A FRAMEWORK TO ELICIT USER REQUIREMENTS FOR INFORMATION SYSTEMS: A LOCALISED PARTICIPATORY APPROACH FROM SOUTHERN AFRICA

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A FRAMEWORK TO ELICIT USER REQUIREMENTS FOR INFORMATION SYSTEMS: A LOCALISED PARTICIPATORY APPROACH FROM SOUTHERN AFRICA

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If we are ready to tolerate everything as understood, there is nothing left to explain; while if we sourly refuse to take anything, even tentatively, as clear, no explanation can be given. What intrigues us as a problem, and what will satisfy us as a solution, will depend upon the line we draw between what is already clear and what needs to be clarified.

— Nelson Goodman, Fact, Fiction and Forecast (1955)

Declaration

I, Mkhululi Tyukala (20330034), hereby declare that the thesis for Doctor of Philosophy in Information Technology is my own work and that it has not previously been submitted for assessment or completion of any postgraduate qualification to another University or for another qualification.

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Mkhululi Tyukala

Abstract

The “What” and “Why” in information system development in resource restricted environments is already well covered in literature. However, the “How” to do it still has not been explored. This thesis reports on the development of a locally flavoured participatory user requirements elicitation framework for the development of information systems in resource restricted environments. It uses existing participatory design practices, user requirements elicitation literature and local participatory norms and traditions to achieve this. In doing so, it takes a step towards the way information systems could be developed in resource restricted environments.

The topic of this thesis is mainly motivated by the recent calls in existing literature for developing countries to start developing their own information systems in order to address their own requirements. Accordingly, and to lay a foundation towards the realisation of this goal, this research is positioned within the user requirements elicitation region of information systems development.

Current user requirements elicitation methods use traditional methods where experts/designers ask system users questions through interviews or learn about their environment through observations. This research proposes a shift from this approach to one that not only views users as equal partners in the elicitation process but in the whole information systems development process. This is in the spirit of participatory design, which was developed in Scandinavia more than four decades ago. Further, recent research in participatory design emphasises the importance of its contextual nature and concedes that there is no single best practice for participatory design in information systems that applies to all contexts.

This research explores the information systems development discourse in resource restricted environments in Africa. Its purpose is to enhance understanding of the local contexts, thus providing new insights on how to develop a framework that speaks to local challenges using norms and traditions in order to develop information systems that address local requirements.

Thus, the main contribution of this research lies in laying a foundation for a locally flavoured participatory approach for information systems development in resource restricted environments. It contributes to the existing information systems development, participatory design and user requirements elicitation body of knowledge by developing a framework for participatory user requirements elicitation. In addition, it contributes to the participatory design body of knowledge by introducing an age-old African participatory decision-making approach to the academic participatory design community. In doing so, it adopts the meaning of participation from an African value system point of view, which is something that has only been previously explored in the Nordic countries and North America.

Finally, recommendations for the application, limitations and avenues for further research are incorporated into the findings of this research.

Author Keywords: Participatory Design, Participatory African Decision-making, Imbizo, Letsema/Ilima, Resource Restricted Environments, Norms and Traditions, User Requirements Elicitation.

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Special thanks to my very best friend, Malixole for the encouragement and support. There is no better friend than you in the history of mankind.

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Mkhululi Tyukala

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5 Dedication

Dedicated to my little angel, Bubuhle.

Part I

Chapter 1
Introduction and Background

This chapter provides an overview of the research reported in this thesis. It discusses the problem to be solved and then highlights the research questions and the subsequent research objectives.

This chapter is structured as follows:

"The beginning is the most important part of the work."

— ***Plato***

1.1. Introduction

The call that information systems (IS) developed in one environment do not work in a foreign environment has been getting louder of the last few years. Proponents of this view are Heeks (1999) and Soriyan, Mursu, Akinde and Korpela (2001). Information systems development (ISD) is traditionally done in developed countries. However, over the last few years the call has been made for underdeveloped environments to shift from buying readymade solutions and develop their own solutions that address their specific understanding of their own environment. Yet IS and ISD have not made a smooth transition in developing countries (referred to as resource restricted environments in this thesis), despite the large body of knowledge and experience from developed countries. For instance, according to a study by The Information Society (in Puri, Byrne, Nhampossa and Quraishi (2004a, p. 44)), "[…] *information systems from the developed world cannot be replicated in developing countries*". The accuracy of this statement can be found in the problems incurred in introducing an off-the-shelf solution in a rural village in South Africa as mentioned in Benjamin (1999). Similarly, a study by Nhampossa (2004) shows that problems also exist when using an information system from one resource restricted environment in another.

The reason for these problems can be summarised through the views of Whetton (2005) who states that information systems fail because they:

- are not suitable or appropriate for the environment for which they are designed;
- interrupt the usual workflow; and
- are difficult to use (poorly designed).

On the other hand, in their famous research paper on success measures for information systems, Delone and McLean (1992) listed a number of success

factors namely:

- **System quality:** ability of the system to produce information;
- **Information quality:** ability of the system to produce accurate, meaningful and timeless information;
- **Use or user satisfaction:** acceptance by its intended users;
- **Individual impact**: ability to influence; and
- **Organizational impact:** ability to improve the organisational performance.

Building on the theme of information system failures, modern IS literature indicates that the major challenges in resource restricted environments are non-technological. According to the aforementioned study by Puri et al. (2004a), in order for information systems from developed countries to work in developing countries, they need to address requirements and institutional dynamics of the developing countries.

To better understand the issues highlighted above, it is important to look at what constitutes an information system. This research takes the view that information systems are sets of components that are organised in a way that supports the execution of some functions (Shackelford et al., 2006). To extend this definition, Tiihonen, Luukkonen, and Korpela (2010) state that a real-life information system can be seen as a socio-technical system of managing information within an organisation; a purposeful systemic entity where people, processes, information and technologies (manual and computer-based ones) converge. Generally, information systems are built with the aim of ensuring that all the components work together in a perfect fit. This, in turn, benefits organisations by cutting costs and increasing the effectiveness and efficiency of their processes. It also lays a basis for more accurate decision-making.

Furthermore, the aforementioned components must be understood and addressed for an IS to be successful. Most IS fail to do what they are intended to when the human, technology, and organisational issues do not fit together (Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008). This point of view can be attributed to a number of issues. However, one relevant issue is found in Yngström and Bjorck (1999) who argue that it is impossible to push a technology solution into any domain without considering the implications of the above factors and components. Charette (2005) emphasises that if the above issues are not considered, information systems failure such as those highlighted above may occur.

Building on this, it is imperative that a proper foundation to develop information systems for resource restricted environments is laid. This will ensure that resource restricted environments enjoy the benefits of information systems and that the chances of information system failure decrease. This can be achieved if system developers use information systems development methods that are adjusted to fit the socio-economic, organisational and technological context of the relevant local environment (Avgerou, 1995; Waema, 1996; Walsham, 2000).

To minimise the chance of information systems failure, scholars such as Soriyan, et al. (2001) are of the view that information systems for the African context cannot be found off-the-shelf. Heeks (1999) agrees that resource restricted environments need to start developing their systems locally instead of getting them off-the-shelf. Failure to do so may result in solutions that lead to failure and low utilisation levels, because the requirements for the local context are different (Ammenwerth, Gräber, Herrmann, Bürkle, & König, 2003; Reddy, McDonald, Pratt, & Shabot, 2005). In this thesis the term “local” or “locally” is often used with a view to emphasising regional or geographical identity or ownership, specifically in resource restricted environments.

In order to build capacity for the development of local information systems, it is important that two fundamental issues are addressed. These are the issues of user requirements elicitation (URE) and the participation of the users in the ISD process. The motivation for this is drawn from studies by Davis, Fuller, Tremblay and Berndt (2006) and Lindquist (2006). These point out that the major reason for the misalignment of user needs and information systems lies with user requirements elicitation and user participation in the ISD process. The first step to achieve this is the elicitation of user requirements in a manner that allows users to have an equal say in the elicitation process. In doing so, the local social, political, institutional contexts, which are generally different from developed countries, will be accommodated early in the information system development process.

Furthermore, one of the accepted approaches to elicit user requirements is the inclusion of the potential users in the user requirements elicitation process as equal partners, so that they embrace the development of the information system and its use when it is completed. In order to address the above social issues, this research makes use of local norms and traditions to include potential information system users in the information systems development process. In this thesis, all these topics will be discussed further in the following chapters.

Finally, this study is primarily motivated by the realisation that there is an increasing need for IS that are built for the context in which they are used. This will ensure that local socio-technical conditions are catered for and that the norms and traditions of the users are incorporated in the information system development process.

1.2. Motivation for This Study

Considering the preceding discussion, a number of realisations motivate the need for this study. These are then succinctly summarised as follows:

i. **The realisation that information systems that are developed with requirements from one context fail to fit properly in another context.**

There are numerous cases in published literature about the misfit of IS designed in one environment and used in another environment. Kaplan and Harris-Salamone (2009) state that most information systems fail due to sociological, cultural and financial issues and not technical issues, as used to be the case in the past. Furthermore, according to Walsham and Sahay (2006), universal solutions are unlikely to be successful in multiple locations spanning different social, political, institutional, and strategic contexts. Consumers around the world are no longer willing to simply settle for one-size-fits-all products with standardised designs (Delaney, McFarland, & Yoon, 2002). A study in New Zealand chronicled by Gauld (2007) further illustrates this argument. This leads to the next realisation.

ii. **The realisation that gaps in user requirements leads to unusable information systems.**

Poor execution of elicitation will almost guarantee that the final project is a complete failure (Davis, Dieste, Hickey, Juristo, & Moreno, 2006). A number of issues need to be taken into consideration when eliciting requirements from users. A study by Tsumaki and Tamai (2005) found that the following aspects lead to problems later in the system development process:

- Incomplete domain knowledge; and
- Different views of different users.

Finally, according to Davis and Dieste et al. (2006), inaccurately capturing system requirements is the major factor in the failure of 90% of large software projects.

iii. **The realisation that resource restricted environments are facing different ICT challenges than the rest of the world.**

The preceding discussion highlighted that several researchers have emphasised the importance of capturing social aspects in system design requirements. Other scholars argue that acquisition of appropriate software for the local environment is a socio-technical issue. To reiterate, software developed for the requirements of industrialised countries does not suit undeveloped (African) requirements, at least without major re-design (Mursu, Soriyan, Olufokunbi, & Korpela, 2000). The requirements in each context are too different for a resource restricted environment to be able to benefit from another environment without major adjustment. This has prompted many scholars to argue that there is a growing need for locally relevant data collection methods to engage "the whole person" at the grass roots level in the process of data creation and interpretation (Thompson, 2002).

These realisations about existing information system development lead to the research problem highlighted in the next section.

1.3. Problem Statement

The challenges that emanate from IS built on the requirements of a particular context increase the need for IS that address local needs. This study addresses the problem that there is a:

lack of locally relevant methods to conduct user requirements elicitation in resource restricted environments.

The current IS literature illustrates that it is difficult to build information systems that suit all and every situation. The abstraction of design to suit all conditions can leave out various issues that are important in other environments. In the words of Carroll and Swatman (1997, p. 2), "inconsistencies, omissions and errors in the requirements specification have

significant impact upon the ability of the developed systems to meet customers' needs".

The problem highlighted above leads to several research questions that need to be answered before a successful solution can be achieved.

Primarily, the question that needs to be answered for the main problem addressed in the research is:

How can participatory user requirements elicitation methods be altered in order to develop information systems for resource restricted environments?

This poses the following sub-research questions:

1. Which existing approaches play a role in the elicitation of requirements when developing information systems?
2. Which locally relevant mechanisms can be used to develop a locally relevant participatory user requirements elicitation approach?
3. How can existing user requirements elicitation be changed to incorporate locally relevant mechanisms to develop information systems for resource restricted environments?

Effectively answering the above questions will ensure that the following objectives are achieved.

1.4. Objectives of the Study

The primary objective of this research is:

to develop a participatory approach to elicit user requirements for information systems in resource restricted environments.

A number of sub-objectives need to be realised to achieve the primary objective. These are:

1. Review and study user requirements elicitation for information systems development.
2. Review and study local decision-making mechanisms, traditions and norms relevant to user requirements elicitation.
3. Develop a suitable locally relevant participatory approach for user requirements elicitation in resource restricted environments.

1.5. Delineations

This research belongs to the discipline of Information Systems. In addition to focusing on the issues that are relevant to user requirements elicitation, it takes the stance that user requirements elicitation is the initial stage of the requirements engineering process. On its own, user requirements elicitation does not comprise issues such as specification and validation, which are phases of requirements engineering instead.

Scholars like Davey and Cope (2008, p. 1) and Den Hengst, van de Kar and Appelman (2004, p. 1) are in agreement that requirements elicitation is the first stage of requirements engineering. According to Christel and Kang (1992), requirements engineering can be decomposed into various activities such as requirements elicitation, specification and validation. This is similar, with minor differences, to the list of activities found in Li, Rahman, Ferrari and Madhavji (2009, p. 241). Li et al. have the following additional activities: (a) analysis of and (b) management of activities as the first and second step respectively. These authors make no mention of requirements documentation - one of the core activities of information system development, which includes requirements engineering. There are also many other varying views regarding the requirements engineering process. Examples of scholars who have distinctive views on what constitutes the requirements engineering process

are Hickey and Davis (2003 & 2004), Macaulay, Jacucci, O'Neill, Kankaineen, and Simpson (2006) and Pimenta and Faust (1997).

The second delineation of the research relates to the exploration of the problem domain. The empirical data gathered in this research relates primarily to the problem domain, which was gathered within healthcare facilities. However, the problem domain was explored beyond the healthcare industry through the literature reviews.

Finally, this research focuses on issues that are related to developing countries. Its focus is within resource restricted environments that are mostly found in Africa, Asia and Latin America (Luoto, McIntosh, & Wydick, 2007). While some empirical data relating to the problem domain was gathered outside of South African borders, the proposed solution harnesses local South African traditions.

1.6. Research Methodology

Although this topic is addressed in greater detail in the next chapter, it is important to cover it now, if only briefly. The research methodology employed in this research is based on the design science research (DSR) paradigm. Particularly, it draws on Hevner, March, Park, and Ram (2004) to describe an IS research approach that is suitable for the development of the output of this research. This decision was motivated by the goal of this research which is to develop an approach to elicit user requirements in resource restricted environments. Design science and its suitability for this research are expanded upon further in the next chapter.

1.7. Structure of the Thesis

The thesis is divided into 8 chapters. This chapter, **Chapter 1**, presents the subject area of the study, the rationale for choosing it, the principal research

problem and how it is addressed through the research questions and objectives. Further, it highlights the significance of this research for information systems development in resource restricted environments. **Chapter 2** presents the philosophical grounding, research strategy and methods influential in this research. It also provides a detailed discussion about the choice of research methodology used.

Chapter 3 examines the current state of user requirements elicitation, participatory design (PD) and information systems development in resource restricted environments. It pays particular attention to the existing knowledge about requirements elicitation. As required by the DSR principles discussed in Chapter 2, this chapter positions this study in the existing body of knowledge and also highlights the problem identified in Chapter 1.

Chapter 4 documents the case studies undertaken during the course of this research, to understand resource restricted environments and enhance the understanding of the lack of locally relevant methods to conduct user requirements elicitation in resource restricted environments as identified in Chapter 1. It sheds light on the issues that need to be considered during the user requirements elicitation process. **Chapter 5** provides a comprehensive discussion of African participatory decision-making with a focus on the South African context. It highlights the issues that drive it and also points out the issues that are borrowed to form part of the participatory user requirements elicitation solution proposed. **Chapter 6** synthesises the discussion of the existing literature, the knowledge gathered in Chapter 3 and ideas borrowed from participatory decision-making and presents the approach for user requirements elicitation in resource restricted environments.

Chapter 7 provides a comprehensive evaluation of the research in terms of design science evaluation methods. **Chapter 8** concludes the thesis. It outlines the contributions and limitations of the research and thereafter proposes areas for further research.

1.8. Conclusion

This chapter provided evidence that there is a need for resource restricted environments to start building information systems suitable to their context. Doing so will cater for local socio-technical conditions and ensure that the systems are modelled on the characteristics of their users, thereby minimising the likelihood of information system failure. However, this call cannot be answered without taking into consideration the issue of user requirements elicitation.

One of the accepted approaches to elicit user requirements is the inclusion of potential users in the user requirements elicitation process as equal partners. This will ensure that they embrace the development of the system and its use when it is completed. Thus, an approach that not only includes users as equal partners, but also makes use of the local norms and traditions needs to be developed. This will increase the success of information system development in developing countries. Although the approach must include local norms and traditions, it has to make use of accepted participatory information systems development practices too.

To start this journey to develop a new participatory user requirements elicitation approach, the next chapter, provides a comprehensive discussion about the choice of research methodology used to conduct this research.

Chapter 2

Research Methodology

This chapter provides an overview and discussion of the research approach followed in this study. It outlines the philosophical thinking behind this study in order to answer the research questions mentioned in the previous chapter. It also provides a discussion of an appropriate research strategy for the study. It outlines the background and assumptions for the techniques and suggestions that will be put forward in later chapters.

This chapter is structured as follows:

2.1	Introduction
2.2	Domain of Discourse
2.3	Information Systems Research Strategies
2.4	Design Science
2.5	Research Process
2.6	Conclusion

"The aim of a research design is to plan and structure a given research project in such a manner that the eventual validity of the research findings is maximised"

— (Mouton and Marais, 1988, p. 33)

2.1. Introduction

The first step in positioning this study within the realms of existing methodological options is to provide an overview of the main characteristics of the problem this research aims to solve and its envisaged solution. This is achieved by focusing on the research characteristics and showing how the research fits into the existing information systems research methodological options. This is followed by choosing and motivating a suitable research strategy that will answer the research question and objective highlighted in the previous chapter. To illustrate the methodological option chosen, the next section provides a detailed characterisation of the research.

As indicated in the previous chapter, this research was conducted using design science research. This choice is motivated in the next section and throughout this chapter and is presented in detail in Section 2.4.

2.2. Domain of Discourse

The objective of this research is to develop an approach, in the form of a framework, to elicit user requirements in resource restricted environments. Specifically, it was undertaken to determine how local traditions and norms can be used to elicit user requirements in the African context.

The research, although focused on user requirements, touches on other fields that are core to the problem and the objectives identified in Chapter 1. This is illustrated in Figure 2:1. First, the field of user requirements elicitation is a core part of the information systems discipline. Therefore, positioning this research within the realm of existing methodological options has to take the principles of this discipline into consideration. Second, this research falls within the field of participatory design.

This research has to take into consideration the principles of information

systems and what is required to develop successful and acceptable information systems within a given environment. This is denoted by the context of the research, viz, resource restricted environments. It is important to consider the challenges within resource restricted environments in order to understand the issues that need to be taken into account when developing information systems in this context.

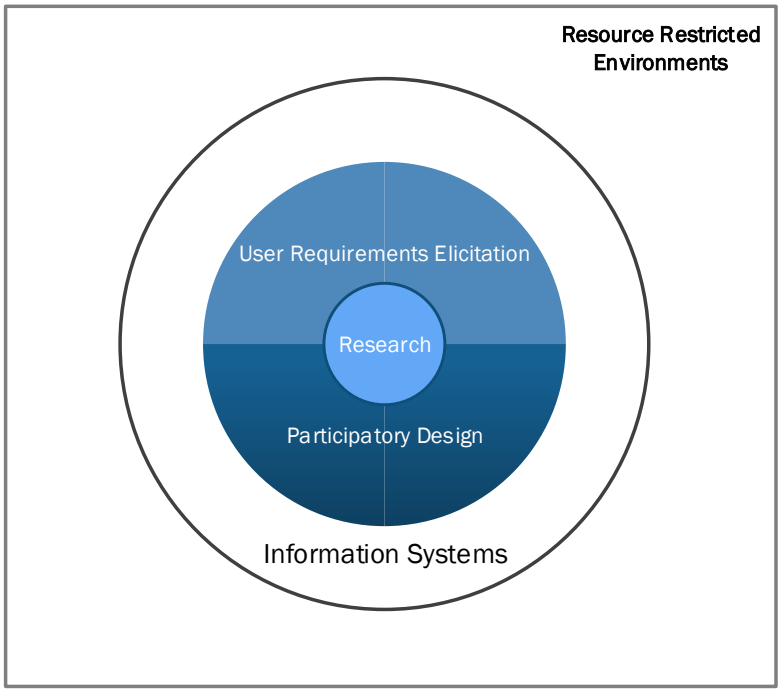

Figure 2:1: Domain of discourse

There are a number of reasons why positioning this research within resource restricted environments is important for the envisaged research output. These include (a) the identification of the type of potential users that are found in such environments and (b) the facilities where the users carry out their daily activities. This is because users within such environments lack a number of essential skills and resources, which play a role in the development of information systems.

Primarily, the level of education of the users, which is not an issue within developed, resourced environments, plays a role in user requirements elicitation and participatory design (Isabirye, 2009; Knoche & Huang, 2012). Equally important are the technology literacy levels of the users because of its importance during the participatory design process (Lalji & Good, 2008). Finally, infrastructure plays a role in both the development and use of information systems (Pentland, Fletcher, & Hasson, 2004).

Given the domain of discourse mentioned above and to know where this research fits within the existing methodological approaches, an investigation into research methodological options suitable for conducting this research was done, starting with strategies for information systems research.

2.3. Information Systems Research Strategies

Avgerou (2000) states that the academic field of information systems is concerned with a large range of multifaceted questions regarding the development, use and implications of information and communication technologies in organisations. The nature of research in information systems is dynamic and ever changing (Boudreau, Gefen, & Straub, 2001). IS research has traditionally been concerned with the development and use of technology and information for improved decision-making. Change in IS research is driven by a number of issues such as new technologies and management trends. In the past decade changes in IS research have been driven by contextual issues (Puri et al., 2004a). They have progressed to include the interaction of people with technology in their environment.

According to Saunders, Lewis, and Thornhill (2002), there are seven traditional information system research strategies that can be used to conduct research, namely: experiment, survey, case study, action research, grounded theory, ethnography and archival research. However, recent studies show that information system research strategies are not limited to this list (Saunders et

al., 2002). Gregory (2011), in his research paper, expands the list thus, “two research strategies that have received increasing scholarly attention recently in IS are *design science research* (DSR) and the grounded theory method (GTM)”.

Design science research is discussed in this chapter together with the seven strategies highlighted above. In the following subsections, each of the strategies is discussed briefly.

2.3.1. Experiment

Experiment is a form of research that owes much to the natural science, although it features strongly in much social science research such as psychology. Further, Saunders et al. (2002) continue, the purpose of an experiment is to study causal links; whether a change in one independent variable produces a change in another dependent variable. To conclude the discussion of experiment research, they state that experiments are conducted in laboratories rather than in the field.

2.3.2. Survey

A survey strategy, which is usually associated with the deductive approach, Saunders et al. (2002) say, is mostly used in business and management research. It is most frequently used to answer who, what, where, how much and how many questions. Due to this, they continue, surveys tend to be used for exploratory and descriptive research. According to them, surveys are popular because they allow the collection of a large amount of data from a sizeable population in a highly economical way. To conclude the discussion of the survey research strategy, Saunders et al. (2002) claim that the data collected through surveys is unlikely to be as wide-ranging as those collected by other research strategies.

2.3.3. Case Study

According to Robinson (in Saunders et al. (2002)), a case study is a strategy for doing research and involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence. Further, according to Morris and Wood (in Saunders et al. (2002)), the case study strategy will be of particular interest if you wish to gain a rich understanding of the context of the research and the processes being enacted. To conclude the discussion of the case study strategy, Saunders et al. (2002) state that the case study strategy is used for explanatory and exploratory research because it has the ability to generate answers to questions such as 'why?', 'what?' and 'how?'

2.3.4. Action Research

In action research, the researcher wants to try out a theory with practitioners in real situations, gain feedback from the experience, then modify the theory as a result of the feedback and try it again (Avison, Lau, Myers, & Nielsen, 1999). Furthermore, Avison et al (1999) state that a case study can use a single case strategy, where the phenomenon under study has not been observed, or a multiple case strategy, where the findings from a case do occur in other cases with a view to generalise the findings.

2.3.5. Grounded Theory

According to Baskerville and Pries-Heje (1999), grounded theory is inductively discovered by careful collection and analysis of qualitative empirical data. A grounded theory strategy is, according to Goulding (2002), particularly helpful for research to predict and explain behaviour, the emphasis being upon developing and building theory. Baskerville and Pries-Heje (1999) continue by stating that grounded theory does not begin with a theory and then seek proof. Instead, it begins with an area of study and allows the relevant theory to

emerge from that area. This, according to Saunders et al. (2002), is achieved from data generated through a series of observations. Further, that data can lead to a generation of predictions, which can then be tested in further observations that may confirm the predictions or not.

