DEVELOPMENT OF A MODEL FOR KNOWLEDGE AUDITING IN THE EASTERN CAPE ESTUARIES WITH SPECIAL REFERENCE TO THE TYOLOMNQA ESTUARY

by

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DECLARATION

I, Pearl Mapeu Maponya, hereby declare that the content of this thesis is my own original work, unless it is specifically indicated to the contrary in the text. This thesis has not been submitted for any other degree to any other university.

Signed: _____

Name: PEARL MAPONYA

As the candidate's supervisor I have/have not approved this thesis for submission.

Signed: _____

Name: PATRICK NGULUBE Date: 19/03/2004

DEDICATION

This work is dedicated to my parents, William Lesetsa and Maria Thabi Maponya. Thank you for the love, care and support you have given me throughout my studies. May God bless you.

ABSTRACT

Estuaries are irreplaceable natural resources that must be managed carefully for the mutual benefit of all who enjoy and depend on them. The estuarine environment is a very dynamic and complex environment, which poses threats and challenges to estuary managers and estuary users. As estuarine management is a very knowledge-intensive task, researchers in the Eastern Cape Estuaries Management Programme (ECEMP), estuary managers and estuary users have recently turned their attention to knowledge management as one of the important means of ensuring continued success and effective management of estuaries. However, knowledge management as an emerging field has been slow in formulating universally accepted methodologies for auditing, capturing, creating, acquiring, sharing and utilising knowledge. Existing methodologies do not adequately address, in particular, the knowledge audit requirements of non-traditional or non-constrained and non-formalised organisations.

The purpose of this study was to develop a context-specific model for auditing knowledge in the Eastern Cape estuaries, with special reference to the Tyolomnqa Estuary. The study intended to identify the knowledge community, analyse existing knowledge and knowledge needs and gaps in the Tyolomnqa Estuary area. In order to achieve the objectives, the descriptive research design, employing the case study approach was used in the study. Focus groups and unstructured interviews were used to collect data. A literature review, concentrating on values and issues surrounding the management of estuaries and key issues in knowledge management and knowledge auditing, was carried out. The collected data was analysed according to themes such as knowledge sources, knowledge identification and knowledge needs and gaps.

The study found that the communities of the Tyolomnqa Estuary lack knowledge concerning the management of estuaries. The study also established that the community has little knowledge on who to contact for expert advice in addressing estuarine issues. Furthermore, the study found that the community needed knowledge on how to address estuarine management issues and how that knowledge could be accessed.

Based on the findings and the literature review, the study proposes a context-specific knowledge audit model for non-traditional organisations. The model is meant to assist non-traditional organisations to evaluate their knowledge health or status, and to develop a much better understanding of the know-how and how it can be used to effectively sustain their services. The model can be used to successfully implement knowledge management strategies in non-traditional organisations. The model needs to be tested for verification and validation purposes.

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CERM:	Consortium for Estuarine Research and Management
DEAT:	Department of Environmental Affairs and Tourism
ECEMP:	Eastern Cape Estuaries Management Programme
ICTs:	Information and Communication Technologies
IFAD:	International Fund for Agricultural Development
KM:	Knowledge Management
n.d.:	Not dated
UPE:	University of Port Elizabeth

LIST OF APPENDICES

CHAPTER ONE: INTRODUCTION TO THE STUDY

"We struggle between 1% of what we know and, 1% of what we don't know, but rarely come across the 98% of what we don't know that we don't know"
(Buckminster Fuller, cited in Multicentric Technology Sdn Bhd 2002).

1.1 Introduction

Knowledge has come to be regarded as the most important asset to all institutions and thus needs to be managed properly (Henczel 2000; Martensson 2000; Radebe 2001; Schaefer, Cook & Barrett 2002). Knowledge management, as a concept that emerged rapidly in the business sector, is gradually gaining acceptance in the environmental sector, for example the management of estuarine knowledge. Managing knowledge is an important and necessary factor for organisational survival. The underlying philosophy behind managing knowledge is to develop and implement appropriate strategies, structures and values to enable participants in an organisation or community to create, share and apply knowledge for the sustenance of their enterprise. In that sense, knowledge management is a holistic process by which an organisation can effectively identify, gather, evaluate, share, analyse and use information from both internal and external sources.

Knowledge is important for decision-making and taking effective action. Knowledge provides the ability to respond to novel situations. This implies that an organisation cannot respond to a situation without proper knowledge in place. It is not about institutionalising knowledge; it is about ensuring that the knowledge is in the right context. To remain at the forefront, organisations must have a good capacity to retain, develop, organise and create a culture of sharing knowledge. Todd (1999) states, "the central argument around which knowledge management revolves is that people hold a wealth of knowledge and experience that represents a significant resource for an organisation". Using the knowledge audit as a first step in developing a knowledge management strategy will ensure successful management of knowledge (Hylton 2002; Kelleher & Levene 2001; Liebowitz *et al.*, 2001; Sallis & Jones 2002; Wiig 1995), particularly the knowledge of the communities of the Tyolomnqa Estuary.

According to the Environmental Protection Agency (2003), "an estuary is a partially enclosed body of water formed where freshwater from rivers and streams flows into the ocean, mixing with the salty sea water". In other words, estuaries are places where rivers meet the sea. They are valued for their scenic beauty and they are a source of recreation, education and aesthetic value. Estuaries are highly complex, dynamic and relatively fragile environments. Protecting them is therefore essential if the natural resources provided by estuaries and the quality of life offered by them is to be maintained (Harrison, Cooper & Ramm 2000; New South Wales, Department of Land and Conservation 2000). In order to effectively manage estuarine environments, decisions should be based on sound scientific information and knowledge and with an agreed, attainable objective for the future state of the estuary. To ensure continued success and effective management of estuaries, local estuary users in the Tyolomnqa Estuary need information and knowledge. It is important for estuary users to maximise their understanding and use of knowledge assets.

Auditing and harnessing knowledge is the most problematic area in knowledge management. Knowledge management is an emerging field for which neither a codified, universally accepted framework nor methodology has been established (Rubenstein-Montano *et al.*, 2001). Most of the methodologies documented in the literature have been implemented in bureaucratic and formal business organisations. Existing methodologies do not adequately address the knowledge audit requirements of non-traditional or non-constrained organisations. The development of a methodology for knowledge auditing in non-constrained environments is potentially useful.

Before discussing the background to the study and the research problem, it is necessary to define key concepts used in the study from the onset, because knowledge management is a new area and its definition has been highly contested.

1.2 Definition of key concepts

This section briefly defines important terms that are used repeatedly in the thesis. By understanding the way these terms are used, the reader will gain a clearer understanding of the nature of the research.

1.2.1 Data, information, knowledge and wisdom continuum

Many writers have addressed the distinctions among data, information, knowledge and wisdom (Allee 1997; Barquin 2000; Beller 2001; Bellinger, Castro & Mills 1997). To ensure that the organisation's knowledge base is used and that it continues to develop, the organisation must take an integrated view of data, information and knowledge, and the knowledge of individuals and groups (Probst, Raub & Romhardt 2000: 17). The progression along the continuum from data, information, to knowledge and finally to wisdom does not occur in discrete stages of development (Bellinger, Castro & Mills 1997). Figure One represents this inherent progression.

