ASSESSING THE ADAPTIVE CAPACITY OF RURAL MUNICIPALITIES TO IMPLEMENT ICT INTERVENTIONS FOR COMMUNITY ENGAGEMENT IN DRINKING WATER SUPPLY MANAGEMENT

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EXECUTIVE SUMMARY

Background

In the past decade, the South African water sector has gone through substantial change to address the disparity of access to potable water, the shortcomings in water infrastructure development, and the adherence to water quality standards. Despite these attempts, recent service delivery protests relating to water and sanitation have highlighted the unsatisfactory communication between municipalities and communities, which has resulted in a lack of trust and constructive engagement. This study was based on the premise that community engagement is paramount to water supply management and sanitation provision. The research proposed an investigation regarding using information communication technologies (ICTs) to engage rural communities in water supply monitoring and reporting of service faults. However, the possibilities of using ICT interventions in engaging communities in managing drinking water supplies depends on both the capacity of municipalities to implement the system and adapt to changes accordingly. Thus, this report presents case study findings on the capacity of two rural municipalities to implement an ICT system and adapt to the change it introduced.

Aims

The aims of the project were as follows:

1. To identify successes and failures of incentivising community engagement through a detailed literature study.
2. To develop a detailed research methodology based on the findings of the literature study.
3. To analyse and assess current community engagement in drinking water supply of three research communities.
4. To identify incentives for reporting supply problems in collaboration with the community and the municipality.
5. To develop and implement a mobile phone tool as well as incentive structures and observe their use for six months.
6. To identify enablers and barriers to the use of ICTs and incentives based on the findings of the field study project scope and limitations.

Methodology

Using a number of rurality criteria, two local municipalities in the Eastern Cape were identified as the case study locations. To fulfil the ethical requirements for the study, the names of the municipalities were anonymised to Municipality A and Municipality B.

Both municipalities are water service providers to their communities and exhibit the relevant criteria for being classified as rural. In each of the municipalities, three communities were identified as case study sites. To analyse the capacity of municipalities to implement an ICT system and adapt to change, a combination of the Adaptive Capacity Wheel and the Information Value Chain was used.

Results and discussion

The analysis of the municipalities prior to the ICT implementation showed that both municipalities did not engage productively with their communities. A lack of proper communication and feedback mechanisms were identified as a hindrance to inform citizens appropriately. The expectation of the ICT implementation for both municipalities was that it would improve internal communication and engagement with the communities by building trust.

Communities experienced limited engagement with the municipality prior to the ICT engagement, and reported frustrations resulting from limited responsiveness on the part of the municipality. This lack of feedback damaged the trust that communities had in the existing communication and engagement

structures, weakening the relationship between municipality representatives, such as ward councillors, and the communities whose interests they were supposed to represent.

The ICT tool was designed in accordance with the feedback from communities and municipalities to address the identified communication issues. A toll-free line was established to allow a cost-free complaints registry; a please-call-me line allowed citizens to use their mobile phones to request a return call from the municipality.

Municipal staff reported positively on the perceived usefulness and ease-of-use of the system, despite both municipalities choosing to adapt the system from the original design to better match their needs, and neither municipalities remaining committed to the agreed process change of providing feedback to citizens.

Municipality A elected to rather use the system as a database log of historical complaints as opposed to a real-time tracker of ongoing issues. This resulted from the municipality struggling to adapt to the revised process of logging complaints as they occur due to the manner in which complaints were addressed. Further to this, contact numbers of complainants were not recorded through the system by Municipality A, which resulted in community members not receiving feedback.

Municipality B performed better in providing feedback to citizens, which was ascribed to a complaints process being in existence prior to the system implementation. Overall, both municipalities were equally constrained by financial resources in the use of the system, but adapted it to suit their own workflow processes. The municipalities did not commit to the idealised process of providing feedback to citizens hence resulting in the system providing more benefits to the municipal staff than communities.

Conclusion and recommendations

This project showed that ICT systems can support complaint management in municipalities and can result in a measurable improvement of adaptive capacity. However, the impact and the improvement are arguably not enough to leave either the municipalities or the communities in a better position to adapt and respond effectively to the changes. This does not necessarily mean that an ICT is not useful to improve the municipal processes, but implementing any system in a rural resource-constrained environment should be done cautiously while focusing on the changes that can be achieved when considering the resource limitations. An ICT is not a guaranteed solution to a difficult problem, but can compensate for resource limitations that result in water and sanitation issues not being addressed. The study highlighted the fact that the ICT system improved the overall knowledge and data tracking but that it could not improve the effectiveness with which citizen complaints were addressed.

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District Municipality of	Cacadu

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LIST OF ABBREVIATIONS

ACW	Adaptive Capacity Wheel
CDW	Community Development Worker
CoGTA	Department of Cooperative Governance and Traditional Affairs
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWQ	Drinking Water Quality
ICT	Information Communication Technologies
IDP	Integrated Development Plan
IT	Information Technology
IVC	Information Value Chain
PAR	Participatory Action Research
PCM	Please-Call-Me
SABS	South African Bureau of Standards
SALGA	South African Local Government Association
UCT	University of Cape Town
WRC	Water Research Commission
WSA	Water Service Authority
WSP	Water Service Provider

1 BACKGROUND

1.1 Introduction

In the past decade, the South African water sector has gone through substantial change in order to address the disparity in access to potable water, the shortcomings in water infrastructure development, and the adherence to water quality standards. Despite an overall improvement of water service delivery countrywide, rural communities are still lagging. Several reasons have been explored to explain these phenomena, which range from resource and skill limitation, to the geographical dispersion and physical distance between villages and towns (Rivett et al., 2013).

Within the growing body of research on water management, it has been observed that reporting of water delivery faults is limited, or even non-existent, in underresourced rural communities. Similarly, even in major metropolitan areas, there is clear a difference between the numbers of complaints logged in affluent areas compared to those in underresourced communities (Rivett et al., 2013). This is thought to result from a variety of factors, including ignorance of the complaints mechanisms available to citizens, a less empowered citizen structure, and complex relationships between water service providers and citizens. It has been noted that citizens may avoid blaming or pointing out non-performances of government or municipal officials, further hindering the identification, and subsequent resolution, of service delivery problems (Rivett et al., 2013).

This study is based on the premise that community engagement is an important component of sustainable water supply management. Such engagement serves a dual purpose: It provides an avenue to establish the needs of communities and, equally importantly, it ensures the buy-in and trust in systems developed by government authorities to deliver these services. Active community engagement relies on communities wanting to engage and contribute to the management and governance of services, and on governance structures proactively seeking such engagement and responding to it appropriately.

One of the hindrances to community members reporting their water supply faults has been their limited understanding of the roles and responsibilities of local and district municipalities. Community members are unclear whom to contact, and are disillusioned when there is no response to their complaints. Attempts to address this lack of feedback through mechanisms such as using complaint reference numbers to follow up logged calls is rarely understood. It is perceived by communities as an obstacle to the process of raising a complaint rather than being an aid. Metropolitan areas have a big disparity in the numbers of complaints logged in affluent areas compared to underresourced communities (Rivett et al., 2013).

Information communication technologies (ICTs) have been shown to offer new ways of engaging with the wider public on aspects such as governance. Over the past ten years, there has been an increase in literature suggesting such possibilities in the water, sanitation and hygiene sector (Champanis et al., 2013). The proliferation of mobile phones in developing countries specifically pertinent to this study, within the rural areas of South Africa, could result in ICTs contributing to overcoming the existing barriers of reporting water supply interruptions.

This research project proposed an investigation into the use of ICTs in order to engage rural communities in water supply monitoring and reporting of faults. To investigate the possibilities of using ICT interventions in engaging communities in managing drinking water supplies, the capacity of municipalities to implement the system and adapt to changes accordingly were assessed.

1.2 Project Aims

The overall aims of the project were as follows:

1. To identify successes and failures of incentivising community engagement through a detailed literature study.
2. To develop a detailed research methodology based on the findings of the literature study.
3. To analyse and assess current community engagement in drinking water supply of three research communities.
4. To identify incentives for reporting supply problems in collaboration with the community and the municipality.
5. To develop and implement a mobile phone tool as well as incentive structures and observe their use for six months.
6. To identify enablers and barriers to the use of ICTs and incentives based on the findings of the field study project scope and limitations.

This report only presents detailed findings on Aim 3, Aim 4, Aim 5, and Aim 6. Detailed findings for Aim 1 and Aim 2 can be located in a separate report titled: “Community Engagement in Drinking Water Supply Management: A Review”, which is downloadable from the WRC Knowledge Hub with reference TT 583/13.

For Aims 3 and 4, three municipalities were identified as potential participants for the study. These participants were selected based on a set of criteria highlighted in the research methodology. A qualitative survey was conducted by interviewing community members, councillors from the selected rural municipalities, and officials responsible for delivering water services. In collaboration with the communities and municipalities, incentive structures were developed. A number of research communities were reviewed, which resulted in two local municipalities and six research communities being identified for inclusion. This section is also presented in Chapter 3.

After collating the data from Aim 3 and Aim 4, an ICT application, coupled with a toll-free line and please-call-me (PCM) service, was developed for community members to report problems with water supplies. Part of the design was to ensure that the intervention integrated the identified incentives. The application was monitored over six months to gain an understanding of use patterns, information received and the drop-off once the novelty of using such a tool had worn off. During this period, several workshops and interviews were held with the municipality to understand the reactions to the additional information received from communities. The results of this analysis address Aim 5, which are presented in Chapter 4.

After the six-month period, final interviews were held with all participants to obtain additional data on the experiences itself. This survey was qualitative and engaged the same groups that had been used in the beginning of the study. The qualitative data was supported with the data received on the server through the ICT application. An analysis of the data and the findings are also presented in Chapter 5. This, and the discussion of findings in Chapter 6, address Aim 6.

1.3 Project Limitations

Selecting participants in action studies is often difficult since engagement is a key requirement to collect rich data. While the research team endeavoured to interview the originally intended number of participants and keep the group similar, the realities of selecting members, identifying dates for meetings and the varying agendas often made this an impossible task. Within the analysis of data, the shortcomings are discussed for each of the sites. During meetings with community members, the view was expressed that participation in studies such as these should be remunerated financially. The research team explained that participation was voluntary and that no financial reward would be paid. However, it has to be appreciated when entering communities with high unemployment that requests like this will occur and it requires collaboration with the relevant authorities to discuss these matters

with the community. It is not possible to determine whether and in which ways the non-payment had an impact on the study.

The municipal election in 2014 resulted in a delay of the project. The local municipalities advised avoiding interviewing communities in the run-up to the election since it could result in the research team being perceived as having a political agenda. The project was therefore extended by approximately three months, which resulted in a deviation from the original project plan.

1.4 General Approach

The project is grounded in a field study, where the researchers intend to understand context, but with the clear goal of intervention to improve existing practices. The research of the community and municipality is not a goal in itself – the intervention is a key component to achieve development. Based on this understanding, a participatory action research (PAR) paradigm was chosen. PAR requires that the researchers engage actively with the community and municipality under study (Denscombe, 2010). Often this results in research objectives changing throughout a study since the researcher adapts objectives based on the findings that were previously not identifiable. As highlighted in the project limitations, a flexible attitude is required throughout the project as the result is of greater benefit to all parties involved in the study.

The research team applied for ethical approval from the University of Cape Town (UCT) prior to engaging with municipalities and communities. Approval for the study was also received from both municipalities. The study was explained in detail to all participants with the help of translators where necessary. Consent was requested and obtained from participants prior to any engagement.

In the analysis and findings section, the names of the municipalities and communities were anonymised to comply with the ethics requirements. Municipalities and communities received feedback throughout the study and have been given access to this report.

2 LITERATURE REVIEW

The literature review focuses on water service delivery, community/public engagement, and the role of ICTs in service delivery. The review consists of excerpts from 1) a detailed and comprehensive review presented to the Water Research Commission as a separate report entitled: "Community Engagement in Drinking Water Supply Management: A Review" (Rivett et al., 2014b), and 2) a review on adaptive capacity presented as part of a master's dissertation (Jacobs, 2016).

2.1 Water Services Delivery in South Africa

The water sector in South Africa has been through a substantial restructuring process since 1994, including updated water acts, developed water policies, and revised water resource management structures resulting in significant institutional changes (Lindfors, 2011; Hudgson & Manus, 2006).

In the White Paper of 1994, the goal of the Department of Water Affairs and Forestry (DWAF) was defined as ending the inequity in access to basic water supply and sanitation services (DWAF, 1994). The central concepts of social equity and the right to a healthy environment are entrenched in the Constitution, adopted in 1996 (RSA, 1996). The Constitution proclaims that *"… everyone has the right to have access to sufficient food and water*" [section 27(1)(b)], and requires the government to *"… take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights"* [section 27(2)], thus making the government responsible for putting arrangements in place to secure access to sufficient water to meet the domestic needs of all South Africans (McDonald & Pape, 2002; RSA, 1996). Several laws and policies such as the National Water Act and White Paper on National Water Policy support these concepts.

As Lindfors (2011) contends, the Department of Water Affairs (DWA)[1] has the overall responsibility of water resource management and water service provision. As the leader of the water sector, its role is to support and strengthen the water service authorities (WSAs). This includes offering guidance toward effective management, monitoring performance and enabling capacity building. Moreover, the DWA has a central role in monitoring the sector's performance and ensuring the effectiveness of its duties. If the WSA is incapacitated to meet these standards, the DWA has the responsibility to intervene (DWAF, 2003). The DWA is also responsible for updating legislation and developing standards and national water policies while the South African Bureau of Standards (SABS) actually defines the standards which water quality must meet (DWAF, 1994). Additionally, the DWA manages information to be used for supporting, monitoring, regulating and planning (DWAF, 2003).

In 2005, the Drinking Water Quality (DWQ) Regulation programme was initiated by the DWA. It required microbial and chemical water quality testing to be done based on the South African National Standard 241 [short SANS 241 (SABS, 2006)]. This programme, which was restructured and renamed in 2008 as the so-called Blue Drop System, had the objective of ensuring that tap water quality improved through the improved performance of WSAs (Souza et al., 2009). The intention of introducing the Blue Drop Certification programme in 2008 was to increase awareness of water quality standards and to hold municipalities responsible for service delivery. While monitoring has substantially increased, the public's trust in water quality has not grown to the same level. By awarding WSAs with Blue Drop status if they are compliant with drinking water legislative and best practice requirements, it was hoped to increase transparency in DWQ management (DWA, 2010).

[1] Prior to 2010, the Department of Water Affairs (DWA) was called the Department of Water Affairs and Forestry (DWAF). The terms DWAF and DWA are used throughout this report based on the timeline of the publication referenced. Any reference prior to 2010 is referred to as DWAF; after 2010 it is referenced as DWA.

In 2011, the Blue Drop System increased its focus on engaging with the public by publishing water quality results. Municipalities were required to engage with the public, but it turned out that publishing these results was more complex than originally anticipated. Provinces such as the Eastern Cape, Northern Cape and Mpumalanga showed the lowest level of engagement with the public, while the provinces with high urban density performed the best.