2.3.6. Ethnography

According to Saunders et al. (2002), ethnography emanates from the field of anthropology and is rooted firmly in the inductive approach. They say that its purpose is to describe and explain the social world the research subjects inhabit in the same way in which they would describe and explain it.

Ethnography research is notable for being time consuming. This is because it takes place over an extended period of time, due to the need for researchers to immerse themselves in the social world being researched as completely as possible.

2.3.7. Archival Research

According to Saunders et al. (2002), archival research, makes use of administrative records and documents as the principal source of data. They state that an archival research strategy allows exploratory, descriptive or explanatory research questions, which focus upon the past and changes over time, to be answered. According to them, the ability to answer archival research related questions is always dependent on records and documents available to conduct the research. In the end, the questions may or may not be answered due various factors such as missing records.

2.3.8. Design Science Research

To conclude the strategies of information system research, Gregory (2011) states that the focal research attention in design science research is placed on the ‘design’ of artificial artefacts and creating something new that does not

yet exist. He continues by stating that design science provides a number of characteristics.

Firstly, it provides a process for building and evaluating artefacts. An artefact can be a construct, model, method or instantiation. Secondly, it provides guidelines to evaluate an artefact for its utility to solve a problem that is formulated at the beginning of the research process.

Taking into consideration the above IS research strategies and the goal of this thesis, which is to develop a locally relevant approach for user requirements elicitation in resource restricted environments, it becomes clear that most of the strategies are not suitable to achieve this goal. As stated above, experiment, survey, case study, action research, grounded theory, ethnography and archival research do not align with the objectives of this research. Table 2:1 shows why each of the above strategies are not suitable for this research.

Table 2:1: Summary of Research Strategies

Strategy	Purpose
Experiment	Used for studying the effect of an intervention in a particular environment
Survey	Used for gaining information about a population that is impractical to observe
Case Study	Used for gaining understanding of a context or environment
Action Research	Used for trying out a new theory to solve a problem in a real life environment
Grounded Theory	Use for predicting or explaining behaviour
Ethnography	Use for understanding social aspects, such as culture, of a context or environment
Archival Research	Used for studying changes over time using existing records

On the other hand, the design science strategy provides a set of guidelines to conduct information system research. It also provides a list of possible output called artefacts that can be developed using the guidelines.

The design science artifact is in line with the envisaged output of this research. The artefact must be evaluated in order to determine whether it meets the needs of the research. Thus, given the research problem identified in the previous chapter and the design-oriented nature of the outcome goals of this research, design science was chosen as the research strategy for this research. The next subsection discusses design science in detail.

2.4. Design Science

Design science, a problem solving process (Hevner et al., 2004, p. 82), was introduced to the IS community in the early 1990s (Peffers et al., 2006, p. 86). From its early stages, design science was viewed in terms of two fundamental actions, namely build and evaluate (March & Smith, 1995). According to Hevner et al. (2004), design science aims to solve practical and theoretical problems by creating new and innovative artefacts. In positioning design science within the existing methodological philosophies, Kuechler and Vaishnavi (2012) state that it is another "lens" or set of analytical techniques and perspectives for performing research in IS.

Contributions of design science research are in the combined novelty and utility of constructed artefacts (March & Storey, 2008, p. 726). The constructed artefact must satisfy one of the four possible outputs as shown in Figure 2:2. According to Hevner et al. (2004), artefacts are broadly defined as **constructs** (vocabulary and symbols), **models** (abstractions and representations), **methods** (algorithms and practices), and **instantiations** (implemented and prototype systems). Ultimately, the use of design science in research has to lead to one of these artefacts.

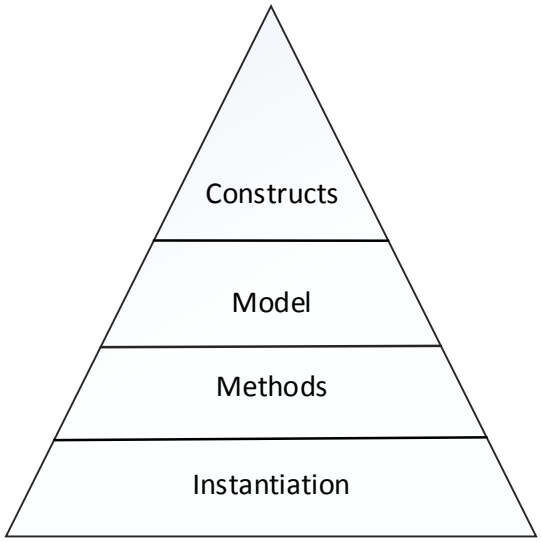

Figure 2:2: Four types of design science artefacts

The four types of design science artefacts can be described as follows (Kuechler & Vaishnavi, 2012; Hevner et al., 2004):

- **Constructs** or concepts form the vocabulary of a domain. In this research the macro concepts are user requirements elicitation, participatory design and information systems. They constitute a conceptualisation used to describe problems and solutions within the domain.
- A **model** is a set of propositions (for example, diagrams and use cases) or statements expressing relationships among constructs. In design activities, models represent situations as problem and solution statements.
- A **method** is a set of steps (an algorithm or guideline) used to perform a task. It combines existing theories and thereby creates processes to solve a given problem.
- On the other hand, an **instantiation** is the realization of an artefact in its environment. Instantiations put together constructs, models and methods in order to realise the artefact in an environment.

The output of this research combines the design science artefacts of constructs, models and methods in the form of a framework. According to

Tomhave (2005), a framework *"[…] defines assumptions, concepts, values, and practices, and […] includes guidance for implementing itself*". On this basis, the output of this research is a framework for the elicitation of user requirements in resource restricted environments.

Building on this, Hevner et al. (2004) proposed seven guidelines to follow in design-science research. The guidelines are from the school of thought that knowledge and understanding of a design problem and its solution are obtained through the development and application of an artefact. This research will adhere to these guidelines.

Table 2:2 shows the seven guidelines by Hevner et al. (2004).

Table 2:2: Summary of the Guidelines of Design Science Hevner et al. (2004)

Guideline	Description
Guideline 1: Design as an Artefact	Design science research must produce an artefact.
Guideline 2: Problem Relevance	The objective of design science research is to develop technology-based solutions to important and relevant business problems.
Guideline 3: Design Evaluation	The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.
Guideline 4: Research Contributions	Effective design science research must provide clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies.
Guideline 5: Research rigor	Design science research relies upon the application of rigorous methods in both the construction and evaluation of the design artefact.
Guideline 6: Design as a search process	The search for an effective artefact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.
Guideline 7: Communication of research	Design science research must be presented effectively to practitioners and fellow academics.

According to Hevner et al. (2004), design science research requires the creation of an innovative, purposeful artefact (Guideline 1) for an identified problem domain (Guideline 2). Because an artefact is purposeful, it must yield utility for the specified problem. Therefore, the evaluation of the artefact is crucial (Guideline 3). Novelty is similarly crucial since the artefact must be innovative and solve an unsolved or known problem in a more effective or efficient manner (Guideline 4). In this way, design science research is differentiated from the practice of design. The artefact itself must be rigorously defined, formally represented, coherent, and internally consistent (Guideline 5). The process by which it is created and often the artefact itself, incorporates or enables a search process whereby a problem space is constructed and a mechanism posed or enacted to find an effective solution (Guideline 6). Finally, the results of the design science research must be communicated effectively (Guideline 7) both to a:

- Technical audience (researchers who will extend them and practitioners who will implement them); and a
- Managerial audience (researchers who will study them in context and practitioners who will decide if they should be implemented within their organisations).

This study adopts these guidelines to develop the output of this research. The guidelines were selected for their wide acceptance by IS researchers and that they were published in one of the top journals for IS. They have been a reference source for a number of research projects since their publication. At the end of this thesis (refer to Chapter 8), these guidelines will be revisited to demonstrate how this research has adhered to them.

Lastly, an issue that needs to be addressed is the appropriateness of design science outside the business environment. Existing literature shows that design science mainly focuses on the construction of artefacts for people, technology, organisations and the intersection thereof. Yet this research is

conducted within a resource restricted environment, which differs from the business environment or organisational context. Previous research by Mayoka, Rwashana, Mbarika, and Isabalija (2012) and Vélez (2011) in resource restricted environments expanded the use of design science from the business environment to resource restricted environments. Therefore there is sufficient reason to believe that design science is appropriate for this research.

2.5. Research Process

All research begins with the identification of a problem and a research methodology that guides the process of finding a solution.

This research was conducted using the five phases of design science. The five phases of design science are: (a) Awareness of Problem, (b) Suggestion, (c) Development, (d) Evaluation and (e) Conclusion. These phases are described as follows (Kuechler & Vaishnavi, 2012; Takeda, Veerkamp, & Yoshikawa, 1990):

- **Awareness of Problem:** The identification of a problem for which a new solution is needed. The awareness of the problem results in an initial solution proposal for a new research effort.
- **Suggestion:** A suggestion on how the initial solution proposal should be achieved. The suggestion leads to a tentative design, which may be a prototype, etc.
- **Development:** Development of the tentative design, resulting in an artefact.
- **Evaluation:** After the construction of the artefact, it is evaluated to determine whether or not it solves the initial problem.
- **Conclusion:** This is the conclusion of the research project. It should be based on the performance measures of the evaluation and should highlight the quality of the solution.

The research reported in this thesis took place from Jan 2009 to Nov 2014. In line with the *problem awareness* phase and as shown in

Figure **2:3**, it began with the identification of the problem area, which is the development of information systems in resource restricted environments. During this phase, the research questions and objectives were identified. A number of other activities which were motivated by the questions and objectives were also conducted. First, the research needed to be aligned with the existing literature in information systems development. Additionally, the conditions under which such systems are deployed and used needed to be understood better. Accordingly, a literature review was conducted to focus the research. The result of the awareness phase are presented in Chapters 1, 3 and 4.

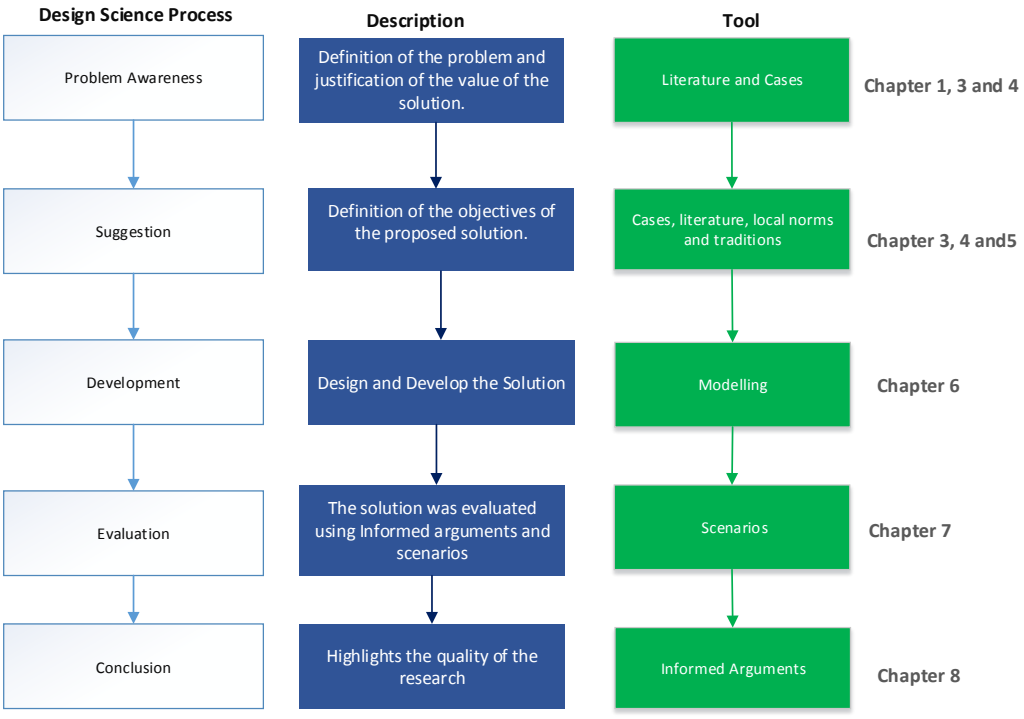

Figure 2:3: Adaptation of Takeda et al. (1990)

The *suggestion* phase focused on enhancing the understanding of the problems and challenges in resource restricted environments. It entailed visiting a hospital and a clinic in two countries. First, the author visited a hospital in Biline, Mozambique. This visit was conducted in the tradition of case study research. It was then followed by a visit to a community clinic in Port Elizabeth, South Africa. In order to satisfy the *suggestion* phase, the research continued to identify various concepts from the local context. It identified local norms and traditions as a significant part of the proposed research solution. Additionally, it identified African participatory decision-making methods as the foundation of the research solution. The results of this phase are presented in Chapters 3, 4 and 5.

During the *development* phase of the research, the proposed solution was developed using concepts identified in the *suggestion* phase. The results of this phase are documented and presented in Chapter 6.

With the aim of satisfying the *evaluation* phase, the research used scenarios around the artefact and informed arguments to demonstrate its utility. The evaluation of the artefact is documented in Chapter 7.

Finally, the *conclusion* phase of the research process reported on the study outcomes, including lessons learnt and possible future research. The conclusion of this research is documented in Chapter 8.

2.6. Conclusion

This chapter examined the research methodology used in this thesis. It began by providing a detailed characterisation of this research and highlighted the domain areas that are important to the research objectives. This included a detailed discussion of the envisaged output of this research. The chapter then continued to position this research within the existing information systems research literature. Having highlighted the eight information systems research

strategies, it was noted that this research was conducted along the lines of the design science paradigm.

In line with this, a detailed discussion of design science was provided. This discussion highlighted the phases that need to be followed to arrive at the output that corresponds to the envisaged output of this research.

Finally, having positioned the research within the existing methodological options, the next chapter continues the theoretical exploration by discussing existing literature on the topics that are significant to the research questions and objectives set out in the previous chapter.

Part II

Chapter 3
Literature Review and Background

This chapter provides a review of existing literature on the topics that are relevant to the objectives of this research. The literature provides a theoretical background for understanding each topic and, in doing so, a better understanding of the problem highlighted in Chapter 1. The content of this chapter forms part of the awareness phase of the design science process.

This chapter is structured as follows:

3.1	Introduction
3.2	User Requirements Elicitation
3.3	Participatory and User Centred Design Approaches
3.4	Conclusion

Each new building is not a finished thing….they are never torn down, never erased; instead they are always embellished, modified, reduced, enlarged, improved.

— **Alexander 1975**

3.1 Introduction

Equally important to the research methodology of this study, is previous research on the topics that are relevant to the study objectives. This chapter discusses the two main concepts that are important for the objectives of this research – namely, user requirements elicitation and participatory design. This discussion builds on the overview provided in Section 1.1. It will become clear that user requirements elicitation is one of the most important aspects of information systems development and that, if not done properly, the likelihood of information system project failure increases. It will also become clear that involving users in the development process as equal partners plays a significant role in the chances of an information system project succeeding. Lastly it will also be shown that resource restricted environments face a different set of challenges that need to be taken into consideration during the user requirements elicitation process.

Therefore, in pursuing this vision, what follows is a series of perspectives on these topics and what they entail. In this regard, the next section presents user requirements elicitation and highlights the importance of including users in this process, specifically in resource restricted environments.

3.2 User Requirements Elicitation

User requirements elicitation, according to Hickey and Davis (2003), can be defined as “learning, uncovering, extracting, surfacing, and/or discovering needs of customers, users, and other potential stakeholders”. It is concerned with obtaining tacit information about "what to build" from the users and their environment (Holbrook III, 1990). According to Nuseibeh and Easterbrook (2000, p. 39), the aim of user requirements elicitation is to find out what problem needs to be solved. They state that this helps define the boundaries of a new information system. Further, Kappel, Prýýll, Reich, and

Retschitzegger (2006) state that better requirements elicitation leads to successful system development.

Previous research, such as that of Charette (2005), shows that many projects fail because of poor or inadequate requirements elicitation. The findings of this study can be illustrated via another study by Davis, Fuller, Tremblay and Berndt (2006). They found that “not accurately capturing system requirements is the major factor in the failure of 90% of large software projects.” This echoes work by Lindquist (2006) who concluded that poor requirements management can be attributed to 71% of software projects that fail; greater than bad technology, missed deadlines and change management issues.

Aligning this study within the realm of the existing body of knowledge and to highlight the possible source of the problems discussed above, a definition of *requirements* from the Institute of Electrical and Electronics Engineers (IEEE) is adopted for this research. IEEE 610.12 defines a requirement as:

> 1) a condition or capability needed by a user to solve a problem or achieve an objective;
> 2) a condition or capability that must be met or possessed by a system or system component to satisfy a contract, standard, specification, or other formally imposed documents;
> 3) a documented representation of a condition or capability as in (1) or (2).

This definition highlights a number of important issues.

The first condition highlights the importance of users in the requirements elicitation process. Further, without the users, their input (or understanding of their work environment) and views, it is highly unlikely that their needs will be met. The second condition highlights the importance that requirements have to address a need, which must be agreed upon by all the stakeholders that have an interest in the requirements elicitation process. Finally, the third condition highlights the importance of requirements being documented.

As an illustration of how important user requirements are in information systems development, Davis and Dieste et al. (2006) and Goguen and Linde (1993, p. 1) state that poor execution of requirements will almost guarantee that the final project is a complete failure. A proof of this statement is found in a study by Charette (2005). It lists more than thirty software projects worth billions of Rands that had to be cancelled, citing badly defined system requirements as one of the causes.

However, solving the problem of poor requirements elicitation is not a straightforward matter because, as Goguen and Linde (1993) state, user requirements elicitation cannot be solved purely in a technological way. The reason is that in requirements elicitation there are many issues that are related to the organisation and not the technology (Olvingson, Hallberg, Timpka, & Lindqvist, 2002).

Various scholars are in agreement that one of the important issues in capturing requirements in information system development is consideration of social issues. Goguen and Linde (1993) add that failures in user requirements elicitation are also related to political and cultural factors. According to the views of Olvingson et al. (2002), it can be argued that the reason for this is that the people for whom the new system is being designed, as well as their environment, are at the heart of user requirements elicitation. This problem is amplified when the potential users and their characteristics are not put at the centre of the requirements elicitation process. This highlights the importance and role of users in the user requirements elicitation process.

3.2.1. The Importance of Users in User Requirements Elicitation

Running hand in hand with the importance of user requirements elicitation as an aspect of usable information system development is the issue of users in the elicitation of requirements. As Tuunanen (2005, p. 16) states,

requirements elicitation involves all relevant stakeholders of the organisation and it has been viewed as a voyage to the needs of the end-users. There are two ways in which the importance of users can be viewed.

First, the success of user requirements elicitation is measured by an information system's ability to address end-user needs. As such, users are more equipped to know about their environment. Therefore, they are better suited to take part in the requirements elicitation process. Failure to include potential system users in the development of a system is likely to lead to a situation where analysts might get incorrect information about the activities in the user environment. In the end, the development of a new system may result in a situation where the system is not aligned with the activities of the users, who then do not use it.

Second, one of the success factors of information systems is their acceptance by users and those whose daily activities will be affected by the system. Pimenta and Faust (1997) state that user requirements cannot be viewed as something that "are already there" and that all that is needed is to just go and question the users. Therefore, it is imperative to involve the users of a new system in the requirements elicitation phase. The motivation for this is to ensure that users accept the end product and that it contains the features they want from it. Furthermore, the importance of users in the elicitation of requirements is illustrated by the example found in Gasston (1999, p. 214). This study chronicles a software development project where the project team only consulted the users during the deployment of the system. To quote Gasston:

> *"… substantial problems were identified with system functionality and interfaces to existing systems".*

In the end, analysis of the situation showed that the root of the problem was due to communication breakdown and an incomplete and ambiguous set of user requirements from the client organisation. The approach used in developing this system shows that the development went against one of the core principles of information systems development. This, according to Lynch and Gregor (in Ndwe et al. (2008)), is to:

> *"… develop a system that meets the users' anticipation of the system, the developers have to depend on the information that is provided by the users or anticipated users of the system".*

Looking at the above problem one can conclude that during user requirements elicitation knowledge is not only gathered about users' needs but about other stakeholders as well. According to Sharp, Finkelstein and Galal (1999, p. 1), stakeholders are all the people or organisations who will be affected by the system and who have a direct or indirect influence on the system requirements.

Although user requirements elicitation is one of the most important stages of software development, including users in the elicitation process is a complex endeavour. A variety of issues that can be viewed as social, political, legal, and/or psychological factors can affect the way users approach the user requirements elicitation process (Goguen & Linde, 1993, p. 152). They add that users can change their minds once they see the possibilities more clearly and that discoveries made later in the development phases may force new additions to be made to requirements.

This is a good and a bad thing. On the one side having users understanding what they are doing towards the development of a new system is a positive

thing. On the other hand, having users changing their minds all the time will eventually affect the project schedule and therefore increase the probability of project failure.

The complexity of user requirements elicitation is increased further by the various types of potential new system users. Problems can become more complex if more distinctive users are involved in the user requirements elicitation phase, for example, users in the health context can be grouped into managers, administrators, technicians, clinicians, nurses and other caregivers.

Users are not all the same, and one of the goals of the elicitation process is to identify the needs of different user classes (Sharp et al., 1999). This may open doors to the issues highlighted above regarding politics, psychological and social issues because users can be differentiated based on characteristics such as knowledge, skill, experience, education, training, physical attributes, and motor and sensory capabilities (ISO 9241-11, 1998, p. 5.3). Furthermore, Butterworth (2006, p. 4) argues that having a culturally diverse user population also presents its own set of difficulties. For instance, the likelihood of miscommunication is high with people from different backgrounds.

Challenges of this nature indicate that there is a need to establish and maintain a strong user relationship throughout the elicitation process, taking into cognisance political, social and other issues. More importantly, the possibility of communication challenges, as highlighted in the study by Gasston (1999), may motivate that talking to the users be done more than once to ensure that information from all stakeholders is collected properly. Although there is limited research on this view, this suggests that the requirements elicitation process is iterative.

3.2.2. The Characteristics of the User Requirements Elicitation Process

To position this research within the existing body of knowledge, the views of three authors on what constitutes the user requirements elicitation process, will be used. The authors are Rzepka (1989) and Kotonya and Sommerville (1998). Rzepka (1989) states that the user requirements elicitation process is made up of five phases which are:

1) **Identify** relevant stakeholders. The stakeholders could be the end-users, interfacing system or environmental factors, etc.
2) **Gather** "the needs" of each stakeholder or problem domain. This could be broken down further into various sections of an organisation and identification of the needs in each of these sections.
3) **Document** and refine the "needs" of each stakeholder or section of the organisation. The needs could include all the activities and data that help the stakeholders carry out their daily duties.
4) **Integrate** the needs across the various relevant stakeholders or problem domains.
5) **Determine the non-functional requirements**, for example, performance and reliability issues and state these in the requirements document.

These are similar to the views of Kotonya and Sommerville (1998) who believe that the user requirements elicitation process is made up of:

a) **Objective setting:** The organisational objectives should be established including general goals of the business, an outline description of the problem to be solved, why the system is necessary and the constraints on the system.
b) **Background knowledge acquisition:** Background information about the system includes information about the organisation where the

system is to be installed, the application domain of the system and information about existing systems.

c) **Knowledge organisation:** The large amount of knowledge collected in the previous stage must be organised and collated.
d) **Stakeholder requirements collection:** System stakeholders are consulted to discover their requirements.

Looking at the first step from Kotonya and Sommerville (1998), there is a noticeable absence of stakeholder identification. However, it is the view of the author that the identification of stakeholders is implied in this stage since the objectives of the organisation cannot be identified without the input of the stakeholders.

The organisation of knowledge (Kotonya and Sommerville, 1998) may focus on prioritising the information gathered about the project and make it possible to identify critical aspects of the new system.

Building on the two user requirements elicitation processes, a number of conclusions can be drawn:

- Firstly, that there is an initialisation phase (or contextual assessment) in user requirements elicitation. In it the relevant system stakeholders need to be identified and a working relationship established with them early in the requirements elicitation process.
- Secondly, reviewing the information gathered during the contextual assessment is important. It will enable the analysts to decide what the most important aspects of the organisation are.
- Finally, that elicitation cannot be conducted without having identified the stakeholders and their needs for the new system.

The user requirements elicitation processes suggested by Rzepka (1989) and Kotonya and Sommerville (1998) will be used as the foundation of the

framework for participatory requirements elicitation (refer to Chapter 6) that will be proposed later because it enables analysts to:

(a) Determine the social challenges early;
(b) Identify the needs of the community and the stakeholders; and
(c) Establish early in the elicitation phase if there are problems regarding communication or related issues between the analysts and the stakeholders.