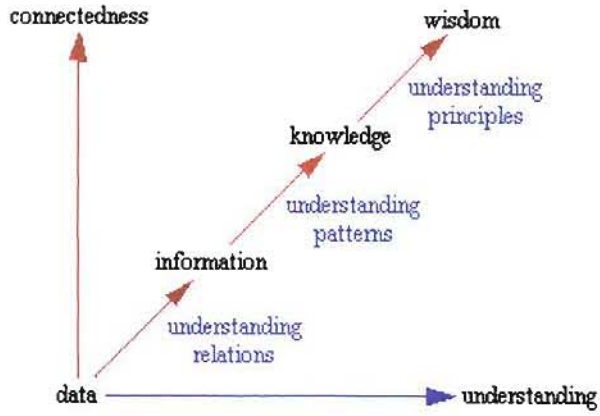


Figure 1: Data, information, knowledge and wisdom continuum (Bellinger, Castro & Mills 1997)

The first layer in Figure One is **data.** According to Suurla, Markkula and Mustajarvi (2002:35), "data refers to codes, signs and signals that do not necessarily have any significance as such". This means that the data are raw facts that have no context or meaning of their own. Organisations collect, summarise and analyse this data to identify patterns and trends. Most of the data thus collected is associated with functional processes of the organisation. To become information, data needs to be contextualised, classified, selected, processed, aggregated and presented in an understandable form (Davenport & Prusak 1998b:4).

The second layer in Figure One is **information**, which as a concept takes up different meanings depending on the context in which it is discussed. Information is when data

becomes organized, patterned, grouped and/or categorized, thus increasing depth of meaning to the receiver (Boone 2001). Therefore the accumulation of data into a meaningful context provides information. Through learning and adoption, information can be changed into knowledge (Suurla, Markkula & Mustajarvi 2002).

The third layer in Figure One is **knowledge**, which is an intrinsically ambiguous term, and therefore defining it precisely is difficult. There is no consensus on the nature of knowledge. At times knowledge is viewed as personal, individual and inaccessible, which could make it difficult to harness.

Much of the current work in the area of knowledge has emerged from the initial work of Michael Polanyi, which draws on Plato's original definition of knowledge as "justified true belief" (Kane 2003; Newell *et al.*, 2002). Newell *et al.*, (2002) argued that such kind of knowledge is individual and does not translate particularly well to the level of the organisation. This implies that beliefs might not be true even if there was a full justification, because people in the organisation might choose not to believe it. Polanyi's work, *"The Tacit Dimension"*, attempts to encapsulate what he perceives as one of the dimensions of knowledge, namely its tacit quality (Kane 2003; Skyrme 2002). Polanyi felt that "we know much more than we can tell" (Newell *et al.*, 2002; Sallis & Jones 2002). The implication of this statement is that there are aspects of what an individual knows that cannot be clearly articulated. This shows that tacit knowledge is difficult to communicate and share.

However, it can be agreed that knowledge is the expertise, experience and capability of individuals, integrated with processes and organisational memory. Other writers, including Nonaka and Takeuchi (1995), have taken this facet of knowledge. Nonaka and Takeuchi (1995) reiterated this distinction between tacit and explicit knowledge. This will be explained in sections 1.2.2 and 1.2.3, respectively.

The fourth layer in Figure One is **wisdom**, which is organised knowledge that creates additional value (Ramanauskiene 2001). Firestone (2001) defined wisdom as "the knowledge of what is true or right, coupled with 'just' judgement about action to

achieve what is right". In other words, it is the capacity to consistently use knowledge effectively with an emphasis on value judgement.

1.2.2 Tacit knowledge

Tacit knowledge is highly personal and hard to formalise. Subjective insights, intuitions and hunches fall into this category (Nonaka and Takeuchi 1995). Tacit knowledge, often referred to as 'know-how', resides in the brains, practical skills and actions of people (Allee 1997; Henczel 2000; Newell *et al.*, 2002; Sallis & Jones 2002; Ubogu 2001).

1.2.3 Explicit knowledge

Explicit knowledge is transmittable in formal, systematic language (Nonaka & Takeuchi 1995). Explicit knowledge, also referred to as 'codified' knowledge, can be easily communicated and shared in the form of manuals of rules, routines and procedures; reports and written specifications (Henczel 2000; Ramanauskiene 2001; Sallis & Jones 2002; Skryme 2002; Ubogu 2001).

1.2.4 Knowledge management

Knowledge management is a term that is used in many different ways by parties with different perspectives and interests. The definitions are different, but they all echo some common purposes of knowledge management. This will be discussed further in section 2.2 of Chapter Two. However, for the purpose of this research the following definition of knowledge management by Skyrme (1997) has been adopted. According to Skyrme (1997), knowledge management is:

> the explicit and systematic management of vital knowledge and its associated processes of creating, gathering, organising, diffusion, use and exploitation, in pursuit of organisational objectives.

Knowledge management is aimed at the development and implementation of appropriate strategies, structures and values or cultures, to enable participants in organisations, communities and other group settings to create, share and apply knowledge, for the realisation of shared objectives.

1.2.5 Information audit

An information audit is a systematic evaluation of information use, resources and flows, with verification by reference to both people and existing documents, in order to establish the extent to which they are contributing to an organisation's objectives (Henczel 2000).

1.2.6 Knowledge audit

Stevens (2000) mentions that the knowledge audit describes what knowledge an organisation has, who has it and how it flows (or does not) in the enterprise. However, Liebowitz *et al.,* (2001) explained that a knowledge audit assesses potential stores of knowledge. It is the first part of any knowledge management strategy. By discovering what knowledge is possessed, it is possible to find the most effective method of storage and dissemination. Part of the knowledge audit is capturing "tacit" knowledge.

The knowledge audit is the process of identifying existing knowledge sources and knowledge needed by the individual, group or organisation. It is the identification of knowledge gaps and flows in order to establish the extent to which they contribute towards achieving knowledge management goals.

1.2.7 Non-traditional organisation

Travica (1999:137) pointed out that the non-traditional organisation is one of the new organisational designs that is "flexible in structure, changeable and adjustable to the purposes at hand, draws on networks of informal information flows, and can be organized quickly for delivering customized products". The non-traditional organisation is free from bureaucratic rigidity pertinent to industrial society. This form of structure is non-constrained, that is it is not a formalised structure, although it does have integrated processes.

1.3 Understanding estuaries

The South African coast is well endowed with estuaries and in many areas they form an important element of the coastal zone, ecologically, economically and culturally (Harrison, Cooper & Ramm 2000). They are unique from other coastal areas because they are a place where various natural forces interact (Mbhele & Mayekiso 2000). An

example of an estuary is shown in Figure Two below, the Keiskamma Estuary. This is one of the permanently open systems and a major source of water in the Eastern Cape region. Estuaries are often the cultural centres of coastal communities, that is focal points for commerce, recreation, customs and traditions (National Estuary Program 2000). The value of estuaries can be assessed from many different perspectives, such as ecological, socio-economic and cultural. Estuaries are valued for their scenic beauty, recreation opportunities and their contribution to the quality of life. Boating, fishing, swimming, surfing, and bird watching are just a few of the many activities people enjoy in estuaries. Estuaries are valued as places for ports, shipping and industry, agriculture, tourism, cities and residential development (Commonwealth of Australia 2002).

Figure 2: Keiskamma Estuary in the Eastern Cape (Photo by CERM UPE)

The Environmental Protection Agency (1998) pointed out that, "as our population grows, the demands imposed on our natural resources increase and protecting these resources for all their natural, economic, and aesthetic values becomes even more important". However, the protection of the estuarine environment in the long term is essential if the natural resources provided by estuaries and the quality of life offered by them is to be maintained (Day & Grindley 1981 cited in Harrison, Cooper & Ramm 2000). This emphasises the fact that human impact issues on the estuarine environment

needs to be addressed in order to protect and sustain the natural resources found in estuaries.

The estuarine environment is a complex blend of continuously changing habitats. Their unique contribution to, and their value for, society is founded on the diverse goods they provide (Institute of Natural Resources 2001:1). Estuaries play an important role in sustaining the rural livelihoods and they provide a wide range of opportunities and benefits. According to the National Estuary Program (2000), estuaries are critical for the survival of many species. Birds, mammals, fish and other wildlife depend on estuarine habitats as places to live, feed and reproduce. These animals are linked to one another and to an assortment of specialised plants and microscopic organisms through complex food webs and other interactions (Michaels 2001).