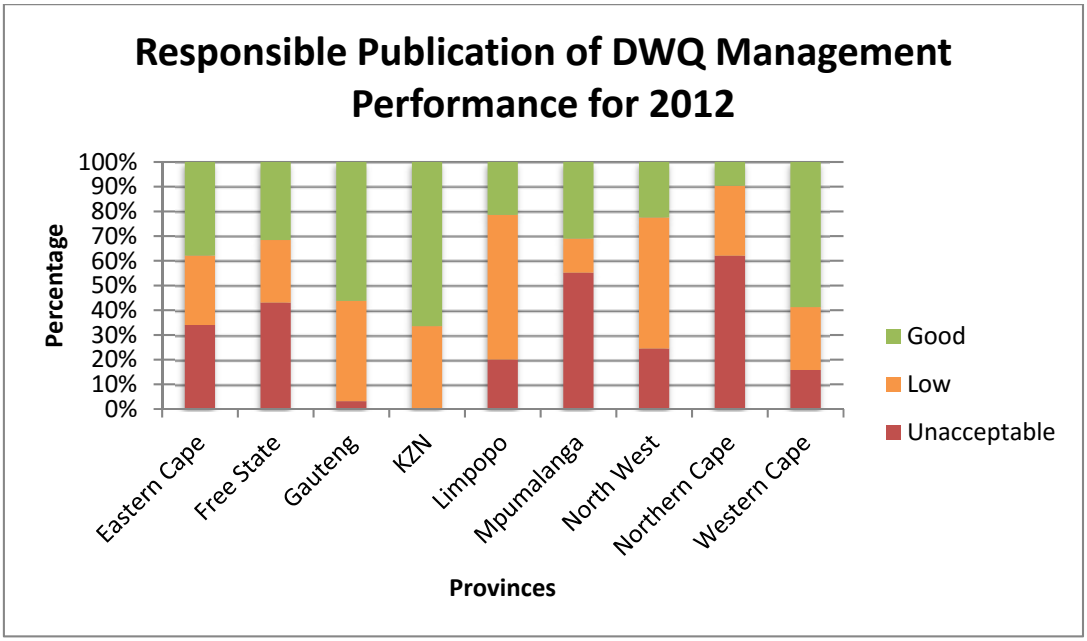

Figure 1: Publication of DWQ per province in 2012

2.2 Public Consultation and Service Delivery

In South Africa, public participation is not a privilege but a constitutional right. The constitutional provision places an obligation on government to establish public participation structures and systems. Tsatsire (2008) argues that public participation must be pursued – not only to comply with legislative prescriptions, but also to promote good corporate governance. In support of the 1996 Constitution, subsequent local government legislation and policy papers include 'local residents' under the definition of local government. Although public consultation and participation are part of the new developmental mandate assigned to local government, they remain a challenge that confront municipalities.

The transformation of local government in South Africa after 1994 has had several important implications. The first implication is that in terms of a variety of legislative prescriptions, the status of local government has changed. Municipalities have been assigned additional responsibilities, and structures have changed to suit these new functions. Planning must be integrated, and developmental and municipal performance must be measured and judged by the municipalities themselves, by residents and by the provincial and national governments. As part of their developmental role, municipalities are required to form partnerships with their communities.

Community participation does not happen in a vacuum. Communities are motivated to participate by the prospect of bringing development to their areas – development that is sustainable and empowering. This type of development is focused on basic and essential human needs such as water, food, health, safety and the like. It also focuses on using indigenous knowledge to ensure that development is appropriate to local conditions and needs.

The primary aim of community engagement is to make municipalities more accountable and responsive by enhancing service delivery and improving governance (Buccus et al., 2007). However, there are some obstacles that need to be addressed. Municipal officials are often perceived by the community to be inaccessible owing to their associated high level of office (Green et al., 2005). This notion is

maintained in a study conducted by Buccus et al. (2007) in which community members felt that community engagement made no difference to governance as they believed that it was used as a mechanism to legitimise decisions that had already been made at a higher level.

Relationships between traditional leaders and elected officials are another challenge to engagement processes and structures where uncertainties in political motivations exist (Buccus et al., 2007). Lack of communication among municipal departments and political intervention also hamper the progress of service delivery as projects are not properly funded or prioritised. This breakdown in communication often leads to inefficiency and uninformed decisions (Smith & Green, 2005). Projects have to be informed by the needs of communities, which are identified through ongoing community involvement and engagement. After implementation, monitoring and evaluation, communities should also be consulted to establish the impact of and their level of satisfaction with the programmes implemented.

2.3 Governance, Service Delivery and ICTs

Hellström (2008) defines governance as the relationships between the state, market and civil society, and the coordination and decision-making according to set norms and rules. Good governance, the form of governance that democratic states aim for, is seen as a "… *functioning democratic system where the freedom of expression and a sound juridical system are in place*" (Hellström, 2008). The term 'good governance' does not have a set definition but comprises participation, the rule of law, effectiveness and efficiency, transparency (built on the free flow of information), responsiveness, consensus orientation, equity, accountability, and strategic vision (UNDP, 1997 cited in Hellström, 2008).

Over the past decade, the notion of having access to mobile communication to influence governance is becoming more prevalent (Castells, 2012). The potential role of ICTs in governance has been identified as one that speaks to the participation from citizens in good governance. ICTs offer a space in which individuals can participate in discussion forums as well as contribute through social networking pages and blogs (World Bank, 2012). Several so-called 'm-government' (mobile government) systems have been developed and implemented in, for example, the Philippines. *"[A]bout half of Philippine government agencies offering e-services have incorporated SMS[2] as a service delivery mechanism and in enhancing political participation"* with the main purposes being to *"provide information, to set-up feedback mechanisms for stakeholders either in form of complaints or suggestions, and to make service delivery faster and more convenient*" (Lallana, 2006, cited in Poblet, 2011).

In South Africa, a number of m-governance systems have been put in place. For example, in Cape Town, service faults can be reported by SMS and rates can be paid through a mobile phone billing system. An SMS system developed by the DWA provides information on the water quality at any location in the country (DWA, 2012). Another example is Lungisa – a community monitoring and reporting application (infoDev, 2012). The application allows people to report complaints about service delivery using their mobile phones. Through a monitoring platform, progress on the complaints made can be tracked (infoDev, 2012). The City of Johannesburg Municipality uses the social media platform Twitter for customers to get real-time updates about water saving and water service issues on @jhbwater (www.joburg.org.za). The municipality has described this as a way of improving service delivery and accessibility. Residents are encouraged to engage on the site with the Twitter account @jhbwater to alert the municipality of any issues. The Lwazi information system allows citizens to report service delivery issues in their preferred language of choice (CSIR, 2011). This service was created with the intention of targeting individuals located in remote rural areas but with access to mobile phones or landlines. The aim is to capture information that can be used to enhance service delivery.

[2] Short message service

Lack of communication and engagement between governments and citizens may be a key reason for protests and social movement resistance. Castells (2012) goes one step further and speaks about the "*networks of outrage and hope*" that represent the notion of communities not being heard and resisting the decision-making of governments. ICTs are seen as a potential avenue for opening up communication, making government accessible and empowering citizens to hold decision makers accountable. The mobile phone is experienced as a tool that individuals may use anonymously to participate in governance without fear of reprisal (Castells, 2012).

South Africa is familiar with the challenge of service delivery protests and the outrage of communities responding to failed implementations of infrastructure developments. ICTs have been identified as providing an opportunity to improve the communication between stakeholders and increase public participation in local decision-making. In 2012, the South African Local Government Association (SALGA) developed a municipal guide and roadmap to successful ICT governance for local municipalities to foster innovation and implementation of ICT projects. The SALGA is the combined representative of local municipalities that seeks, among other directives, to *"… transform local government to enable it to fulfil its developmental role … develop capacity within municipalities*" (www.salga.org.za).

The SALGA recognised the importance of aligning ICT and governance to improve the role of local municipalities, which is highlighted in its strategic plan of implementing ICTs in service delivery. The following aspects are highlighted in the SALGA ICT agenda (SALGA, 2012):

- Recognising that ICTs 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.
- Raising the political and actual profile of ICT within local authorities and communities.

ICT use is seen as having the potential for sustainable economic and social development, speeding up service delivery, and improving efficiency and accountability within municipalities i.e. the potential for building capacity within municipalities. Realising this potential, however, depends on the ability of municipalities to adapt and respond to change – change which ICTs seek to bring about.

2.4 Local Municipalities as Institutions and Adaptive Capacity

Local municipalities are institutions. As institutions, they 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 et al., 1999: 437), and are inherently resistant to change (Gupta et al., 2010). While this does not mean that municipalities are unable to change, it does mean that change depends on their ability to adapt and respond to that which introduced the change in the first place. In the context of this study, ICTs introduce change.

This ability to adapt and respond to change is referred to as adaptive capacity (Gupta et al., 2010), which is defined 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: 4).

Applying this concept to institutions, Gupta et al. (2010:4) 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*".

"*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. "*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).

Gupta et al. (2010) identify six dimensions and 22 criteria that affect the ability of institutions to adapt and respond to change (see Figure 11). They include conventional factors of failure associated with ICT projects (Gichoya, 2005; Kimaro, 2006; Ndou, 2004), and introduce other new factors that are key in determining adaptive capacity.

Hypothetically speaking, if an institution, such as a local municipality, had no ability to adapt and respond to change, the likelihood of an ICT successfully bringing about change and building any capacity would be low; thus, a low adaptive capacity would result little to no capacity building within a municipality. At the other extreme, if a local municipality had no robustness and exhibited no resistance to change, it too would fall apart in the face of change.

The assumption is that somewhere between these two extremes lies an optimal point of institutional adaptive capacity – a point where ICTs have the best possible chance of building capacity within local municipalities. Municipalities with adaptive capacities either side of this ‘optimal point’ will arguably impact the implementation and sustained use of ICTs, and hence the extent to which the ICTs build capacity.

3 RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design and methodology of that part of the study concerning municipal capacity changes, in the following sequence:

1. Methodological approach for the study.
2. Study site selection and description of each site.
3. Methodology used for analysing the capacity of municipalities.

For a description of the research design and methodology of that part of the study concerning the ICT system design, implementation and evaluation, please see sub-report K5/2214: “ICT System Sub-report”.

3.2 Methodological Approach

Assessing the possibilities of engaging communities in managing drinking water supplies requires an investigation into several different aspects fundamental to the delivery of drinking water. Most municipalities and government structures assume that difficulties or failure of water supplies – be they smell, taste or interruptions to service – will be reported by the public through available channels, such as telephone, the media or other stakeholders. Municipalities may even rely on the public to report such problems. The literature review showed that despite clear evidence that rural water supplies fail more often than urban systems, reporting from rural communities is unusually low. The assumption is that there are barriers that hinder reporting, which may include the following:

- The financial ability to contact the municipality.
- The lack of knowledge of whom to contact.
- A general lack of motivation.

The study investigated whether the above-mentioned barriers can be mitigated through a system that provides the finances, the knowledge and the incentive to report water supply failure. To develop such a system and to assess the barriers, the following steps were followed in this project:

1. Selecting study sites and assessing preparedness for participating.
2. Investigating how communities can be incentivised to contribute to water supply monitoring.
3. Designing, developing and implementing an ICT system that can be used for reporting water supply faults (covered in detail in sub-report K5/2214: ICT System Sub-report).
4. Assessing the ICT system and how it can play a role in improving the current reporting by providing the knowledge and overcoming the cost of contacting the appropriate municipal offices.

The research adopted an intensive case study approach, which assessed how a process is established in a particular setting, what produces a change, and what participants or the intervention did to produce change. The study was exploratory in nature: respondents were given the opportunity to engage freely, reflect on their learning, assess changes – and, equally, the researchers built up their knowledge throughout the study (Mingers, 2004; Sayer, 2010).

The methodology of the study took the existing and possibly different structures in each of the study sites into account. The difference between the sites could obscure the findings and it was therefore important to assess the impact of contingent relationships. Attention was paid to social and political relationships within the study sites. This was particularly important in the context of engaging two often opposing groups of municipalities and communities, with the communities receiving services and municipalities providing the service. Since a number of sites contributed to the artefact design, it was expected that the levels of diversity would be representative of the diversities found in communities and municipalities in South Africa.

3.3 Study Site Selection and Description

Since the focus of the study was on water service delivery in rural areas, the notion of rurality had to be defined prior to selecting the study sites. The term 'rural environment' is highly contested, particularly in South Africa, where the delineation of the country into different areas has resulted in an unequal distribution of resources. Even though the criteria for delineating settlements vary from country to country, the contrast between urban and rural areas is generally related to stereotypical differences associated with their populations.

In South Africa, the classification of settlement type is generically based on the dominant dwelling type and land use as well as a lack of resources available, which include access to water, sanitation, housing and education. To define rurality beyond population density, an extended set of criteria was developed using a number of parameters highlighted in recent studies (Everatt, 2009).

Table 1: Criteria for assessing rurality of study sites

Indicator	Definition
Population density	Number of households per square km
Female-headed households	Proportion of households headed by women
Education level	Proportion of population (20+) who have completed matric
Rate of unemployment	Proportion of the economically active population who are unemployed
Social grant dependency	Proportion of households dependent on social grants
Dwelling type	Proportion of households classified as traditional
Water	Proportion of households without access to a basic drinking water supply
Sanitation	Proportion of households without access to basic sanitation

Community-based research faces many ethical dilemmas, which range from the power-intent relationship of the research team entering the community to the perceived benefits of being seen to work with universities and the hope that something will change once the research team leaves. This study relied heavily on the engagement between researchers, municipalities and communities. It was therefore paramount to establish early on the intentions from the researchers' side as well as the expectation of the community and municipality. Throughout the duration of the study, the community as well as the municipality perceived the researchers as a resource. This required ongoing management to avoid creating expectations that may not continue after the finalisation of the study. The research team was aware of these challenges and the potential of these types of research projects where information is extracted for self-advancement without giving anything in return.

In order to minimise these challenges, a detailed process of engagement was entered into prior to the study and each municipality was assessed regarding its preparedness for participating. The process of engagement prior to starting the study can be found in Appendix A.

3.3.1 Description of study sites

South Africa comprise nine provinces with an estimated population of 53 million (Stats SA, 2013). The rural areas as per the criteria in Table 1 can be identified within each of the provinces. Several constraints were considered prior to site selection. Owing to budget requirements, it was important that the sites did not require extensive travel. Additionally, it was felt that areas previously used as field sites should be avoided since a certain research fatigue has set in. This is particularly true for the former homelands of the Eastern Cape, which were therefore excluded from the study. Based on these constraints, it was decided that the rural areas of the Eastern Cape coastline would be appropriate.