The processes should be executed iteratively should there be a need to get more information about a certain aspect of the environment or stakeholders.

Lastly, it should be noted that various elicitation techniques can be used throughout the elicitation process. These are subsequently discussed.

3.2.3. Methodologies/Techniques of User Requirements Elicitation

Davey and Cope (2008) cite a study by Maiden and Rugg (1996) as a source of a requirements elicitation framework. It lists 12 user requirement elicitation techniques as shown in Table 3:1.

Table 3:1: Requirements Elicitation Techniques (Maiden & Rugg, 1996)

Observation	Unstructured interviews
Structured interviews	Protocol analysis
Card Sorting	Laddering
Brainstorming	Rapid prototyping
Scenario analysis	RAD workshops
Ethnographic methods	Repertory grids

It is noteworthy that some techniques involve individual users, while others involve the interaction of a group of users (Van de Kar & Den Hengst, 2009). This is not a finite list of techniques for requirements elicitation. For instance, in a study on user requirements elicitation techniques by Goguen and Linde (1993), focus groups are listed as one of the requirements elicitation techniques. Meanwhile, Nuseibeh and Easterbrook, (2000, p. 40) are of the view that elicitation comprises the following classes or categories of techniques:

- Traditional techniques, which include a broad class of generic data gathering techniques;
- *Group elicitation techniques,* which aim to foster stakeholder agreement and buy-in. JAD/RAD workshops are an example of this technique;
- *Model-driven techniques,* which provide a specific model of the type of information to be gathered and then use this model to drive the elicitation process;
- *Cognitive techniques,* which include protocol analysis during which an expert thinks aloud while performing a task, to provide the observer with insights into the cognitive processes used to perform the task; and
- *Contextual techniques,* which include the use of ethnographic techniques such as participant observation.

Davis (1992) further cites *prototyping,* which is often *used* for elicitation when there is a great deal of uncertainty about the requirements, or where early feedback from stakeholders is needed.

The above shows that there are varying views about what comprises requirements elicitation techniques. The above scholars make no mention of the context in which each of the above techniques is suitable. As will be seen in Chapter 4, there are a number of issues that need to be taken into consideration when conducting user requirements elicitation. This is due to

the number of challenges and other issues that are unique to a particular context. Owing to this, the technique or combination of techniques to be used and steps to be taken to elicit requirements depends greatly on the situation at hand (Den Hengst et al., 2004, p. 2).

With the objectives of this study in mind and in agreement with Davey and Cope (2008), this study takes the view that requirements elicitation is a multi-facet exercise. It may be carried out using one of the techniques listed above, each of which has its own merits. For instance, Davis and Fuller et al. (2006, p. 79) agree that conducting requirements elicitation based merely on interviews and questionnaires is not sufficient to elicit all the requirements.

In summary of the afore-going discussion, requirements elicitation techniques can be grouped into a number of categories. Nuseibeh and Easterbrook (2000) and Tuunanen (2003) group elicitation techniques into the categories listed in Table 3:2.

It also needs to be noted that not all these methods depend on user involvement in the elicitation process. For instance, in cognitive model driven techniques users do not take part.

Table 3:2: Categories of Requirements Elicitation Techniques (Nuseibeh & Easterbrook, 2000; Tuunanen, 2003)

Technique	User Involvement
Traditional techniques	✓
Prototyping	✓
Group elicitation techniques	✓
Contextual techniques	✓
Cognitive techniques	✗
Model-driven techniques	✓

However, the above, like most research on user requirements elicitation, has been restricted to developed countries such as the United States and various countries in Europe. Little has been done to study user requirements elicitation in resource restricted environments, which are found in countries like those in Africa. Due to lack of capacity, most research in developing countries is focused on customisation to meet local needs. So, developed countries will continue to affect the way software is adopted in resource restricted environments.

Finally, recognising that users play an important role in the elicitation of requirements, the next section looks at design methodologies that put users at the core of the elicitation process. The aim is to have a thorough understanding of the role of the users during the execution of the methodologies and what characteristics of the methodologies, if any, can be adapted to achieve the objectives of this research.

3.3 Participatory and User Centred Design Approaches

I'll just wind up by saying that I think you don't have to look for solutions outside. Look for solutions within. And listen to people that have the solutions in front of you. They're all over the world. Don't even worry. Don't listen to the World Bank; listen to the people on the ground. They have all the solutions in the world (Roy, 2011).

The previous section highlighted that the involvement of intended users early in the development process is seen as a precondition for good design. The

above quote from Roy (2011) and the views of Donner et al. (2008, p. 84) regarding user participation suffice to highlight the importance of users in the early stages of the development process:

> *Spend time early, spend time frequently, and spend a lot of time (Donner et al., 2008, p. 84).*

According to Donner et al. (2008), it is not only spending time with the users that is important to the development of information systems, but doing so "*in those circumstances in which the development of the system might take place*". As such, the next sections provide a theoretical background of participatory design and user centred design (UCD), which address the participation of users in the development process. The discussion focuses on the foundations of each of the concepts. Then, similarities and differences between the concepts are highlighted. In the end, the characteristics from each of the concepts that are important to the achievement of the research objectives are highlighted. Participatory design is discussed first.

3.3.1. Participatory Design

It is widely documented in existing information systems development literature that users of the system being designed should be included in every step or phase of the design of the particular system. Yet, their role in the design of the system is sometimes limited. Participatory design was the first development methodology that advocated the involvement of users as equal partners in the development process. The reason for this is twofold. The first was the realisation that the users' knowledge of work processes would help to improve the final product. Second, involving users early in the development process would increase ownership of the project by the users and therefore its acceptability and success. This view is supported by Bediang, Bagayoko, and

Geissbuhler (2008, p. 49) who state that a participatory approach has the advantage of ensuring shared ownership and promotes institutionalisation and sustainability.

Building on this, numerous scholars state that PD started in the early 1970s (Carroll & Rosson, 2007; Reich, Konda, Monarch, Levy, & Subrahmanian, 1996; Sharp, Rogers, & Preece, 2007). Others pre-date it earlier (Sanoff, 2007). Academic literature suggests that PD exists in two forms – namely, North American and Scandinavian. This section aligns the two forms of PD to their originating continents. Participatory design has its roots in Scandinavia. According to Spinuzzi (2005a), PD in Scandinavia started off as a resolution of a conflict between employees and their management due to the introduction of computer-based machinery in the work place (Jacko & Sears, 2003; Spinuzzi, 2005a). Since that time, PD has been adapted in other parts of the world to the extent that some authors have given it alternative names. So, it is important to understand how other parts of the world view it given that the conditions under which it started in Scandinavia might be non-existent in those areas. Essentially, the questions that need to be answered are:

1. What is participatory design?
2. What does participatory design entail?
3. What is the current state of participatory design around the world?

According to Sanoff (2007), there can be no single definition of PD. This view is supported by Blomberg and Henderson (1990) who state that there is no single view of PD nor is there a unified position on its theoretical underpinnings. Their argument is based on the notion that PD has different backgrounds and the areas of its application are diverse. PD draws from various fields such as software engineering, architecture, public policy, psychology, anthropology, sociology, labour studies, communication studies and political science. PD, according to Jacko and Sears (2003), is a set of theories, practices, and studies related to end-users who are full participants

in the activities leading to software and hardware computer products and computer based activities. PD helps create an environment where the system developers and the users of computer applications can learn to develop systems that better suit the way work is actually carried out (Jacko & Sears, 2003).

Building on this, PD is based on *pragmatic* and *moral* propositions (Carroll & Rosson, 2007). The motivation for the pragmatic proposition is that the users who will adopt a newly designed artefact or the design outcome are included in the design process since they are most conversant with their work functions, tasks, and other related processes in their work environment. The motivation for the moral proposition is that the users, whose activities and daily experiences are affected by a proposed change, should be involved in the outcome of the change. This is what distinguishes PD from other design approaches; the role of the users in the design process. Users are involved in the process as co-designers (Jacko & Sears, 2003). Users share the responsibility for the quality of the design proposal and the implemented system (Bjerknes, 1993). Furthermore, users are not simply consulted at the beginning and asked to evaluate the completed system; they are treated as partners throughout the design process (Jacko & Sears, 2003).

In order to understand what participatory design entails, it is imperative to look at the participatory design process.

3.3.1.1. Participatory Design Process

The fundamental principle of PD is mutual and reciprocal learning between the designers and the future users of the artifact that is being designed (Beguin, 2003). According to Gregory (2003), this is accomplished by dividing all the design stakeholders into various teams that independently design paper mock-ups of the new systems. In the end, the best design solution is chosen. This is done by a three stage iterative process (Shneiderman, 1997):

(a) Elicitation of knowledge about the domain,
(b) Design of the user interface or prototype,
(c) Work practices and job redesign.

The future users of a system are most knowledgeable about their work environment and are most suitable to provide information about it. Therefore, during the first stage, it is necessary to gather this knowledge prior to the development of a system that suits their needs and working conditions.

The second stage focuses on the computer systems. It allows the users to draw up paper sketches, with the help of the expert designers, of the new system prior to it being built. The sketches are divided into small prototypes that are video-taped to create a mock-up of the system (Shneiderman, 1997). Ultimately, the video of the prototype is used to test any usability issues that may exist in the user interface.

While the new artefact will bring benefits to the organisation and the employees, it may bring changes to the work environment (Gregory, 2003). These changes may require that the users be re-trained. Therefore, it is important that the changes are managed properly and that the users affected are active role players during the third stage of PD.

In order to understand the current state of participatory design around the world, it is imperative to consider a historical overview of participatory design and how it has spread to other parts of the world.

3.3.1.2. Participatory Design in Scandinavia

In the preceding discussion, it was highlighted that PD came about to resolve employer/employee relations due to the introduction of computer systems by employers in the workplace without consulting employees. The employees had no input into the design of the new computer applications and were forced to use them (Spinuzzi, 2005b). Accordingly, they had to abandon their

lifelong experiences and skills to learn to work with the new technology. This led to a number of problems for the employees (Jacko & Sears, 2003). The problems were due to the fact that:

a) The computer-based technologies reduced the number of jobs.
b) The introduction of computer applications and machinery was deskilling the workers.

As a result, the labour unions in Scandinavia lobbied for laws that made it mandatory for employees to be involved in how their work environment was changed. According to Sharp et al (2007), the laws governing such labour problems still exist today. Furthermore, this has led to Scandinavian PD being associated with trying to achieve the following three principles (Gregory, 2003):

- Striving for democracy and democratisation;
- Explicit discussion of values in design and imagined futures; and
- Methods that solve conflicts and contradictions in the work place.

These principles motivated Scandinavian researchers, Spinuzzi (2003) claims, to embark on finding a method that helps the software developers and employees to collaborate in developing new technologies. This was the first step towards PD in Scandinavia and the first time that employees took control of their work environment.

The projects that resulted from the start of PD in Scandinavia include; the Swedish DEMOS project (1975 – 1979), the Danish project DUE (1977 – 1980) and the well-known UTOPIA project (1981 – 1984) (Gregory, 2003; Jacko & Sears, 2003). According to Gregory (2003), these projects paved the way for new variants of PD.

PD has since led to other variants such as cooperative design and has influenced the design approaches in other continents such as North America.

3.3.1.3. Participatory Design outside Scandinavia

Participatory design started in North America in the mid-1980s (Carroll & Rosson, 2007). According to Greenbaum, PD in North America was developed due to emerging problems with UCD (Carroll & Rosson, 2007). Essentially, a need existed for a new design approach because there was a need for computer systems which were both user-friendly and aligned with the work flow of the organisations for which they were designed. The start of PD in North America is in contrast to the start of Scandinavian PD. Scandinavian PD started on political grounds and the need for human development. Furthermore, the systems were required to function in the workplace without requiring the users to change how they carried out their duties. The need to understand the work environment and the intended users of the system meant that the principles of PD, as defined in Scandinavia, could be employed.

Factors of workplace democracy and human empowerment, which were critical in the genesis of PD in Scandinavia, however, were not the driving force behind the need for a new design methodology in North America. This led to the assertion that North-American PD is more oriented towards software production and rooted in Human Computer Interaction (HCI). HCI aims at involving users in the testing of products rather than their involvement, over time, in the organisational development of change. The latter is traditionally more common in Europe and Scandinavia (Clement & Van den Besselaar, 1993; Spinuzzi, 2005b).

North American PD is viewed as more focused on the management of organisations or on the pragmatic premise of PD. North American PD is too friendly to management (Jacko & Sears, 2003). The literature review provides a variety of reasons about why North American PD differs from Scandinavian PD:

1. North America is a multi-cultural society and therefore faces more

challenges than Scandinavia (Greenbaum & Kyng, 1991; Muller, 2009). These cultural diversities may become a challenge when working with users of difference races or languages. The choosing of one culture over another to follow in the PD process alienates various people who feel discriminated against.

2. Labour, in North America, is poorly organised and concerned with employment security and wage rates (Carroll, 1996).
3. American companies are larger when compared to the small to medium size companies of Scandinavia.

Finally, to reconcile the two branches of PD, Table 3:3 depicts a summary of the fundamental characteristics of Scandinavian PD and North American PD.

Table 3:3: Comparison of Scandinavian and North American PD approaches

Scandinavian PD	North American PD
Based on pragmatic and moral propositions (Carroll & Rosson, 2007);	Based on the pragmatic proposition Greenbaum in (Carroll & Rosson, 2007);
Based on activity theory (Carroll & Rosson, 2007) ;	Based on UCD and HCI (Clement & Van den Besselaar, 1993);
Work with users as equal partners (Sharp et al., 2007);	Simplification of duties;
Few or close to non-existent cultural challenges.	Major cultural challenges.

Table 3:3 highlights the subtle differences between Scandinavian and North American PD. For instance, North American PD is based on one of the two propositions of Scandinavian PD, namely the pragmatic proposition. It is further influenced by UCD and HCI.

This concludes the discussion in answering the three questions concerning participatory design highlighted earlier. The questions were:

1. What is participatory design?
2. What does participatory design entail?
3. What is the current state of participatory design around the world?

In order to identify the characteristics that can be adopted for the solution of this research, it is imperative to look at the second type of design methodology that focuses on users during the design process.

3.3.2 User Centred Design

User centred design, in contrast to PD, began in the 1980s as a result of the limitations of traditional system-centred design, which focused on the strengths of the system (Vredenburg, Mao, Smith, & Carey, 2002). Therefore, UCD was developed to accommodate the emerging complex information and user needs that arose from the introduction of computers and computer systems to households and businesses (Keshavarz, 2008). This design methodology aims to ensure that applications are both user-friendly and more rooted in the practices of their users, states Greenbaum (Carroll & Rosson, 2007).

According to Bowen and Reeves (2008), user centred design is an iterative approach to building computer applications. It allows the designers to keep the requirements of the users central to the design and ensure that their feedback is considered as the design is amended. Users are placed at the centre of the various design process stages, from the planning and designing of the system requirements to implementing and testing the product (Spector, 2008). According to Lumsden (2008), this is done by focusing on the needs, wants and limitations of the users. However, Olsson (2004) states that users do not participate in the design process but rather work with the designers to

ensure that they are aware of the issues that relate to how the users perform their tasks in their work environment.

Furthermore, there are three stages to be followed during the design process to ensure that computer systems are useful and easy to use (Barrington, 2007; Bowen & Reeves, 2007; Henry, 1998). Gould (1995) includes a fourth stage, the scaled "integration" stage which focuses on bringing all the design stages together. Despite these minor differences, the stages as described by Barrington (2007), Bowen and Reeves (2007) and Henry (1998) can be mapped as follows:

Establishing the context of use – This stage deals with identifying the intended users of a product, the tasks they will perform and the environment in which they will use the product. Its goal is to establish who the users are, their goals for the product and their characteristics such as skills, experience, training, and priorities. Ultimately, the product has to fit the characteristics of the users and their work context.

Designing for usability – The purpose of this stage is to ensure that the designers understand what is required to make a system or product usable. The designers use usability guidelines to ensure that the artefact being designed can be used by its users to achieve their specific goals with effectiveness, efficiency and satisfaction in its specified context of use.

Evaluating usability – This stage deals with producing prototypes of the product being developed and this activity can start as early as possible. According to Barrington (1998), various prototypes such as paper prototypes are used to accomplish this. The prototypes are tested by the intended users and their feedback can be integrated into the design. The iteration stage occurs at the end of this process.

Finally, the fundamental goal of UCD is that there is a need for system developers to learn from the experiences of the people using the computers

(Carroll & Rosson, 2007). Users do not take part in the actual design of the system but they are involved in the process when the designers require information (Sanders, 2002). This leads to a discussion of the relationship between PD and UCD.

3.3.3 The Relationship between PD and UCD

In sections 3.3.1 and 3.3.2 PD and UCD were reviewed. The history and characteristics of each method were highlighted. The two concepts are now reconciled to highlight the characteristics that are adoptable for the development of the output of this research.

In an effort to illustrate any differences between PD and UCD, Table 3:4 presents a summary of these two concepts. However, it is important to note that PD is not presented in its two forms as discussed earlier. The reason is that apart from the distinctive environments in which the Scandinavian PD and North American PD started and fundamental characteristics and circumstances, no clear differences exist between the two.

Table 3:4: Comparison of UCD and PD methodologies

Participatory Design	User Centred Design
Users are involved throughout the design process(Weng, McDonald, Sparks, McCoy, & Gennari, 2007)	Users are involved during requirements gathering and usability testing (Fischer, 2003)
At least one user is involved in the design process as a co-designer (Gregory, 2003)	Users are involved in the design process as informants to the designers (Sanders, 2002)

Building on this, Section 3.3.1 highlighted that PD entails: (a) the elicitation of knowledge about the domain, (b) the design of the user interface, and (c) work practices and job redesign. According to Spinuzzi (2005b), PD is distinguished from related approaches such as UCD because the latter

supposes that the *research* and *design work is done on behalf of the users; while in PD*, this work is *done with the users*. This presents PD and UCD as two separate concepts that include users in the development process differently. This argument is supported by Fischer (2003) who states that in UCD, the *designers generate solutions by placing users mainly in a reactive role*. On the other hand, PD *seeks to involve users more deeply in the process as co-designers by empowering them to propose and generate design alternatives themselves*.

Therefore, participatory design is espoused as the basis for the output of this research because it has been adapted in other parts of the world in order to accommodate the social makeup of those environments. It enables the interaction of users and system analysts in their environment as equal partners. Furthermore, the adaptability of PD will make it possible to define participation from the local users' point of view and taking their characteristics into account.

Finally, although it is not in the scope of this research, adapting participation to the users' characteristics will also pave the way for a locally flavoured participatory design approach.

3.4 Conclusion

The chapter provided a discussion of the concepts that are relevant to this study. In doing so, it highlighted user requirements elicitation as one of the most important activities of information systems development. In addition to its importance for the development of information systems that are aligned to user needs, it highlighted the problems that can be encountered if user requirements elicitation is not done properly.

Additionally, this chapter provided a detailed discussion of participation in the information systems development process. It presented two types of

approaches – namely, participatory design and user centred design. In the discussion, similarities and differences between these approaches were highlighted. Then, the applicability of each approach to the development of the output of this research, was highlighted. In the end, participatory design, due to its adaptability and how it makes it possible for users to take part in the development process, was selected as one of the foundations of the output of this research.

Armed with the current body of knowledge, the next phase of the research aims to seek a better understanding of the local context. The next chapter reports on the results of this quest by reporting on cases that were undertaken to understand the issues that might affect user requirements elicitation and information system development.

Chapter 4
Case Studies on the State of the Local Environment

The previous chapters covered the objectives of this research and also the current body of knowledge regarding the areas important for this study. This chapter presents case studies that were undertaken during the study to gain a better understanding of resource restricted environments. It reports on two case studies that were undertaken in two different environments.

This chapter is structured as follows:

"Basically, I'm not interested in doing research and I never have been. I'm interested in understanding, which is quite a different thing."

— David Blackwell

4.1. Challenges of Requirements Elicitation in Developing Countries

In the preceding chapter, it was highlighted that various problems in requirements elicitation are due both to a lack of knowledge about the application domain and user-designer communication breakdowns. Owing to this, various techniques such as (a) user participation, (b) artificial intelligence-based requirements capturing systems and (c) prototyping are used to provide methodological support for the process of domain knowledge capture. They are also used to adapt software design to meet the needs of specific user communities (Pimenta & Faust, 1997).

Section 2.2 in Chapter 2 discussed how the development of information systems becomes a problem due to a number of challenges such as, to reiterate, lack of facilities, lack of understanding of technology, lack of education, etc.

Another issue of importance is donor supported solutions, which leads to problems in information systems development in resource restricted environments. Donor-supported information technology (IT)–based projects developed or implemented in less-developed economies (LDEs) end up as complete or partial failures or are unsustainable (Kimaro & Nhampossa, 2005, p. 273). In this research, donor – supported information technology refers to software developed based on funding by external donors. Table 4:1 illustrates how donor funded information technology is a problem in resource restricted environments. According to Abouzahr and Boerma (2005, p. 578), donors fuel the problem by prioritising urgent needs for data over longer-term country capacity-building. Kimaro and Nhampossa (2005) state that this problem can be attributed to issues such as: inadequate infrastructure and human resource capacity, donor policy, and the lack of policies to manage information systems.

Furthermore, the development of information systems in resource restricted environments has depended on methods borne from contexts that do not face the challenges that resource restricted environments deal with on a daily basis. Yet each of these challenges plays an important role in the elicitation of requirements.

Finally, a summary of challenges highlighted above is in shown Table 4:1.

Table 4:1: Summary of Challenges in Developing Country Contexts

Challenge	Problem
Professional Education (Dörflinger, Friedland, Merz, & de Louw, 2009, p. 3)	May affect communication and use of technology.
Knowledge of Technology (Dörflinger et al., 2009, p. 3)	Lack of skill to know what can/cannot be done with technology. Owing to this, it may be hard for users to conceptualise what technology might be able to do if they are not familiar with what it does or how it is created (Marsden, Maunder, & Parker, 2008).
Communication (Warner-Smith, 2004)	Different languages can affect the quality of requirements. Also, communication at every level below the top management is impediment in developing countries (Abera & Kaasbøll, 2008, p. 3).
Donor financed solutions	The requirements of donors may affect how a new system works with other systems.
Giving donors total control of the development process.	Donors normally come from outside the environment of the new system and so cannot be in a position to understand all the issues about it.
User Participation	Lack of skill to know what can/cannot be done with technology. Forcing things on lower level workers without their approval.
Overall Organisation View	Organisations are not standalone. Any approach to elicit requirements has to take into consideration the overall information flow issues within and outside the organisation, including NGOs, donors, government and community.

Therefore, to ensure that information systems development is performed successfully in resource restricted environments, user requirements elicitation needs to take into consideration the challenges highlighted above. To summarise, it needs to address the information needs of the stakeholders, the needs of the environment in which the system will function and the boundaries of the system. With the aim of developing a solution for this research based on a comprehensive understanding of the problem context, an exploratory study of information systems in resource restricted environments was conducted in South Africa and Mozambique. While the problem domain was explored broadly through the literature reviews, the collection of empirical data related to the problem domain was limited to information systems in the healthcare sector, as explicated in Chapter 1, section 1.5.

4.2. Understanding Resource Restricted Environments Part I: A Case in Beline, Mozambique

The case study presented in this section was conducted at the Centro de Saude de Bilene-Macia (Macia health centre and directorate), hereinafter referred to as Macia Healthcare Centre, in the town of Bilene in the Gaza district of the Xai Xai province in Mozambique. A group of information systems researchers led a project to determine the heath information systems needs of a local healthcare centre. The case study took place in November 2010. The visit to the local healthcare centre highlighted a number of challenges that needed to be taken into consideration when gathering user requirements from an environment such as Macia.

As in most resource restricted environments, a routine paper-based information system was found to be in place to collect and report data (Lippeveld, Sauerbron, & Bodart, 2000). Lippeveld et al. (2000) state that resource restricted environments are often inadequate to effectively support

healthcare as data is merely collected to be fed upward. Mozambique is not different due to its lack of infrastructure and other socio-economic issues. In the following discussion, the findings of this case are discussed in detail.

4.2.1. The Environment: Profile of the Organisation

Bilene is mostly a rural district that is faced with a number of social challenges. For instance, in certain sections of the clinic there is a lack of electricity, which makes the use of machinery such as computers impossible. Furthermore, the nursing staff has to work in a small office with little space to accommodate the visiting patients.

The health system in Mozambique is divided into three parts:

(a) Public – currently responsible for most of the population's healthcare needs;
(b) Private – usually found in urban areas and most of the population cannot afford it; and
(c) Non-profit – mainly run by non-governmental organisations (NGOs) to cater for the poorest of the community.

