the municipality receive regarding water service delivery issues → how many phone calls (incoming and outgoing) per month?
   How successful is your public participation process? And at which stage do you engage the community? E.g. session to explain to people what a pit latrine is and then a decision-making session
5. Do usually individuals report faults or is the communication through community representative for a, such as ward committees?

6. How often are meetings held to discuss challenges or updates (duration, venue, means of presentation e.g power point, debates, informal decisions) and how would you rate your meetings?
7. Who are the most influential members of the community and municipal sector?
8. Do you inform the community of the challenges you are facing (e.g. lack of funding, staff, time delays)
9. What does the municipality do to incentivize community participation?
10. Do you consider ward committee meetings to be an adequate public participation method? Are monthly meetings frequent enough?

Evaluation of service delivery – customer service survey

1. How do you evaluate customer satisfaction and how often?
2. How do you reach people that don't have access to the forms available on the Internet and where do people drop the forms off?

Access to information

1. How do you share information with the public? And what suggestions do you have for improvement?
2. How do citizens access information? (Manager and mayor)

Current information systems

1. What is your current IT infrastructure?
2. What is the current means of passing and receiving information between community and municipality (Facebook, sms, newsletter, emails, and posters?
3. Does the community have access to the technology and how would you evaluate the use of it (good, people hardly use it)?
4. Do you have an IT system to manage your workflow?
5. What kind of information does it capture (Financial, Water, Accounting etc.)?
6. Who manages/ operate the IS?
7. Do you have satisfactory IT skills in the municipality?
8. Are you happy with the current IT infrastructure?
9. What do you think are the shortcomings of your current system?
10. Have you faced financial challenges to keep systems up and running? E.g. license costs, consultancy fees etc.
11. How often do you experience problems with your IT infrastructure?
12. How much does the system failure impact your workflow/ service delivery?
13. What is the average delay between system failure and troubleshooting?
14. How are mobile phones used within the structure of the municipality?
15. What type of mobile phones and applications are most popular?
16. Do you have any suggestions regarding in which way (IS) systems (or call centers) can be used to improve your work?

Generic questions

1. Would a system (be specific about the proposed system) make your life easier?
2. Do you feel that if it is easier to report service delivery problems that your workload would increase?
3. What is your understanding of the term community (What constitutes a a community or how do you define a community)?
4. Who are the main role players in your community (Farmers, religious leaders? Tribal leaders)?
5. What are the things you consider when you analyze your particular community (current resources, infrastructure, skills of population)?
6. What are your thoughts, concerns and expectations regarding this research project?

APPENDIX B: Adaptive Capacity Wheel Questions

VARIETY

How does the municipality currently inform citizens of issues related to water & sanitation? (Criterion 1)
How are citizens involved in resolving issues of water & sanitation? (Criterion 2)
Do you rely on other departments when resolving issues of water & sanitation? (Criterion 2)
Please describe the current process when an issue (relating to water & sanitation) is reported. (Criterion 3 & 4)

LEARNING CAPACITY

Do you think mutual respect & trust has improved between a) municipal staff members and b) the municipality & citizens since the introduction of the ICT system? (Criterion 5)
Does the municipality achieve its goals, values and mission? If not, does the municipality change its action strategies and techniques to achieve them? (Criterion 6)
Does the municipality ever change its goals, values and mission so that they are achievable within their context? (Criterion 7)
Are the limitations of the municipality discussed openly? (Criterion 8)
Are any records of issues relating to water and sanitation kept? (Criterion 9)

ROOM FOR AUTONOMOUS CHANGE

Do the municipality and/or citizens have access to information regarding issues of water and sanitation? (Criterion 10)
Are citizens informed about issues of water & sanitation? If so, how? (Criterion 10)
Are citizens aware of what to do during a water and sanitation emergency? (Criterion 11)
Do citizens improvise when faced with issues of water and sanitation? (Criterion 12)

LEADERSHIP

Is visionary leadership present? (Criterion 13)
Is entrepreneurial leadership present? (Criteria 14)
Is collaborative leadership present? (Criteria 15)

RESOURCES

With regard to water & sanitation, does the municipality follow constitutional laws? (Criterion 16)
Are the correct expertise, knowledge and human labour available to deal with issues of water and sanitation? (Criterion 17)
Is sufficient financial funding and technology available to deal with issues of water and sanitation? (Criterion 18)

FAIR GOVERNANCE

Are citizens involved in decision-making? (Criterion 19)
Have citizens been accepting/supportive of the new ICT system? (Criterion 19)
With regards to issues of water & sanitation (and specifically the new ICT system), are all citizens treated equally? (Criterion 20)
With regards to issues of water & sanitation, does the municipal status quo respond to all voices of society? (Criterion 21)
Is the municipality held accountable when issues of water & sanitation are not resolved? How? And what are the consequences? (Criterion 22)