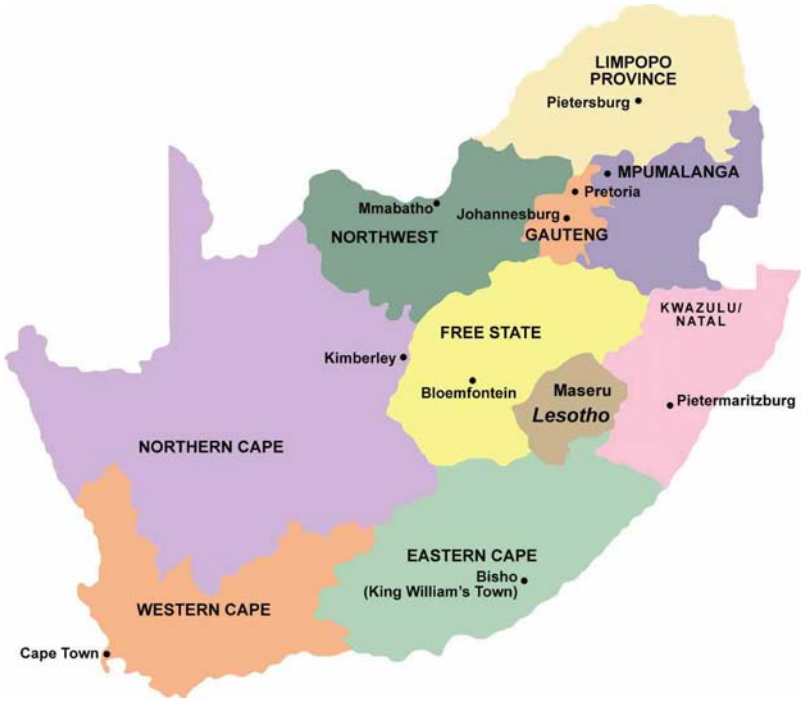

Figure 2: South Africa and its nine provinces[3]

Geographically, the Eastern Cape is the second-largest province covering an area of 168 966 km^2 (Stats SA, 2012) and is home to 6.62 million people (Stats SA, 2013). The Eastern Cape consists of two metropolitan municipalities (Nelson Mandela Bay and Buffalo City), six district municipalities (Alfred Nzo, Joe Gqabi, OR Tambo, Chris Hani, Amathole and Cacadu) and 37 local municipalities (Anon, 2011).

Figure 3: Municipalities of the Eastern Cape

The study sites selected were Kou-Kamma Local Municipality and Ndlambe Local Municipality, which are located in the Cacadu District (Figure 4). These sites were selected by applying the rurality criteria

[3] Source: Wikipedia Online Encyclopedia, 2011. Retrieved from http://en.wikipedia.org/wiki/File:Map_of_South_Africa_with_English_labels.svg [Accessed: 24 February 2014].

and following the process described in Appendix A to assess preparedness to participate. The rurality criteria per site are presented in Table 2.

Table 2: Rurality criteria per study site

Indicator and Definition		Kou-Kamma Municipality	Ndlambe Municipality
Population density	Number of households per square km	3.1	10.5
Female-headed households	Proportion of households headed by women	31.2%	42%
Education level	Percentage of population who have completed matric	17.6%	20.1%
Rate of unemployment	Proportion of the economically active population who are unemployed	15%	30.3%
Social grant dependency	Proportion of population between ages of 15 and 64 dependent on social grants	52.1%	54.3%
Dwelling type	Proportion of households classified as traditional	0.3%	3.8%
Water	Proportion of households without access to basic drinking water supply	35%	17%
Sanitation	Proportion of households without access to basic sanitation	20%	32%

The overall Blue Drop score for the Eastern Cape in 2012 was 82.1% with Cacadu District Municipality achieving an average Blue Drop score of 40% (DWA, 2012b).

Figure 4: Map of Cacadu District [4]

[4] Source: The Local Government Handbook Website. 2012. Retrieved from http://www.localgovernment.co.za/districts/view/3/cacadu-district-municipality# [Accessed: 24 February 2014].

3.3.2 Ndlambe Local Municipality

Ndlambe Local Municipality is bordered by the Makana Local Municipality in the north, Sundays River Valley in the west and Ngqushwa (Amathole District Municipality) in the east. It encompasses the towns Alexandria, Port Alfred, Bathurst, Boknesstrand, Cannon Rocks and Kenton-on-Sea. The Ndlambe Local Municipality serves a population of approximately 61 000 people, comprising 78% black people, 14% white people, 7% coloured people and less than 1% of people are of Indian or Asian descent. The dominant language spoken is Xhosa (77.7%), followed by English (12.2%) and Afrikaans (11.7%) (Stats SA, 2011a).

The unemployment rate for the area is 30% with a large portion (about 42%) of female-headed households. Literacy rates are estimated to be 54%, which is below the provincial average of 60.2% (Ndlambe Local Municipality, 2013). Only 20.1% of the population residing within Ndlambe has completed matric and only 9.9% have some form of higher education (Stats SA, 2011a).

The Ndlambe Local Municipality is a WSA and water service provider (WSP) with the Amatola Water Board. In 2012, the municipality achieved an overall Blue Drop score of 42.37% and ranked 11th (out of 17 municipalities audited), which is an improvement on its 2011 score of 20.93% (DWA, 2012a). However, the 2012 Blue Drop score is *"… not a true reflection of the Ndlambe Local Municipality's drinking water quality management*" because "… *inspectors had great difficulty obtaining information from those responsible for the various functions*" (DWA, 2012a: 57).

A total of 83.2% of residents has access to municipal water (shown in Figure 5), but only 36.1% of the population has access to piped water inside a dwelling (Stats SA, 2011a). "*The Ndlambe Municipality defines low level access to water services as that of RDP[5] standards, being a tap supply within a 200 m radius of all urban consumers, while high level access is considered when water supply is available within households*" (Ndlambe Local Municipality, 2008: 28).

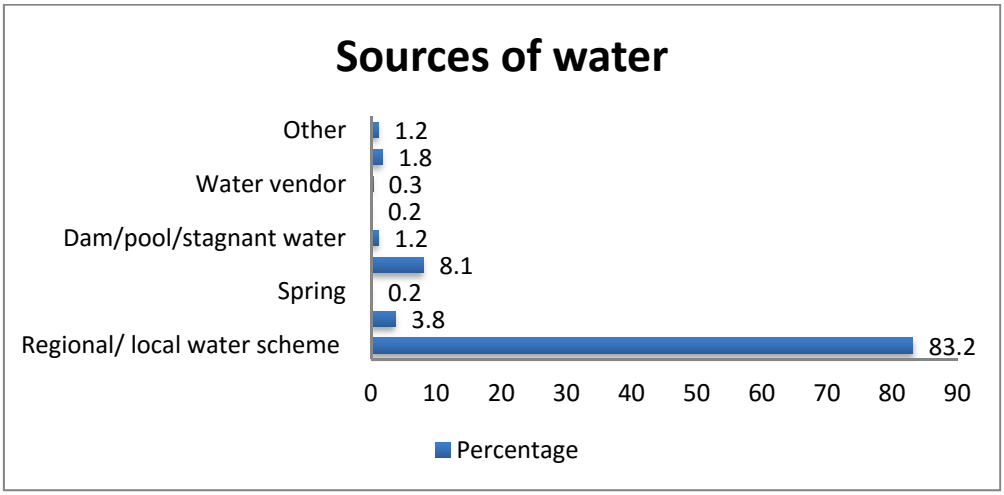

Figure 5: Water sources (Stats SA, 2011a)

The Ndlambe Municipality maintains and operates all sewerage systems within both its functions as WSA and WSP (Ndlambe Local Municipality, 2008). As shown in Figure 6, only 35.6% of households have access to a flush toilet connected to a sewerage system; 25.1% of households have access to a flush toilet connected to a septic tank; and 20.6% of households have access to a pit toilet without ventilation (Stats SA, 2001a).

[5] Reconstruction and Development Programme

According the Blue Drop Report of 2012, the municipality was not an easy audit case (DWA, 2012a). Obtaining information proved difficult for the auditors and none of the water treatment works were classified in terms of the legislative requirements. However, this municipality was said to perform satisfactorily in terms of the quality of tap water when compared to similarly sized municipalities. However, substantial improvements were required (DWA, 2012a). Because no results have been made available to the public beyond 2012, it is difficult to know whether the municipality is currently following constitutional laws in terms of water and sanitation.

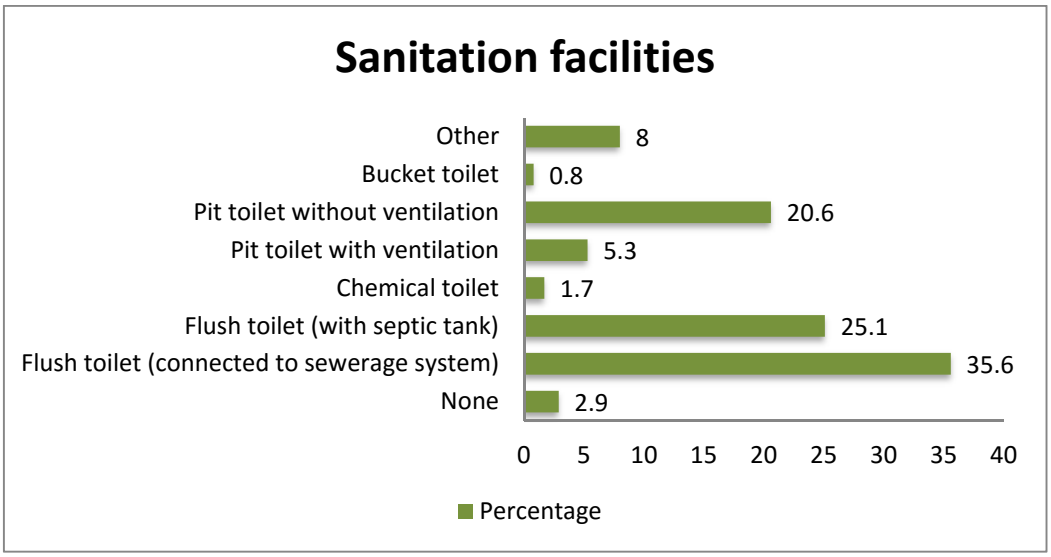

Figure 6: Sanitation facilities (Stats SA, 2011a)

Figure 7 shows that most people (about 12%) residing in Ndlambe access the Internet using mobile phones; 11% have access to the Internet at home; 3% from work; 4% from 'elsewhere' with 70% without any access (Stats SA, 2011a).

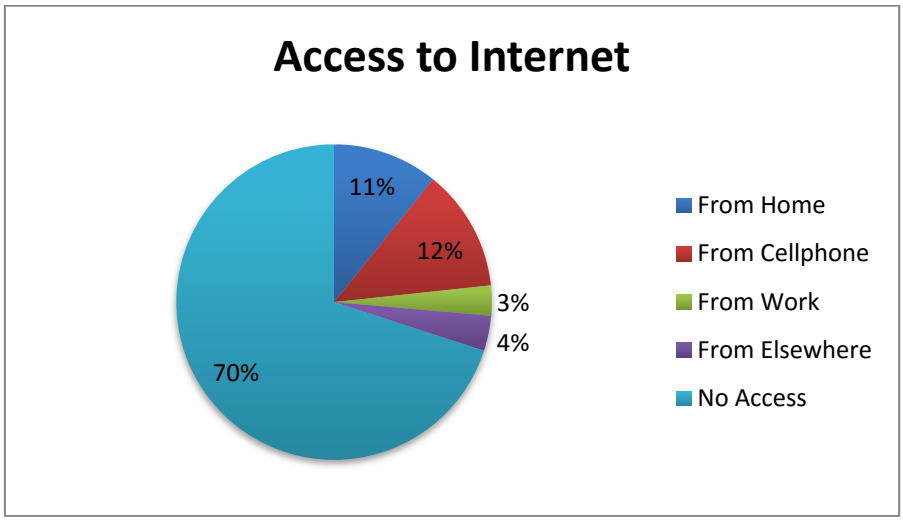

Figure 7: Access to Internet (Stats SA, 2011a)

3.3.3 Kou-Kamma Local Municipality

Three other local municipalities border Kou-Kamma Local Municipality, namely, Kouga to the east, Baviaans to the north, and Bitou (Western Cape) to the west. Kou-Kamma Municipality comprise the Langkloof area, which consists of the towns of Kareedouw, Joubertina and Louterwater, and the coastal belt, which comprise the Tsitsikamma area and includes Storms River, Coldstream and Clarkson (Kou-Kamma Municipality, 2011; Kou-Kamma Local Municipality, 2012).

Kou-Kamma covers an area of 12 570 km^2 (Kou-Kamma Local Municipality, 2006) and houses a population of approximately 41 000 people, which comprise 60% coloured people, 31% black people, 9% white people, and less than 1% people of Indian or Asian descent. About 1.1% of the population is classified as 'Other', which may partially be explained by the high level of migration labour from other countries (Stats SA, 2011b).

Afrikaans is the most commonly spoken language in the area with 74% of the population as Afrikaans primary language speakers, followed by Xhosa with 20% of the population as primary language speakers and only 2.5% of the population as English speakers (Stats SA, 2011b).

The unemployment rate for Kou-Kamma is 15%, which is the lowest in the province (Kou-Kamma Local Municipality, 2012). Only 17.6% of the population residing in Kou-Kamma has completed matric and only 3.9% has some form of higher education (Stats SA, 2011b). The education levels are considerably lower than those of Ndlambe and Kouga.

Kou-Kamma Local Municipality is both the WSA and WSP for its designated area. According to the Blue Drop Report, the municipality ranked 16th out of the 17 audited municipalities. It is regarded as the worst-performing municipality. Kou-Kamma's Blue Drop score for 2012 was 5.6%, which is a regressive score from 2011 when it scored 14.36%. Most of the water systems failed to score on the DWQ compliance, management of the water system and treatment processes (DWA, 2012a).

A total of 68.2% of Kou-Kamma households have access to water from within a dwelling and 64.7% of households receive their water from a municipal water scheme (refer to Figure 8). The second-largest source of water for 14.6% of households is boreholes; the third-largest source of water for 10.7% of households comes from dams/pools/stagnant water (Stats SA, 2011b).

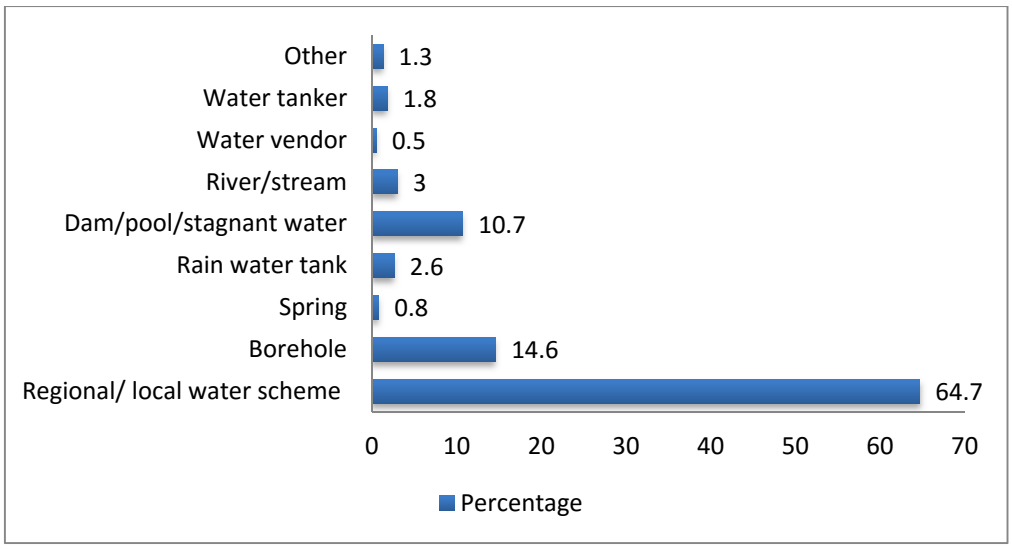

Figure 8: Water sources (Stats SA, 2011b)

Most households (68%) have access to a flush toilet connected to a sewerage system as shown in Figure 9 (Stats SA, 2011b). One of the major service delivery challenges that Kou-Kamma experiences is the vast geographical distances between settlements, which places a high demand on the limited resources needed for operation and maintenance (Kou-Kamma Local Municipality, 2012). "*Communities complain that they wait up to two weeks to have sewerage problems attended to and this poses health-related risks. Solutions should be found to deal with this problem. Part of the solution needs to consider community awareness regarding their own practices that result in blocked pipes*" (Kou-Kamma Local Municipality, 2012: 77).