The Macia Health Centre provides a number of medical services such as vaccinations, maternal care and outpatient care (for patients that need treatment but do not need to be hospitalised). It is also responsible for the various administrative functions of the Bilene district, such as mobile care for outreach services for the areas that are far from proper healthcare centres. The case presented here focused on four main units of the centre, namely:

(a) Administration – contains four computers, three printers, one photocopier and a filing cabinet. This section is run by one individual who has been in this job for less than six months.
(b) Outpatient Care – This section has two nurses (one for adult patients and the other for paediatric patients) who are responsible for

consultations. As part of their daily job, the two nurses check vital signs, symptoms and observe, diagnose, pre-counsel and write prescriptions for the patients. Where necessary, the nurses refer patients to the laboratory and transfer serious patients to the ward, lab assistants and pharmacists. HIV/AIDS Counsellors also work with the nurses to test patients for malaria, HIV and other viruses. They issue medication to patients and do counselling for HIV positive patients.

(c) Vaccinations – This section of the clinic deals with vaccinations (infants and adults), nutritional supplements and monitoring the growth of infants and young children.

(d) Maternal care – this section is responsible for pre-natal and post-natal healthcare. The pre-natal healthcare includes the Anti-Retro-Viral Treatment (TARV) program while the post-natal healthcare is divided into family planning and immunisation.

4.2.2. Participant Information and Roles

To conduct this case study, a number of individuals from both the local clinic and the research group participated in various roles. The members of the local clinic were mainly the nursing staff from each of the four abovementioned sections. The research group was made up of a group of academics and students from universities in South Africa, Mozambique and Finland. The students were mainly masters degree level research students. Other contributors included the involvement of the members of the department of health for the district of Bilene. This was essential in order to get permission to visit the clinic as well. A summary of all the stakeholders that were part of data collection process is depicted in Table 4:2 below.

Additionally, one senior member of the clinic participated as a facilitator between the nursing staff and the researchers. As a member of the academic staff, the role of the author was mainly to observe the activities of the students throughout the exercise, while they asked questions to determine the heath

centre's information systems needs. The author kept notes of the observations in a research diary and captured further notes during a debriefing session where the students' data collection activities were discussed by the research group. The author used the research diary to do theme extraction to summarise the findings, as presented in sections 4.2.3 and 4.2.4. Notably, since the activities of the students were taking place concurrently, the author could only focus on one group of students at a time.

Table 4:2: Breakdown of the Stakeholders

Stakeholder	Quantity
Nursing staff	5
Translators	5
Academics	12
Students	16
Government officials	1
Healthcare Centre Manager	1

4.2.3. Day-to-day Activities of the Clinic

In order to gain insight into the day-to-day activities of the healthcare centre, the students were divided into groups of four. This corresponded to the four sections of the clinic that were under study. Each group had one Portuguese speaking member to facilitate communication between the clinic staff members and the group. The student groups were required to gather information about the daily activities of the clinic.

However, before the visit to the clinic, permission had to be obtained from a local government health department. The health department liaised with the clinic about the planned visit and its aim. According to a local member of the research group and despite the prior arrangements with the local government health department:

"…keeping the government officials informed, about the activities and plans of the research group (specifically the plans of the day in particular), is a sign of politeness and respect that builds a good foundation for future arrangements".

After the administrative activities with the health department were concluded, the students were given a brief overview of the issues they were required to focus on during the visit to the clinic. For instance, the students were required to find out about: (a) the activities that take place during a day for a particular nurse, (b) the type of information that is kept in the clinic, and (c) the patient related policies that are used to ensure that the clinic functions properly. Additionally, the students were not informed about the disposition of the clinic and its health facilities. This was done on purpose so that the visit to the clinic would maintain its '*unknown context'* status.

To accomplish their tasks, the students used a variety of methods of enquiry to explore and understand the data and its flow in the clinic. Primarily, they relied on interviews with the nursing staff and observation of the workplace and facilities. Some of the student groups collected a number of paper forms for document analysis. One group noted that due to time constraints, as stated above, they could not get the nursing staff to explain how certain things function in the clinic. For instance, one group mentioned that they could not get the nursing staff to explain how the paper forms would be used to gather information and what types of information would be filled in on a normal working day.

Furthermore, other problems were experienced during the interview process. The groups indicated that communicating with the nursing staff through a translator was ineffective, frustrating, time consuming and slowed down the pace of the questioning significantly. Throughout the interview process, one member in each group recorded the questions and the answers. However, according to one group there was also a distinct lack of confidence from the interviewers regarding whether the questions and answers were understood

by each side. Consequently, one of the groups felt that *it would be more effective if interviews were carried out in a language that is spoken by both parties.*

Finally, after the visit to the clinic, each group analysed its findings to determine if there were any problems with the current system and what could be done to improve activities in the clinic. This analysis also included the determination of whether a better system could be recommended.

4.2.4.Implication of the Findings to this Research

A number of useful lessons were learnt from the visit to Mozambique. Firstly, the language barrier between the clinic staff and the research groups became clear as most of the interviewers did not speak the local language, Portuguese. This meant that a translator had to be used to facilitate communication between the nurses and the analysts.

Secondly, communication between the clinic staff members and researchers proved to be a major barrier to effective requirements elicitation. All the groups had to communicate through a translator, which proved to be time consuming and made the elicitation process longer. More time had to be spent on a particular problem area than would normally be necessary. For instance, one of the groups had the following to say about the communication problem (which was also alluded to by other groups):

"…the interview was fairly time consuming especially when clarification was required on some aspect of a given answer".

The findings about the communication are consistent with existing requirements elicitation literature. For instance, in the previous chapter it was highlighted that communication problems are likely to be encountered during the requirements elicitation phase. It was highlighted that it is imperative that there should be many communication interfaces between the various

stakeholders involved in the elicitation process. For example, an interface could focus on the social/technical world of users and the technical world of analysts. Further, it was highlighted that communication problems are likely to increase in complexity when the culture of stakeholders involved in the elicitation process is taken into consideration.

The findings of this case are consistent with existing literature with regards to challenges within developing countries. To reiterate, it was highlighted that resource restricted environments face challenges such communication, lack of technology literacy etc.

4.3. Understanding Resource Restricted Environments Part II: A Case in Motherwell, South Africa

The case study reported in this section took place at the Emmanuel Haven Wellness Centre, a community clinic, which is situated in Motherwell, Port Elizabeth, in the Eastern Cape Province of the Republic of South Africa. Unlike the case study in the previous section, this one aimed to replace the current existing paper-based system and to implement the use of mobile devices. Therefore, as part of the data gathering process, the researcher had to understand the day-to-day activities of the caregivers inside and outside the clinic.

To achieve this aim, structured and unstructured interviews, training and observations were used. The study started at the beginning of May 2011 and finished in July 2011.

4.3.1. The Environment: Profile of the Organisation

Motherwell is a township with a population of almost 200 000 (unofficial). According to Wikipedia (2008), a township is used to refer to different kinds of

settlements in different countries. Motherwell is divided into various sections (1 to 13) or units which are officially differentiated by their numbers. For instance, the first section is referred to as NU1. The first nine units were built before 1991 and all the owners had to buy their houses from private contractors. The rest of the units were built by the government as part of the reconstruction and development programme (RDP) between 1992 and 1996 (Wikipedia, n.d.). The RDP was geared towards poorer homes and NU10 – NU12 are home to some of the poorer people of Motherwell.

Emmanuel Haven, which according to their mission statement (Emmanuel Haven, n.d.), aims to provide prevention, treatment, care and support to the community and to create an enabling environment for mitigating the health, psychological and socio-economic impact of HIV and AIDS on the family and community. It is situated near NU12 and is divided into the following sections (Yogi Nambiar, 2011):

1. **Health Cluster** – five clinics, day care and step down centres (similar to a hospice), home-based care and transportation for patients to clinics.
2. **Small-Medium Enterprises** – shoe manufacturing, brick manufacturing, small business initiatives.
3. **Horticulture Cluster** – commercial and open field farming, family tunnels.
4. **Education Cluster** – crèche and school for orphans and vulnerable children, social messaging on the Emmanuel Haven FM radio station, computer and bible schools.

This study was solely focused on the Health Cluster (caregiving) since community care giving falls under the health wing of the clinic. As part of the aforementioned mission, the health cluster of the clinic is managed by a retired nurse (matron) with the help of more than 300 caregivers in various roles inside the clinic and the surrounding community.

4.3.2. Participant Information and Roles

The stakeholders who took part in this case study included the management of the clinic, caregivers and one researcher who I followed as an observer throughout. The age of the caregivers who participated in the study ranged from 27 to 74 years. They were volunteers from around Motherwell who had to undergo short training on caregiving before they were accepted by the clinic. According to Abera and Kaasbøll (2008, p. 6), a volunteer health worker is defined as:

> *"[…] members of the community who are early adapters of health actions and volunteer to practice do-able health actions to their relatives, friends and neighbours".*

However, at Emmanuel Haven, caregivers are not limited to only taking care of people in their communities; they also take part in other activities inside the clinic. In line with the number of activities that take place within the health cluster of the clinic, caregivers are also required to provide care to patients (TB patients) inside the clinic. As such, their five day week is divided into three days inside the clinic and two days in the nearby community.

My role in this case was to observe the methods used by the researcher to gather the requirements for the use of a mobile device for data capturing. To understand the kind of issues that are likely to affect the URE process, it was important to understand the environment in which Emmanuel Haven operates, the community it serves and the profile of the caregivers.

Interviews were transcribed by the researcher and the author of this thesis had access to the interview transcripts. During the interviews and the training, the author's observations were captured in a research diary. The author supplemented the notes in the research diary having reviewed the interview transcripts for matters that were not noted. Further notes were captured

based on a debriefing session between the researcher and the author of this thesis. Theme extraction based on the notes in the research diary assisted to compile and summarise the findings, as presented in sections 4.3.3 – 4.3.6.

4.3.3. The Training: Relationship Building

Before the research took place, a training programme was conducted to empower the caregivers with computer literacy skills. The selection of the participants for the training was solely the responsibility of the Emmanuel Haven and only names of the people attending the training were forwarded to the research team.

Similarly, the selection of the interviewees for the interviews and observation was solely the responsibility of the centre. Furthermore, the participants for the computer literacy training course varied in age and education. The age of the caregivers that participated in the training ranged from 27 to 74 years.

The training programme was divided into various computer literacy subject areas that included understanding and using operating systems, word processing and the Internet. The course was completed over two days.

4.3.3.1. The First Day of Training

The first day of training covered a number of issues including capturing biographical information. This was important for two reasons. First, since the training was taking place at an institution of higher learning, a record of the training and its participants had to be kept. Second, the trainees were issued with certificates at the end of the training.

Since the trainees were not computer literate - mostly less educated and spoke English as a second language - various teaching methodologies had to be employed to accommodate potential problems. For instance, to understand a computer and word processing a mobile phone was used as a metaphor.

Examples: creating a document was compared to creating a text message on a mobile phone and using the start button on Microsoft Windows was compared to the menu button on a mobile phone.

4.3.3.2. The Second Day of Training

The second day of the training focused mainly on word processing and using the Internet.

One caregiver could not attend the training and later it was established that the reason for this was due to the lack of funds to travel to the training centre. Further, another caregiver had to leave in the middle of the course as she claimed to have received a call to go to an interview that afternoon. At the end of the day, a certification ceremony was held to complete the training.

4.3.4. Day-to-day Activities of the Caregivers

The research was mostly conducted using interviews and as for the training programme, the selection of the participants for the interview was done by the manager of the caregivers. The ages of the participants in the interview process varied from 35 to 63 years. It is noteworthy that the age group of these caregivers is different from the group that took part in the training mentioned previously.

There were a total of six caregivers who took part in the interviews. Three of the interviewees were part of the aforementioned training programme and the other three were new to the researcher. The aim of the interviews was to gather information about the activities of the caregivers during their visits to the communities. Furthermore, the manager of the caregivers decided to have the interviews over two days. Two issues led to this decision. Firstly, interviews were time-consuming. Secondly, since the study was taking place in the middle of winter, the other caregivers were getting cold while waiting and so they were sent home and asked to come back the next day.

4.3.4.1. The First Day of Interviews

In line with the afore-going briefing, three caregivers were interviewed on the first day. All three of the caregivers were part of the group that took part in the aforementioned computer literacy training course. Since the caregivers and interviewer had met before, it was not hard to understand the reasons for the interview. The caregivers had been told during the training course what would happen from that point onward. However, for record keeping purposes and in accordance with the requirements of the university, the interviewer had to explain the purpose of the interview and seek the consent of the caregivers to carry on with it.

One of the issues that were highlighted is participation. Before the interview the caregivers were given an account of the purpose of the interview including what they should expect from the interviewer. Further, it was mentioned that their participation in the interviews was not forced. As such, they were told that should they wish not to take part or change their mind in the middle of the interview, they were allowed to do so.

A voice recorder was used to capture the proceedings of the interview. However, the interviewer was sometimes forced to use paper and pencil to take notes. As she explained after the interview:

> *"If an answer from the interviewers triggered a question, I'd write it (the question) down so I could ask it later on."*

However, this seems to be one of the reasons that slowed the speed of the interview process and this was corrected on the second day of the interviews.

4.3.4.2. The Second Day of Interviews

In contrast to the proceedings of the previous day, all three of the participants on the second day were not part of the training program. This means that they

were meeting the researcher for the first time that day and unlike the caregivers who took part in the training, they were not computer literate. Further, their duties were slightly different from the participants of the previous day.

One of the participants was, unlike other caregivers, spending two days in the community and three days of the week doing office work, mostly to ensure the smooth running of the caregiver programme. As an example, one of her duties was to aggregate caregiver reports at the end of each month and to send these to the provincial government health department. Another of her duties was to make sure that all caregivers had their caregiver forms when they needed them.

The other caregiver was working, in addition to care giving in the community, as a teacher at the orphan pre-school for grade 0 (pre-primary) children.

The third caregiver had similar duties to the caregivers interviewed on the first day.

The interview process was shorter on the second day compared to the first because there were less follow-up questions. This is because some of the questions were amended to include some of the follow-up questions from the previous day. This meant that less time was spent on delaying issues such as taking notes.

However, one of the challenges of the day was getting the caregivers to talk openly about their duties. For instance, one caregiver, after some time during the interview, mentioned that she felt uneasy talking to us in the beginning as she felt that talking to us would mean answering questions about sensitive matters such as orphaned children in the pre-school.

Since the interviews finished early on the second day, there was enough time to accompany two of the caregivers on a visit to the local community to observe the tasks they perform for each patient.

4.3.5. Observation of Caregivers in the Community

To observe the caregivers meant that the researcher had to follow them to the community. One visit was in the NU12 community near Emmanuel Haven while the other was a little further away, about 5 kilometres, in NU2.

Again, similar to the requirement for the consent of the caregivers in the clinic, the university required that visits to patients' homes to be agreed upon by the patients and their families. As such, the researcher had to explain to the patient and her family what the reason for the visit was and what the patient could expect from it.

During each visit to the community, caregivers are required to carry forms to record information about their patients and their well-being. The information includes issues such as: (a) the personal details of the patient, (b) how they feel or anything that is different compared to the previous visit, etc.

However, the caregivers highlighted during the interviews that they do not carry the forms to the community for various reasons. One of the reasons was security of the forms due to issues such as theft, rain, etc. As such, the researcher was unable to determine whether the use of forms was affecting the activities of the caregivers.

4.3.6. Implication of the Findings to this Research

A number of issues were observed during this case study. One of the significant ones was dealing with the caregivers during the interviews. Having met the caregivers before the interviews seemed to have made things easier

as discerned from the attitude of the caregivers who were not part of the training programme.

As mentioned previously, the caregivers who had met the researcher were more welcoming than those who met the researcher for the first time during the interview.

Second, the visit to the community exposed the researcher to very sick people. It was noted that people who may not have dealt with such issues before, could be affected by the visits. In discussion with the researcher after the visit, she highlighted that she had a sick family member who was worse than the patients visited in the community. Therefore, although she was not expecting to see patients as sick as those in the community, she was not shocked or overly affected by it.

Thirdly, the communication issues identified during the study in Mozambique, although not as problematic, seemed to exist in this context as well. For instance, during the training course there were many instances where certain tasks had to be explained in isiXhosa, which is the language spoken by most of the caregivers. Similarly, during the interviews some of the questions had to be interpreted (or explained) in isiXhosa. However, as the researcher speaks both isiXhosa and English, changing from one language to another was not a major problem, but it affected the time it took to complete the interviews.

Fourth, the fact that the researcher spoke the language of the caregivers seemed to prevent most of the communication problems experienced in Mozambique. However, to make the whole process more effective, it would have been better if the participants in the interviews had been introduced to the researcher beforehand, in order to gauge the nature of any language issues.

Notably, the visit to the community seemed to open another dimension for the researcher. The possibility of having to deal with patients suffering various

inflictions, needs to be acknowledged and considered beforehand, as someone else may have been unable to deal with the psychological issues that arose from the visit.

Finally, as per the objective of this research, the above issues need to be taken into consideration during requirements elicitation in developing countries. Accordingly, the framework presented in Chapter 6 will incorporate these lessons in order to ensure that the elicitation process is carried out effectively.

4.4. Conclusion

The aim of this chapter was to validate the problem identified in this study. Accordingly, two case studies were undertaken to understand resource restricted environments and the issues that might negatively affect user requirements elicitation.

During the observations, a number of lessons that could play a significant role in achieving the objectives of this research were learnt. The findings of the case studies show that the local context is made up of challenges that exist in developing, low resource environments and also other issues that need to be taken into consideration in order to achieve successful user requirements elicitation.

Firstly, it was evident that the workers in both clinics had no training or experience in using technology such as computers. Although this is mainly due to their environments and their jobs which use paper based systems, it is significant for developing systems in such environments.

Secondly, it was discovered that some of the caregivers in the Emmanuel Haven Wellness Centre have low levels of education. It was also discovered that it is hard for an outsider, who does not speak the language of the local population, to communicate within the environment.

Thirdly, it was discovered that building a relationship with the caregivers beforehand had a positive effect on how they interact with an outsider.

This research, armed with the knowledge of the problem and the local environment, now changes focus in order to develop a solution for the research problem. Accordingly, the next chapter provides a discussion from the point of view of the local environment. It aims to find elements that can be adopted to develop a solution for this research.

Chapter 5
Participatory Decision-Making Approaches in the African Communities

This chapter provides insights in local participatory decision-making approaches. True to the aim of this research, which is to develop an approach to elicit user requirements using local traditions and norms, it provides an overview of participatory decision-making from the African point of view. In addition to gaining insights, this chapter argues that there are aspects of local participatory decision-making that can be adopted to develop participatory user requirements elicitation for information systems development in resource restricted environments.

This chapter is structured as follows:

"What happens in an imbizo is that you get called by the leadership in your area, village or whatever, you get called to a discussion of particular issues…you don't act, you discuss the action that you should collectively take" ***— (Mbeki, 2002).***

5.1. Introduction

Information systems development in the African context requires moving away from the business environment to a community-based environment that is less resourceful in terms of infrastructure and skills. This has raised questions about developing information systems for this type of environment and about the idea of taking information development practices and methods from well-resourced environments to less-resourced ones. For instance, Mursu et al. (2000) raised a number of issues that need to be taken into consideration when developing information systems in the context of a developing country. This move to less resourceful communities, although it opens doors to the benefits of information systems, has highlighted a number of challenges that need to be overcome before a true African participatory user requirements elicitation approach is born. These challenges were summarised in Chapter 4, section 4.1. Another significant issue is that of community participation, which is discussed in this chapter. It is important to remember the issue of including the potential users of a new system in the ISD process, to lower the chances of information system failure, as highlighted in Chapter 3. According to the study cited above by Mursu et al. (2000), the involvement of the community in ISD has a number of benefits. For example, the alleviation of problems like computer phobia, thus increasing a user's technological capacity to sustain a system and reach a positive socio-economic impact.

Further, similar to the lack of information systems developed locally, there is no participatory approach for the development of information systems in these communities. A participatory approach would help users in resource restricted environments, such as Africa, to ensure that users and communities participate in information systems development using their known traditions and norms. It is this lack of African-borne participatory user requirements elicitation approaches that motivates this research. Having a participatory

user requirements elicitation approach will go a long way to realising locally developed information systems.

Whereas Chapter 3 focused on existing participatory literature in IS, this chapter focuses on a new concept that is foreign to the field. It emphasises the use of community participation in decision-making in African communities which, from time immemorial, has been used as an approach to finding resolutions to problems that affect these communities. The presentation of a traditional participatory decision-making approach is necessitated by the need to find a resolution to the challenges highlighted in Chapter 4 from a local point of view. This will improve the development of information systems in developing countries and realise the benefits of IS not only in business but in resource restricted environments as well. As such, African decision-making and its characteristics are discussed from the point of view of addressing local problems through the use of local problem solving traditions. In the following discussion, several African decision-making variants are presented briefly.

5.2. Traditional Participatory Decision-making in Africa

There is documented academic evidence, albeit not widespread, that participatory practices are not new to Africa. According to Wiredu (2008), quoting the former Zambian president, Kenneth Kaunda, "[…] *original African societies, before the influence of the European culture and others, operated by consensus*". As such, Kaunda continued, "*an issue was talked out in solemn conclave until such time as agreement could be achieved"*. This view is in agreement with Nyerere (1963), who stated that "[…] *in African society, the traditional method of conducting affairs is by free discussion*". African communities have used participatory decision-making as an approach to find resolutions to problems that affect their communities through community participation.

Furthermore, there are many issues that drive the use of participatory decision-making in traditional Africa. The most compelling feature of this practice is the notion that all decisions are a community-based activity that:

- *Is not driven by wealth:* everyone was heard from the chief and subject, warrior and medicine man, shopkeeper and farmer, landowner and labourer (Mandela, 2000);
- *Is not driven by class war:* Instead, it aims to ensure peace, togetherness and responsibility in society. Traditional African societies tried to avoid all forms and manifestations of confrontation, conflicts and unhealthy competition because they are inimical to progress and stability (Dukor, 2011); and
- Deals with interpersonal and intercommunity issues.

The above characteristics have led to African participatory decision-making practices being adopted in other spheres of life. Political organisations have adopted this practice to engage with communities on issues that are important to the wellbeing of these communities.

In this regard, it is imperative that a participatory user requirements elicitation approach, grounded in the norms and traditions of such communities, starts by understanding the existing participatory practices of these communities. In doing so, the issues that are core to the traditions of such communities will be used as a foundation for the proposed participatory user requirements elicitation approach. The discussion below looks at participatory decision-making in the South African context. It presents a concept called imbizo.

While it is recognised that decision-making mechanisms other than imbizo are used in different African cultures, a broad generalisation of African cultural practices is not appropriate given the need to address the contextual nature of participatory design.

5.2.1. Traditional Decision-making in the South African Society

Recent times have seen the resurrection of an age-old South African participatory decision-making concept, which is generally called *imbizo*. Although, there is no documented time or location about where this concept originated, *imbizo* is a word from the isiZulu language in South Africa which is used to refer to a community gathering. The lack of documentation does not, however, affect the wide knowledge of this concept as a participatory decision-making approach to problem resolution. Further, *imbizo*, as a concept, has a meaning and usage in almost all the various cultures within South Africa. Different words are used to define it from one ethnic group to another. In spite of the distinctive names used, the activities that take place during these discussions, as well as the main principle of the concept, are still the same.

The principles of imbizo have seen the concept being adopted and adapted by the South Government. They are also used by various community focused organisations as a form of gathering and finding solutions to problems within those communities on a platform that promotes equality between age groups, genders and stature.

5.2.1.1 Imbizo and Its Uses in the South African Indigenous Culture

Imbizo is a traditional community gathering called by the leadership of a particular community to solve issues pertinent to that community (Hartslief, 2005, p. 14; Mabelebele, 2006, p. 103; Matshedisho, 2008). When translated to English, the word imbizo means “gathering”. Traditionally, the purpose of such a gathering would be discussing or relaying important matters within a group or community. Further, this community gathering was convened mainly by the chief to provide a platform with the aim of resolving community challenges through honest engagement. The challenges could be between

the chief and the community or between members and families in the community or they could be community environmental concerns and interests.

However, as highlighted above, like most African traditions there is little documentation on the genesis and history of the concept of imbizo. Owing to this, an example from old isiXhosa literature is used to illustrate the use of this concept.

Mqhayi (1970) provides one of the well-known illustrations of imbizo found in the isiXhosa language literature in the work of S.E.K. Mqhayi's novel, *Ityala Lamawele* or "The Lawsuit of the Twins". AmaXhosa is one of the local ethnic groups in South Africa and their language is referred to as isiXhosa. The novel explores a case of two brothers, *Wele* and *Babini*, in which each was laying claim to being the heir to their dead father. For the sake of brevity the novel can be summarized as follows:

A case was opened and brought to the king by one of the twins, Wele, regarding who the older of the two brothers is and, to get to a resolution, the king suspends judgment and investigates the case by calling an imbizo. To get to a solution, a number of steps are taken (Lalu, 2007, p. 161; Nyamende, 2010).