Besides serving as important habitat for wildlife, the wetlands that fringe many estuaries also perform other valuable services. Water draining from the uplands carries sediments, nutrients and other pollutants. As the water flows through fresh and salt marshes, much of the sediment and pollutants are filtered out. This filtration process creates cleaner and clearer water, which benefits people and marine life (Michaels 2001).

1.3.1 Major issues and pressures affecting estuarine environments

South African estuaries are subject to a range of impacts. It has been identified that there is a complex and diverse range of environmental, socio-economic, management and scientific issues and problems that are considered to be affecting the estuarine environment. This includes, for example, declining estuarine water and sediment quality; degradation and loss of estuarine habitats; unsustainable use of estuarine resources; and lack of research and monitoring of estuarine environments (Boyd 2000; National Estuary Program 2000; Whitfield *et al.*, 2000).

1.3.1.1 Declining water and sediment quality

Declining water quality and sedimentation are regarded among the most serious issues affecting estuaries. Elevated nutrients and sedimentation are largely the result of inappropriate catchment land use practices, sewage discharge and urban run-off (New

South Wales, Department of Land and Water Conservation 2000). The use of pesticides and fertilizers and practices such as monoculture by farmers were identified as leading causes of pollution and sedimentation (Boyd 2000).

1.3.1.2 Degradation and loss of estuarine habitats

Many of the environmental issues relate to water quality and habitat loss and are overlapping in nature. Significant losses of salt marshes and mangroves have occurred near urban areas through reclamations, drainage and other developments (Boyd 2000; Dent & Breen 2001; Mbhele & Mayekiso 2000). This affects fish and other marine life, which are dependent on these areas as nursery and feeding grounds. Furthermore, significant losses have occurred as a result of agricultural drainage.

1.3.1.3 Unsustainable use of estuarine resources

The major human impacts on the estuaries are those due to development, harvesting, recreation and pollution. Over-harvesting of fish by commercial and recreational fishermen, unsustainable tourism, disposal of effluent, draining of coastal wetlands and conflicting resource use are critical issues that are often exacerbated by the above issues (See sections 1.3.1.1 and 1.3.1.2). These impacts pose threats to estuaries. Estuaries are highly complex, dynamic and relatively fragile environments. They are particularly sensitive to inappropriate catchment development, increased sediment and nutrient loads and the degree of tidal flushing or exchange of ocean water (New South Wales, Department of Land and Water Conservation 2000).

The open space and pristine scenery associated with natural estuaries attracts many people and these people enjoy the aesthetic appeal of the natural resources. However, Reimold *et al.,* (1980) cited in Harrison, Cooper and Ramm (2000), pointed out that "when an area has such aesthetic appeal people flock to it and over-use it, thereby reducing the aesthetic qualities that attracted visitors in the first place". Despite their value, estuaries are in trouble.

The estuarine environment is a very dynamic and complex environment, which poses threats and challenges to estuary managers and estuary users. Beckley (2000) pointed out the importance of acknowledging the fact that there are both catchment issues (for example, water extraction, erosion, pollution) and proximate issues in and around

estuaries (for example, housing, port development, bank stabilisation, jetties, fishing, bait collecting, mangrove chopping, sand winning, subsistence netting and boat traffic). The impact on catchments occurs if there is excessive damming and extraction of freshwater and this threatens the functioning of estuaries. Estuaries require a continuous supply of freshwater to maintain salinity gradients (Van Driel & Breen 2001). Pollution comes in the form of plastic, oil, sewage and sedimentation and causes toxicity, eutrophication, sediment loading and a loss of aesthetic appeal (Pauw & Durham 2001). Whitfield *et al.*, (2000) pointed out that South African estuaries are threatened by many anthropogenic influences, including:

- catchment degradation, which leads to excessive siltation within estuaries.
- freshwater deprivation, especially the capture of minor flood events by dams.
- encroachment by agricultural, residential or industrial developments onto the estuarine flood events by dams.
- water pollution arising from harmful agricultural, aquacultural, industrial or residential activities.
- overexploitation of fish and bait resources.
- poor management, including lack of expertise and/or administrative capacity.
- lack of education, particularly among the public, local authorities and regional planners, with respect to the sustainable use of estuaries.
- premature breaching of temporarily closed estuaries.

The above issues impact on the health of estuaries. Over-exploitation of estuary resources can negatively affect recreational and tourism opportunities and reduce the aesthetic value of estuaries. If estuaries are to be managed it is important to consider the consequences of human activities that impinge on estuaries. For example, commercial and subsistence farming increase siltation, decreasing the production of plants. Furthermore, the abstraction of water and building of dams and roads restrict the flow of rivers, with dire effects on the estuarine ecosystem (Branch 2000). When constructed

near the mouth they can stabilise the position of the mouth, interfering with natural processes (Van Driel & Breen 2001).

Given the enormous value of estuarine resources, as well as mounting human pressure on estuarine ecosystems, increasing attention is being given to improving the management of the estuaries, especially in the Eastern Cape. Successful estuarine management requires clearly articulated policies, goals and practices that have public support.

1.3.2 Estuarine management

Estuaries are irreplaceable natural resources that must be managed carefully for the mutual benefit of all who enjoy and depend on them. Estuary management is a complex task, dealing with the use and care of the interface between land, rivers and sea and it is continuously changing. To promote effective management of estuaries there is a need for a deeper understanding of the issues that confront estuary managers. Morant and Quinn (1999), cited in Institute of Natural Resources (2001), pointed out that the management of South African estuaries has been, on a piecemeal basis, driven by sectoral interests. Lack of integrated planning and management is, to a large degree, seen to be the main cause of such fragmented estuary management.

Mbhele and Mayekiso (2000) contend that "estuarine management is not about understanding the biophysical relationships that exist between estuaries but management is about influencing human behaviour as it relates to the systems and processes". This implies that the management of estuaries is multi-faceted and it should incorporate the government at different levels (national, provincial and local), local scale institutions and the community. Beckley (2000), on the other hand, pointed out that "estuarine management should aim for 'best practices' and this requires a good understanding of estuarine functioning as well as decision-making protocols on use and care of estuaries".

Estuary managers and local users need access to information and knowledge generated on issues regarding the estuaries in order to understand and participate in the process of managing estuaries and resources. There is a growing need for estuarine expertise and knowledge in order to manage the estuaries effectively. Estuary managers and users are

faced with a challenge to effectively protect the estuarine biodiversity, sustain estuary resources, monitor the estuary system, rehabilitate the estuary system and to establish a culture of integrated estuary management. It is important for estuary managers and users to locate information and knowledge available on estuaries.

The increasing need for improved estuarine management dictates that the government, estuary researchers, estuary managers and local estuary users must collaborate and co-ordinate. There is no system in South Africa to link estuary management authorities, developers, planners, government, estuary resource users, consultants, local interest groups and conservation services, to support the sharing of data, information and knowledge or to combine them across databases and fields of expertise. There is a growing awareness among estuary stakeholders of the need to develop more consistent and better means to generate, identify, manage, integrate and share information and knowledge on estuaries. This dynamic and complex environment has led researchers in the Eastern Cape Estuaries Management Research Sub-programme and estuary managers and local estuary users of the Tyolomnqa Estuary to search for innovative ways to manage and sustain the Eastern Cape estuaries.

1.3.3 The Eastern Cape Estuaries Management Programme

The Eastern Cape Estuaries Management Programme (ECEMP) was established to promote the formulation of management policies and procedures and to establish management structures for Eastern Cape estuaries. The ECEMP, co-ordinated and managed by the Institute of Natural Resources, has as its main purpose the promotion of effective management and sustainable use of Eastern Cape estuaries. The ECEMP has four Sub-programmes, namely the Local Estuary Management Sub-programme, the Estuary Management Institutional and Policy Development Sub-programme, the Estuary Management Capacity Building Sub-programme and the Estuary Management Research Sub-programme (Institute of Natural Resources 2001).