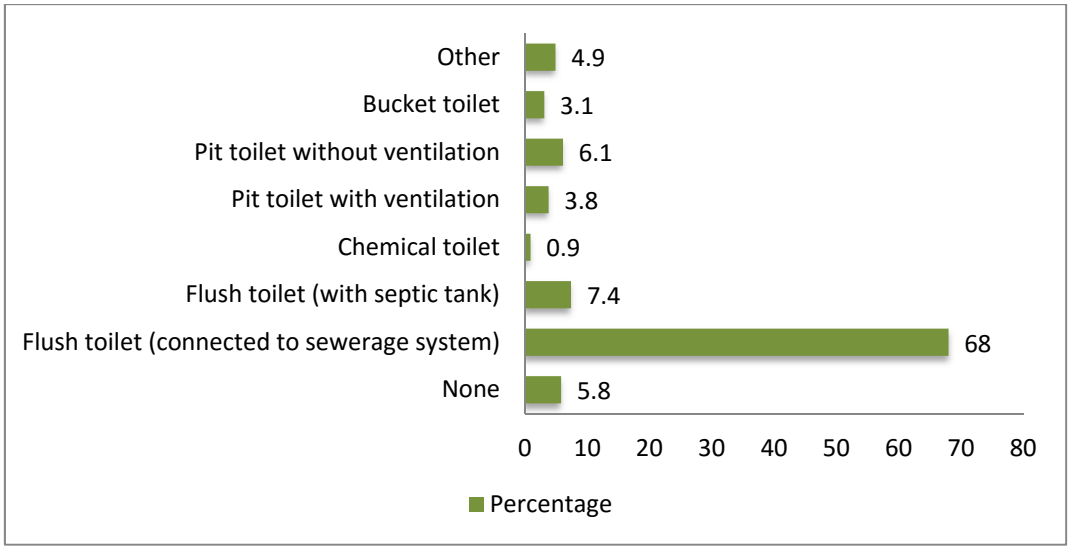

Figure 9: Sanitation facilities (Stats SA, 2011b)

According to the Blue Drop Report of 2012 (DWA, 2012a), Kou-Kamma Municipality has been facing several challenges regarding water quality management. The municipality's performance was marked as dismal during the audit. The report highlighted that there was little commitment to safeguarding citizens against the risks of poor water quality. The DWA had issued warnings to all residents and visitors of the Kou-Kamma area not to consume tap water without taking measures to improve its quality (DWA, 2012a). The 2012 Blue Drop results for the period of the report indicated that the municipality did not follow constitutional laws regarding water and sanitation. Unfortunately, no further data regarding water quality has been made public since 2012.

The analysis of the prevalence of ICTs in Kou-Kamma Municipality showed that most households (77%) do not have access to the Internet (Figure 10). Only a few households have access with 9% using mobile phones, 5% accessing from home, 3% accessing from work and 6% accessing from elsewhere (Stats SA, 2011b).

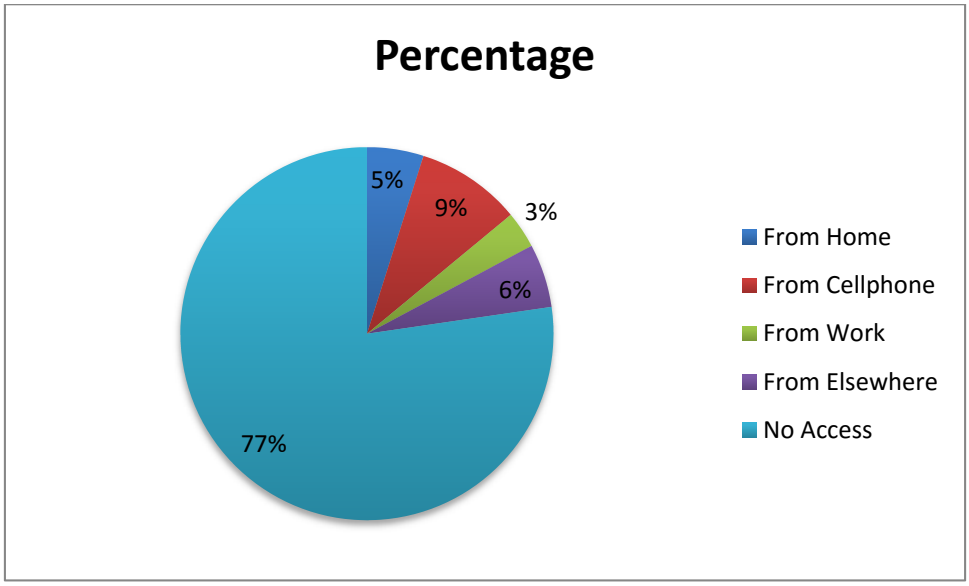

Figure 10: Access to Internet (Stats SA, 2011b)

3.4 Methodology for Analysing the Capacity of Municipalities

A combination of the Adaptive Capacity Wheel (ACW) and the Information Value Chain (IVC) was used to analyse the capacity of municipalities to implement a system and adapt to change.

3.4.1 The ACW method

The ACW was developed by Gupta et al. (2010) as 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. It is one of the methods developed and tested in the context of government capacity assessment. The ACW consists of six dimensions and 22 criteria.

To match the method to this study, the criteria were adjusted to better reflect the adaptive capacity for each municipality in the context of service delivery. The adaptive capacity was assessed, both before and after the implementation of the ICT complaints management system, which highlighted those aspects of each municipality that enable or inhibit their ability to adapt to change. A detailed overview of the specifics of the method is given in Appendix C.

Figure 11: The ACW (Klostermann et al., 2010)

ACW consists of five steps (Gupta et al., 2010):

- Preparing for research.
- Collecting data.
- Analysing data.
- Interpreting data.
- Presenting it.

Preparing for the research involved internalising and modifying the dimensions and criteria to establish their relevance to the study. Data was collected through semi-structured interviews. The data was analysed by scoring each criterion of the wheel and providing reasons for each scoring. The five scores with their colour-coding and explanations are shown Table 3.

Table 3: Scoring the criteria of the ACW (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 have been scored, an aggregate for that dimension was calculated. This was done by adding the scores and dividing them by the number of criteria for that particular dimension. The aggregated scores for each dimension were scored according to the values in Table 4.

Table 4: 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 4 were also the values used when scoring the overall adaptive capacity, which was aggregated from the scores of each dimension. The data was interpreted to present it in a way "*… that communicates the strengths and weaknesses of a specific institution or institutional context in terms of adaptive capacity*" (Gupta et al., 2010). As outlined by Gupta et al. (2010), this includes:

- Interpreting the scores to give them meaning in their context.
- Explaining (inter-) dependencies between dimensions and/or criteria and tensions between dimensions and/or criteria.
- Explaining which criterion appears to conflict with another criterion in a specific situation and why.
- Drawing conclusions on what the interpretations imply about the ability of a specific institution to promote adaptive capacity and what can be done to improve the adaptive capacity of the institution.

The results prior to the ICT implementation are presented in Chapter 4 and the analysis after the implementation is presented in Chapter 6.

3.4.2 IVC method

The IVC is used frequently in the economics sector to model value-creating events and evaluate an organisation's competitive advantage (Kaplinsky & Morris, 2001). The IVC is an adaption of the value chain principles. It is defined as "*… an integrated framework that bridges the processes, organisations, technology necessary to manage, analyse and use information*" (Gresham & Andulis, 2002). The IVC approach was used in this study to understand the value of information, the information flow and the decision-making processes within rural municipalities.

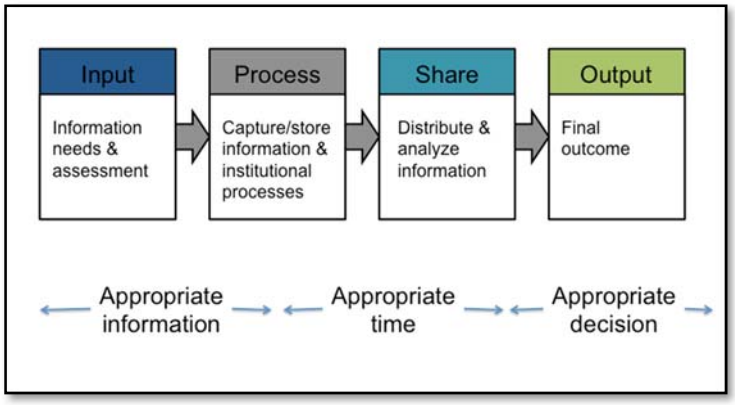

Figure 12: IVC (Kaplinsky & Morris, 2001)

IVC has four aspects, namely, input, process, share and output. All four chains are connected by transformation activities where information is transformed from an input to a final outcome.

- Input – considers what information is needed by the municipality to respond (outcome).
- Process – looks at how information is captured and stored and also considers the institutional process which follows, i.e. the workflow within the municipality.
- Share – municipalities are required to share information, issue warnings and keep the public informed of the municipality's general activities. This takes place through various forms such as publishing in media such as newspapers, radio, websites etc. or occurring in public meetings.
- Outcome – the final decision-making product and takes the form of a response or action.

Municipal staff were interviewed using topic guides including themes such as municipal structure, daily work functions and workflow, complaint mechanisms, community interaction with municipality, service delivery challenges and others. Community interviews and focus groups were structured in a similar way to garner information of citizen perceptions and expectations of the municipality as well as real interactions. The IVC approach was used as an analytical tool by categorising information into phases (such as input, process, share and outputs), perspectives (such as information needs and assessments and institutional processes among others), objectives (such as appropriate information, time and decision). Each category had a list of features or questions that had to be satisfied. An overview of the topic guide can be found in Appendix B.

The analysis prior to the ICT implementation is shown in Chapter 4 and the findings for each of the municipalities after the implementation are in Chapter 5.

4 ANALYSIS OF THE PRE-ICT IMPLEMENTATION MUNICIPAL CAPACITIES

4.1 Introduction

As highlighted in the literature review, a constructive relationship between municipalities and communities can serve as an incentive for positive engagement between both parties. Such engagement relies on understanding the capacity of the municipality for responding to community needs and the community's requirements for engagement with the municipality.

This section describes the status quo of capacity, information flow and public engagement prior to the implementation of the ICT complaints management system. The results are presented per municipality.

4.2 Municipality A and its Communities

Municipality members and communities were interviewed at the outset of the study to understand critical challenges that impact current practices of engagement as well as challenges in service delivery.

4.2.1 Analysis of Municipality A's adaptive capacity

The analysis of the interview data to assess the adaptive capacity of Municipality A resulted in the wheel in Figure 13.

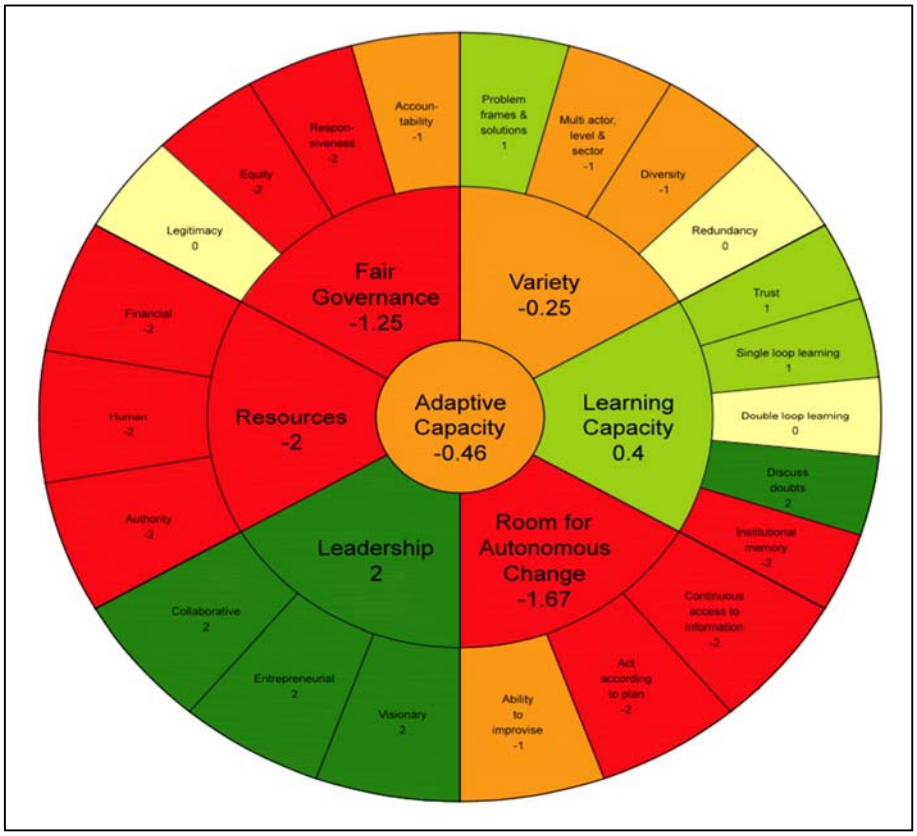

Figure 13: Municipality A: Pre-ICT implementation ACW

Municipality A's adaptive capacity is −0.46, which shows a slightly negative ability to adapt and respond to change. The main dimensions contributing to this outcome were: *Resources* (−2), *Room for Autonomous Change* (−1.67) and *Fair Governance* (−1.25).

The dimension of negative resources was identified by all municipal interviewees during interviews. It was highlighted that the municipality often required the skills of external service providers to resolve water and sanitation issues. Skills in the workforce of the municipality were lacking and/or insufficient. Although water controllers had been trained properly, there were not enough water controllers to manage the current workload. There was a strong experience of the municipality being understaffed owing to a lack of funding. It was also suggested by some of the participants that the "*aging human resources needed to retire*" and be replaced by "*new energetic people*" (Municipal Staff Member, 2014). Some interviewees stated that their positions were not attractive and potential employees did not see room for growth. Staff indicated that there was an aspiration to work for metropolitan municipalities. As the score of −2 for *Financial Resources* shows, the municipality relies substantially on external funding and raises little of its own budget. External funding is not always readily available and thus access to resources is compromised. The lack of financial and human resources was highlighted as contributing substantially to the difficulty of the municipality to comply with the legal requirements for water and sanitation service provision.

The dimension of *Autonomous Change* depends on the ability to improvise, act according to a plan and have access to information. A lack of information was identified as a substantial hindrance for the municipality as well as citizens. The municipality communicated water quality information to the public via the municipal website. However, most citizens only have access to the Internet via the municipal library. More locally relevant methods, such as making hard copies available in community centres, were not employed. Citizens were informed of issues in the municipality through formal structures such as ward councillors and ward committee members.