(1) The complainant, *Wele*, is called to state his case and he mentions that he is filing a lawsuit against his brother, *Babini*. Since their father is deceased, it is hard to carry out daily family duties because they both claim to be the older. Therefore he seeks the help of the court to solve the problem for them.

(2) The king calls various witnesses to testify on the case. Among others, the midwives who helped deliver the twins during their birth, the headman of their (the twins) clan and an elderly man who, customarily, is taken as a source or custodian of knowledge in similar cases.

(3) Having listened to all the parties involved in the case, the king consulted an old man before giving his judgment.

(4) In the end, the king, although admitting that Wele is the oldest through the birth process, decides to give the management of the family affairs to the younger brother because of his natural talent. However he highlights that management should be done in consultation with his brother in order to maintain harmony at the house.

A number of conclusions can be drawn from the above. First, it shows that there has to be a problem for an imbizo to be called. Secondly, the king calls the imbizo and all activities take place at the king's palace. Thirdly, various people including experts take part in the imbizo process (Mathagu, 2010). It is noteworthy that in this instance women are allowed to take part in the imbizo but not in the decision-making process. Finally, in this case, the king has the final say on the outcome of the imbizo. Under normal circumstances the participants in the imbizo are the ones that decide its outcome. However, the participants may not agree on what decision should be taken and leave it for the king or chief to decide. Similar to the above judgment, the king or chief would take a stand and make a decision that benefits all the groups. Otherwise, people who do not agree with a decision would normally leave the village for another one, which, if it happens often enough, may leave the king or chief with no people to lead and thus lose his power.

5.2.1.2 Imbizo Today: Uses of Imbizo in the South African Government

In addition to its use in dealing with social issues, imbizo has, for a long time, found a home in politics. However, since the times mentioned above, the power of chiefs and kings within their local communities has diminished significantly. The major reason for this is the changes within the political landscape that have been taking place over the last century or so. Kings and chiefs have little to no control of their subjects. Nowadays, there are various

government levels below which chiefs and kings function. For instance, there is the national government, provincial government, district government and municipal government. Furthermore, the decisions of chiefs are not accepted above those of the judiciary. Taking this power shift from chiefs to the government and to emphasise the use of imbizo in other areas of society, two examples will be used. The first one presents the use of imbizo by chiefs in modern times. The second one presents the use of imbizo by the South African government to engage with the communities on issues concerning its performance in delivering services to the communities and also to identify problems in those communities that it may not know about.

From a historical perspective and to illustrate the use of imbizo by the South African government an example can be found in the autobiography of former President of South Africa, Nelson Mandela (Mandela, 2000, p. 24).

Mandela starts by stating that philosophies on leadership were influenced by observing the regent and his court. This, he says, was done by watching and learning from the tribal meetings that were regularly held at the Great Place. Mandela spent his adolescent years at his uncle's palace. According to him, these meetings, unlike modern government ones, were not scheduled but were called as needed. They were held to discuss various national matters such as drought, the culling of cattle, policies ordered by the magistrate, or new laws decreed by the government. When these meetings took place, the regent would be surrounded by his *amaphakathi*, which is a group of councillors of high rank who functioned as the regent's parliament and judiciary. Further, these men were not ordinary community members but were wise men who were custodians of the knowledge of tribal history and customs and whose opinions carried great weight. Similar to the traditional imbizo, it is worth noting that women or children were not present in these meetings. This can be attributed to the culture of the time, which viewed men as the heads of

their homes and the decisions that affected the wellbeing of their homes as their sole responsibility.

Mandela goes on to say that these meeting were called via letters dispatched from the regent advising chiefs and headmen of a meeting. Before the start of the meeting, the guests would gather in the courtyard in front of the regent's house and he would open the meeting by thanking everyone for coming and explaining why he had summoned them. From his recollection a number of things are noticeable:

(a) After the opening address, the regent would not say another word until the closing moments of the meeting;
(b) Everyone who wanted to speak did so, which according to Mandela, was democracy in its purest form;
(c) Even though there may have been a hierarchy of importance among the speakers everyone was heard from the chief and subject, warrior and medicine man, shopkeeper and farmer, landowner and labourer; and
(d) People spoke without interruption and the meetings lasted for many hours.

The foundation of self-government was that all men were free to voice their opinions and were equal in their value as citizens. Further, it is worth noting that no man would hold back his views even if it meant the criticism of the regent. He continues by highlighting that no matter how serious the criticism, the regent simply listened, not defending himself, showing no emotion at all.

To conclude the views of Mandela on the use of imbizo, a number of things can be highlighted about these meetings. First, the meeting would continue until some kind of consensus was reached. Second, consensus was always reached, whether the meeting ended in unanimity or not. This might include being in agreement or disagreement, or a decision to wait for a more propitious time to propose a solution. Third, he goes on to state that majority

rule was a foreign notion at these types of meeting and a minority was not to be crushed by a majority. This leads to the second example of the use of imbizo in modern times.

As highlighted above, in recent times the use of imbizo has been mostly by the South African Government when engaging with communities on the introduction and performance of government programmes. To understand how the government views and uses the concept of imbizo, the views of its former president Thabo Mbeki are used. According to him, "[…] *what happens at an imbizo is that you get called by the leadership in your area, village or whatever, you get called to a discussion of a particular issue…you don't act, you discuss the action that you should collectively take*" (Mbeki, 2002). Another definition is found in Mabelebele (2006), who states that imbizo, as used by the government, *is a meeting where members of a given neighbourhood and community discuss pertinent issues with leadership for their own development*. From this definition it is clear that since decision-making in politics is hierarchal, it is impossible to make decisions on the discussion of imbizo until all the policy related issues have been sorted out. It is not rare to find that before a decision is made it has to go through to provincial or national government. This view is different from imbizo as presented from the times of Mandela's youth or traditional imbizo. Two reasons can be attributed to this difference.

The first one is that there has been a major change in the political landscape since the times mentioned by Mandela. Owing to this, decision-making power does not lie with the kings, chiefs or communities but with the government. Furthermore, the government cannot make decisions instantly which means the decision-making has to go through a number of steps. These steps include the consideration of the legal issues surrounding the decision as well alignment of the decision with the programmes of the government. This is why Mbeki (2002) states that decisions are not made in these meetings. According

to Hartslief (2005, p. 14), imbizo encapsulates an active reciprocal participatory programme through which South African citizens provide feedback on policy delivery in a typical bottom-up approach, engaging the political and administrative leadership directly. However, others, such as Mabelebele (2006, p. 103), have criticised the use of imbizo by the government as nothing but a political strategy to remain in power as long as possible by making people think that the government is concerned about their wellbeing.

To further illustrate the use of imbizo by the South African government, **Figure 5:1** shows phases that must be completed in the government imbizo to solve a particular problem.

Figure 5:1: Phases of a government imbizo (Mathagu, 2010)

Each of the phases in Figure 5:1 is made up of a number of steps as listed hereafter.

The pre-imbizo phase is made up of the following steps: (a) Planning (b) Establishing a national task team (c) Role clarification (d) Budget and (e) Consultation with the province and local municipality.

The second phase comprises these steps: (a) Media liaison (b) Publicity and promotional material and (c) Conducting research for an imbizo. Using these steps the government imbizo, unlike the traditional imbizo of the olden days, makes use of faster and far-reaching methods to get to the communities using the media.

This leads to the third phase of the government imbizo which is made up of these steps: (a) Recording and documenting all issues discussed and (b) Monitoring the programme for time management.

Finally, the last phase is made up of the following steps: (a) Evaluation (b) Reporting and (c) Follow-up. The noteworthy issues of this phase are the follow-up, which deals with going back to the community to give feedback about the decisions taken by the government regarding the issues raised at the imbizo.

5.2.1.3 Differences and Similarities Between Traditional and Government Imbizo

The use of imbizo by the government differs from traditional imbizo in a number of ways. For instance, traditional *iimbizo* (plural for imbizo) are held regularly to ensure that community problems are addressed as they emerge while the government imbizo takes place on rare occasions when the government evaluates its programmes.

Another issue of importance between these two forms of imbizo is that of participation. In the traditional imbizo, the chief and his subjects, warriors and medicine man, all take part and endeavour to influence its decisions (Mathagu, 2010). On the other hand, in the government imbizo, everybody is allowed to attend irrespective of age, gender, colour, creed or standing in society. Another distinction between these two concepts is the location of the imbizo. In traditional imbizo the participants have to go to the palace, as illustrated in the above example while in the government imbizo leaders go to

the people. Furthermore, in both forms of imbizo, participants can air their opinions and concerns (Puri, Byrne, Nhampossa, & Quraishi, 2004b, p. 45). Another distinction between these two types of imbizo is that the traditional imbizo emphasises consensus, unity and equality of participants. However, as illustrated above the decision-making regarding these issues differs.

5.3. The Motivation of Using Imbizo for User Requirements Elicitation

Social characteristics of the individuals are the cornerstone of participatory user requirements elicitation. For instance, user requirements elicitation is involved with exchanging knowledge or information that is embodied in human beings and it and its meaning can be extracted only through dialogue. Owing to this, it is important to understand the beliefs, values or behaviour of the people involved in the elicitation process. In this regard, imbizo, in the African context is appropriate to conduct user requirements elicitation.

In addition to the need for locally constructed participatory approaches, there are other reasons that imbizo and its principles are proposed to use for the elicitation of user requirements in the local context.

a) Social Characteristics Of Users

Social characteristics of the individuals are the cornerstone of the process of information systems development. Therefore, focusing on an approach that accommodates the future users of the system will go a long way to ensure that developing countries realise the benefits of building their own information systems.

b) Participation from the Host Environment Point of View

Existing participatory design literature does not address participation from the host environment point of view. Studies that have taken place

in developing countries employ participatory design as defined in Scandinavia. Therefore, participatory culture, local norms and traditions are rarely considered or used. An exception to this is a study by Winschiers-Theophilus, Bidwell, Chivuno-Kuria, and Kapuire (2010), where they embraced the norms of a local rural community in eliciting and analysing user information system requirements. Notably they observed that local people preferred the spoken word to carry out user requirements elicitation.

In this research, the characteristics of the users, including their traditions and norms, are taken into consideration through the use of the local traditional decision-making approach.

5.4. Evaluation of Traditional Decision-making Mechanisms and Challenges in Modern Society

In order to use imbizo in today's environment, it is imperative to critically look at it through the lens of what it can or cannot be used for. One thing that is clear in the above discussion of traditional imbizo is that it was first used in an environment where the availability of or lack of resources was not an issue. This cannot be said about the business environment in which ISD normally takes place nowadays. Furthermore, the change in the political landscape has another implication for using traditional imbizo in modern society. Therefore, for imbizo to be used in modern society, the following problematic issues need to be ironed out.

First, imbizo has become an institution that is no longer faithfully adhered to by South African indigenous communities, particularly in urban areas (Mathagu, 2010, p. 104). Because of this, it is not foreign to find that some people are not aware of the concept. Furthermore, modern society functions under a different type of government that promotes the preferences of the majority. The voice of this majority might affect decisions although such

decisions might not be the best for the wellbeing of the community. Another issue, which plays a major role in the lives of many, is the equality of all citizens under the constitution of the country. This is one of the reasons the patriarchal nature of traditional imbizo cannot be appropriate in today's society. Therefore, for imbizo to be embraced in modern society, especially in ISD, people from all walks of life such as women and children should be part of any decision-making body dealing with the changes in their communities.

Second, many things need resources to work properly and these resources need to be used wisely. For instance, in the above discussion of government imbizo, Mandela (2000) alluded to the fact that imbizo would go on for hours until an agreement or disagreement is reached. That kind of scenario cannot be possible in today's society because staging an event such as imbizo might be costly to business or the individuals who take part. Therefore, any call for imbizo must take these issues into consideration.

Third, the other issue that has been raised about imbizo is the involvement of participants in the participatory process. Traditional imbizo does not allow women and children to participate in the decision-making process.

Finally, in addition to imbizo, there is another type of participatory decision-making method that is currently in use in certain parts of the local community.

5.5. Understanding Local Decision-Making Mechanisms: The Letsema/Ilima Participatory Method

The Letsema (*going on a mission* in English), which is called Ilima (*built from the word uku-lima which means plough* in English) in some Nguni languages, is a *SeSotho* word that describes the communal practice of doing things as a collective (Motlhamme & Martins, 2011). Various other issues are based on this tradition. For instance, there is an old African saying which goes: "*it takes*

a village to raise a child". This does not focus on children per se but covers all types of problems that may arise in the community. However, it is the view of the author, from knowledge of local decision-making methods, that the translation of Letsema/Ilima is specific to this group as they aren't related, as explained.

The Letsema Participatory Method is the brainchild of a non-governmental organisation (NGO) called Letsema Circle. The Letsema Circle uplifts communities from poverty by supporting various food projects such as gardening. According to (Motlhamme & Martins, 2011), the Letsema Circle achieves its goals by following the five steps to initiate a project in a community. First, they have adopted a "get to basics" approach for dealing with community issues. They look at what resources and capacities are located in the community that can be used to effect change. Second, they adopt approaches that are relevant for and rooted in the traditional cultural practices of the communities they are working with, such as the Letsema concept and the Lekgotla method. Third, they utilise interactive processes like *role playing, mapping and visioning, to determine community concerns and develop solutions*. Fourth, they make attempts to involve not only community structures and institutions, but also ordinary members within the communities in which they work. Lastly, they use the community mobilisation model to engage with the community.

5.5.1. Understanding the Use of the Letsema/Ilima Method

To understand the Letsema/Ilima participatory method and how its characteristics can be adopted for the development of the output of this research, the author attended a Letsema Circle workshop that took place on the 28th of November 2011 in Sandton City, Sandton, South Africa. The aim of the workshop was threefold: first, to demonstrate how the Letsema/Ilima participatory method is used, second, to build links with the academic

fraternity and third, to build links between the Letsema Circle and local businesses.

A number of participants took part in the workshop. They consisted of management of other NGOs, current funders of the workshop, prospective funders and guests from academe. Other guests were also invited to get an understanding of the activities of the Letsema Circle. The author was one of the invited guests. The interest of the author was limited to how the Letsema/Ilima method is used and which of its characteristics, if any, can be adopted for this research.

To demonstrate the Letsema/Ilima method, all the attendants of the workshop were divided into four groups of between eight to ten members. The selection of what group each attendant belonged to was determined by the colour code of the chair they were sitting on, which was arranged before the start of the workshop. To my knowledge, no attendant knew what the colour codes meant beforehand.

After the groups were finalised, each group represented a village that was facing various problems such as joblessness, suffering, sicknesses in the form of HIV and AIDS, and teenage pregnancies. As such, the “villagers” were required to come up with a common understanding of the problems faced by their villages and the driving force behind those problems. For instance, in my village we sat in a circle and each member was required to explain their understanding of the problems. This seating arrangement is based on the idea of an extended family environment, where each member of the family has an equal say on the direction it should take.

To solve the problems, each group was advised to think of including tools that might currently exist in the community as part of their solution. This is called the identification of areas of strengths within the community. The thinking behind this approach is to ensure that outsiders do not come with wholesale

changes to the community. Instead, embracing existing strengths is thought of as a better approach to get the support of the community. Otherwise, a community might be hostile towards outsiders.

In the end, the problems were written down and presented to the other three groups/villages. All presentations were done while sitting.

The second activity of the workshop was based on the problems defined above by the individual groups. In this activity each group was required to come up with solutions to the problems they had brought forward initially. The members of the groups were required to come up with individual solutions by drawing or writing on a big piece of brown paper what they thought should be done to solve the village's problems. This activity is called "dreaming the future".

In the end, each member was required to explain their solution for the village to other group members. At the start and end of each presentation, each group was required to start with a song and dance to demonstrate their acceptance of their solution.

All the individual solutions of the group members were combined and categorised in terms of long term or short-term solutions. In the end, a volunteer from each group was required to present the vision of each group to the other three groups.

The following summarises the Letsema/Ilima participatory method:

1. Each member of each group represented a villager who had an equal standing to any other member of the group.
2. To demonstrate this equality, no member was required to stand up when they spoke.

3. All members of each village were sitting in a circular arrangement to eliminate the possibility (resemblance) of hierarchies. Again, this was meant as a way of demonstrating equality.
4. Members of the groups were not required to give their titles or the nature of the jobs they do outside the workshop.
5. The groups were not required to have any type of structure such as leaders except for a volunteer to speak on behalf of the group during presentations.
6. Throughout the workshop each of the activities was preceded by an ice-breaking activity such as a song or dance. These ice-breaking activities were used before the start of the workshop.
7. In making use of the Letsema/Ilima method within the workshop, each member was required to work individually to come up with an the idea of what should be done to solve the problem at hand. At the end of the phase the members of the group came together with their dreams and came up with one dream that represented the group.

5.5.2. Lessons Learnt and Observations

Any controlled environment is bound to shield one from real world problems. The Letsema Circle workshop was not immune from this problem. The demonstration of this participatory method worked flawlessly from the discussions to the presentations. However, this does not reflect real life communities and therefore the results might be different in an unpredictable real life situation. For instance, there are various issues that divide communities such as political affiliations or religious beliefs which may affect whether a community project, such as those run by the Letsema Circle, succeeds or not.

Finally, although this workshop demonstrated another locally based participatory method, it was silent on methods/ways to handle problems and conflicts in a real world environment.

A number of characteristics that will be adopted for the output of this research from the Letsema/Ilima method, were identified. First, the equality of participants, which is also a characteristic of traditional imbizo. Second, song and dance as part of relationship building and third, “dreaming the future”. The use of these characteristics is expanded on in the next chapter.

5.6. Conclusion

The discussion presented in Chapter 5 showed that decision-making in Africa revolves around the sense of community and humane living, which are both highly cherished values of traditional African life. Traditional African societies eschewed all forms and manifestations of confrontation, conflicts and unhealthy competition because they are inimical to progress and stability (Dukor, 2011).

In this chapter the focus was on the concept of imbizo - tracing its evolution and then presenting its use in modern society. It highlighted that imbizo can be useful in finding solutions to certain modern day problems but it finds little to no use in modern society. This is a view supported by Mathagu (2010, p. 104), who attributes this lack of use of imbizo to modern day living conditions, which result in people adopting other forms of government. Because of this, he states, imbizo has become an institution that is no longer faithfully adhered to by African communities, particularly in urban contexts. Courts and other forms of decision-making bodies are used instead.

In the following chapter, an attempt is made to provide a broader solution to the requirements elicitation problems outlined in this thesis so far, as well as the arguments in the previous chapters. The solution, which is presented in the form of a framework, is founded on the issues that were highlighted in user requirements elicitation and the challenges that exist in information systems development in developing countries.

Part III

Chapter 6
A Participatory User Requirements Elicitation Framework

This thesis has so far considered all the concepts that are important to the objectives of this research. In Chapter 2, the lens through which this research is viewed was presented. Chapter 3 presented a comprehensive discussion of the existing literature in the various fields that make up this study. Chapter 4 presented a report on the case studies that were conducted during the course of this research. Chapter 5 presented African decision-making mechanisms, which is the last of the concepts that make up the literature background of this research. The insights gained in the previous chapters shaped the way for the development of an African participatory user requirements elicitation framework, the Afri-PURE Framework, which is presented in this chapter.

This chapter is structured as follows:

The only difference between a problem and a solution
is that people understand the solution.

—Charles Kettering

6.1. Introduction

The primary objective of this research is to develop a participatory user requirements elicitation framework for information systems in resource restricted environments. To develop the proposed participatory user requirements elicitation framework and to take a step towards achieving the objective of the research, it is imperative to consolidate the issues highlighted so far in this thesis. The issues highlighted in the preceding chapters include:

1. *Developing countries need to build their own information systems.*

In Chapter 1 it was established and motivated that developing countries, specifically those in Africa, need to start developing their own information systems instead of buying off-the-shelf solutions. This is because the off-the-shelf solutions fail to address their problems due to misalignment of user requirements, according to existing literature on information systems development.

2. *Using participatory approaches, which promote the treatment of users as equal partners during the development process, increases the chances of success in information systems development.*

The investigation of existing literature in Chapter 3 established that including users as equal partners in the information systems development process is a moral and pragmatic issue. It also increases the likelihood of a successful information system at the end of the development process. Furthermore, the fact that traditional participatory design provides a mechanism to treat users as equal partners in the development process was also established.

3. *Traditional PD is spreading to other parts of the world.*

In addition to the above findings in Chapter 3, it was also established that participatory design, since its inception in Scandinavia more than four

decades ago, has been spreading to other parts of the world. The spread of traditional PD to other parts of the world shows that it has been adopted and changed to conform to the characteristics of local environments. This finding is one of the main reasons that a local participatory user requirements elicitation approach is proposed in this research.

4. The local context is faced with a number of challenges.

In Chapters 1, 3 and 4, it was established that a number of challenges exist in resource restricted environments. Primarily, there is a problem of low resources in resource restricted environments. However, there are also other issues, such as low computer skills and low formal education that might negatively affect user requirements elicitation. These need to be taken into consideration in order to achieve successful user requirements elicitation.

5. African decision-making is an existing mechanism which could be adopted for user requirements elicitation in the local context.

To conclude the findings of the preceding chapters, it was established in Chapter 5 that African decision-making mechanisms such as imbizo facilitate the participation of the community in the decision-making. These mechanisms also visibly promote and demonstrate equality, encourage and promote communication and are known in the local communities. Because of this, the principles of African decision-making have been adopted to be the core of the proposed solution presented in this chapter.

Furthermore, the consolidation of the discussion in this thesis so far is significant for two reasons. First, it highlights the elements in the previous discussion that have been drawn to form part of the proposed solution. These elements are:

- The traditional participatory design process (discussed in Chapter 3);
- The user requirements elicitation process (discussed in Chapter 3);

- The case studies conducted to understand the challenges within local resource restricted environments (discussed in Chapter 4); and
- The African decision-making mechanisms (discussed in Chapter 5) - notably the traditional imbizo, government imbizo and Letsema/Ilima approaches.

Second, it highlights how the constructs feed into the solution called the Afri-PURE Framework, which is African Participatory User Requirements Elicitation Framework. Figure 6.1 below depicts how the aforementioned constructs fit together.

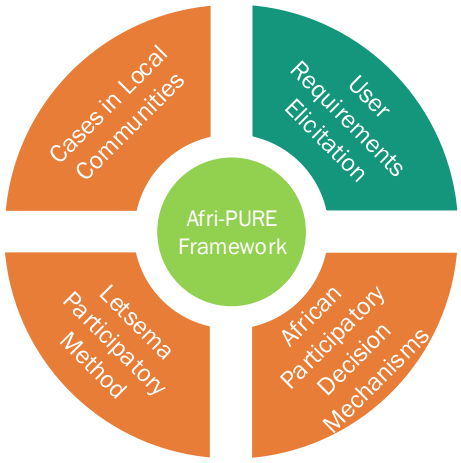

Figure 6:1: A macro level construct of the proposed solution

Moreover, a number of reasons motivated the need to draw from these constructs. Importantly, the proposed solution has to fit within the realm of existing information systems development approaches. It is not a call, however, to make wholesale changes to the existing approaches. Equally important, user requirements elicitation, which is the main focus of the research presented in this thesis, is one of many steps of the ISD process.

Therefore, except for the elicitation of user requirements, existing practices have to be used to realise a complete and successful information system.

Having identified the constructs and their relationships to the proposed solution, the thesis can now proceed to discuss in detail the contribution of each of the concepts to the development of the framework.

6.2. Genesis of the African Participatory User Requirements Elicitation Framework

As stated above, the new framework draws from a number of components in existing literature (discussed in Chapter 3) and the principles of African decision-making approaches (discussed in Chapter 5). The proposed framework is, in part, the result of reconciling the concepts from the approaches highlighted in Figure 6.1 and the lessons learnt from the case studies conducted as part of this research.

This section starts by describing how the principles of participatory African decision-making mechanisms contribute to the framework. Secondly it shows how the constructs shown in Figure 6.1 are used to form the framework (refer to Table 6:1). The method or steps of the Afri-PURE Framework are discussed thereafter (refer to Table 6:2). The principles are:

Principle 1: Relationship Building

The aim of the relationship building activities is to build a relationship between the participants and the analysts. The motivation for this came about during the case studies presented in Chapter 4. Relationship building is also a core activity of the Letsema/Ilima approach. It makes use of song and dance in their relationship building. Song and dance allows the different participants to speak in one voice and language.

Principle 2: Agreement on the Problem At Hand

The second principle of participatory African decision-making deals with attaining common ground about the problem at hand. The earlier discussion of the Letsema/Ilima approach, stated that before a journey to find a solution, all participants are required to agree on the problem at hand. It is therefore imperative that all participants have a common understanding of the task at hand.