The Eastern Cape Estuaries Management Research Sub-programme arose out of a recognition that to promote effective management of estuaries there is a need for a deeper understanding of the issues that confront estuary managers and a need to develop additional estuary management processes and tools to enhance estuary management

decision-making (Institute of Natural Resources 2001). The Sub-programme, with its directed research, is driven by the needs of estuary managers and estuary users through effective co-operative governance, co-operative management systems, knowledge management, biodiversity protection, rehabilitation, monitoring and sustainable use of the Eastern Cape estuaries. The Eastern Cape Estuaries Management Research Sub-programme consists of researchers from different institutions.

The Knowledge Management Sub-programme aims at developing knowledge management guidelines for generating and sharing knowledge for the sustainable use of estuaries in the Eastern Cape. The Sub-programme used the Tyolomnqa Estuary as a case study to identify knowledge existing and missing in terms of managing estuaries. Applicable knowledge audit and knowledge sharing models were developed for non-traditional and non-formalised structures such as the Tylomnqa Estuary area.

1.3.4 Tyolomnqa Estuary

The Tyolomnqa Estuary is situated approximately 45 kilometres west of East London, near the coastal resort of Kaisers Beach. The estuary is permanently open to the sea and the mouth is fixed at a rocky spit to the west as is shown in Figure Three below.

Figure 3: Tyolomnqa Estuary (Photo by Coastal Resources Management UPE)

1.3.4.1 Land use surrounding the Tyolomnqa Estuary

A portion of the east bank of the Tyolomnqa Estuary is utilised as an exclusive, low-density residential development, with plots on Chalumna Estates, and it is privately owned. The Chalumna Conservancy bought the farmland (Wood 2002). Outside of this privately owned property, the land is State-owned and under the jurisdiction of Tribal Authorities. The dominant communities on the west bank of the estuary are the Phozi, Ncera, Sandile and Xhama village communities. The east bank is low profile, with little or no agricultural influence, as opposed to the steep-sided west bank, where planted crops and roving cattle can be found intermittently along its entire length (Wood 2002). Tyolomnqa Estuary lies within the Buffalo City Council boundary and falls within the jurisdiction of the regional Department of Environment Affairs and Tourism (DEAT), in conjunction with Marine and Coastal Management of the Buffalo City Marine Services.

1.3.4.2 Access to the Tyolomnqa Estuary

Access to and use of the estuary has been predominantly by those who own property on the east bank or reside within the Tribal Trust Land (mainly on the west bank). There are no formalised access points available to the general public and the use of the estuary is exclusively by those who own property there or reside on the Tribal Trust Land (Wood 2002). However, the public could previously gain access to the estuary via the Tribal Trust Land. As this access was increasingly used by people conducting illegal commercial fishing operations, private owners on the east bank began paying an annual fee to the communities on the west bank to restrict public access (Brett 2000 cited in Institute of Natural Resources 2000).

1.3.4.3 Activities in the Tyolomnqa Estuary

Tyolomnqa Estuary is attractive and its natural heritage has been maintained through a low level of physical development and recreational use. Subsistence farming takes place in the catchment and along the entire length of the river. Recreational impacts, such as fishing and general boating activities, are minimal and mostly confined to riparian property owners and their guests. Subsistence fishing and bait collecting is practised by those who reside within the Tribal Trust Area. However, there is a history of

intermittent poaching and commercial fishing from outsiders targeting the estuary (Institute of Natural Resources 2000).

1.3.4.4 Institutional arrangements in the Tyolomnqa Estuary

A suggestion was made that at the level of an individual estuary Local Estuarine Management Forums could be formed to include directly relevant stakeholder groups and formulate estuarine management plans (Beckley and McKenzie 2000). This kind of structure provides a structure for people with common interests, the estuary and a shared vision of what it should be like to engage and contribute to planning and management at the local level (Dent & Breen 2001).

The key institutions for the integrated management of the Tyolomnqa Estuary are as follows (Institute of Natural Resources 2000):

- National government: Department of Environmental Affairs and Tourism, under the Marine and Coastal Management, is responsible for coastal management and for the use, conservation and development of estuarine living resources.
- Provincial government: co-responsibility with national government for environmental management and conservation. Involved in various aspects of coastal management.
- Local government: falls under the Buffalo City Council for Marine Services.
- Community-based organisations: Tyolomnqa Forum which is made up of members from different villages in the west bank, namely the Phozi , Sandile, Xhama and Ncera villages; and east bank, namely the Chalumna Estates and Chalumna Conservancy.

If estuaries in South Africa are to continue to sustain the desired flow of goods and services to society, better management practices need to be applied. In order to meet these challenges, estuary users need information and knowledge to enhance and successfully facilitate improvement of estuary management. One approach that the Eastern Cape Estuaries Management Research Sub-programme is turning to in its effort to effectively exploit and sustain the management of estuaries is the use of knowledge management. To ensure continued success and effective management of estuaries, it

was important to identify the knowledge that is available and missing in the Tyolomnqa Estuary area. This was done through conducting a knowledge audit.

According to Liebowitz *et al.,* (2001), "one of the critical first steps in the knowledge management area is to conduct a knowledge audit", in order to identify where knowledge is being created, where it already exists and where it is needed to achieve knowledge management goals. The local institutional arrangement in the Tyolomnqa Estuary is a non-traditional and non-formalised structure and therefore developing a context-specific knowledge audit model was essential. This is because, "...there is also no universally accepted model for the information audit process because of the dramatically varying structures, natures and circumstances of the organisations in which they are conducted" (Henczel 2000). Existing models are for formal business organisations and might not be suitable for non-traditional and non-formalised organisations.

1.4 Problem statement

Knowledge in the Eastern Cape estuaries is not harnessed for the effective management of estuaries. The management of knowledge largely hinges upon identifying the existing knowledge and the knowledge gaps. The knowledge audit is one of the tools used for achieving that goal (Hylton 2002; Liebowitz *et al.,* 2001; Sallis & Jones 2002). It is evident from the literature that problems abound in the knowledge audit process, considering that knowledge management has only recently come to the fore. In addition, "one size does not fit all". Therefore, developing a context-specific model for knowledge auditing in a non-traditional and non-formalised structure, as opposed to formal organisation such as business, was essential.

1.4.1 Purpose of the study

The purpose of the study was to develop a context-specific model for knowledge auditing in the Eastern Cape estuaries, with special reference to the Tyolomnqa Estuary area.

1.4.2 Research objectives

The objectives of the research were to:

1. Identify the knowledge community in the Tyolomnqa Estuary area.

2. Analyse existing knowledge sources in the Tyolomnqa Estuary area.
3. Analyse knowledge gaps and needs.
4. Develop a knowledge audit model applicable for non-traditional organisations.

1.4.3 Research questions

Based on the objectives stated above, the following research questions were posed:

1. Who are the knowledge generators and carriers in the Tyolomnqa Estuary area?
2. What knowledge sources exist in the Tyolomnqa Estuary area?
3. What knowledge gaps exist in the Tyolomnqa Estuary area? What knowledge is needed in the Tyolomnqa Estuary area?
4. What applicable techniques exist for conducting a knowledge audit in a non-traditional organisation?

The objectives of the study and the research issues are summarised in Table One below:

Table 1: Conceptualisation of research issues

Research objectives	Research questions	Sources of information
1. Identify the knowledge community in the Tyolomnqa Estuary area.	1. Who are the knowledge generators and carriers in the Tyolomnqa Estuary area?	Interviews, literature Focus groups
2. Analyse existing knowledge sources in the Tyolomnqa Estuary area.	2. What knowledge sources exist in the Tyolomnqa Estuary area?	Literature review (content)
3. Analyse knowledge gaps and knowledge needs.	3. What knowledge gaps exist in the Tyolomnqa Estuary area? What knowledge is needed in the Tyolomnqa Estuary area?	Focus group interviews Workshop
4. Develop a knowledge audit model.	4. What applicable techniques exist for conducting a knowledge audit in a non-traditional organisation?	Literature

1.5 Justification for the study

The established knowledge audit model will contribute to and form a foundation on which future research in auditing knowledge in non-constrained and non-formalised structures could be built. The nature of this study is applied research. It tends to be more practical and emphasises the provision of information that can be used in resolving actual problems. One of the critical first steps in the knowledge management area is to conduct a knowledge audit (Liebowitz *et al.*, 2001). Conducting a knowledge audit will form a solid foundation on which successful knowledge management strategies can be based, by providing knowledge base that enables the identification of how and where knowledge is being created and used and where it is needed to improve the outputs. Despite the fact that it is helpful to perform a knowledge audit prior to commencing a knowledge management initiative, it appears that available models are not suitable for non-traditional and non-formalised structures. Developing a context-specific model for such structures will contribute to the literature on knowledge auditing.