Loud hailers were a popular method used for making public announcements. Notice boards, community radio stations and local newspapers did exist but were underutilised. Most of these methods required the citizen to engage to be kept informed. This made it difficult for citizens to be involved in resolving issues of water and sanitation. Although some information systems were in place in the municipality, keeping these updated remained a problem owing to the lack of human resources. A lack of access to information left both the municipality and its citizens in a position where improvisation is a near impossible feat. It was also stated that citizens were generally unaware of what to do during a water and sanitation emergency. Room for *Autonomous Change* is hence low.

The conditions were not conducive for the municipality to be in a position where it was able to effectively respond to the community it serves. Certain geographical areas of the municipality experienced more challenges; the municipality distributed its resources to provide a "*greater part of that slice*" to these areas (Municipal Staff Member, 2014). It was highlighted that some citizens perceived that preferential treatment occurred based on their experience of not receiving feedback on lodged complaints. Citizens had the opportunity to raise their concerns and engage with the municipality as part of the Integrated Development Plan (IDP) consultation process. It was, however, unclear how many citizens used this opportunity. The municipality had not experienced protest action in the recent past, which could be interpreted as support for the decisions made by the municipality. There was no evidence of the municipality being held accountable or suffering consequences when failures relating to water and sanitation delivery occurred. However, without access to information and institutional memory, it remained difficult for the municipality to know whether they comply with regulations and policy.

There was no identifiable lack of trust and mutual respect between municipal staff members and different departments. The leadership had the support of the staff, and departments were able to rely on one another when resolving issues of water and sanitation. It was recognised that the existing complaints process made it difficult for citizens to lodge complaints, which affected the ability of the municipality to respond. A method of 'job cards' was used but no record of the number of complaints was kept and hence institutional memory was low or non-existent. Feedback on citizen complaints was a substantial challenge with no process in place. The failure to provide feedback had the serious consequence of a perception of preferential treatment occurring. This hampered the mutual respect and

trust between the municipality and its citizens. The municipality staff was openly discussing and acknowledging challenges and shortcomings, which highlighted the ability to share issues without concern in the municipality.

In summary, the lack of *Resources* greatly affected the municipality's *Variety* and *Room* for *Autonomous Change*. Even with a *Capacity to Learn* and *Good Leadership* in place, *Fair Governance* was still affected (whether directly or indirectly) by the lack of resources. Municipality A's characteristics and dimensions were interlinked and affected each other both positively and/or negatively. The linkages determine the impact the municipality had on its own ability to adapt and respond to change.

The expectation of the ICT intervention was to bring about changes in the characteristics and dimensions of the municipality. This would result in improving the impact the municipality has on its own adaptive capacity.

4.2.2 Analysis of Municipality A's IVC

The analysis of interview data evaluating the value of information in Municipality A is shown in Figure 14.

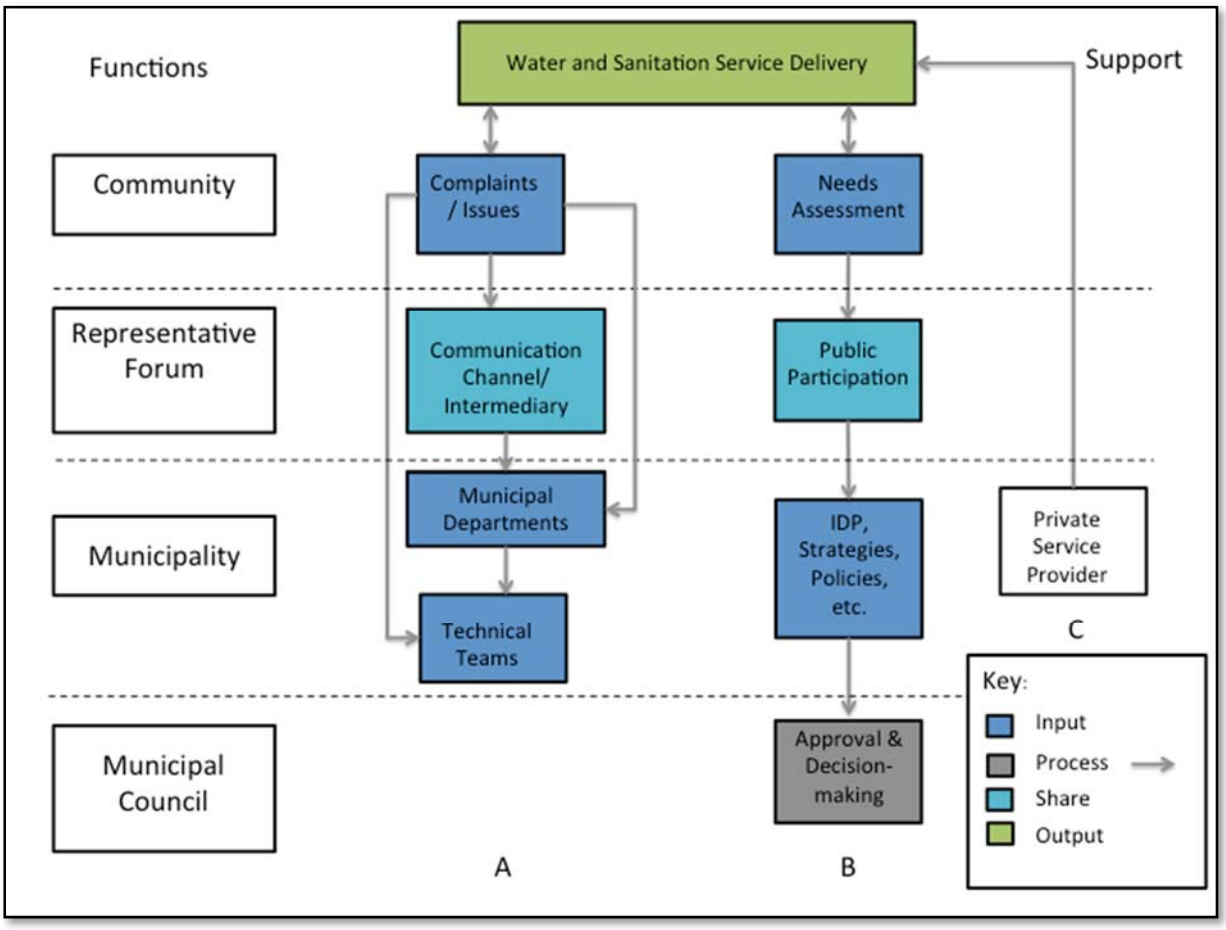

Figure 14: Municipality A: IVC map

Input (dark blue)

Input refers to the information needed by the municipality to respond to any service issues. Chain A represents the workflow of response to issues raised by the community in Municipality A. There are numerous methods of engagement and channels of communication. Communities might raise issues by either addressing the municipality directly, or going through ward councillors, community development workers (CDWs) and other field staff. These become intermediaries as they liaise between the community and municipality, and share information. Differing methods of engagement were observed in different social classes. Ward councillors seemed to be more utilised in low-income areas, while affluent areas communicated through resident associations or other independent bodies. Affluent residents were experienced to gain access to the municipality using a variety of methods, such as the Internet, email and telephone. The low-income demographic relied on traditional communication channels that were considered to be the most economical and convenient such as interacting with the elected representative or a technical team working in their area (this required longer waiting times) or as a last resort, calling the municipality or personally visiting the municipal offices (Forlee & Rivett, 2015).

Process and share

Process looks at how information is captured, and this is represented in grey in Figure 14. Prior to the ICT implementation, some information regarding complaints was captured by the municipality using existing ICT-based platforms. However, since most of the population had no access to Internet facilities, the decision makers such as the municipal council did not always receive information that was valuable for decision-making. The constraint of access to digital media also limited the municipalities' ability to share information. Owing to high levels of illiteracy, information sharing still relied heavily on public meetings and loud hailers.

Output

The IVC output appears in Table 5 and Table 6, which outline the enablers and barriers to an improved information value contribution for the Municipality A prior to the ICT implementation.

Table 5: Municipality A: Enablers for improved value contribution

General Enablers	
Enabler	**Description**
Social media and communication strategies	Municipality A has a Facebook page and the use of social media was identified as a potential communication channel, especially to engage with young people. On a follow-up visit, the municipality presented the research team with a communication strategy that incorporated various communication channels, such as social media, radio, and newspapers.
Satellite offices	These offices are an alternative and convenient form of interaction with community members, especially the elderly who prefer personal contact. Ensuring effective communication between these offices and the municipality is very beneficial for information transfer and flow.
Willingness to co-operate	Developing a communication strategy shows a willingness to participate and improve.
Information sources	Utilising multiple sources of information allows citizens to choose a preferred method of communication. Although organising and gathering data are complicated, once the different sources are collated, it would make information and workflow easier.

Table 6: Municipality A: Barriers to improved value contribution

General barriers	
Barrier	**Description**
Information technology (IT) skills	Substantial lack of IT skills.
Customer service	Customers and municipality have recognised that staff are unable to assist (owing to a lack of technical knowledge) and are occasionally unfriendly.
Roles of staff	There is a need to identify staff to manage complaints system.
Unsure of who to contact	Most customers use the emergency number because they are unsure of whom to contact directly.
Contact number	Numbers are not toll-free.
Multiple sources of information	Information is reported telephonically, email, formal letters, word of mouth via CDWs or ward councillors, walk-ins, etc. Need to integrate all these sources into a central register.
Tracking mechanisms	Tracking mechanisms do not exist.
Municipal capacity	Municipality is concerned about its capacity to respond to complaints.
Outsourcing	IT systems are outsourced.

4.3 Municipality B and its Communities

Municipality B members and the communities were interviewed at the same time as those of Municipality A to understand the critical challenges that affect the local practices of engagement and service delivery.

4.3.1 Analysis of Municipality B's adaptive capacity

Similar to Municipality A, Municipality B had a slightly negative capacity of −0.42 to adapt and respond to change. *Resources* with −1.67 and *Room for Autonomous Change* with −2 were the main dimensions contributing to this, with *Fair Governance* having less of an impact than in Municipality A.

The negative resource factor regarding human resources was classified as −2 owing to the challenges experienced with the qualifications of technical staff. Some of the staff were not trained or qualified as per the requirements of the legislation. Additionally, there was a high turnover of mid-level employees. No external or internal facilities for training of municipal staff members existed. The municipality rated itself as 'low' in relation to skills levels with participants highlighting the fact that skills shortage was not identified as a priority in the municipality. Financial resourcing was repeatedly brought up as the major challenge facing the municipality.

Participants identified interdepartmental communication breakdown as the reason for communities receiving little or no information on issues of water and sanitation delivery. While the municipality had several platforms (such as Facebook, website, radio, notice boards) available for information sharing, these were not used for direct communication purposes. It was highlighted that communities were not always informed immediately of water quality failure. Citizens were not necessarily aware of what to do in an emergency situation, and/or had little or no ability to improvise when faced with issues of water and sanitation delivery. There was no evidence of the municipality being held accountable or suffering consequences when failures relating to water and sanitation occurred.

As with Municipality A, the existing conditions did not leave Municipality B in a position where it was able to respond effectively to all voices of society. Although the needs of the communities were included in the formulation of the IDP, the municipality decided on prioritising and implementing IDP goals. Citizens living in urban environments (such as the main towns) were identified as having better access

to information and therefore as being "*easier to deal with*" (Municipal Staff Member, 2014). The municipality stated that urban communities were given preference in water and sanitation service provision. Citizens echoed these sentiments, stating they felt that the existing reporting system was not equitable and preferential treatment occurred. It is important to highlight that similar to Municipality A, Municipality B received a +2 for *Leadership*. The staff highlighted the positive engagement with management. There was clearly visionary leadership that had the support of the staff and the community.

Figure 15: Municipality B: Pre-ICT implementation ACW

In summary, the lack of resources affected the municipality's *Room for Autonomous Change*. Additionally, an impact on its *Learning Capacity* was observed. *Learning Capacity* is affected by *Variety*, and *Variety* affects the *Room for Autonomous Change*. Both *Variety* and the *Room for Autonomous Change* affected the municipality's *Fair Governance*. Municipality B had characteristics and dimensions that were interlinked and affected each other both positively and/or negatively.

As with Municipality A, the implementation of the ICT intervention was intended to bring about changes in the characteristics and dimensions to change the linkages and improve the municipality's adaptive capacity. It was also hoped that the ICT system would support the municipality in interdepartmental communication in order to provide information to communities.

4.3.2 Analysis of Municipality B's IVC

The IVC map for Municipality B in Figure 16 had unsurprisingly great similarities to that of Municipality A (Figure 14).

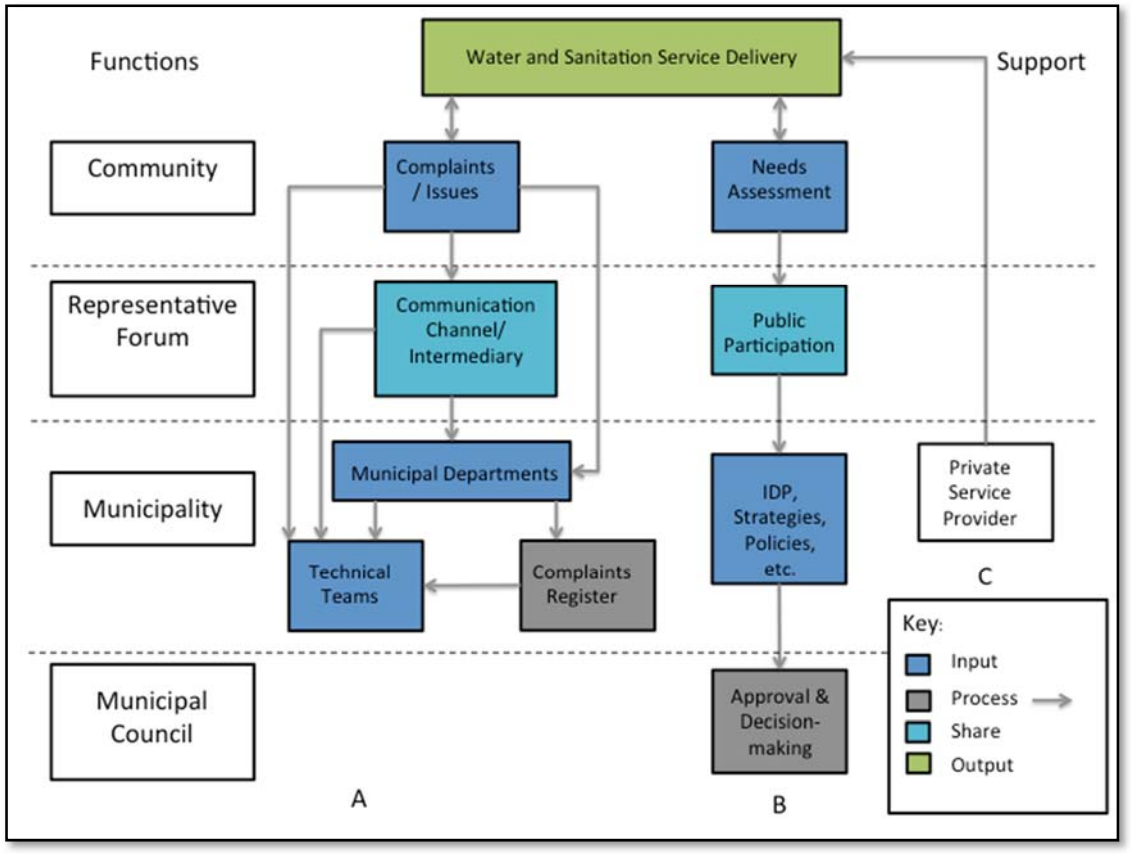

Figure 16: Municipality B: IVC map

As Figure 16 highlights, Municipality B relied, Municipality B relied, as in the case of Municipality A, on outsourcing certain services and insourcing skills and capacity, shown in Chain C. Chain A is slightly more complex in Municipality B, providing evidence of different forms of engagement. A key difference between the municipalities was that a formal complaints registry existed in Municipality B, which adds to the process function of the municipality.