Principle 3: Equality of Participants

At its core, participatory African decision-making is grounded on the equality of the participants. Although women and children did not historically take part in these decision-making activities, recent use of the African decision-making mechanism in South African politics has seen this change. All participants affected by an issue are now allowed to participate in finding its solution.

Principle 4: Freedom to Disagree With Others Including Those in a Position of Power

Different views and disagreements are part of all decision-making. As highlighted in the previous chapter, African decision-making mechanisms encourage participants to disagree. They also allow them the freedom to raise their own opinions during the decision-making process regardless of the status of the community member they are disagreeing with. However, it is noteworthy that this freedom to openly air opinions is not used to challenge authority.

Principle 5: Reaching Consensus Rather Than Majority Rule

Building on the previous principle, the principle of consensus about the issues under discussion is at the core of the African decision-making mechanism. With regards to the framework, it is imperative that all participants speak with one voice during the user requirements elicitation process. However, in the

real world, people can see things differently, which means that the chances of participants seeing things differently are always there.

On this basis, it is important that the rest of the community always help lead the way forward by making a decision they view to be beneficial for the whole community. This view is in line with the problem previously presented about *Wele* and *Babini* who didn't agree on who should be the leader of their father's homestead. In the end, as the story highlighted, it was decided through an *imbizo* which of the two brothers should lead the homestead. Similarly, where two or more people disagree about an issue, it is imperative that the rest of the participants make a decision that assists the user requirements elicitation process. The decision may or may not be made in the presence of the disagreeing participants.

Table 6:1 shows the steps of each of the underlying constructs that contributed to the development of the Afri-PURE Framework. The name of the construct is shown in the first column and its steps in the second column. The third column of Table 6:1 shows the Afri-PURE Framework colour-coded steps according to each source construct. Multiple sources can be seen where relevant. For example, step 10 of the Afri-PURE Framework originated from step 4 of URE, step 3 of the Government Imbizo and step 6 of the Letsema/Ilima.

The steps of the Afri-PURE Framework as shown in Table 6: , are expanded further in Table 6:2 to include a brief description of each.

Accordingly, Table 6: shows that steps 1 – 6 of the Afri-PURE Framework comprise a PRE-PURE phase and steps 7 – 8 form part of the PURE phase. Steps 9-11, due to their nature, are not included in a specific phase but are rather shown as continuous activities.

This concludes the discussion on the genesis of the Afri-PURE Framework. In section 6.3, the framework is discussed in detail.

Table 6:1: Constructs of the Afri-PURE Framework

Construct	Steps			Afri-PURE Steps		
User Requirements Elicitation	1. Stakeholder Selection	✓	9. Consensus Making	1. Community Engagement	11. Relationship Building	10. Documentation
	2. Objective Setting	✓		2. Identify Strengths		
	3. Requirements *Collection*	✓		3. Problem Definition		
	4. Documentation	✓		4. Objective Setting		
	5. Knowledge Organisation			5. Identify Areas of Information Flow		
Traditional Imbizo	1. Problem Definition	✓		6. Participant Selection		
	2. Participant Selection	✓		7. Dreaming the Future		
	3. Communal *Elicitation*	✓		8. Communal Elicitation		
	4. Consensus Making	✓				
Government Imbizo	1. Planning	×				
	2. *Communal Elicitation*	✓				
	3. Documentation	✓				
	4. Reporting (Feedback)	×				
	5. Evaluation	×				
	6. Follow up	×				
Ilima/Letsema	1. Community Engagement	✓				
	2. Identify Strengths	✓				
	3. Relationship Building	✓				
	4. Dreaming The Future	✓				
	5. Consensus Making	✓				
	6. Documentation	✓				
Research Cases	1. Community Engagement	✓				
	2. Identify Areas of Information Flow	✓				
	3. Relationship Building	✓				

Table 6:2: Steps of the Afri-PURE Framework

Phase	Element	Description
PRE-PURE	1. *Community Engagement*	Identify people in leadership positions that make it possible to gain access to the rest of the community and understand its overall view from its leaders.
	2. *Identify Strengths*	Identify things within the community that can be used to solve the problem that may be identified in the following step. Strengths can come from the individual members of the community or from the community itself (example: buildings).
	3. *Problem Definition*	Identify the problem for which user requirements elicitation will be conducted.
	4. *Objective Setting*	Describe the problem to be solved including why the system is necessary and the constraints of the system.
	5. *Identify Areas of information flow*	Identify the areas where activities take place in the community.
	6. *Participant Selection*	Identify the individuals that are familiar with and reflective of the local community.
PURE	7. *Dreaming the Future*	Allow the participants to share their ideas about how the problem could be solved. This is done by starting from individual ideas and reconciling these into one solution through consensus. The dreams must fit within the constraints identified in Step 4.
	8. *Communal Elicitation*	Elicit the requirements about the activities of the community from the participants.
Continuous	9. *Consensus Making*	Make decisions throughout the URE process as a group for the benefit of the whole community.
	10. *Documentation*	Document all the activities and the user requirements for verification and for the next steps of the URE process.
	11. *Relationship Building*	Build the interaction between the community members and the system analysts through song and dance.

6.3. The Afri-PURE Framework

6.3.1 The Stakeholders

In the context of this study, there are four types of stakeholders that form part of the Afri-PURE Framework. The stakeholders are:

(a) the community members;
(b) the community leaders;
(c) the system analysts; and
(d) external donors.

Each of these stakeholders plays a distinctive yet important role and each can be internal or external to the community. For instance, the community members and their leaders are internal members while the system analysts and external donors are external members.

The *community members*, who are the main users of the new system, participate in identifying the problem, areas of information flow and the elicitation of user requirements for the system together with the system analyst(s). The community members play a role in the elicitation process by defining the problem at hand. They also play a role in gathering and finalising the user requirements.

The *community leaders* provide a link and access between the external stakeholders and the community. The donors and system analysts are the external stakeholders in the context of this research. Furthermore, as they have overall knowledge of the community and the interaction of its activities, community leaders are able to provide a clearer picture when community members are not able to do so.

System analysts, from the traditional system analysis viewpoint, gather user requirements for the development of the new information system.

Furthermore, where applicable, the system analyst provides status reports to the external donors.

External donors in the context of this research provide funding for the development of the new information system where applicable. It is noteworthy that not all information system development projects are funded by external donors. Therefore, this stakeholder may or may not play a role during the elicitation of the user requirements.

Participants as referred to in step 6 of the Afri-PURE Framework, are all the individuals including the community members and community leaders that take part in the elicitation process.

Finally, having described the primary stakeholders and their roles in the URE process in this chapter, the framework will now be presented in detail.

6.3.2 The Phases of the Framework

To reiterate, the Afri-PURE Framework is the result of the amalgamation of the characteristics of PD, URE and African Decision-making. Furthermore, Afri-PURE comprises of the:

- PRE-PURE;
- PURE; and
- Continuous phases.

The PRE-PURE and PURE phases correspond to activities that take place before and during the user requirements elicitation activity.

On the other hand, the Continuous phase corresponds to the activities that take place throughout the PRE-PURE and PURE phases.

It is noteworthy that some of the steps highlighted in Table 6: are iterative in nature. For instance, communal elicitation can be performed again if and when the system analysts decide that there is a need for it.

Figure 6:2 depicts the completed framework for the elicitation of user requirements in resource restricted environments. The two phases (PRE-PURE and PURE) and eleven steps of the framework as well as the relevant stakeholders are shown.

The PRE-PURE phase corresponds to the steps that take place before the user requirements elicitation process. As indicated in the framework, the steps of the PRE-PURE phase are carried out by the following stakeholders: community leaders, systems analysts, donors and the community members.

The PURE phase corresponds to the steps that take place during the actual user requirements elicitation. The steps are: *Dreaming the Future* and *Communal Elicitation* and are carried out by the systems analysts and the (selected) participants.

It is noteworthy that the continuous activities take place throughout both phases of the framework.

This concludes the discussion of the Afri-PURE Framework.

The next section discusses the method to use the framework. Each of the 11 steps of the framework is discussed in detail. The execution of the steps will be illustrated practically through the use of a scenario in the next chapter.

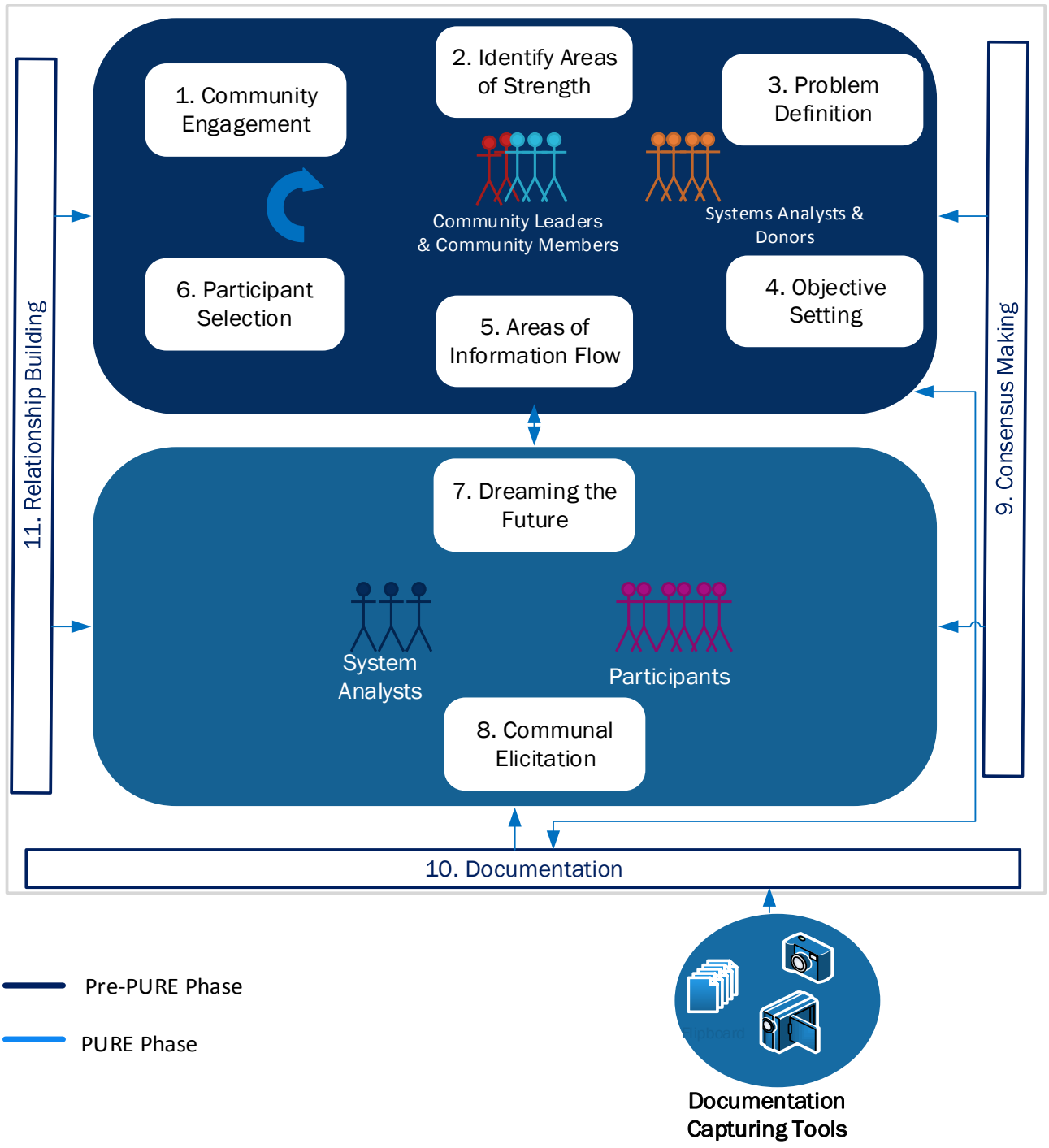

Figure 6:2: The Afri-PURE Framework

6.4. The Method – Using the Steps of the Afri-PURE Framework

In the following discussion, each of the steps of the framework is described in detail. For each step, the name of the step is listed, followed by a description of the step (in italics) as initially provided in Table 6.2. Thereafter, the stakeholders involved in the step are shown in tabular format, whereafter the step is discussed in more detail.

Step 1. Community Engagement

Identify people in leadership positions that make it possible to gain access to the rest of the community and understand its overall view from its leaders.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓	✓		

Before the participatory user requirements elicitation can take place, the analysts need to find community members (leaders) who are not only knowledgeable about the community, but have authority and access to the rest of the community. This is important for two reasons: (1) the system analysts need an influential individual in a leadership position within the community in order to establish links with the rest of the community; and (2) as highlighted in one of the case studies conducted, the community leaders also need to have an understanding of information flow between different sections of the community.

Step 2. Identify Strengths

Identify things within the community that can be used to solve the problem that may be identified in the following step. Strengths can come from the

individual members of the community or from the community itself (example: buildings).

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓			✓

Entering a new environment from its point of strength is an indication by those coming from outside the community that they are not coming to take over. From the Letsema/Ilima approach point of view, the point of strength can be the skillset of the community or the tools that can be used to develop a solution that is beneficial to the whole community. Further, the identification of the community's point of strength can be useful in two ways:

- As a guide to identify a problem that can be solved in the community when the problem is initially unknown; and
- As a tool to solve the problem.

All the things that work well in the community will be used as the starting point of the user requirements elicitation process. Having identified the strengths of the community, the next step is the definition of the problem. The problem may already be known or may be identified during the following step.

Step 3. Problem Definition

Identify the problem for which user requirements elicitation will be conducted.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓	✓		✓

In light of the above discussion, it becomes clear that a community may not always have a problem for which to seek a solution. For instance, a donor

may offer to help uplift a community without knowing the needs of the community. Further, donors may have constraints in their donation and end up not aligning with the needs of the community. Therefore, when the problem is unknown, the identification of the point of strength of the community may be used as a guide to the nature of the problem to be solved. On the other hand, when the problem is known beforehand, the skillset or toolset of the community can be mapped to the identified problem.

Additionally, from the African participatory decision-making point of view, problem definition lays a foundation for the rest of the elicitation process:

- It helps establish a common understanding of the problem between the analysts, donors (where relevant), community leaders and the rest of the community; and
- It identifies the scope of the elicitation process and therefore the daily activities that need to be taken into consideration.

Having identified the problem, the next step of the framework is setting the objectives.

Step 4. Objective Setting

Describe the problem to be solved including why the system is necessary and the constraints of the system.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓	✓		✓

Objective setting entails a comprehensive description of the problem identified previously, why a new solution is needed and its constraints. Further, due to the participatory nature of the process, it is imperative that all are involved in

this phase. To clarify, as in steps 2 and 3, all community members will be invited, although it is accepted that not all will be able to attend.

The rest of the steps of the framework must be highlighted at this point. Further, this is an opportunity to identify appropriate or suitable relationship building activities.

Step 5. Identification of Information Flow Areas

Identify the areas where activities take place in the community.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓			✓

Contrary to other features of the framework that are motivated by African decision-making principles, the identification of areas of information flow is motivated by the findings of the studies conducted within the resource restricted environments as discussed in Chapter 4. The areas of information flow mean all the different areas of the community where community related activities take place. For instance, using the Emmanuel Haven and Beline as examples, this means all the different sections of the clinic where daily activities such as patient registration and patient care take place.

Importantly, identification of areas of information flow is motivated by (a) the need to ensure that the subsequent selection of participants is reflective of the community where the activities take place, (b) ensuring that there are no knowledge gaps about the various relevant areas within the community.

Community members who form part of the participants (to be selected in step 6) have to come from the different areas of information flow to share information that might be unique or known only within that area of the

community. Further, the identification of areas of information flow is important for the PURE phase for the following reasons:

- Allows the analysts to find the relevant community members in each area of the community.
- Focuses the PURE phase by finding resources only in the areas with information flow.
- Makes it easier to focus on a particular issue during the next iteration of the PURE phase rather than start the process from the beginning all the time.
- When the problem is unknown, the identification of areas of information flow can highlight issues that may need to be addressed for the community to function effectively and efficiently.

It is noteworthy that all the afore-mentioned steps take place before the actual user requirements elicitation. Further, they include the entire community. Having gained a better overview of the community, the analysts can then select the suitable participants in step 6, to commence the PURE phase of the Afri-PURE Framework.

Step 6. Participant Selection

Identify the individuals that are familiar with and reflective of the local community.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓			✓

The selection of participants, from both the traditional participatory design and African decision-making viewpoints, is driven by a number of requirements. Participants should be:

- **Experienced and knowledgeable about the community:** the knowledge of any community is held by the members who have been part of the community for a long time. It is therefore imperative to select participants that have age-old knowledge of the community and how things work.
- **Affected by the problem:** in addition to knowledge of the community, African decision-making promotes the participation of the community members that are affected by the problem and who will be part of the solution through instituting certain changes. The selection of users for participatory user requirements elicitation must therefore have this requirement in mind. In the context of this research the change will be brought about by the introduction of a new information system to carry out daily activities.
- **Leaders of the community:** true to participatory African decision-making principles, the selection of participants should include the leaders of the community.

The selection of participants is followed by step 7; allowing the participants to think individually and amalgamating the individual solutions into one solution for the problem at hand.

Step 7. Dreaming the Future

Allow the participants to share their ideas about how the problem could be solved. This is done by starting from individual ideas and reconciling these into one solution through consensus. The dreams must fit within the constraints identified in Step 4.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
		✓		✓	

According to the Letsema/Ilima method, dreaming allows participants to propose solutions to the problem individually. Then the individual solutions are amalgamated into one solution for the identified problem. As highlighted in the previous discussion of the Letsema/Ilima workshop, after a problem is identified, participants are given an opportunity to individually propose a solution for it. This is called dreaming. Following this, the participants are brought together to share their ideas about the solutions and then the individual solutions are used to find an overall solution.

Step 8. Communal Elicitation

Elicit the requirements about the activities of the community from the participants.

Stakeholders	Community Leaders	System Analyst	Donors	Participants	Community Members
		✓		✓	

Communal elicitation gives the participants an opportunity to share the knowledge of their environment during the user requirements elicitation process. From the participatory African decision-making point of view, the communal elicitation enables any participant to voice his/her opinion about the issue or problem under discussion. Decision(s) are then made based on the acceptance of the views of the participants within the group.

Each participant that has something to say is given an opportunity to do so openly. This could be a new idea, correcting, agreeing or disagreeing with other participants in the group. Further, communal elicitation follows participatory African decision-making principles by adopting the following principles:

- **Equal sitting:** the sitting of the participants is borrowed from traditional decision-making practices. To reiterate, participants in African

traditional decision-making sit in a circle in order to promote equality. This form of sitting eliminates the possibility of a start and end to the seating arrangement.

- **Communicating through spoken word:** as indicated in Chapter 5 (section 5.3), the most preferred mode of communication is spoken word. The participants are the ones that should drive the transfer of knowledge about the activities, tasks and policies of their respective areas. Given the seating arrangement proposed above, any participant can choose to share this information with the group.

Going hand in hand with communal elicitation is consensus making to manage decision-making during the requirements elicitation process.

Step 9. Consensus-Making

Make decisions throughout the URE process as a group for the benefit of the whole community.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓	✓	✓	✓

Consensus making is concerned with decision-making as a community during the communal elicitation process. From a participatory African decision-making point of view, a number of things drive consensus making:

- **Freedom to disagree:** from the viewpoint of participatory African decision-making, all participants have an equal chance of voicing their views whether they concur or disagree with other members.
- **Make a decision for the benefit of the community:** on the surface, the freedom to disagree may lead to situations where participants do not reach a decision. However, African societies have always practised togetherness and all community decisions were made for the progress

of their communities. Thus, situations where participants do not agree on an issue are always handled in a manner that promotes a view that contributes to the progress of the community. As highlighted in section 6.2 (Principle 5), when participants do not agree on an issue, it may be considered that they be excused from participating at that moment. The rest of the participants then make a decision that they consider will take the process forward. This should only be necessary when it is impossible to reach consensus.

Step 10. Documentation

Document all the activities and user requirements to verify them and for the next steps of the URE process.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓	✓	✓	

The documentation of user requirements is one of the core activities of the user requirements elicitation process.

The Afri-PURE Framework includes a number of activities that need documentation before and during user requirements elicitation. This research proposes that documentation be mainly the responsibility of the system analysts and the selected participants (refer to step 6). Further, as the system analysts have a better understanding of the whole user requirements elicitation process it is envisaged that they will always be in a better position to drive the Afri-PURE Framework activities.

Additionally, documentation of the user requirements is important for a number of stakeholders - system analysts, system developers, participants and external donors or funders. These stakeholders have various needs and uses for the documentation.

System Analysts: during the execution of the phases and steps of the Afri-PURE Framework, the system analysts need to keep track of the user requirements and other important activities that take place. They need the documentation to prepare the user requirements for the system developers.

System Developers: need the documentation of the user requirements specification, which they will turn into system code that will eventually result in an information system.

Participants: need the documentation for consensus making during the actual elicitation. Due to the iterative nature of the phases of the Afri-PURE Framework, they also need the documentation during the validation of the user requirements.

External donors: need documentation from the point of view of agreeing on providing funding for the proposed solution.

Imperatively, the documentation has to make sense for each of the above stakeholders. It is noteworthy that various elements of the framework are based on local norms and traditions, yet no traditional local method of documenting exists. Instead, the views of Winschiers-Theophilus et al. (2010) exist, as mentioned previously. To reiterate, in their study they observed that local people preferred the spoken word to carry out user requirements elicitation.

This use of alternative forms of documentation is not uncommon in environments that are similar to resource restricted ones. Literat (2013) is of the view that documentation in resource restricted environments can be enhanced through using techniques such as sketching, photography and video. These hold the inherent potential of painting a more nuanced depiction of lived realities, while simultaneously empowering the participants and placing the agency literally in their own hands.

Step 11. Relationship Building

Build the interaction between the community members and the system analysts through song and dance.

Stakeholders	Community Leaders	System Analysts	Donors	Participants	Community Members
	✓	✓	✓	✓	✓

It is noteworthy that each of the steps of the Afri-PURE Framework encompasses relationship building.

As highlighted in the previous discussion on the Letsema/Ilima approach, relationship building is the use of various activities with the goal of building a relationship between the participants. This activity takes place not only during the elicitation process but also throughout the information system development process. The activities can be as basic as song and dance or training. However, these are not the only activities that can be used to achieve this goal.

This concludes the description of the method for using the Afri-PURE Framework.

6.5. Conclusion

This chapter focused on the presentation of a new participatory user requirements elicitation framework called the Afri-PURE Framework. The primary purpose of the chapter was to provide a clear understanding of how the issues highlighted throughout this thesis come together to form the framework presented. To achieve this, the chapter entailed a presentation of the principles of African decision-making that contributed to the framework. This was followed by a presentation of the macro-level constructs of the

framework and the phases and the steps that make up the framework. Additionally, stakeholders and their roles were identified.

In the next chapter the framework is evaluated using the evaluation methods required by design science.

Chapter 7
Evaluation of the Afri-PURE Framework

The previous chapter provided a comprehensive discussion of the development of the Afri-PURE Framework based on the research objectives identified in Chapter 1. This chapter provides an evaluation of the framework based on the requirements of design science evaluation methods for artefacts. It begins with an overview of design science evaluation methods, which is followed by the identification of a suitable evaluation method for this research. Then, it continues to provide the actual evaluation of the Afri-PURE Framework

This chapter is structured as follows:

"Exploration is in our nature. We began as wanderers, and we are wanderers still. We have lingered long enough on the shores of the cosmic ocean. We are ready at last to set sail for the stars."

— Carl Sagan, Cosmos

7.1. Introduction

The importance of the utility and quality of research outputs has been emphasised and reiterated in Design Science discussions (Hevner et al., 2004; Iivari, 2007; Peffers, Tuunanen, Rothenberger, & Chatterjee, 2007).

This chapter builds on the previous chapter, which provided a detailed discussion of the development of the artefact for this research, as required by design science. The artefact, which is a framework, is the solution for this research.

The previous chapter focused on the development of the Afri-PURE Framework and how the various concepts discussed in preceding chapters were used to develop it. Accordingly, this chapter reflects on the artefact developed and provides a detailed evaluation of the artefact by using scenarios.

Due to the inherently iterative and incremental activity of design, the evaluation of the Afri-PURE Framework provides feedback for the next iteration of its design. The feedback is relevant to both this thesis and the people who will use the framework after the thesis is published.

7.2. Methods for the Evaluation of Design Science Artefacts

Chapter 2 specified the use of the design science research paradigm as a lens to view this research. Having developed the artefact, it is imperative that its utility is demonstrated through evaluation.