Knowledge strategies can be developed to facilitate knowledge capturing, acquisition, development, sharing and distribution and utilisation for the effective management and sustainability of estuaries in the Eastern Cape. Information and knowledge is important in all aspects. Information and knowledge concerning estuaries must be managed effectively, to ensure that the basic objectives are attained to the greatest extent possible. Knowledge available on estuaries must be nurtured, preserved and used for the effective management and sustainability of estuaries and their resources. This study will benefit researchers in various fields of estuarine environment, estuary managers and local estuary users, in developing a better understanding of knowledge assets and how they can be used to stimulate creativity and innovation in estuary management. The knowledge audit will raise awareness of the importance of collaboration, co-ordination and integration of knowledge assets in the Eastern Cape estuaries. The model could be used in the other estuaries of South Africa.

1.6 Scope and limitations of the study

The study focused its research in the Eastern Cape Estuaries Management Programme, using the Tyolomnqa Estuary as a case study. Knowledge management is a multi-disciplinary area of research, which would be impossible to cover extensively, given the

constraints of time and resources. This study concentrated its efforts on the areas of knowledge management and its application to the environmental sector, such as estuaries. The study focused on conducting a knowledge audit in order to develop a context-specific model for non-traditional structures. The developed model was not tested.

1.7 Literature Review

The literature review discussed the aspects of knowledge management in terms of describing the situation out of which this concept emerged and its approaches. This was seen as important determining the shortcomings related to the theory of knowledge management and how it has been applied to other sectors such as the environmental sector. The study also discussed the knowledge audit and the processes involved. This aspect was the core of the whole research project. The idea was to identify the techniques or models used to conduct knowledge audits. The literature focused on ways of mapping knowledge. This aspect was deemed appropriate, as it relates to the concept of knowledge audit.

1.8 Methodology

The nature of this study was applied research, as it tended to be more pragmatic and emphasised the provision of information that could be used in resolving actual problems. The study used the descriptive research design utilising the case study approach. Data was collected from focus groups and by conducting unstructured interviews with the Tyolomnqa Estuary communities. The methodologies used do not allow results to be generalised, but they provide an in-depth insight into the knowledge status of the Tyolomnqa Estuary communities.

1.9 Thesis outline

The thesis contains six chapters. Chapter One aims at setting the scene for the whole research study. In order to get the reader acquainted with the study, key concepts are defined. The chapter provides contextual background information about the value and issues regarding management of estuaries in the Eastern Cape and challenges faced by estuary researchers, estuary managers and local estuary users. The problem statement, research purpose and research objectives are included. The scope and limitations of the study are explained.

Chapter Two presents a review of various aspects of knowledge management in terms of its emergence and approaches. One of the first steps in knowledge management is to conduct a knowledge audit. The chapter discusses and analyses available research on knowledge auditing and its processes. In order to recognize and locate knowledge in a wide variety of forms, tacit and explicit, formal and informal, codified and personalized, internal and external, mapping knowledge is necessary. The concept of knowledge mapping will be discussed in the chapter. Knowledge management as it evolved rapidly in the business sector, is gaining acceptance in other sectors. It will be explored in the chapter.

Chapter Three details the research design and methodology underpinning the study and explains the basis on which it was chosen. The chapter provides detailed information about the population used in the study, as well as the instrumentation used to gather information from the population. A description of the data collection and analysis procedures will be given in the chapter.

Chapter Four presents, interprets and discusses the results of the study, with reference to the contextual background information regarding estuaries, which was discussed in Chapter One, and with reference to the literature review in Chapter Two. Key themes such as knowledge sources, knowledge identification and knowledge needs and gaps will be used in the interpretation of results.

Chapter Five presents the knowledge audit model for non-constrained and non-formalised structures such as the Tyolomnqa Estuary communities. The chapter will outline and discuss the main processes and sub-processes of the model and their relationship to each other.

Chapter Six draws conclusions and makes recommendations. It summarizes the main aspects of the research and points out directions for future research work.

1.10 Summary

Estuarine management is facing a number of far-reaching changes. These changes require that information and knowledge be managed to ensure continued success and effective management of estuaries. Success begins and ends with people. Engaging with knowledge management will ensure the sustainable use of estuaries in non-traditional structures such as the Tyolomnqa Estuary.

In view of the above notions, this chapter introduced the study. Key concepts were defined in order to get the reader acquainted with the research. The study provided contextual background information about the value and issues regarding the management of estuaries and challenges faced by local communities in the Tyolomnqa Estuary. The role of researchers in the Eastern Cape Estuaries Management Programme in addressing the issues impacting estuaries was discussed. The chapter also presented the statement of the problem, as well as research objectives and questions. The chapter established the justification, scope and limitations of the study. The research methodology and literature reviewed in this study were dealt with.

CHAPTER TWO: LITERATURE REVIEW

"An immense and ever-increasing wealth of knowledge is scattered about the world today; knowledge that would probably suffice to solve all the mighty difficulties of our age, but it is dispersed and unorganised. We need a sort of mental clearing house for the mind: a depot where knowledge and ideas are received, sorted, summarized, digested, clarified and compared" (H.G. Wells, cited in Multicentric Technology Sdn Bhd 2002).

2.1 Introduction

Knowledge management is a concept that has emerged rapidly in the business community and has been the subject of much discussion over the past decade (Allee 1997; Bhatt 2002; Davenport & Prusak 1998b; Probst, Raub & Romhardt 2000; Skyrme 1997; Wiig 2000). This indicates that knowledge management is seen as important for organisational survival. It is a complex concept, influenced by a set of multi-disciplines and subjects (White 2002:iv). The recent emphasis on knowledge management arises out of the need for organisations to leverage their knowledge base to survive the knowledge economy. Skyrme (1997) claimed that knowledge management is now a well-established discipline in many large organisations. However, the field of knowledge management has been slow in formulating universally accepted methodologies for auditing, capturing, creating, acquiring, sharing and utilising knowledge.

The review begins by looking at attempts made to define knowledge management as a multidisciplinary concept. This chapter will also describe the situation from which knowledge management emerged. Different attempts to determine knowledge management have been undertaken and this review will present various knowledge management approaches. Most organisations in various sectors are becoming knowledge-based and thus knowledge is important for decision-making and a necessary factor for organisational survival. Organisations need to identify their know-how and determine how it can be shared throughout the organisation. The knowledge audit is the first major stage of a knowledge management initiative and a knowledge management programme or system should never be implemented without a knowledge audit having

been conducted. This chapter discusses the knowledge audit and processes involved in conducting it. The knowledge audit is important as it assesses potential stores of knowledge. In order to recognize and locate knowledge in a wide variety of forms, tacit and explicit, formal and informal, codified and personalised, internal and external, mapping knowledge is necessary. The chapter will discuss the role of knowledge mapping for improving knowledge management and concludes by looking at how knowledge management has been applied in various sectors.

2.2 Defining knowledge management

Knowledge management is not easy to define and many definitions supplied in the literature are highly ambiguous. Ambiguity makes knowledge management amenable to multiple interpretations, which potentially extends its relevance across different communities of practice. A study by Raub and Ruling (2001) found that there was not an accepted single area of discourse within the academic or popular management literature. The scope of knowledge management is wide and the existing literature gives an endless number of definitions from various authors (Mockler & Dologite 2002; Scarbrough, Swan & Preston 1999; Skyrme 1997; uit Beijerse 1999). As a result, the term knowledge management is often problematic, as there is little consensus regarding its definition (Neef 1999; Bhatt 2001).