Input

The input for the IVC stems from previous needs assessments studies that had been conducted during Chain B as part of the strategies for development (e.g. IDP), the record of complaints (i.e. complaints register), institutional memory and various communication channels (e.g. walk-ins, email, telephone and website).

Process

Municipality B had limited resource capacity. However, there was a dedicated person who captured all queries from the public onto an Excel spreadsheet, created job cards based on the queries, and assigned the job to the necessary technical team or department. However, the lack of tracking mechanisms affected the workflow as not all departments were able to access the spreadsheet. Consequently, there were multiple versions of the spreadsheet and information was scattered across various departments. ICT-based platforms existed within the municipality, but similar to the case of Municipality A, a large percentage of the population lacked access to the Internet or was constrained by illiteracy.

Share

Municipality B reported a satisfactory relationship with its community, which was represented by engagement processes with community members. However, the municipality did acknowledge that feedback does not always happen, and that this aspect is frustrating for community members. During the community interviews, some community members admitted that they felt there was no point in reporting to the municipality because they felt that nothing would be done. Information was shared and distributed through various means, namely loud hailing, satellite offices, public notice boards and posters, as well as official structures such as newspapers, the municipal website, and public meetings, among others.

Output

The barriers can be addressed to improve the services rendered to the community and enablers can further be enhanced to ensure effective participation and information flow.

Table 7: Municipality B: Enablers to improved value contribution

General enablers	
Enabler	**Description**
Dedicated staff member to manage complaints register	The proposed ICT system could result in a higher workload for this staff member, but it also means that there is one person to manage and capture all information and collate data.
Satellite offices	Satellite offices offer an alternative and convenient form of interaction to community members, especially the elderly who prefer personal contact. Ensuring effective communication between these offices and the municipality is very beneficial for information transfer and flow.
Willingness to co-operate	Including the research as part of the communication strategy shows a willingness to participate and improve.
Information sources	Utilising multiple sources of information allows citizens to choose a preferred method of communication. Although organising and gathering data is complicated, once the different sources are collated, it would make information and workflow easier.
IT department	There is capacity in the IT department with an efficient IT system to help support the proposed ICT system.

Table 8: Municipality B: Barriers to improved value contribution

General barriers	
Barrier	**Description**
IT skills	Substantial lack of IT skills.
Customer service	Customers and municipality have recognised that staff are unable to assist (owing to a lack of technical knowledge) and are occasionally unfriendly.
Contact number	Numbers are not toll-free.
Multiple sources of information	Information is reported telephonically, by email, formal letters, word of mouth via CDWs or ward councillors, and walk-ins, among others. There is a need to integrate all these sources into a central register.
Tracking mechanisms	Tracking mechanisms do not exist.
Municipal capacity	Municipality is concerned about its capacity to respond to complaints.

5 EVALUATING CAPACITY AND ENGAGEMENT POST-ICT IMPLEMENTATION

This chapter presents an analysis of the changes that occurred for each municipality and its communities after the ICT implementation and use for six months.

5.1 Municipality A

Interviews were held with Municipality A and its communities after the system had been used for six months. The data was then analysed using the same methods as used prior to the implementation. The results are shown below.

5.1.1 Analysis of Municipality A's capacity post-ICT implementation

With reference to Figure 13, Figure 17 shows that the implementation of the ICT intervention only slightly improved the municipality's ability to adapt and respond to change. While the Resource factor improved from −2 to −1.67, it remained the main dimension contributing to the municipality having a slightly negative effect of −0.13 on its adaptive capacity.

Figure 17: Municipality A: Adaptive capacity post-ICT implementation

Room for Autonomous Change and *Fair Governance* both improved, but remained negative values, which contributed to the overall adaptive capacity. *Variety* experienced an improvement due to *Multi-actor Level* and *Sector Engagement* as well as *Diversity* becoming positive scores. The municipality's *Learning Capacity* and *Leadership* remained the same overall. Although the conditions post-ICT implementation did not leave the municipality in a position where it was able to respond effectively to all voices of society, the municipality stated that the intervention had helped them to implement a first-come-first-serve policy more effectively (this excludes any water and sanitation incidences that were classified as emergencies). It also increased their institutional memory in keeping records of complaints.

Citizens interviewed after the ICT implementation were appreciative of the intervention's design taking their concerns into consideration but were sceptical as to whether it would actually "*… change the fact that currently their problems are not being attended to*" by the municipality. Citizens reported that they still had to call "*three or four times*" to follow up on their problem and an explanation for the delay was not always given. The interviews with the community showed that not all citizens were aware of the new system. Although the ICT system introduced a variety of methods (PCM, face-to-face and toll-free line) to promote context-relevant and diverse methods of logging a complaint, making phone calls was identified as a challenge for elderly citizens. It became apparent that they preferred face-to-face engagement and traditional methods of speaking to people.

Since Municipality A used the ICT system as a database for uploading complaints after resolving them, all complaints were recorded using the traditional job card system. The cards are created by a community liaison person in the municipality and given to the relevant technical teams. Only once the issue has been resolved and a supervisor has signed off the job card, the details are recorded on the online complaints database. This means that a reference number can only be sent via SMS after an issue has already been resolved, and then only if a contact number was recorded on the original job card. Despite changing the system usage in this way, the municipality stated that mutual respect and trust had improved between municipal staff members and that information was often shared between the Finance Department, communications officer and the Department of Water and Sanitation when resolving issues. Citizens felt that communication with the municipality had improved and that responses to issues seemed quicker than before.

In summary, although the ICT intervention improved the municipality's *Variety* and certain aspects of its *Learning Capacity* and *Fair Governance*, it could not compensate for the lack of *Resources*. The financial and human resource challenges facing the municipality still affected its *Room for Autonomous Change*, *Variety* and *Learning Capacity* in a negative manner. Despite the existence of *Good Leadership*, Municipality A remained in a position where it has a negative effect on its own ability to adapt and respond to change. The negative adaptive capacity pre-ICT implementation had an impact on the usage of the ICT system and how it was accepted and used.

5.1.2 Analysis of Municipality A's IVC Post-ICT Implementation

Figure 18 maps the IVC chain for Municipality A post-ICT implementation. As indicated in the system design, the workflow and processes remained the same, except the addition in Chain A, where the orange process highlights the ICT intervention.

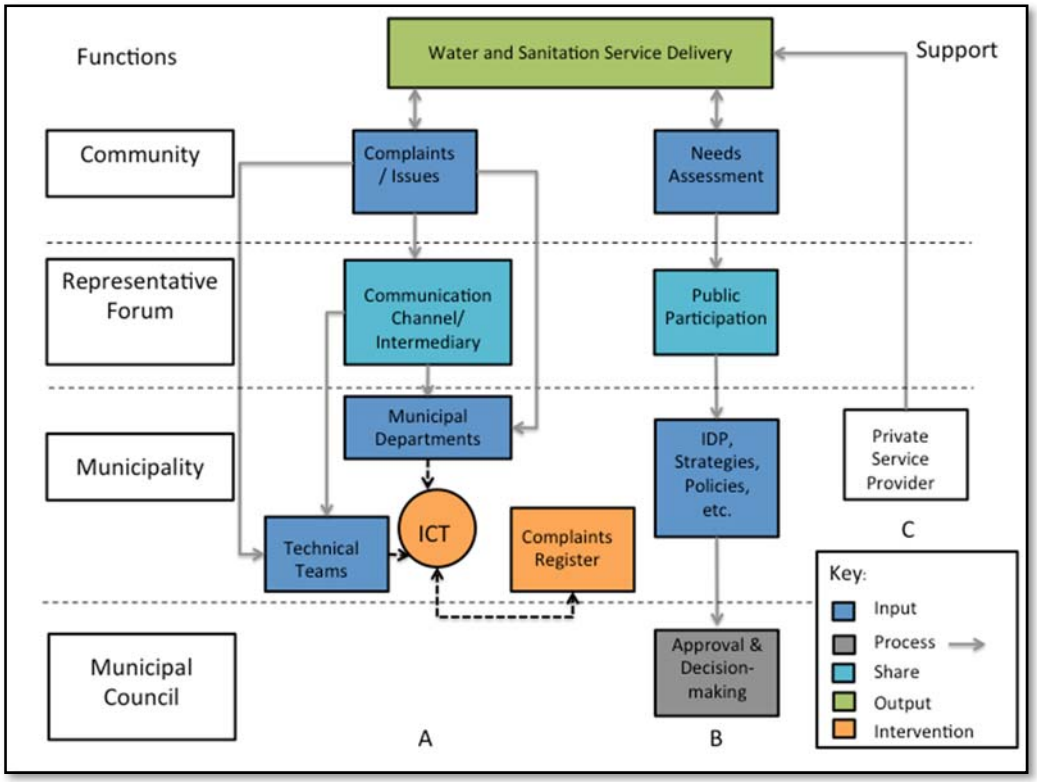

Figure 18: Municipality A: IVC map post-ICT implementation

Input

The toll-free line and PCM system contributed to information inputs. It also added value to the engagement methods previously used in the municipality. By increasing the input methods, information input was improved.

Processes

While the day-to-day workflow processes did not change, the addition of the online database and complaints register impacted water and sanitation delivery processes slightly. Municipality A acknowledged that the online database helped them to schedule jobs more effectively and increased institutional memory as record-keeping improved. However, since the municipality did not use the system as per design, the process was only partially integrated (this is represented by the dotted arrows in Figure 18) and the municipality reverted to the established workflow prior to the system implementation.

Share

Municipality A did not use the ICT system for sharing information with the community. Community members indicated that information sharing had not improved with the implementation of the ICT system. While the municipality reported that it shared information with other departments, the ICT data usage analysis did not reflect this as such.

Output

The municipality indicated that it benefitted with valuable outputs, such as improved communication among the different departments and increased trust from the community. Table 9 shows the barriers before the ICT interventions and provides an overview of how these barriers were addressed.

Table 9: Municipality A: Analysis of barriers post-ICT implementation

Addressing the Barriers		
Barrier	Description	Post-ICT Implementation
IT skills	Substantial lack of IT skills.	Staff members were trained to use the database and familiarise themselves with the procedures to record queries/ issue. This contributed to IT skills development.
Customer service	Customers and municipality have recognised the fact that staff are unable to assist (owing to a lack of technical knowledge) and are occasionally unfriendly.	Both the community and municipality felt that communication and trust had improved.
Roles of staff	There is a need to identify staff to manage complaints system.	Using the intervention highlighted the need for dedicated personnel to properly manage the system.
Unsure of who to contact	Most customers use the emergency number because they are unsure of whom to contact directly.	The customers felt that providing a direct line made it easier to identify municipal staff who could help them.
Contact number	Numbers are not toll-free.	Customers felt that the PCM system and toll-free line addressed their concerns with cost and made complaining easier and more convenient.
Multiple sources of information	Information is reported telephonically, via email, formal letters, word of mouth via CDWs or ward councillors, walk-ins, etc. There is a need to integrate all these sources into a central register.	The database allowed all forms of queries to be captured in one place. The municipality had evidence of the number of queries that came in daily, when captured.
Tracking mechanisms	Tracking mechanisms do not exist.	Tracking mechanisms were included in the database and issued to the customer once the query had been captured.
Municipal capacity	Municipality is concerned about its capacity to respond to complaints.	Municipal capacity of resources is still a limitation, but the new workflow has highlighted the need for more staff and efficient processes.
Outsourcing	IT systems are outsourced.	The outsourced systems had little to no effect on the ICT intervention.

The intervention helped to address the barriers identified pre-implementation and highlighted areas that needed further attention. Municipal capacity has been a challenge due to the limited resources available; however, skills development did support staff in performing their roles more confidently and effectively. The SMS notifications with the tracking number helped customers feel acknowledged and improved their perception of the municipality. Some community members commented on the improved response times when they reported an incident and felt that communication had also improved.

5.2 Municipality B

As in Municipality A, interviews were held with Municipality B and its communities after the system had been used for six months. The data was then analysed using the same methods as were used prior to the implementation. The results follow.

5.2.1 Analysis of Municipality B's Capacity Post-ICT implementation

Figure 19: Municipality B: Post-ICT implementation ACW

With reference to Figure 15, Figure 19 shows that implementing the ICT intervention only slightly affected the adaptive capacity overall by improving it from −0.42 to −0.16. Similar to Municipality A, *Room for Autonomous Change* and *Resources* remained the main dimensions contributing to the municipality having a slightly negative effect on its adaptive capacity. *Room for Autonomous Change* did not change from −2, with *Ability to Improvise*, *Act According to a Plan* and *Continuous Access to Information* remaining low.

Fair Governance improved from −1 to −0.75 but remained the second-largest contributor. *Variety* and *Learning Capacity* both experienced an improvement after the ICT intervention's implementation, whereas *Leadership* remained the same overall.

The municipality felt that although their technical staff managed to complete jobs and resolve issues, they required improvement in terms of their skills and needed to learn new things. However, the severe financial constraints affect their ability to do so. It was stated that there was still no information given to citizens regarding issues of water and sanitation. Only if citizens enquired did they receive feedback or information. This did not change with the implementation of the ICT system, despite it having been agreed to as a step in the new process.

The Department of Cooperative Governance and Traditional Affairs (CoGTA) (2013) and other groups have audited the municipality in terms of water services, waste removal and public participation. Treasury had retracted the municipality's portion of the equitable share (R7 million) because the municipality, as one staff member put it, "*did not do things correctly*". This was an example of the municipality being held accountable by provincial and national government.

The conditions post-implementation still did not leave the municipality in a position where it was able to respond effectively to all voices of society. As before, citizens living in more urban environments had better access to information. As described by one of the municipal staff members, this makes them "*easier to deal with*". The municipality stated that these communities are given preference when issues are raised. Citizens also stated they felt that the current reporting system was not equitable and preferential treatment continued to occur. The municipality had also received no comments on the new system. Many citizens had not used it and were not sure of what it would change. However, they felt their local knowledge had been valued and incorporated in the design of the system. Whether there was overall general support for the system was unclear.