Hevner et al. (2004) views the evaluation of a design science artefact as a fundamental part of the design science process. According to Ahmed and Sundaram (2011), evaluation is a key tool for learning about how well design artefacts fit their purpose. The importance of evaluating an artefact is further

highlighted by Peffers et al. (2007) who state that to appropriately demonstrate an artefact it has to be applied to “one or more instances of the problem”.

According to Ahmed and Sundaram (2011), evaluation establishes whether or not research has contributed to addressing the problem it set out to resolve. This echoes the views of Helfert et al. (2012), who state that evaluation delivers evidence that a developed artefact achieves the purpose for which it was designed. Helfert et al. (2012) also state that the evaluation of a design science artefact, which is assessed against criteria of value or utility, aims to answer the question: *does it work*?

Without evaluation, outcomes of design science research are merely unconfirmed declarations that the artefacts meet their purpose (that is, are useful for solving a problem or making some improvement).

According to Hevner et al. (2004), design science artefacts can be evaluated using multiple empirical methodologies and logical proof that the artefact solves the problem. The five possible evaluation methods are shown in Table 7:1.

It is noteworthy that not all of the evaluation methods shown in Table 7:1 can necessarily fit a given research project. The nature of the problem or the designed artefact itself determines the most suitable evaluation method.

Taking the methods listed into consideration, the most appropriate methods for this research are *observational (1)* and *descriptive (5)*.

Due to matters of cost and time limitations, the observational method could not be executed.

The descriptive evaluation method is appropriate because it suits the innovative nature of this type of artefact (Hevner et al., 2004). On this basis, the *descriptive* method, using a scenario, has been adopted as the evaluation

tool for the artefact produced by this research. It is appropriate because it makes it possible to evaluate the solution in a practical (although simulated) way. This is discussed in the next section.

Table 7:1: Design Evaluation Methods (Hevner et al., 2004, p. 83)

Method	Description
1. Observational	**Case Study**: Study artefact in depth in business environment **Field Study:** Monitor use of artefact in multiple projects
2. Analytical	**Static Analysis**: Examine structure of artefact for static qualities (e.g., complexity) **Architecture Analysis:** Study fit of artefact into technical IS architecture **Optimization:** Demonstrate inherent optimal properties of artefact or provide optimality bounds on artefact behaviour **Dynamic Analysis**: Study artefact in use for dynamic qualities (e.g.,performance)
3. Experimental	**Controlled Experiment:** Study artefact in controlled environment for qualities (e.g., usability) **Simulation** - Execute artefact with artificial data
4. Testing	**Functional (Black Box) Testing:** Execute artefact interfaces to discover failures and identify defects **Structural (White Box) Testing:** Perform coverage testing of some metric (e.g., execution paths) in the artefact implementation
5. Descriptive	**Informed Argument:** Use information from the knowledge base (e.g., relevant research) to build a convincing argument for the artefact's utility **Scenarios**: Construct detailed scenarios around the artefact to demonstrate its utility

7.3. Using the Afri-PURE Framework in Emmanuel Haven Wellness Centre: A Scenario

For the purpose of conducting the evaluation of the Afri-PURE Framework as required by Hevner et al. (2004), a scenario based evaluation was selected. The scenario used builds upon the case of the Emmanuel Haven Wellness Centre which was initially presented in Chapter 4 (section 4.3). According to Carroll (2000), scenarios are stories. He continues by stating that "[…] *they are stories about people and their activities*". In this chapter, the scenario is presented as a first time interaction between all stakeholders involved. It illustrates how the Afri-PURE Framework can be used in the local context.

The Afri-PURE Framework comprises the following steps: (1) Community Engagement, (2) Identify Strengths, (3) Problem Definition, (4) Objective Setting, (5) Identify Areas of Information Flow, (6) Participant Selection, (7) Dreaming the Future, (8) Communal Elicitation, (9) Consensus Making, (10) Documentation, and (11) Relationship Building.

To summarise what these steps involve:

1. **Community Engagement:** Is concerned with the identification of people in leadership positions that make it possible to gain access to the rest of the community and to understand its overall view from its leaders.
2. **Identify Strengths:** Focuses on identifying things within the community that can be used to solve the problem that may be identified in the following step. Strengths can come from the individual members of the community or from the community itself.
3. **Problem Definition:** The identification of the problem that will improve the wellbeing of the community if solved.
4. **Objective Setting:** Description of the problem and how it fits in with the strategies of the centre.

5. **Identify Areas of information flow:** Identify the activities and the areas in which they take place in the community.
6. **Participant Selection:** Identify the people that take part in the elicitation of user requirements. They must be familiar with and reflective of the local community.
7. **Dreaming the Future:** Focuses on allowing the participants to share their ideas about how the problem could be solved. This is done by starting with individual ideas and reconciling these ideas into one solution through consensus making.
8. **Communal Elicitation:** Focuses on eliciting the requirements for the problem identified. This is done by allowing each participant to voice their opinion and contribute ideas as equals within the group of participants..
9. **Consensus Making:** Is concerned with making decisions as a group for the benefit of the group.
10. **Documentation**: Documents all the activities and the user requirements for verification and the next steps of the URE process.
11. **Relationship Building:** Builds the interaction between the community members and the system analysts through song and dance.

In order to execute the phases of the framework, there are some matters that need to be taken into consideration and a number of assumptions to be made:

Primarily, the availability of the various stakeholders may pose a problem as they have duties to carry out each week. They are also not always available at the same time, as their arrangements to visit home-based patients differ. Further, their communication skills are mostly limited to their mother language. This poses a challenge for external stakeholders who are not fluent in that language, especially if there is no one to translate between the two groups.

The first assumption is that the analyst visiting the centre has had training in using the artefact and knows how it works. The second is that the members of the centre and the analysts speak the same language. This is to ensure that communication between the various stakeholders is possible without a third party translating, which is the reality in most cases.

The third assumption is that plans about the visit of the analysts to the centre have been made beforehand. This is to ensure that the need for an intervention within the centre has been identified.

Finally, unlike the case study presented previously, the scenario assumes that the analysts have no knowledge of the issues faced by the centre and will therefore find this out during the visit.

7.3.1. Step 1: Community Engagement

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓	✓		

In order to gain access to the community, the system analysts need the support of people in a leadership position. Consequently, they identified the Emmanuel Haven *centre manager* as the person who would both help with access to the community and provide support for the duration of the user requirements elicitation process. Moreover, they identified a *school principal* who manages the day-care centre, and a *caregiver manager* who works as a link between the centre manager and other stakeholders, for example, the *caregivers*. The caregivers were divided into two groups, namely, day-care group and the home-based care group. The relationship between these stakeholders is depicted in **Figure 7.1**.

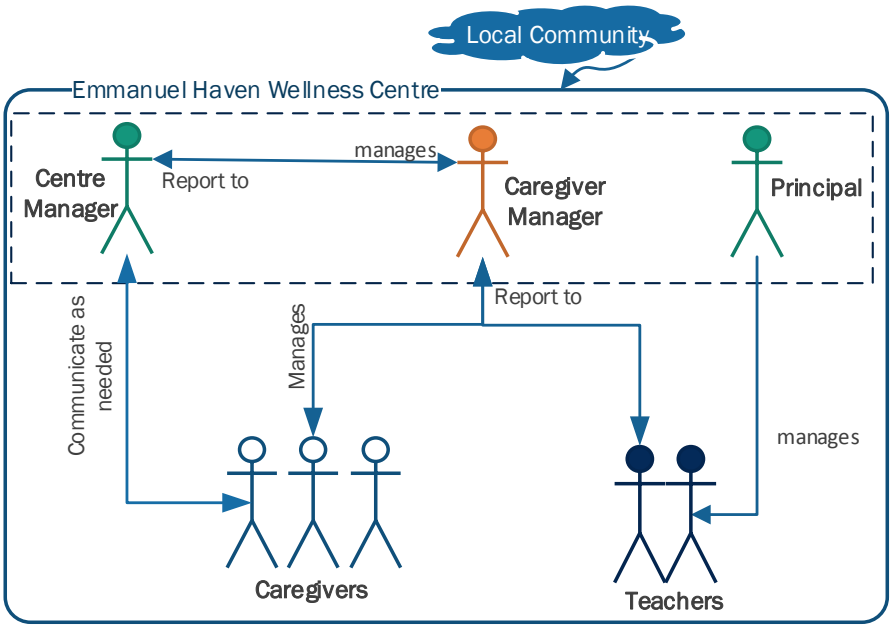

Figure 7:1: Organogram of the Emmanuel Haven Wellness Centre

As illustrated in **Error! Reference source not found.**, the centre manager, a qualified and retired matron, is responsible for the day-to-day management of the centre. She guides the caregivers in their duties in the local community and within the centre. With the help of the care manager, the caregivers submit data forms every time they visit patients from the local community. In turn, the data forms and other information sources are used to compile reports at the end of each month. The principal manages the day-care centre. It must be noted that the day-care caregivers also submit their data forms to the caregiver manager.

Furthermore, viewed through the lens of imbizo, the centre can be described as follows:

- The centre manager (and the principal) can be viewed as the chiefs of the community from who support must be requested to access the community. On the other hand, the caregiver

manager can be viewed as the right hand of the chief who assists the chief in carrying out his duties.

- Lastly, the caregivers can be viewed as community members and amongst whom there are members that are most knowledgeable about the day-to-day activities of the community.

In addition to identifying the various leaders and community members at the centre, the system analysts needed to include other information sources as required by the principles of user requirements elicitation as discussed in section 3.2. Consequently, they identified various data forms and policy documents as part of this process. This was followed by the identification of the strengths of the centre.

7.3.2. Step 2: Identification of Areas of Strength

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓	✓		✓

After identifying the centre manager as the person to provide an overall view of the organisation, the centre's areas of strength were identified. This process entailed the identification of all things that could be used to solve the problem still to be identified.

By visiting the various sections of the centre and interacting with the people in each area, the following areas of strength were discovered:

- horticulture
- primary school education facility (day-care centre) for orphans
- caregiving facility
- computer and printer used to print various documents in the centre.

Afterwards, the centre manager called a meeting that included the system analysts, day-care principal, the caregiver manager and all the caregivers. Before gathering user requirements for the centre, it was imperative for the system analysts to understand the context in which the centre is situated and how the stakeholders interact. This led to the next step of problem definition.

7.3.3. Step 3: Problem Definition

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓	✓		✓

Having identified both the centre manager and the strengths of the centre, the system analysts examined the activities that take place in the centre. This was to identify possible problems to solve that could improve the effectiveness and efficiency of the activities. This was done in an imbizo group meeting with all the stakeholders seated in a circle. The meeting started with the caregivers and teachers singing and dancing. During the meeting each individual shared information about which part of the centre they belonged to and their activities and tasks.

At the end of the meeting the system analysts identified that:

- The Haven has two types of caregivers. Those who are tasked with home-based patients and those who work inside the centre only. The caregivers, whose tasks are outside the centre, also provide care to walk-in patients. These are the patients who can still walk on their own to the clinic. The caregivers who work inside deal with the more vulnerable patients such as children. These caregivers (or teachers) also run the day-care centre for the children.
- The home-based care group of caregivers goes to the community to visit their patients. The day-care group of caregivers, on certain

occasions, visit the homes of the orphans to get the latest information on how they live in their homes.

- The caregivers record the details of their visits and related activities on a paper form that they submit to the centre afterwards. The collection of the forms ensures that the information is kept in a secure place and is also used to create reports. These are submitted to the provincial health department once a month.
- There are certain patients who visit the centre for caregiving.

The systems analysts also learnt that the caregivers occasionally take the forms to their homes after their community visits because they do not always manage to return back to the clinic on time.

This step was followed by objective setting where the problem was described in detail.

7.3.4. Step 4: Objective Setting

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓	✓		✓

Building on the identification of the problem, the Objective Setting step entailed a description of the problem and why a new system to capture patient records was needed. As with the problem definition, this was done by convening a group meeting involving all stakeholders and system analysts.

At the end of the meeting, the following was concluded:

- The caregivers identified the need to carry the patient records as a security risk. Further, this risk is heightened by the fact that the caregivers also walk around the community with forms on rainy days

and in doing so run the risk of losing the collected patient details. They suggested that a new system should cater for this problem.

- The caregivers need quick access to the information during community visits.
- The caregivers need an easy way in which to give patient records to the caregiver manager.
- It was suggested that the way in which the new system captures the information must work with the current provincial health department systems and data formats.

Based on the above issues, the system analysts and all who attended the meeting agreed that the collection and storage of patient information needs to be improved. This led to the following step.

7.3.5. Step 5: Areas of Information Flow

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓			✓

The centre has different sections that the system analysts needed to understand. So, an understanding of the day-to-day activities and the interactions of the stakeholders was key to achieving this. Unlike the gathering in the previous phase where all stakeholders were involved, this phase only included people from the individual sections, the centre manager and the system analysts. The members of each section highlighted their activities and the tools they need to carry these out to the system analysts.

It is noteworthy that the areas of information flow were identified by the two types of caregivers that work at the centre. Further, there is no information exchange between the two types of caregivers. Each set of caregivers share

information with the caregiver manager who then shares it with the centre manager.

Finally, the identification of the areas of information flow was useful for the subsequent activities of the Afri-PURE Framework such as *Participant Selection* and *Participant Grouping*.

7.3.6. Step 6: Participant Selection

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓			✓

The selection of the participants had to ensure that all the participants selected for the group had knowledge of information flow activities within the clinic. The selection was driven by the following issues:

- Knowledge and experience of working at the centre
- Participants representing all the identified areas of information flow
- Leaders or individuals holding positions within the centre, the centre manager, principal and the caregiver manager.

It is noteworthy that since the different sections of the centre do not share information, the groups of caregivers and teachers only have information unique to their own activities. On the other hand the caregiver manager only has information that deals with her activities and those of the caregivers. The day-care principal has information that deals with the day-care centre while the centre manager has an overall view of the information flow at the centre. Therefore, to facilitate participatory user requirements elicitation the various types of participants had to be divided into different groups that reflect each area of information flow.

Participant Grouping

The aim of participant grouping is to ensure that the participants provide an overall flow of information inside the centre and that they take part in the user requirements elicitation process by focusing on the area where they carry out their duties within the clinic. This is important because the flow of information may not be clear to all individuals as they may only know the information flow regarding their own activities.

To reflect the overall activities of the centre, the participants needed to be grouped so that they represented the information flow activities in each of its sections. For instance, the caregivers only know the information flow regarding their activities and do not know what happens to the information after they submit it to the caregiver manager. Therefore, to ensure that the overall information flow activities are captured during the elicitation process, the grouping had to focus on participants with common knowledge of the data flow activities of the centre and include people who had unique and partial knowledge of the information flow.

The grouping of the participants is depicted in Figure 7:2.

The centre manager, who has overall knowledge of the activities of the centre, was part of the user requirements elicitation process. The centre manager was part of the following groups: the home-based care group, the day-care group and the management group.

The management group is made up of the centre manager, caregiver manager and the principal.

The home-based care group is made up of the management group and a number of home-based caregivers.

On the other hand, the day-care group is made up of the management group and the teachers. Similarly, the caregiver manager, who has knowledge of the

activities that take place in her section of the centre and its caregivers, was to be part of all three groups.

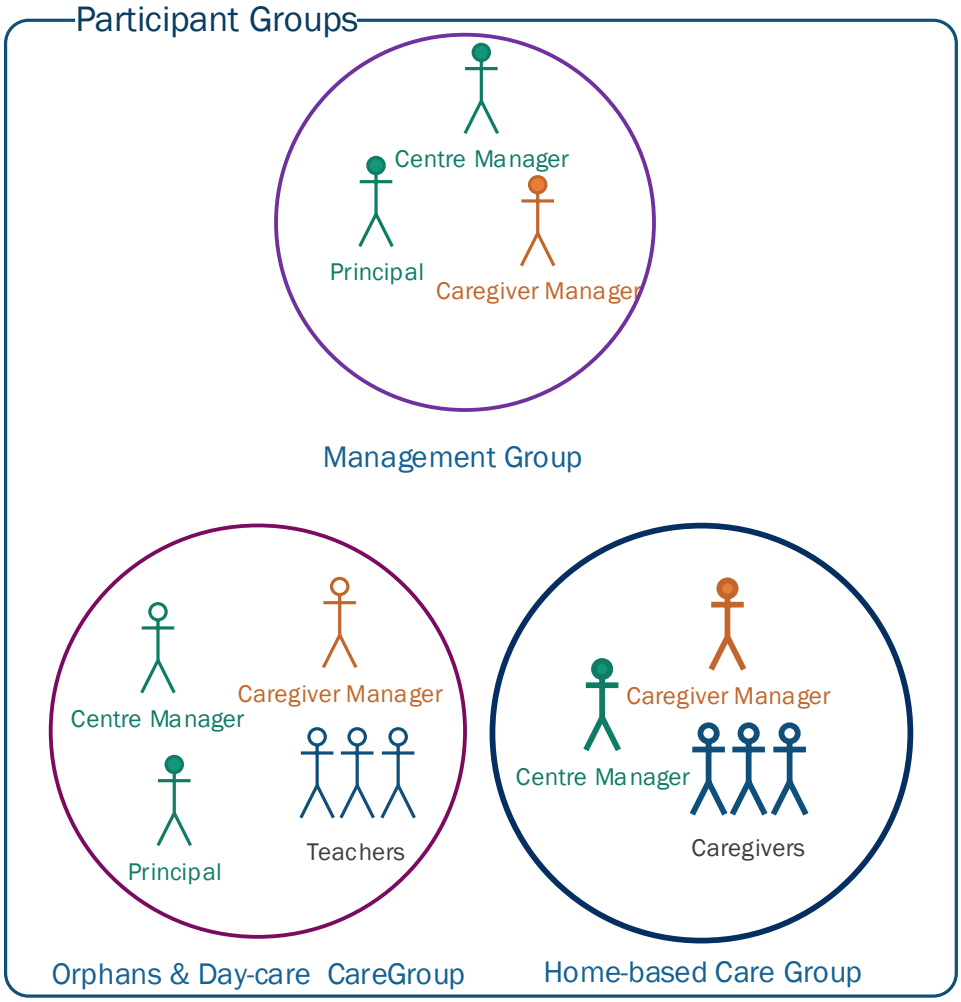

Figure 7:2: Grouping of participants for participatory user requirements elicitation at Emmanuel Haven Wellness Centre

The selection of participants ended the PRE-PURE phase and led to the next phase (PURE) of the Afri-PURE Framework.

7.3.7. Step 7: Dreaming the Future

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓		✓	

Having identified the problem and selected a suitable group of participants to find a solution to the problem, the Afri-PURE Framework then requires the participants to dream about the problem's solution. To accomplish this, two possibilities were considered. The first was to have one big user requirements elicitation session made up of all the caregivers. The second was to separate the two types of caregivers and conduct separate user requirements elicitation sessions with each group. A decision was made to have a separate session with each of the groups since the two groups of caregivers do different types of tasks.

In the tradition of the Letsema/Ilima approach, participants from each of the groups were given an opportunity to dream about the development of an effective and secure solution for the management of information during community visits. This took place in two parts: dreaming of a solution firstly on an individual level and secondly on a group level. This was done for both groups of caregivers.

The individual dreams were reconciled into one group dream by allowing each participant to share their dreams with the group. This was done by writing the dreams on a flip chart. Then the dreams were refined by checking for overlaps until a final group dream was agreed on. To reconcile the dreams of the two groups, a meeting was called where each group shared its dream. Finally, it was agreed that a possible solution would be for the caregivers to use a mobile phone system to capture information and then send it instantaneously to a storage facility.

7.3.8. Step 8: Communal Elicitation

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓		✓	

7.3.8.1. User Requirements Elicitation Session

The user requirements elicitation process was divided into a number of sessions that corresponded to the participant groupings depicted in Figure 7:2. Before the user requirements elicitation sessions began, the groups were briefed again about the remainder of the process. Participants were seated in a circular arrangement denoting equality of all participants.

The first and second sessions were made up of both the day-care and home-based care groups. This was followed by a session with the management group. Each of the sessions began with a continuation of the relationship building activities highlighted previously. Throughout the sessions, song or dance or a combination of both was used to indicate the beginning of or agreement on the elicitation of user requirements for each activity.

7.3.8.2. User Requirements Elicitation Approach

Spoken words and drawings were used to conduct and document the user requirements elicitation.

For both the day-care and home-based care groups, the elicitation process began by allowing volunteer participants within the groups to draw their different activities on a flip chart in front of the whole group. The drawings showed the sequence of tasks for each activity conducted by an individual caregiver. For instance, with respect to the home-based care caregivers, the drawing showed the sequence of tasks a caregiver conducts in a community. Other participants shared their own activities and tasks with the rest of the

group. On occasion, there were different activities that required additions to be made to a drawing.

It should be noted that these were not viewed in terms of right or wrong. Instead they were viewed as distinctions that emanate from the various patients that different caregivers have. For instance, a patient might need bathing and feeding during a home visit from one caregiver while only feeding might be needed by another patient. Each addition was therefore viewed as an extension of another caregiver's activities.

At the end of the user requirements elicitation process, the system analysts had collected the following information: the different types of users that exist at the centre, their daily activities, and the matching of activities to the different user types.

Finally, the systems analysts had voice recordings and photographs of the flip board drawings with the activities from all of the user requirements elicitation sessions.

7.3.9. Step 9: Consensus Making

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓	✓	✓	✓

The discussion of African participatory decision-making in Chapter 5 stated that consensus making is concerned with making decisions as a community for its greater good. With this tradition in mind and throughout the PRE-PURE and PURE phases, a number of steps require the participants to reach consensus on various issues. The steps are: *Problem Definition*, *Participant Selection*, *Dreaming the Future* and *Communal Elicitation*.

Problem Definition: During the meeting for all the members of the Emmanuel Haven Welness Centre, a number of problems were identified. All the members agreed on what the main problems were, the solution of which would ease data capturing during community visits.

Participant Selection: From the African participatory decision-making point of view, the selection of participants was driven by a number of factors such as their standing within the community and their knowledge of the problem domain. It was necessary for all stakeholders to agree on the suitability of the selected participants with a view to achieving greater good for the community.

Dreaming the Future: The *Dreaming the Future* step followed African participatory decision-making in its execution. As stated previously, the final solution for the identified problem evolved out of the individual solutions. The participants amalgamated their solution ideas by suggesting and agreeing on the solution they thought would lead to better management of patient information.

Communal Elicitation: During the *Communal Elicitation* step, care was taken not to view any input as righ or wrong. New additions were viewed as extentions of activities as per agreement attained in the group. Each activity was identified and its tasks agreed upon by the rest of the participants.

7.3.10. Step10: Documentation

Stakeholders	Clinic Management	System Analysts	Donors	Participants	Caregivers
	✓	✓	✓	✓	

During the PRE–PURE and PURE phases of the Afri-PURE Framework, the activities of the stakeholders were recorded using a digital camera, video recorder and voice recorder depending on the task at hand. For instance,

during the community engagement stage, a voice recorder was used to record the meeting between the system analysts and the management of the centre. A digital camera and video camera were used to document the Communal Elicitation step.

7.3.11. Step 11: Relationship Building

Stakeholders	Clinic Management	System Analyst	Donors	Participants	Caregivers
	✓	✓	✓	✓	✓

Throughout the Afri–PURE activities, song and dance was used to bring the participants together. Importantly, every time a participant finished sharing their knowledge they would sing their own song.

7.4. Lessons Learnt from Applying the Afri-PURE Framework

Having demonstrated the use of the Afri-PURE Framework in the scenario mentioned above, it is imperative to highlight the lessons learnt. These may be useful for any further development of the framework to ensure that it suits the environment it might be used in.

Three primary aspects came to the fore during the evaluation of the Afri-PURE Framework. These related to (1) the grouping of the participants, (2) the sources of documentation, and (3) reaching consensus.

Grouping of the participants: During the demonstration of the framework it became clear that it doesn't address the grouping of participants within their own environments. Therefore, it is suggested that consideration be given to addressing *Participant Grouping* as a step, or sub-step within the framework in a next iteration of the framework.

Sources of documentation: It became evident that there is a need for the various sources of documentation such as videos, drawings and voice recordings to be converted to a format that makes sense to the various stakeholders. For example, the system developers (coders) have to make sense of the documentation to be able to develop a solution as per the user requirements. This particular aspect, while outside the scope of this study, needs to be considered in future iterations of the framework.

Reaching consensus: It was realised that the extent to which all stakeholders espouse the principles of participatory African decision-making as discussed in Section 6.2, for example, freedom to disagree, equality of participants and reaching consensus for the good of the community, would be instrumental in the utility of the consensus-making mechanism of the framework.

7.5. Conclusion

This thesis presents a framework for participatory user requirements elicitation in resource restricted environments. The framework was developed using existing literature on participatory design and user requirements elicitation. Its development also utilised the knowledge gained from case studies conducted in resource restricted environments and the norms and traditions of these environments.