In addition, Yu (2002) stated that, although knowledge management has been seen as used widely in companies, governments, institutions and other organisations, there is no one unique definition of knowledge management. Others argue that knowledge management is closely related to concepts such as organisational learning, organisational memory, information sharing and collaborative work (Schultze 1998, cited in Venters 2002). Mockler and Dologite (2002:14) refers to the practice of knowledge management as

> the process of identifying and generating, systematically gathering, organising and providing access to, and putting to use anything and everything which might be useful to know when performing some specified business activity.

Their view of knowledge management as a process puts emphasis on knowledge that adds value to the organisation, in that it should be knowledge that should be used

effectively to respond to situations. Similarly a definition by Skyrme (1997) states that knowledge management is:

> the explicit and systematic management of vital knowledge and its associated processes of creating, gathering, organizing, diffusion, use and exploitation. It requires turning personal knowledge into corporate knowledge that can be widely shared throughout an organization and appropriately applied.

Skyrme's (1997) definition stresses that unless something is made explicit, it frequently does not get properly managed. Managing knowledge in a systematic way helps create consistency of methods and the transfer of best practices. Knowledge should add value to the organisation, that is, critical knowledge should be identified and managed in a formalised way. It is evident that the definition emphasises the fact that tacit knowledge needs to be turned into explicit knowledge in order to be shared throughout the organisation, to achieve its desired goals.

Within a literature review of knowledge management, Scarbrough, Swan and Preston (1999), cited in Venters (2002), defined knowledge management as "any process or practice of creating, acquiring, capturing, sharing, and using knowledge, wherever it resides, to enhance learning and performance in organisations". Such a definition, while encompassing aspects of "process" around knowledge management, implies an essentially objectivist view of the subject. The term knowledge management as pointed out by Denning (2000a), is used to refer to a broad collection of organizational practices and approaches related to generating, capturing and disseminating know-how and other content relevant to the organisation's business. Knowledge management is seen as a way of managing and integrating work processes through knowledge.

According to Macintosh (1999), knowledge management involves the identification and analysis of available and required knowledge assets and knowledge asset related processes and the subsequent planning and control of actions to develop both the assets and the processes, so as to fulfil organisational objectives. Macintosh (1999) implies

that knowledge management is not only about managing knowledge assets but also about managing the processes that act upon the assets. These processes include developing knowledge, preserving knowledge, using knowledge and sharing knowledge. By knowledge assets, Macintosh (1999) refers to collections of knowledge, which can be exploited by the organisation for value. However, there are problems associated with identifying these knowledge assets and being able to use them and manage them in an efficient and cost-effective manner. Organisations need to be able to identify, model and explicitly represent their knowledge and to share their knowledge and to create a culture that encourages knowledge sharing.

Overall, whatever the term employed to describe it, knowledge management is increasingly seen not merely as the latest management fashion, but as signalling the development of a more organic and holistic way of understanding and exploiting the role of knowledge in the processes of managing and doing work and as an authentic guide for individuals and organisations in coping with the increasingly complex and shifting environment of the modern economy (Denning 2000a).

The field of knowledge management is relatively new and quickly expanding. Many of the terms and definitions used are dependent on the organisation implementing the concept. The exact definition of knowledge management varies but the concept is the same. As organisations recognise and value knowledge as a strategic resource, they need tools, such as standards, that help them define, organise, classify and re-use organisational knowledge. In defining knowledge management, standards set a framework or approved model by which organisations can measure their level of excellence in applying knowledge management activities and processes to ensure that knowledge is identified, classified, communicated and created effectively (Freeman 2001:27).

Most definitions suffer from the lack of careful treatment of the words "management" and "knowledge". Firestone (2001) feels that knowledge management experts think that knowledge management is not a form of "management" and therefore does not have to be defined or characterised in a manner consistent with well-established meanings of

that term. Most knowledge management definitions tell a little about the activities that are part of the concept and the target of those activities.

It can be argued that knowledge management is aimed at the development and implementation of appropriate strategies, structures and values or cultures, to enable participants in organisations, communities and other groups to create, share and apply knowledge for the realisation of shared objectives. Knowledge management focuses on turning personal knowledge into organisational knowledge, in that it can be shared throughout the organisation (Skyrme 1997). Knowledge management is set to offer many opportunities for today's organisations; it enables organisations to identify people that have the expertise and know-how. In other words, knowledge management is aimed at making knowledge usable for more than one individual, for example for an organisation as a whole, to share it.

2.3 The emergence of knowledge management

The literature and theories concerning knowledge management have grown remarkably during the past years and many organizations have embarked upon knowledge management programmes (Scarbrough & Swan 1999; Venters 2001). Knowledge management has existed and has been used for a long time, although it was not recognised as what it is until a few years ago (Davenport & Prusak 1998b).

Knowledge management has become very popular, particularly as we are in the "information age" and "knowledge era", and much has been written on the topic from various disciplines, including management, strategy, economics and computer science. Some of the intellectual roots of knowledge management in various disciplines, such as psychology, aimed at understanding the role of human behaviour; in economics and social sciences focused on understanding the role of knowledge in society; and in business theory aimed at understanding work and its organization (Wiig 1999). Each of these disciplines has provided numerous viewpoints and approaches to knowledge management, although they all centre around the notion that knowledge is a valuable asset that must be managed (Henczel 2000; Martensson 2000; Radebe 2001; Schaefer, Cook & Barrett 2002). The essence of knowledge management is to provide strategies

to get the right knowledge to the right people at the right time and in the right format (Milton *et al.,* 1999, cited in van Beveren 2002).

Wiig (1999) pointed out that the broad, present-day knowledge management has many origins. One comes from abstract philosophical thinking, that is understanding the role and nature of knowledge and permission of individuals to think for themselves. Another comes from concrete concerns for requirements of expertise in the workplace. Others come from perspectives of educators and business leaders. It can be said that there are theoretical and empirical origins to knowledge management (Martensson 2000; Prusak 2001). Wiig (1999) stated that recent perspectives come from efforts to explain economic driving forces in the "knowledge era" and from 20th century efforts to increase effectiveness.

2.3.1 Managing knowledge in a knowledge economy

Knowledge management grew in popularity as organisations began to realise the importance of better managing what became recognised as one of their most valuable assets, namely their knowledge. The emergence of knowledge management may be explained by the confluence and natural evolution of several factors. The need to manage knowledge is strong. Skyrme (1999) noted that "an increasing proportion of today's wealth creating industries are knowledge intensive", estimating that 70% of work is information or knowledge related. Furthermore, organisations are attempting to place a value on their collective intellectual assets, known as 'intellectual capital'.

To some organizations, managing knowledge is a necessity, driven by the forces of competition, market place demands, new operating and management practices and the availability of knowledge management approaches and information technology. Mann (2002) indicated that knowledge management has evolved from the academic thinking of Peter Drucker in the 1970s, from a management thinking perspective; and from Nonaka and Takeuchi in the 1990s, when they introduced the concept of a 'knowledge company'. The concept coincided with the rise of the idea of a post-industrial economy, which placed increasing value on the importance of knowledge and innovation in the economy and less on physical assets. As a result, the success of an organisation is based on what it knows.

2.3.2 Changes in work patterns and organisational environments

Carrillo (2000) felt that the emergence of knowledge management seemed, to a great extent, to be business driven. Global competition, the ever-increasing pace of change and the continuous onslaught of the new challenges in business and industry are placing substantial pressures on all types of organisations. It is pointed out in the literature that most organisations are trying to deal with the effects of downsizing, globalisation and employee turnover. Ramanauskiene (2001) argued that to establish long-term competitive advantages from information and knowledge management points of view, it is no longer sufficient for a business to depend solely on having efficient access to internal and external information resources. It has now become a business requirement to efficiently exploit what the business actually knows, not only what it owns.