Similar to Municipality A, citizens lodged their complaints mainly in the traditional way by using a phone or walking to the nearest office. The PCM system was hardly used, which might have been due to the number not being known. When a complaint was received, the details were first recorded onto a job card. It was then entered into the online complaints database that provided the reference number. The job cards were also kept in storage. The reference number was added to the job card before being handed to the technical teams. If a contact number was recorded, the reference number was sent to the citizen via an SMS. Feedback to community members did increase. It was reported that complaints were seen to on a first-come-first-serve basis unless there was an emergency. At times, departments relied on each other for information when resolving issues. Because of this, turnaround times varied from one complaint to the next and were affected by the municipality's lack of resources. This was in contradiction to the information that preferential treatment existed when addressing complaints. It was also identified that councillors did not distribute the telephone numbers for the ICT system willingly but preferred for complaints to be lodged directly with them rather than with the main office. It was not possible to determine whether that was due to councillors being gatekeepers or their wanting to be kept informed of the challenges in their community.

The mayor, municipal manager and municipality were said to engage with the citizens regularly on various issues. It was observed that community meetings were being held to explain the problems being experienced with the supply of water. However, in the satellite towns a feeling remained that the "*problems of the municipality were not openly discussed*". Financial resources may affect the municipality's ability to visit and engage with satellite towns in the same manner as in the main town, which added to the experience of preferential treatment. Linked to this was the experience of trust and mutual respect between citizens and the municipality. Citizens could not comment whether the system built trust, and were unsure of potential changes through the system. The municipality, on the other hand, felt that the feedback provided via SMS gave citizens hope that their problem was being seen to and that this should strengthen their respect and trust. The municipality also felt that it achieved its goals, values and mission. It was highlighted by the municipality that the reason for not experiencing service delivery protests was based on the municipality's "*managing them*" (referring to the community).

In summary, although the ICT intervention improved the municipality's *Variety* and certain aspects of its *Learning Capacity* and *Fair Governance*, it could not compensate for the *Lack of Resources* and *Room for Autonomous Change*. The financial and human resource challenges facing the municipality affected its *Variety* and *Learning Capacity* in a negative manner. This in turn affected its ability for *Fair Governance*. The lack of *Room for Autonomous Change* is affected by *Variety*, *Fair Governance* and hence, indirectly, the *Lack of Resources*. Despite the existence of *Good Leadership*, Municipality B remains in a position where it has a negative effect on its own ability to adapt and respond to change. Similar to Municipality A, the pre-ICT implementation status quo had an impact on the success with which the ICT intervention was taken on and used.

5.2.2 Analysis of Municipality B's IVC post-ICT implementation

Figure 20 shows the analysis of the IVC post-implementation. As can be seen from the figure, the ICT system was integrated as part of the existing complaints process.

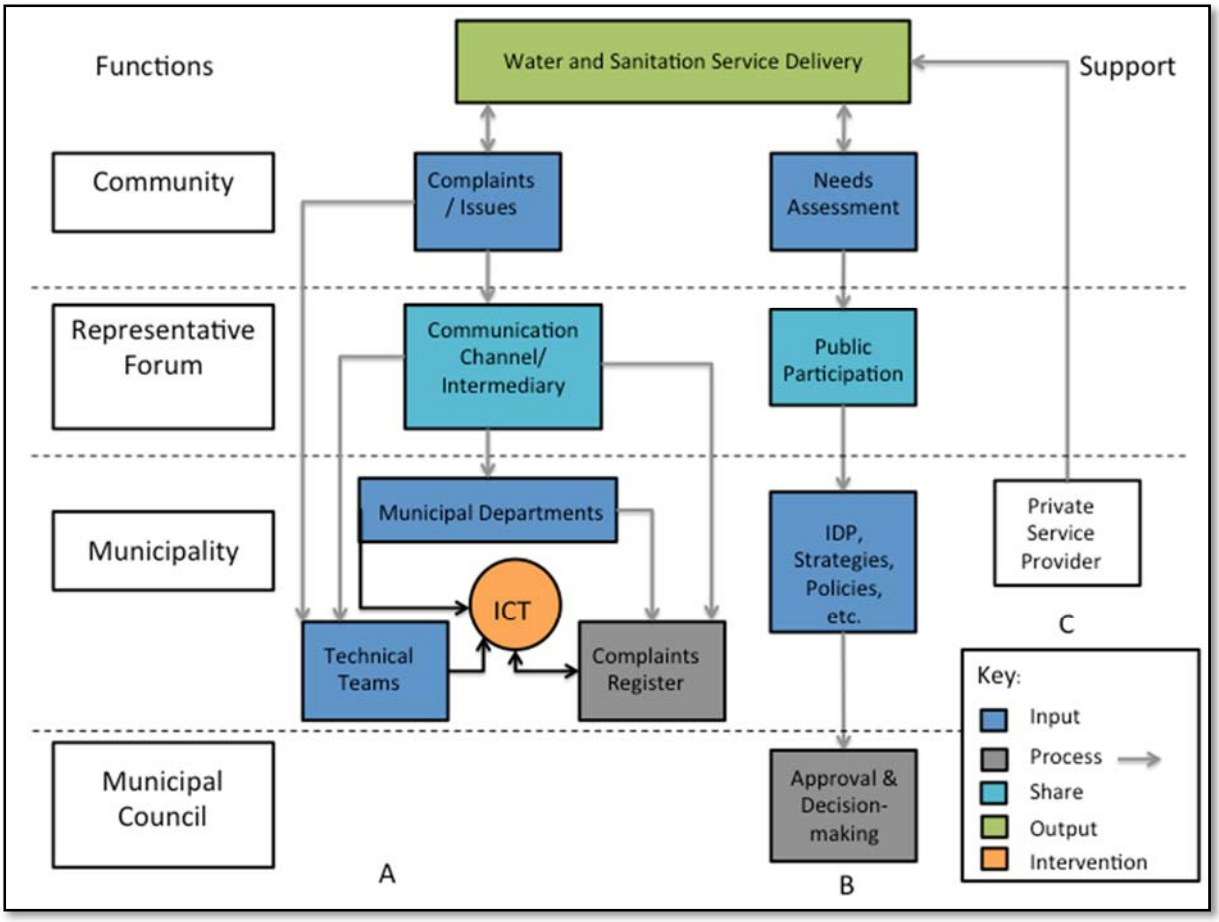

Figure 20: Municipality B: IVC post-ICT implementation

Input

The new information inputs were the toll-free line and PCM system. However, the PCM system was used seldom and residents still preferred the usual methods of engagement such as personal interaction at the municipality or satellite office and traditional phone calls.

Process

Very little changed in the day-to-day processes of Municipality B, except for the online database that functioned as a complaints register and the addition of reference numbers as tracking mechanisms. The designated person still managed the system and included reference numbers on job cards, which he issued to the necessary departments. He was also responsible for sending out reference numbers via text message to complainants. The staff still felt incapacitated to respond to queries even with the intervention in place.

Share

The municipality acknowledged that they were understaffed and could not always respond to all issues and information was not openly shared, unless requested.

Output

Most of the community members who were interviewed felt less confident using the telephone or mobile devices and thus preferred personal interaction with municipal staff and they continued to utilise the conventional methods of reporting. Younger community members were more supportive of the ICT

intervention as they recognised the benefits of convenience at no cost to report. The barriers and post-ICT evaluation are given in Table 10.

Table 10: Municipality B: Analysis of barriers post-ICT implementation

Addressing the Barriers		
Barrier	**Description**	**Post-ICT Implementation**
IT skills	Substantial lack of IT skills.	Staff members were trained to use the database and familiarise themselves with the procedures to record queries/issues. This contributed to IT skills development.
Customer service	Customers and municipality have recognised the fact that staff are unable to assist (owing to a lack of technical knowledge) and are occasionally unfriendly.	The few customers who did use the system seemed satisfied. Most community members still preferred personal interaction with the municipality and were unsure of any improvements.
Contact number	Numbers are not toll-free.	Younger customers were supportive of the toll-free line and PCM system and recognised the benefits of reporting in a cost-free and convenient manner. The older customers preferred the traditional methods of personal interaction.
Multiple sources of information	Information is reported telephonically, via email, formal letters, word of mouth via CDWs or ward councillors, walk-ins, etc. There is a need to integrate all these sources into a central register.	The database allowed all forms of queries to be captured in one place. The municipality had evidence of the number of queries that came in daily, when captured. Satellite offices would have been utilised more to accommodate the elderly.
Tracking mechanisms	Tracking mechanisms do not exist.	Tracking mechanisms were included and issued to the customer once the query had been captured.
Municipal capacity	Municipality is concerned about its capacity to respond to complaints.	Municipal capacity of resources is still a limitation, but Municipality B has benefitted with dedicated staff to manage the complaints register.

6 DISCUSSION OF FINDINGS

This chapter provides a discussion on the findings and highlights the lessons learnt.

The study set out to assess whether communities can be incentivised to play an active role in the management of water supply delivery by reporting interruptions or problems to the relevant municipality. The literature review (located on the WRC Knowledge Hub, Report Number TT 583/13) had indicated that incentivisation does not necessarily need to be monetary, but those aspects such as the experience of being a citizen and part of the governance structure may result in a greater engagement. Recognising the social structures in rural communities, the resource constraints of rural municipalities and the geographically challenging environment, it was hypothesised that the use of an ICT system could increase engagement in order to motivate citizens to contribute and provide municipalities with the relevant information. The research was of particular importance in South Africa where service delivery protest actions have resulted in social unrest, vandalism and a breakdown of relationships between communities and their municipalities.

As the analysis of the municipalities showed, the implementation of the ICT intervention brought about changes to certain characteristics and dimensions of each municipality. For Municipality A, the ICT intervention improved its *Variety* and aspects of its *Learning Capacity*, as well as *Fair Governance*. The *Learning Capacity* improved through the ability to discuss doubts more openly and increase the institutional memory. *Fair Governance* improved through the ability to stick more rigidly to a first-come-first-served prioritisation; hence, treating citizens with more equity. That said, the system could not compensate for the *Lack of Resources*. The financial and human resource challenges facing the municipality still affected its *Room for Autonomous Change*, *Variety* and *Learning Capacity* in a negative manner. Municipality A has positive *Leadership* but owing to the resource constraints, its ability to change, to adapt and to respond to change remains negative.

Similarly, Municipality B saw an improvement in *Variety* and aspects of its *Learning Capacity* and *Fair Governance*, such as the ability to discuss doubts more openly and having an increased institutional memory and accountability. It could not, however, as with Municipality A, compensate for the *Lack of Resources* and *Room for Autonomous Change*. The financial and human resource challenges were too substantial to overcome the negative values on *Variety* and *Learning Capacity*. The link between the various aspects did not change or become more independent. Low resources impacted on every aspect of the municipality's ability to change, to adapt to change or to respond to it appropriately.

Despite pamphlets being distributed relating to the public meetings and focus groups being held in the study sites to announce the initiation of the project, there still seemed to be a breakdown in communication and a lack of initiative from both the community and the municipality. Most community members said they did not hear about the implementation of the ICT and those who did, forgot to spread the news to others. While the municipality staff was aware of the new reporting system, some of the community leaders had not been informed. As a result, not enough was done to ensure that key members in each community knew about the project in order to pass on information to other community members. Despite a reasonable number of staff from the municipality being involved, system implementations require ongoing engagement with both municipalities and communities, which results in high costs being incurred.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Research Methodology

This study was an intensive case study with an intervention in order to explore potential change. Since the study entailed several aspects ranging from community engagement to ICT system design and municipal capacity assessment, it was decided to use different methodologies for each of these aspects. This sub-report specifically covered the aspect of municipal capacity change due to the ICT system.

The methodology for analysing the capacity of the municipality was twofold in order to evaluate, on the one hand, the capacity, and on the other hand, the value of information. The capacity assessment was done using the ACW developed by Gupta et al. (2010), while the information value was assessed using the IVC method as described by Kaplinsky and Morris (2001).

The methodology for analysing public engagement was done using the Social Goals Evaluation Framework as developed by Beierle (1998). This method allowed the researchers to analyse whether the public felt engaged with the municipality.

In order to analyse the impact of the ICT intervention, communities and municipalities were assessed using the above-mentioned methods prior to the implementation and again six months after the implementation in order to assess the impact.

7.2 Analysis of Capacity Changes

Municipality and community members were interviewed at the outset of the study to understand challenges that impacted the practices of engagement as well as the challenges in service delivery.

The adaptive capacity of Municipality A showed to be negative at −0.46 with a strong positive experience in *Leadership*, a slightly positive effect on *Learning Capacity* and strongly negative effects on *Fair Governance, Resources* and *Room for Autonomous Change*. The municipality highlighted the fact that limited financial and human resources resulted in its inability to respond timeously to service delivery challenges. Municipality A was also relying on external service providers to support lacking internal skills. Lacking information was identified as a hindrance for the municipality as well as the citizens. The municipality had the expectation that the ICT intervention would bring the necessary change to improve the adaptive capacity. The IVC analysis of Municipality A showed that a number of enablers for the implementation of an ICT system existed that could potentially increase the information value even further. Social media and communication strategies were available, willingness to co-operate was high and the satellite offices were functioning as information hubs. Barriers to the implementation were the substantial lack of IT skills, the limited customer service experience and the limited human resource. The community engagement processes in Municipality A were done in the three towns of A1, A2 and A3. The main method of engagement between the municipality and its community was via public meetings and loud hailers. The communities perceived loud hailers to be ineffective, since they were a one-way engagement that did not allow feedback from citizens. The engagement with ward councillors differed between the towns and clearly depended on the positive nature of the relationship between councillor and community.

Municipality B was interviewed at the same time as Municipality A and meetings were organised with the communities of B1, B2 and B3. The adaptive capacity of Municipality B showed a value of −0.42, with *Resources* being at −1.67 and *Room for Autonomous Change* being at −2. The municipality identified interdepartmental communication breakdown as the main reasons for communities not receiving notifications on water- and sanitation-related matters. It was hoped that the ICT intervention would support the municipality in improving this aspect. The analysis of the IVC showed that Municipality B had a substantial benefit in having an established complaints management process and a dedicated staff member to manage these complaints.

Barriers to a system implementation were similar to those in Municipality A, namely, the lack of IT skills and a low level of customer service experience. The analysis of the community engagement method showed that loud hailers and public meetings were used to communicate with the community. Participants in B1 felt positive about public meetings, while participants in the other towns highlighted the fact that the meetings required better organisation. Ward committee meetings and engagement with councillors were the least valued methods. Community members also highlighted the fact that there was not enough opportunity to provide feedback in the established methods of engagement.

7.3 Enablers and Barriers to ICT

Aim 6 of the study focused on identifying enablers and barriers to the use of ICTs and incentives based on the findings of the field study. Using the methods of the ACW and the IVC, the experiences of the municipality and the communities in Municipality A and Municipality B were assessed to understand whether the ICT did improve the challenges that had been highlighted prior to the design. The adaptive capacity assessment showed that the municipal capacity for both Municipality A and Municipality B only marginally improved through the ICT system. The resource constraints of both municipalities were too substantial to use the system constructively to improve processes and feedback to citizens. Municipality B performed better in providing feedback to citizens, which was ascribed to a complaints process being in existence prior to the system implementation. Municipality A resolved most complaints and had few 'pending' complaints.

In both municipalities, the system was of greater benefit to the municipal staff than it was to the communities. The hope that information would be shared easier between departments was not confirmed during the six-month period. Councillors were identified as potential gatekeepers by avoiding handing out the toll-free numbers to remain informed of the challenges in their wards. Community members continued using the traditional methods of complaints, namely, telephone calls and face-to-face engagement in municipal offices. It became apparent that municipalities did not advertise the system as they had originally committed to, and community members remained uninformed.