This chapter provided a comprehensive evaluation of the framework as required by design science, which is outlined in Hevner et al. (2004). It provided an evaluation of the utility of the Afri-PURE Framework by demonstrating its use by means of a scenario. The scenario was based on a wellness centre based in Port Elizabeth, South Africa, which provides care to a local community.

The scenario began by identifying the activities and tasks of the centre and its

problems. It was also important to identify the stakeholders of the centre who were the caregivers and leaders of the centre. Following this, a solution to ease and secure the activities and tasks performed at the centre was suggested. In the end, the scenario illustrated how participatory user requirements elicitation is performed using the Afri-PURE Framework.

Finally, the next chapter concludes the research by demonstrating how its objectives were achieved, considering the limitations of the research as well as possible future research to originate from this study.

Chapter 8
Conclusion and Recommendations

This chapter concludes this thesis by revisiting the objectives identified and how they were achieved. It provides a synopsis of the overall research and its output and assesses how the output solves the problem identified in Chapter 1. It then reflects on the methodology used to achieve the objectives as well as the limitations of the research. Finally, it explicitly highlights the contribution of the research to the existing body of knowledge, the applicability of the framework and areas of possible further research.

This chapter is structured as follows:

"As for the future, your task is not to foresee it, but to enable it."

— ***Antoine de Saint-Exupery***

8.1. Introduction

The gaps identified in existing literature regarding the lack of information systems developed locally for local problems and requirements provided the initial interest in undertaking this research. As indicated earlier in this thesis, “local” and “locally” refer to regional or geographical identity or ownership, specifically in resource restricted environments. Realising some of the most important issues that need to be addressed before the actual development of an information system, this research was scoped within:

- user requirements elicitation;
- participatory design in information systems development;
- African participatory decision-making mechanisms.

The research identified a number of questions and objectives, which led to a comprehensive discussion of the above-mentioned concepts. This discussion, in turn, motivated two research case studies within local communities. These emphasised the problem and also highlighted a number of challenges that needed to be taken into consideration throughout the ISD process.

Building on this, the identification of the challenges motivated a search for a solution that is both locally relevant in terms of user participation and built using local norms and traditions. Further, highlighting the challenges helped ensure that a sound foundation is put in place for IS that fits the local context.

A locally relevant solution, in the form of a framework, was developed and presented. This framework was then evaluated by using a scenario to demonstrate its utility and to conform to the design science guidelines for the development of an artefact.

This chapter concludes the journey constituted by this research, by revisiting the objectives of the research, providing a summary of the research and how

its output satisfies the objectives of the research as well as the requirements posed by the design science methodology. The limitations of the research, its contribution to the body of knowledge and possible future research are further explored.

8.2. Research Summary

In Chapter 1 the foundation of this research was laid. It discussed earlier studies that showed a gap in literature and practice regarding user requirements elicitation in resource restricted environments. The literature review established that information systems in resource restricted environments fail because they are not built on the basis of local user requirements. To reiterate, Heeks (1999) states that resource restricted environments need to start developing their systems locally instead of getting them off-the-shelf. The literature review also established that in order to tackle this problem, a foundation must be laid using a locally flavoured participatory approach for user requirements elicitation in resource restricted environments. Further, the chapter outlined the research question and also provided three sub-questions. The research question was:

> ***"How can participatory user requirements elicitation methods be altered in order to develop information systems for resource restricted environments?"***

Chapter 2 provided a detailed discussion about the choice of research methodology employed to carry out the research reported in this thesis. The study was positioned within the realms of existing information systems research strategies. The chapter focused on the characteristics of the research problem and output. In the end, Design Science was identified as the appropriate research strategy.

Chapter 3 provided a comprehensive literature review of the domains that were identified to be important for the objectives of this research. The domains are user requirements elicitation and participatory design. Chapter 3 highlighted the current thinking within each of the domains and how they relate to both the problem and objectives of the research. It also provided insights into the existing problems that need to be taken into consideration during information systems development in resource restricted environments.

Chapter 4 presented a detailed account of the case studies that were conducted to understand the research problem. These provided new insights into the problem in the local context and an empirical understanding of the challenges within resource restricted environments. The chapter also highlighted the problem in the local context so as to sensitise people unfamiliar with it to the existing challenges that could play a role during user requirements elicitation. These new insights laid the foundation for finding a solution to the research problem.

The conclusion was that the research problem needed to be solved using a participatory approach and that the solution should be locally relevant and built from local norms and traditions. Chapter 5 provided details of African decision-making mechanisms and the need to view participation in light of the local communities, their norms and traditions. It also mentioned which existing participatory decision-making mechanisms were identified to be the foundation of a locally relevant approach to elicit users requirements in resource restricted environments.

Chapter 6 presented the framework that was developed to address the main research objective, based on the insights of the case studies, African participatory decision-making and existing literature on user requirements elicitation and traditional participatory design.

A descriptive, scenario-based evaluation of the artefact, the Afri-PURE Framework, was presented in Chapter 7.

Finally, this chapter, Chapter 8, contains an evaluation of the research based on its research questions and objectives and the research conclusions. In addition, the research limitations and potential areas of future research are highlighted.

8.3. Achievement of the Research Objectives

The primary objective of this research was to develop:

> ***"a participatory approach to elicit user requirements for information systems in resource restricted environments."***

In order to achieve this objective, a number of sub-objectives needed to be achieved first.

The first research sub-objective was to:

> ***"review and study user requirements elicitation for information systems development."***

A comprehensive investigation on existing user requirements elicitation literature was conducted to determine how to gather user requirements. The results of the investigation are documented in Chapter 3. During the investigation two very similar approaches were identified. The first approach is by Rzepka (1989) and is made up of five phases while the second, by Kotonya and Sommerville (1998), is made up of four phases. Due to their similarity, this research took the view that the two approaches could be amalgamated to form one user requirements elicitation process. Through this process an important goal was attained and the first sub-objective identified

was met. Achieving this sub-objective answered the first sub-question which was:

"Which existing approaches play a role in the elicitation of requirements when developing information systems?"

The second sub-objective was to:

"review and study local decision-making mechanisms, traditions and norms that are relevant to user requirements elicitation".

In an attempt to address the second sub-question, an investigation was conducted of African participatory decision-making mechanisms. The discussion about this investigation was presented in Chapter 5. The investigation was important for two reasons. First, it was important to understand the landscape of African decision-making. Second, it was important to identify the characteristics of African decision-making mechanisms, which could possibly be adopted for the development of the solution of this research.

In the investigation a number of participatory decision-making principles and practices relevant to user requirements elicitation were identified. This answered the second sub-question, namely:

"Which locally relevant mechanisms can be used to develop a locally relevant participatory user requirements elicitation approach?"

The final sub-objective was to:

"Develop a suitable locally relevant participatory approach for user requirements elicitation in resource restricted environments".

Having identified the challenges that exist in resource restricted environments, a number of findings were made in both user requirements elicitation and

participatory design, which form part of the literature review of this research and the case studies that were conducted. First, it was established that potential users must be included in the whole ISD process as equal partners. Doing so will ensure the success of the URE process and also increases the chance of the eventual information system under development succeeding.

Additionally, it was established that traditional participatory design is practised in environments outside Scandinavia, but with significant changes in order to cater for the uniqueness of those environments. Both participatory design and African participatory decision-making mechanisms were discussed in Chapters 3 and 5 respectively. Local participatory decision-making mechanisms and other traditions and norms were identified to cater for the aforementioned challenges. Armed with this knowledge, the next step of the research was to develop the participatory user requirements elicitation approach as proposed in Chapter 1. The results of the development of this approach were presented in Chapter 6 as the Afri-PURE Framework. This answered the third sub-question, which was:

"How can existing user requirements elicitation be changed to incorporate locally relevant mechanisms to develop information systems for resource restricted environments".

Finally, meeting the three sub-objectives of this research also meets the primary objective, which was "*to develop a participatory approach to elicit user requirements for information systems in resource restricted environments"*. This, in turn, answers the main research question, which was, *"how can participatory user requirements elicitation methods be altered in order to develop information systems for resource restricted environments?"*

This leads to the evaluation of this research through the lens of the research methodology.

8.4. Meeting Design Science Principles

This research was conducted using the design science paradigm. The reasons for deciding to use design science were highlighted and substantiated in Chapter 2. Design science has a number of guidelines that must be adhered to during the development of an artefact. The following subsections demonstrate and discuss in detail how each of the design science guidelines was adhered to.

8.4.1. The Afri-PURE Framework as an Artefact

According to Hevner et al. (2004):

> *Design science research must produce an artefact in the form of a construct, method, model, or an instantiation.*

This research produced an artefact in the form of a framework. The framework was presented in the form of its assumptions (or principles), its macro-level constructs as well as its detailed steps, which provide guidance for its implementation.

8.4.2. The Afri-PURE Framework Solved a Relevant Research Problem

According to Hevner et al. (2004):

> *The objective of design science research is to develop technology-based solutions to important and relevant problems.*

In Chapter 1, this research shed light on the current information systems development landscape in developing countries, with a special focus on user requirements elicitation. The research highlighted the lack of information systems developed in this type of environment and the lack of information

systems development methodologies for this environment. The importance of the above two problems were further highlighted by the different challenges that exist within the local context. Therefore the Afri-PURE Framework can be said to have solved a relevant research problem.

8.4.3. The Afri-PURE Framework was Rigorously Evaluated

According to Hevner et al. (2004):

> *Design science research relies upon the application of rigorous evaluation methods for utility, quality and efficacy of the design artefact.*

The evaluation of the designed artefact is an essential part of the research process. “The utility, quality, and efficacy of a design artefact must be rigorously demonstrated via well-executed evaluation methods.” (Hevner, et al., 2004, p. 83).

To achieve this, a scenario was developed and evaluated. Chapter 7, *Evaluation of the Afri-PURE Framework*, presented the execution and lessons learnt from the evaluation.

8.4.4. The Afri-PURE Framework made Research Contributions

According to Hevner et al. (2004):

> *Effective design science research must provide clear and verifiable contributions in the areas of the design artefact, design foundations, and/or design methodologies.*

This research contributes to existing literature in a number of areas and plays a significant role in information systems development in resource restricted environments. First, it highlights the existing challenges in these

environments. It achieved this by conducting case studies in the early stages of the research. The challenges were published in a conference paper.

Second, this research contributes to the existing participatory design and user requirements elicitation body of knowledge by providing a locally flavoured way of thinking. It does this by using African decision-making mechanisms and other local traditions and norms as the core of conducting these activities in resource restricted environments.

With regards to participatory design, this research had to take a different approach from traditional participatory design, which was originally introduced in Scandinavia. It had to cater for the local environment in the same way that North America did when participatory design was initially introduced there. Therefore, this research contributes to existing traditional participatory design literature, specifically the knowledge acquisition phase of PD, by incorporating a step by step guideline on how to elicit user requirements in resource restricted environments using the findings of this research.

Finally, this research contributes to existing URE knowledge by proposing a participatory approach that is meant to cater for the challenges that exist in resource restricted environments.

8.4.5. The Development of the Afri-PURE Framework followed a Rigourous Research Methodology

According to Hevner et al. (2004):

> *Design science research relies upon the application of rigorous methods in both the construction and evaluation of the design artefact*

The development of the Afri-PURE Framework followed three cycles that Hevner et al. (2004) define as (1) the relevance cycle, (2) the rigor cycle and (3) the design cycle. These cycles are discussed in the following subsections.

8.4.5.1. The Relevance Cycle

This research was motivated by the need for the development of an approach that takes into consideration the challenges that exist in resource restricted environments. Additionally, it was motivated by the need for such environments to develop their own information systems in a manner that allows potential system users to participate in the development process as equal partners. This participation needs to take place in both the initial stages and throughout the development process. Having a solution that satisfies the afore-mentioned conditions would improve the existing approaches in information systems development.

According to Hevner et al. (2004), for a research project to fit the relevance cycle its motivation must be a desire to improve the environment by introducing new and innovative artefacts into the problem domain as defined by the relevance cycle. This research was motivated by the need to develop a participatory user requirements elicitation approach (artefact) for the development of information systems in resource restricted environments (problem domain). Throughout the research, the researcher was guided by the relevance of the proposed solution, to the identified problem domain.

8.4.5.2. The Rigor Cycle

According to Hevner et al. (2004), the rigor cycle provides past knowledge to the research project to ensure its innovation. To cater for this requirement, this research made use of various sources of past knowledge. The Afri-PURE Framework is built from previous knowledge of African decision-making mechanisms, traditional participatory design and user requirements elicitation literature.

Secondly, the rigor cycle requires rigorous design and evaluation methods. The methods used by the researcher to develop and evaluate the Afri-PURE Framework were well-documented throughout this thesis.

8.4.5.3. The Design Cycle

According to Hevner et al. (2004), the requirements of this cycle are the input from the relevance cycle and also the design and evaluation theories and methods drawn from the rigor cycle. Equally important, Hevner et al. continue, is maintaining the balance between the efforts spent in constructing and evaluating the evolving design artefact. As such, the development of the Afri-PURE Framework went through a number of iterations throughout the course of this research.

Initially, a first version of the framework was developed iteratively from the findings of the literature review (Chapter 3) and the case studies (Chapter 4). The second version of the framework – presented in Chapter 6 of this thesis - was developed iteratively by incorporating the findings of the African participatory decision-making mechanisms as discussed in Chapter 5. Additionally, the framework was evaluated and lessons learnt based on the evaluation, presented in Chapter 7.

8.4.6. Design as a Search Process

According to Hevner et al. (2004):

> *The search for an effective artefact requires utilizing available means to reach desired ends while satisfying laws in the problem environment.*

The development of the Afri-PURE Framework was preceded with a search process to discover the problem domain as well as the state-of-the-art in African decision-making mechanisms, traditional participatory design and user requirements elicitation literature. These findings were supplemented with a search process in the form of two case studies which contributed to the problem awareness and initial design phases of the research. The search process terminated after evaluation of the proposed Afri-PURE Framework for user requirements elicitation in resource restricted environments.

8.4.7. Communication of Research

According to Hevner et al. (2004):

> *Design science research must be presented effectively to user requirements elicitation practitioners and fellow academics.*

The output of this research, the artefact, was communicated to fellow researchers in the field of user requirements elicitation. First, the artefact was presented at a user requirements related workshop from which useful feedback was provided to the author.

The 2nd ISD4D International Research Workshop was hosted by Universidade Eduardo Mondlane Departamento De Matemática E Informática (Department Of Mathematics and Informatics of Eduardo Mondlane University) and was held in Maputo from the 26th – 30th of March 2012. The main goal of the workshop was to "develop a comprehensive approach for the analysis and design of sustainable and scalable socio-technical information systems that promote social development of local communities in varying developing country contexts". A number of stakeholders from various universities from Finland, Mozambique, and South Africa such as researchers, lecturers and research students participated in the workshop.

The 3rd ISD4D International Research Workshop was hosted by Cape Peninsula University of Technology and was held in Cape Town from the 22nd – 26 October 2012. The aim of this workshop was to produce guidelines on how to conduct a base-line study on a community and the services available to it currently. Similar to the previous workshop, a number of stakeholders from various universities participated in the workshop.

Furthermore, two papers were produced during the course of this research. These peer-reviewed papers were presented at the respective conferences and included in the conference proceedings.

A list of the publications and presentations related to this research, can be found at the end of this thesis.

8.5. Contributions to the Existing Body of Knowledge

> *"[…] countries in Africa need to adapt and develop their own information systems based on their own needs and structures using their own methods and practices"*
> *(Soriyan, Korpela, & Makanjuola, 2009)*

Since the publication of the above and similar narrations, there has been little progress to answer the call for locally developed information systems.

This research is about affecting a change in the gap identified in the existing information systems development literature and practices. Throughout this thesis it was highlighted that there is a need for a locally relevant user requirements elicitation approach built on local norms and traditions. This would lay a foundation for developing information systems for local users and their requirements. On this basis, this research has identified various traditions and norms, which formed part of the foundation of the Afri-PURE Framework to bridge the gap identified above. Thus the value and uniqueness of the research lies in its contribution to close this gap.

The contributions of this research to the existing body of knowledge is subsequently viewed in terms of the value it adds to the body of knowledge on user requirements elicitation, participatory design and information systems development, as identified in the domain of discourse of this research (refer to Section 2.2).

8.5.1 Contributions to User Requirements Elicitation Literature

The major contribution of this research to the existing URE body of knowledge is the development of a participatory user requirements elicitation framework that is grounded in the norms and traditions of the local community. Drawing from existing URE theory, this contribution integrates African decision-making approaches to propose the African Participatory User Requirements Elicitation Framework for resource restricted environments.

During the development of the framework attention was drawn to the unique challenges that exist in resource restricted environments and how using local norms and traditions as the foundation of the framework speaks to the challenges.

8.5.2 Contributions to Participatory Design Literature

As discussed in Chapter 3, Scandinavian PD and North American PD feature prominently in literature. These approaches, in their genesis, espouse Nordic and American socio-economic and cultural values respectively. In this research, the Afri-PURE Framework has been positioned to espouse African decision-making values, drawing inspiration and methods from a different cultural area.

With this practice in mind, African participatory decision-making mechanisms were identified:

- firstly, to define participation from the perspective of local norms and traditions; and
- secondly, to adapt participatory design to the local community by using African values instead of Scandinavian or North American values.

Finally, the contribution to user requirement elicitation and traditional participatory design leads to a contribution to information systems development in the local context as well.

8.5.3 Contributions to Information System Development Literature

This research is about affecting change within information systems development in Africa. This is in answer to a recent call that Africa needs to develop its own information systems to cater for their requirements instead of adopting readymade solutions from other environments that end up failing. This research attempts to affect change. It has done so outside the traditional business environment, where ISD solutions are mostly concentrated, in an environment where a number of challenges exist, such as lack of resources, skills and education.

As such, the contribution of this research to ISD lies in providing new understanding of how to elicit user requirements to develop information systems “for Southern Africa, by Southern Africa”. This implies the design and development of bespoke Information Systems based on the needs of the local context and using the methods and practices of the local context.

8.5.4 Contributions to Information System Development Practices

Building on the contributions highlighted above, the value of this research can also be viewed from practical and pedagogical points of view.

From a practical point of view, this research will benefit information systems analysts in resource restricted environments by providing a user requirements elicitation tool that is built on local norms and traditions. It is envisaged that

this will make it easier for the local communities to participate in the development of information systems in their environment.

From a pedagogical point of view, this research lays a foundation for the enhancement and development of locally relevant information systems development methods. These can help answer the call for Africa to develop its own information systems, by training systems analysts and programmers how to approach information systems development using the Afri-PURE Framework as a basis.

Finally, this research is a small and unique step towards realising the goal of developing information systems in resource restricted environments and Africa at large.

8.6. Applicability of the Afri-PURE Framework

The Afri-PURE Framework is highly relevant in Southern Africa, due to the relevance of African decision-making mechanisms in this context. The main area of application would not be highly commercialised environments, but resource restricted environments where systems are needed to improve the lives of communities. Therefore outside catalysts for change, such as NGOs and sponsors may find the framework particularly applicable.

It can be argued that under certain conditions (eg espousal of African traditional decision-making), the Afri-PURE Framework could be applied beyond information systems development, for example:

- Local level government could use it as a mechanism to effect change for the betterment of communities.
- It could be used in workplace settings where change is imminent, as a way to draw people together to think about this change and together decide about it, thereby ensuring a strong foundation for the change.

- Environments where there is a culture of consensus-making as a form of decision-making, may find application in using the framework to re-engineer old ways and modernise the environment.

Looking beyond Southern Africa, arguably, the framework would not be useful in highly authoritarian environments (eg Asian countries) and overly democratic environments where people are happy to vote out those who disagree. Politics is an example of an environment where participants might align themselves with parties instead of their communities. The applicability of the framework in “resource rich” environments remains to be tested.

8.7. Limitations

This research involved the development of a locally relevant participatory user requirements elicitation approach in resource restricted environments. While this research lays a foundation for locally relevant approaches and development in this type of environment, it faces potential limitations. The main limitation of this research is the fact that the Afri-PURE Framework has not been evaluated rigorously in a real world environment. As a result, there is no empirical data that can help identify aspects of the framework that still need further enhancement or development. Additionally, this lack of empirical data affects the weight of the arguments and conclusions made in this thesis to a certain extent. It also makes it hard to know how the Afri-PURE Framework will function in a real world environment.

Finally, despite the lack of testing or empirical data in a real world environment, the relevance and validity of the problem identified in this research cannot be questioned. Further, this research should not stop here. Several avenues of additional investigation are worthwhile in order to answer the call for Africa to start developing its own information systems based on its own needs and structures and using its own methods and practices. Hence,

this research study should be viewed as the groundwork for further empirical research on the user of the Afri-PURE Framework in a real life environment.

8.8. Future Research Avenues

The research reported in this thesis was centred on the question of how user requirements elicitation methods can be altered to develop information systems that accommodate the challenges of resource restricted environments. To address this question, a number of domains of interest were identified. Primarily, African participatory decision-making mechanisms, information systems, user requirements elicitation and traditional participatory design were identified as the domains of interest for the research.

This research has laid a foundation for participatory user requirements elicitation and information system development in resource restricted environments. However, it is important to note that this research is only an early step in the development of information systems development literature in this type of environment. The results must be accepted with an understanding that further critical research needs to be undertaken to explore various aspects of the solution. Importantly, the use of participatory practices based on African decision-making approaches in order to conduct user requirements elicitation in resource restricted areas, is proposed in this research for the first time. It needs to be explored more in similar environments.

Furthermore, this research has proposed the use of African participatory decision-making mechanisms for traditional participatory design. However, this proposal has not yet been tested in practice and there is scope to explore how it can best be amalgamated with traditional participatory design. Doing so will contribute significantly to information systems development practices in contexts such as those selected for the case studies conducted during this research.

Finally, although the contributions of this research are not proven in practice, it is envisaged that future research will make use of the foundation resulting from it.

8.9. Conclusion

The research presented in this thesis is important because the research narrative on information systems development in Africa advocates the need to empower users to participate in the design and implementation of information systems (Waema, 1996). Yet, there are no participatory information system development methods that are founded on local norms and traditions to develop such systems in the same spirit of participatory design as practised in Nordic countries and North America, which is founded on the values of those environments.

The gaps identified in existing literature regarding the lack of information systems developed locally for local problems and requirements are the motivation for undertaking the research reported in this thesis. Realising the most important issues that need to be addressed before the actual development of an information system, this research was scoped within URE, PD and African participatory decision-making mechanisms. On this basis, the aim of this research was to develop a locally flavoured participatory user requirements elicitation framework for ISD in resource restricted countries.

To achieve the above aim, this research introduced the concept of participation from the point of view of the local environment. One of the methods introduced is an age old participatory method called imbizo. As a result a number of variations of imbizo were highlighted. Further, the research emphasised that imbizo is not presented as a substitute for existing participatory methods, but rather as an addition. Its aim is to address the lack of participatory methods based on local norms and traditions, which speak to ordinary people instead of business environment people that PD originally

addressed. Similarly, research on the adaptation of PD in other environments was also premised with people from business environments in mind.

Moreover, this research continued by developing a framework to achieve the objectives of the research. The framework was evaluated for its utility to conform to the design science guidelines for the development of an artefact, as described in Chapter 2. Following this, the research demonstrated how the objectives identified were achieved and how the research questions were answered. As a consequence it brought imbizo to the mainstream academic audience. This, we believe, is the first step in answering the call to develop local information systems using local flavoured methods that the existing IS research narrative has been calling for. It also hopes that the ISD and PD research communities will recognise the significance of this expansion of the respective domains and encourage its adoption.

In conclusion, it is appropriate to conclude this research with the views of Peter Checkland (1981):

> *"[…] the work is not finished, and can never be finished. There are no absolute positions to be reached in the attempt by men to understand the world in which they find themselves: new experience may in the future refute present conjectures. So the work itself must be regarded as an on-going system of a particular kind: a learning system which will continue to develop ideas, to test them out in practice, and to learn from the experience gained".*

9 List of Publications and Presentations

During the course of this research the following research papers were published:

1. First paper: (Tyukala, Pottas, & Korpela, 2012a)
2. Second paper: (Tyukala, Pottas, & Korpela, 2012b)

During the course of this study the research output was presented at the following workshops:

Tyukala, M. (2012). [*Presented by Prof Mikko Korpela*]. How to Apply the African Imbizo Tradition in Participatory User Requirements Elicitation. 2nd International Information Systems for Development (ISD4D) Research Seminar and Workshop. Maputo, Mozambique. 26-30 March 2012.

Tyukala, M. (2012). A Participatory Requirements Elicitation Framework for Developing Countries. 3rd International Information Systems for Development (ISD4D) Research Seminar and Workshop. Cape Town, South Africa. 22-24 and 25-26 October 2012.

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