DiMattia and Oder (1997) indicated that the growth of "knowledge management" has emerged from two fundamental shifts: downsizing and technological development. During the 1980s, downsizing was the popular strategy to reduce overheads and increase profits. Corrall (1998) noted that one of the effects of downsizing in the 1980s was a loss of corporate memory, that is, the downsizing strategy resulted in a loss of important knowledge, as most workers left and took the knowledge with them. Their accumulated knowledge was not tapped.

The practice of downsizing was a mistake for most organisations. Newell *et al.*, (2002:15) pointed out that "organisations only discovered that they had 'lost' valuable knowledge required for critical organisational processes which could no longer be located within the organisation". With time, organisations had failed to appreciate the value of knowledge and expertise held by their staff. One of the main benefits offered by knowledge management is its potential to counteract this effect. This led management to undertake a knowledge management strategy in an effort to store and retain employee knowledge for the future benefit of the company (Forbes 1997 in Martensson 2000). Townley (2001) described how increased fluidity in working patterns led to a reduction in the amount of knowledge retained within an organisation. Townley (2001) further noted,

> knowledge that used to be concentrated in one person or process increasingly is being held by multifunctional teams with limited life spans, operated with rapidly changing systems and environments.

Viewing organisational knowledge as an asset to be managed has helped organisations to plan strategically and manage the flow of knowledge among staff.

The changing organisational environments demand more knowledge utilisation and knowledge creation at the organisational level. Such environments need flexible and adaptive organisations. Newell *et al.*, (2002:14) stated " a significant impact of these changes is visible changes in organisation structures". It has become necessary for managers and executives to address knowledge management. In other words, the importance of managing knowledge can be seen as a response to some profound problems and changes occurring in organisations. For example, Hanka and Fuka (2000) are among many authors who have argued that knowledge management may help organisations deal with the increasing problem of information overload. They felt that an emphasis on the distribution and delivery, as opposed to the storage of knowledge, would better help staff access knowledge when it is needed.

Technological development has heightened the interest in knowledge management through two main sources: the growth of information resources such as the Internet and the accelerated pace of technological change. In addition, technological developments in the 20th century have transformed the majority of wealth-creating work from physically based to knowledge-based (EnterWeb 2002). Technology and knowledge are seen as key factors of production. The recent information technology development has affected the lives of people and organisations (Martensson 2000) and this makes people feel that they are missing important details concerning information. DiMattia and Oder (1997) felt that knowledge management is an attempt to cope with the explosion of information and to capitalise on increased knowledge in the workplace.

Although knowledge is being recognized as the most important strategic asset that an organisation has, many information units are being closed or downsized and organisations are encouraging information users to acquire, control and manage their

own resources that support knowledge creation and development (Henczel 2000). Skyrme and Amidon (1997), in Doyle and du Toit (1998:92), listed four key factors, which have given rise to the concept of knowledge management. These are:

- Realisation of the changing roles of knowledge in society and business;
- Cost avoidance by reducing duplication of knowledge processes;
- Knowledge leverage as a competitive enabler; and
- Increasing appreciation of the value of intangibles, which is often reflected as intellectual capital in the share price of listed companies.

As a result, knowledge management is aimed at identifying best practices and know-how, in order to avoid "re-inventing the wheel". Kalseth and Cummings (2001) pointed out that "the concept of knowledge management is about identifying means for business performance and business improvements, comprising both work performance, deliveries, and products and services". Knowledge management requires that organisations be knowledge-based in order to achieve their desired goals.

Skyrme (2002) pointed out that there are recurring drivers that are found to increase growth and interest in knowledge management:

- Dispersion – the organisation is dispersed over several geographic locations. This makes it more necessary to find out what is already known elsewhere, to avoid 'reinventing the wheel'.
- Minimising uncertainty and risk – better access to relevant knowledge will help managers make better decisions and so minimise various risks that may confront the business.

What Skyrme (2002) is saying is that knowledge management is seen to play a major role in decentralised and globally dispersed organisations and it tends to emphasise integration of knowledge sources, to avoid duplication. An example can be made from the case of the Ebank organisation (Newell *et al.*, 2002). The Ebank is a large European bank, which is globally dispersed and located across 70 different countries, worldwide. It had a number of product divisions, including domestic, international and investment banking. The major issue was that its services were not integrated, which made sharing of knowledge difficult. In order to avoid 'reinventing the wheel', Ebank developed a

global network to integrate the knowledge existing within the bank. This was basically a knowledge management initiative (Newell *et al.*, 2002). Organisations embark on knowledge management for various reasons. The central argument around knowledge management is to make knowledge available and accessible, thus enabling organisational managers to make effective decisions.

The focus of knowledge management today is driven by the need to share, collaborate and learn internally and externally in the organisation. Alavi and Liedner (1999), cited in Rubeinstein-Montano *et al.*, (2001), indicated that many organisations are developing information systems designed specifically to facilitate the sharing and integration of knowledge. Thus knowledge management is viewed as a survival technique for most organisations; and organisations have become knowledge-based. The driving forces behind knowledge management have led to the development of frameworks or approaches to determine knowledge management.

2.4 Approaches to knowledge management

Knowledge management is a young discipline for which neither a codified, universally accepted framework nor methodology has been established (Rubenstein-Montano *et al.*, 2001). The field of knowledge management has been slow in formulating a universally accepted methodology. Standardised knowledge management methods and techniques are still not available. In spite of this fact, there have been several efforts to develop frameworks to understand knowledge management which have been implemented across a variety of organisations (Bhatt 2001; Holsapple & Joshi 1999; Probst, Raub & Romhardt 2000; Rubenstein-Montano *et al.*, 2001). These frameworks have always dealt with high level processes only, have been too specialised on specific aspects, or dealt with knowledge management too broadly. The following sections will review the knowledge management methodologies that have been reported in the literature (Bhatt 2001; Probst, Raub & Romhardt 2000; Rubenstein-Montano *et al.*, 2001) and discuss important insights gained from the current state-of-the-art. These frameworks or approaches are classified as specific or, what Holsapple and Joshi (1999) call, 'prescriptive' methodologies. In other words, frameworks prescribe methodologies to follow in dealing with knowledge management.

Knowledge management includes various processes such as acquisition, creation, renewal, archiving, dissemination and application (Malhotra 2000:53). Probst, Raub and Romhardt (2000) stated that knowledge management has six core processes: knowledge identification; acquisition; development; sharing and distribution; utilisation; and retention. Bhatt (2001) categorised knowledge management into knowledge creation; knowledge validation; knowledge presentation; knowledge distribution; and knowledge application activities. Rubenstein-Montano *et al.,* (2001) developed a specific methodology for knowledge management called SMARTVision. The methodology incorporates the following phases: strategise; model; act; revise; and transfer. The approaches for knowledge management activities differ, reflecting the unique character of each organisation. Abell and Oxbrow (2001:44) felt that the selection of approach is very dependent on the products and services of the organisation. Despite the variations there are nevertheless common elements and features that are characteristic of the environments that are being developed to compete with knowledge.

The opinion of Probst, Raub and Romhardt (2000:31) was that knowledge could be developed. They refer to *knowledge development* as a process of "generating new skills, new products, better ideas and more efficient processes". They contended that knowledge development could be facilitated in the organisation's market research and in its research and development. Bhatt (2001) pointed out that *knowledge creation* refers to the ability to originate novel and useful ideas and solutions. He contended that knowledge could not be created through planning, but that knowledge creation is an emergent and evolving process. Bhatt (2001) did not recommend organisations to create new knowledge from scratch, but organisations could create knowledge through analysing existing profiles or knowledge that exists. In their book, Nonaka and Takeuchi (1995) hypothesised that knowledge creation is a continuous circular process. This means that organisational knowledge needs to be evaluated and updated. Nonaka and Takeuchi (1995) reiterated that organisational knowledge creation should be understood as a process that 'organisationally' amplifies the knowledge created by individuals and crystallises it as part of the knowledge network of the organisation. This facilitates the exchange, sharing and utilisation of knowledge and information within the organisation. When an organisation has identified what it knows, valued and prioritised that knowledge, and develops mechanisms for leveraging and sharing it, it leads directly

to the creation of new knowledge. Rubenstein-Montano *et al.*, (2001) argued that in the 'act' phase, knowledge could be created through having an open discussion with customers and interested parties, both internal and external to the organisation; and by performing exploration and discovery.