7.4 Concluding Remarks and Recommendations

This project showed that ICT systems can support complaints management in municipalities and that such systems can result in a measurable improvement of adaptive capacity. However, the impact and the improvement are arguably not enough to leave either municipalities or communities in a better position to adapt and respond effectively to the changes. This does not necessarily mean that an ICT is not useful for improving municipal processes, but implementing any system in a rural resource-constrained environment should be done cautiously, focusing on the changes that can be achieved while considering the resource limitations. An ICT is not a guaranteed solution that can compensate for resource limitations, which result in water and sanitation issues not being addressed. The study highlighted that the ICT system improved the overall knowledge and capacity for data tracking, but could not improve the effectiveness with which complaints raised by citizens were resolved.

Overall, the system was of greater benefit to the municipality than to the community. It allowed the municipality to track the number of complaints and, as the final interviews showed, all municipality staff appreciated the graphs and visual representation of workload, issues resolved and feedback sent. For both municipalities, the system allowed an overview of the actual number of complaints for the first time, rather than anecdotal evidence from individual staff members. This resulted in both municipalities staying committed to using the system beyond the end of the project.

The greatest benefit for the communities was the toll-free line, which allowed complaints to be lodged without incurring costs. This is an important finding, since it is a simple tool that can be implemented at relatively low costs and which sends a clear signal to the community that there is a commitment from the municipality to hear citizen complaints. The concern that had been raised by municipalities that such a toll-free line would be abused was not confirmed in the study.

Assessing conclusively whether the ICT tool resulted in incentivising communities to report and engage with the municipality has not been possible for either of the municipalities. In Municipality B, a greater number of citizens felt heard, while in Municipality A there was still an experience of certain areas receiving preferential treatment and trust not having been established to an extent where it could indeed foster improved engagement.

Both municipalities have continued using the system beyond the study period and the database will remain open for their use for the foreseeable future.

For future projects it is important to highlight that action research is complicated when requiring communities to engage proactively with a system. In certain towns, community members expressed the view that they felt they should be paid for contributing to the study. This is a reasonable request when considering that there is an expectation on the side of the researchers to receive feedback and take time from the community. While it had been made clear from the outset of the project that there would be no remuneration for participation, it should be kept in mind for future projects that aspects like this have to be negotiated upfront.

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APPENDICES

Appendix A: Process Description of Municipal and Community Engagement

The process of initiating engagement with district municipalities, local municipalities and communities was as follows:

1. Identify rural district municipalities and assess current water supply challenges through Blue Drop and Green Drop status. Analyse media reports for the study area.
2. Contact district municipalities explaining the study and request a meeting.
3. Meet with district municipality to discuss details of the project:
    1. Explain study in detail.
    2. Highlight expectations of research team.
    3. Highlight possible benefits to communities, local municipality and district municipality.
    4. Explain process of engagement with local municipalities and communities.
    5. Provide details on the expected resource requirements (mainly time of staff and ability to respond to community concerns).
    6. Assess together with the district municipality whether local municipalities and district municipality as well as communities will be able and willing to participate in the study.
    7. Request subsequent meeting with local municipalities.
    8. Request information on the process of receiving formal acceptance of the study in the district municipality as well as requirements for ethical approval.
    9. Request for the district municipality to identify relevant stakeholders who have to be informed throughout the study (e.g. provincial departments and mayoral committees).

4. Meet with local municipalities to discuss details of the project:

    1. Explain study in detail.
    2. Highlight expectations of the research team.
    3. Highlight possible benefits to communities, local municipality and district municipality.
    4. Explain process of engagement with municipal employees and communities.
    5. Provide details on the expected resource requirements (mainly time of staff and ability to respond to community concerns).
    6. Assess together with the local municipalities whether the municipal offices and the communities will be able and willing to participate in the study.
    7. Request for local municipality to facilitate meetings with the community representatives and other appropriate stakeholders to outline project.
    8. Request information on the process of receiving formal acceptance of the study in the local municipality as well as requirements for ethical approval.
    9. Request for the district municipality to identify relevant stakeholders who have to be informed throughout the study (e.g. technical departments and mayoral committees).

5. Meet with community representative and other identified stakeholders:

    1. Explain study in detail.
    2. Highlight expectations of the research team.
    3. Highlight possible benefits to communities, local municipality and district municipality.
    4. Explain process of engagement with communities, community leaders and municipal employees.
    5. Provide details on the expected resource requirements (mainly time of community members and willingness to participate in reporting water supply challenges).
    6. Assess together with stakeholders' willingness of the community to participate and analyse possible ethical or operational difficulties.
    7. Request for community representatives to guide the process and facilitate meetings with the community.
    8. Request information on the process of receiving formal acceptance of the study from the community as well as requirements for ethical approval.

Request for community representatives to identify relevant stakeholders who have to be informed throughout the study and the appropriate means to keep community members informed.

Appendix B: Municipality Questionnaire 2014

The objectives of the visit to the municipality are as follows:

- An assessment of the current municipal structure and the work/information flow of addressing service delivery issues (includes aspects of governance and policy).
- An assessment of the relationship and communication strategies between the municipality and the people.
- An assessment of existing technologies (ICTs) in the municipality.
- Assessment of current challenges and possible solution identified by the municipality.

In order to respond to the objectives, we would like to interview the relevant stakeholders in the municipality.

A more detailed breakdown of the topics that will guide the interviews is as follows:

1. *Municipal Structure (interviewer Mr Carl Jacobs)*
   In this section we would like to get to know the municipality to gain insight and context. Aspects of this would entail understanding the administrative structure in the municipality, the flow of responsibility, resources and staffing (organogram) and the overall vision, strategy and culture.

2. *Water and Sanitation (interviewer Ms Bianca Forlee)*
   In this section we would like to meet with the relevant departments responsible for delivering water and sanitation services, which could include stakeholders from the technical teams, environmental health officers, the director of water and sanitation services, etc. We would like to understand how the departments interact as well as how obligations and feedback to provincial and national government are currently managed. We would also like to discuss the Blue and Green Drop Reports.

3. *Service Delivery (interviewer Mr Carl Jacobs)*
   In this section we would like to understand the experience of the municipality regarding service delivery expectations of the community. We would also like to assess how communities currently engage with the municipality in order to report faults, and the overall performance and assessment of service delivery in the municipality.

4. *Customer Relations (Ms Bianca Forlee)*
   Customer relation management is a very important aspect of this research and in this section, we would like to understand the process of engagement with the community. This would involve understanding the local context (e.g. the number of meetings, the platforms for engagement, the distribution of information). We would also like to gain insight into the municipality's perception of the current engagement with the community and the possible incentives for communities to contribute.

5. *Current Information Systems (Prof. Ulrike Rivett)*
   In this section we would like to understand which technologies or information systems are currently being used in the municipality. We would like to understand how information is being distributed, the level of local IT staffing and skills, as well as possible IT solutions the municipality has considered in the past.

Appendix C: Adaptive Capacity Wheel

Below is a detailed explanation of the ACW. It is quoted from C. Jacobs's master's thesis, submitted to the UCT.

Gupta et al. (2010) define institutional 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*". *Planned measures* include the formal and informal characteristics, rules, norms and beliefs of institutions that enable society (individuals, organisations and networks) to cope with climate 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 climate change (Gupta et al., 2010).

It is said that an institution promoting adaptive capacity is one that:

- *"Encourages the involvement of a variety of perspectives, actors and solutions;*
- *Enables social actors to continuously learn and improve their institutions;*
- *Allows and motivates social actors to adjust their behaviour;*
- *Can mobilise leadership qualities;*
- *Can mobilise resources for implementing adaptation measures; and*
- *Enhances principles of fair governance"* (Gupta et al., 2010)

It is these aspects upon which the six dimensions and 22 criteria of the ACW are based.

The ACW was developed by Gupta et al. (2010) as 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. It consists of six dimensions. Each dimension is subdivided into criteria (22 in total). Figure 21 shows the ACW with its dimensions and criteria.

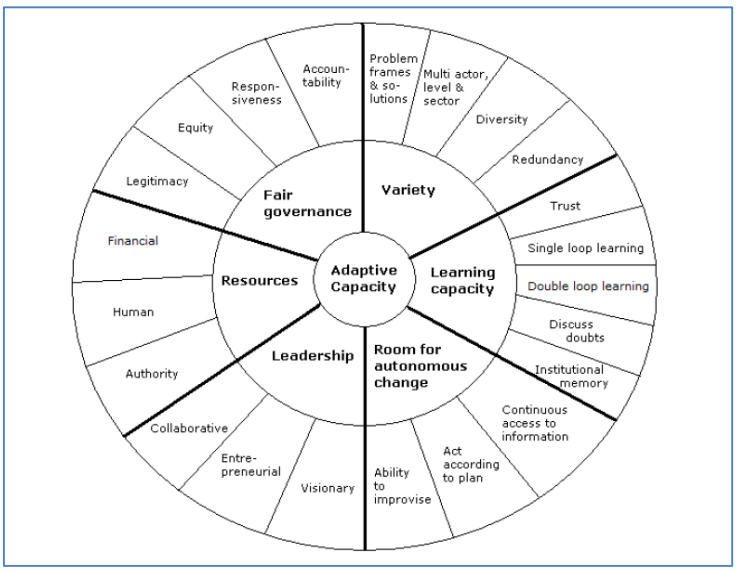

Figure 21: ACW (Gupta et al., 2010)

The inner circle shows adaptive capacity as a whole, the middle circle shows the dimensions and the outer circle shows the criteria.

1. Variety

An institution is said to embed variety when it meets the criteria described in Table 11:

Table 11: Criteria for variety (Gupta et al., 2010)

Number	Criteria
1	It allows for a variety of problem frames and solutions.
2	It allows for a variety of actors (multi-actor), levels (multi-level) and stakeholders (multi-sector) during the solution formulation process.
3	It promotes diversity to reach context-relevant, tailor-made policies.
4	It allows redundancy in the short-term to promote the best long-term solutions.

2. Learning capacity

An institution is said to demonstrate learning capacity when the criteria in Table 12 exist:

Table 12: Criteria for learning capacity (Gupta et al., 2010)

Number	Criteria
5	A presence of institutional patterns that promote mutual respect and trust.
6	An ability of institutional patterns to learn from past experiences and improve their routines (single loop learning).
7	Evidence of changes in assumptions underlying institutional patterns (double loop learning).
8	An institutional openness toward doubts and uncertainties.
9	An institutional provision of monitoring and evaluation processes of policy experiences.

3. Room for autonomous change

An institution is said to provide room for autonomous change when the criteria in Table 13 exist:

Table 13: Criteria for room for autonomous change (Gupta et al., 2010)

Number	Criteria
10	An accessibility of data (information) within institutional memory and early warning systems to individuals.
11	An increase in the ability of individuals to act by providing plans and scripts for action, especially in the case of disasters.
12	An increase in the capacity of individuals to self-organise and innovate i.e. a fostering of social capital.

4. Leadership

An institution is said to embed leadership when it encourages the rise of the types of leadership described in Table 14:

Table 14: Criteria for leadership (Gupta et al., 2010)

Number	Criteria
13	Visionary leadership (which includes elements of reformist, intellectual and sticks and carrots leadership). This allows room for long-term visions and reformist leaders.

Number	Criteria
14	Entrepreneurial leadership (which includes elements of leadership by example, designing tools to engage the market, unilateral and directional leadership). This allows room for leaders that stimulate actions and undertakings.
15	Collaborative leadership (which is also referred to as instrumental leadership). This allows room for leaders who encourage collaboration between different actors (adaptive co-management).

5. Resources

An institution is said to be resourceful when they encourage the criteria in Table 15:

Table 15: Criteria for resources (Gupta et al., 2010)

Number	Criteria
16	Authority – There is provision of accepted or legitimate forms of power and the institutional rules are embedded in constitutional laws.
17	Human Resources – There is availability of expertise, knowledge and human labour.
18	Financial Resources (including access to technological resources) – There is availability of financial resources to support policy measures and financial incentives.

6. Fair governance

An institution is said to have fair governance when it promotes the criteria highlighted in Table 16:

Table 16: Criteria for fair governance (Gupta et al., 2010)

Number	Criteria
19	Legitimacy – Whether there is public support for a specific institution i.e. legitimate policymaking that is accepted by members of society.
20	Equity – Whether institutional rules are fair and policy processes and outcomes account for unequal circumstances in society.
21	Responsiveness – Whether institutional patterns show response to society and whether responsive processes show a high degree of transparency and are able to respond to different voices in society.
22	Accountability – Whether institutional patterns provide clear accountability procedures that assign responsibilities to different parties.

If an institution meets all the criteria described above, it is said to promote adaptive capacity. However, as Gupta et al. (2010) point out, there are some key points to consider when using the ACW:

1. In the case that an institution does promote adaptive capacity, it does not mean that society will necessarily make use of this capacity and/or adapt successfully.
2. The dimensions and criteria of the ACW are not independent of one another. They can reinforce each other – for example, *Fair Governance* and *Adequate Resources* can reinforce the other dimensions. Tension between different dimensions and/or criteria can also occur – for example, strong *Leadership* may not always lend itself to high *Variety*.
3. Some criteria may cause others to be less relevant – with sufficient *Entrepreneurial Leadership Visionary Leadership* may not be needed.
4. The dimensions and criteria are context dependent – the importance of certain dimensions and/or criteria will vary according to the specific problem it is being applied to. This implies that weighted criteria and/or dimensions should be used according to the specific problem.

Because of this, the ACW cannot be applied objectively. Rather it is applied subjectively using normative judgments on the part of the researcher. 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).

Appendix D: IVC – Questionnaire Municipality

Step	Perspective	Dimension	Objective	Feature
Input	Information needs	Manage information Engagement	Appropriate information	What information is available? What information is needed? (across departments) What information does the customer require?
	Information assessment	Engagement Skills & resources		Are the sources of information categorised? What are the information sources? What are the communication channels? Who are the information brokers? How are the information gaps prioritised?
Process	Capture information	Manage information		Standardise data sources Assign resources to update information Eliminate redundant data Link multiple capture channels across departments
	Store information			Integrate systems to allow all agencies access to information
	Institutional processes	Analyse information Workflow Skills & resources		Train staff to handle operations Existing communication channels Inter-department communication Assigning workflow
	Query information	Workflow Skills & resources	Appropriate time	Prioritise queries & ensure valuable information is delivered Provide dynamic feedback – generate reports & queries instantly

Step	Perspective	Dimension	Objective	Feature
Share	Distribute information	Engagement Workflow		Understand how stakeholders want to receive information Evaluate policy that prevents information sharing among various departments Establish intranets, shared repositories or central database Identify communication channels to provide feedback
	Analyse information	Workflow Skills & resources	Appropriate decision	Ensure resources have skills to analyse information Regularly update customer information Establish governance model that promotes analysis
Output	Act/ learn	Use knowledge Final outcome		Provide incentives for resources to act in the best interest of customers Provide services based on customer needs Develop processes to incorporate lessons learnt Establish processes & management systems to measure outcomes & predict future performance
	Achievement	Use knowledge Final outcome		Information capabilities Informed decision-making Human & social capabilities – influence policy, strategy, IDP, etc.