Comparing these perspectives, Bhatt (2001), Probst, Raub and Romhardt (2000); and Rubenstein-Montano *et al.*, (2001) have differing views in terms of how new expertise can be created or developed. Bhatt (2001) stresses that knowledge creation is emergent and evolving, whereas Probst, Raub and Romhardt (2000) contend that new expertise can be developed and anchored in the organisation's research and development department. Rubenstein-Montano *et al.*, (2001) place more emphasis on the fact that the knowledge creation stage should be planned, rather than allowed to occur automatically.

In order for the organisation to learn, knowledge should be validated. Bhatt (2001) refers to *knowledge validation* as "the extent to which a firm can reflect on knowledge and evaluate its effectiveness for the existing organisational environment". It can be argued that an organisation should be in a position to analyse the knowledge available in terms of value that it adds, or whether the knowledge plays a major impact on the organisation's survival. Bhatt (2001) stated "for organisations it becomes important that they continually review, test, and validate their knowledge base to keep up with the latest knowledge discipline and discard the outdated knowledge". Bhatt (2000b) pointed out that, in most cases, multiple and continual interactions between technologies, techniques, and people may be necessary to test the validity of the knowledge.

However, Rubenstein-Montano *et al.*, (2001) suggested that it is important for the organisation to conduct a knowledge review for validity and accuracy. Their emphasis is placed on performing quality control and relevance review. The organisation should determine and analyse whether the knowledge available is pertinent to the demands of responding to situations and making decisions. Probst, Raub and Romhardt (2000:34) stated that the way the knowledge goals are formulated determines the ways in which they can be assessed. The emphasis is on *knowledge assessment*. As a result, knowledge has to be appraised or evaluated. Probst, Raub and Romhardt (2000) felt

strongly that the monitoring process is essential for the effective adjustment of long-term knowledge management procedures.

It has been established that knowledge is a valuable asset to corporations. However, Huseman and Goodman (1999) pointed out that the ability to manage knowledge as an asset, allocate its value, and leverage its worth starts with the ability to identify, value, and prioritise it. The process of validating or evaluating knowledge seems to be related to technology when it becomes obsolete, as there are new advances. Evaluating knowledge becomes important when there are high demands for knowledge. It can be argued that knowledge needs to be updated in terms of relevancy, accuracy and quality. Bhatt (2001) articulated that there are number of ways through which an organisation can employ its knowledge resources. For example, an organisation could repackage available knowledge in a different context, raise the internal measurement standard, train and motivate its people to think creatively and use their understanding in the organisation's processes and services, that is making knowledge more active and relevant for the organisation creating values. Therefore knowledge needed by the organisation to achieve its goals has to be a valuable asset that can be used effectively to keep up with the high demands and supply of knowledge. As a result, organisations will remain competitive in the knowledge economy.

Organisations are beginning to realise that there is a vast and largely untapped asset diffused around the organisation – knowledge (Gupta, Iyer & Aronson 2000). In order for organisations to realise what they know, knowledge needs to be identified. The process of knowledge identification involves analysing both the internal and external knowledge useful to the organisation, in order to clearly define and describe the organisation's knowledge environment (Probst, Raub & Romhardt 2000). Knowing what knowledge is available within the organisation helps to avoid duplication of efforts.

Knowledge identification may reveal gaps in the availability of knowledge within the organisation. Knowledge which is not available within the organisation can be acquired if it is felt it will be useful to the goals of the corporation. Huseman and Goodman (1999:204) pointed out that there are times when an organisation does not possess certain knowledge internally and does not have the skills to find it. This will require the

organisation to look outside its own boundaries. The organisation must outsource or acquire new knowledge. Knowledge, especially tacit knowledge, can be acquired through external consultants; while explicit knowledge can be acquired through the purchase of various knowledge products and media such as blueprints, technical reports, software and research reports. Probst, Raub and Romhardt (2000) pointed out that most companies import a substantial part of their knowledge from outside sources. In this case, systematic knowledge management must take these possibilities into account. Strategic alliances can also be made with relevant institutions for the sake of knowledge acquisition.

When knowledge has been identified, it needs to be visualised or represented (Kazi *et al.*, 2002). Locating vessels of knowledge and constructing what Davenport and Prusak (1998b) call "knowledge maps" would then be possible. Rubenstein-Montano *et al.*, (2001) stated that it is important to formalise how knowledge is represented. They suggested that knowledge should be classified and encoded. The emphasis is placed on the way knowledge is displayed, for example the use of knowledge mapping. Rubenstein-Montano *et al.*, (2001) emphasised that knowledge should be organised and stored in the knowledge management system. Bhatt (2001) refers to the ways knowledge is displayed to the organisational members as *knowledge presentation*. He indicated that organisational knowledge is distributed and scattered in different locations, embedded in different procedures and stored in different media such as disks and optical media.

Bhatt (2001) is of the view that organisational members might find it difficult to integrate and interpret information in different perspectives due to different formats. He suggested that an organisation might choose to employ similar codification standards and make use of predefined templates and schema to present data, information and knowledge. Probst, Raub and Romhardt (2000) emphasised that there should be knowledge retention. Thus, the processes for selecting, storing and regularly updating knowledge of potential future value must therefore be carefully structured. Knowledge retention depends on the efficient use of a wide range of organisational storage media. Murray (1999) pointed out that there are five ways in which knowledge may be represented, namely conceptual indexing, conceptual mapping, hypertext, information modelling and semantic networks. The purpose of representing knowledge is, therefore,

to point to the stores and location of knowledge that exist throughout an organisation (Huseman & Goodman 1999).

One of the most common goals of knowledge management activities is the encouragement of knowledge sharing. Once knowledge has been captured, represented and converted, it needs to be shared efficiently (Kazi *et al.*, 2002:158). The notion of knowledge sharing has attracted much attention from researchers and practitioners in the field of knowledge management (Chua 2003). One of the major challenges facing organisations is how to ensure that knowledge is shared. McEvily, Das and McCabe (2000) stressed that knowledge sharing is an important strategy for developing a competitive advantage. Knowledge needs to be *distributed and shared* throughout the organisation, before it can be exploited at the organisational level (Bhatt 2001). In reality, distribution and knowledge sharing is not an easy task (Davenport 1994). The interactions between organisational technologies, techniques and people can have a direct bearing on knowledge distribution. The sharing and distribution of knowledge within an organisation are a vital precondition for turning isolated information or experiences into something that the whole organisation can use (Probst, Raub & Romhardt 2000:31). For many organisations, this can be the most daunting aspect of knowledge management because it has to overcome several barriers (Huseman & Goodman 1999).

Many studies have been conducted to identify the factors that impede knowledge sharing. One factor is the lack of visible top management support for knowledge sharing activities (Trussler 1998). Organisations with rigid hierarchies and avenues of communication may find that organisational members do not see any opportunity to share what they know. Another factor is the failure to make knowledge sharing a basis for advancement in the organisation (Hiebeler 1996). Knowledge sharing requires a change in organisational culture. Kazi *et al.*, (2002) contended that in the past, there has always been some resistance to change, as people view knowledge as an individual asset rather than an organisational one. The establishment of a successful knowledge-sharing programme will ensure that organisational members understand the benefit of sharing experience and expertise (Kelleher & Levene 2001). Most existing incentive systems neither recognise nor reward knowledge sharing behaviour. The final and probably the

most significant factor is the lack of a relationship between the source and the recipient of knowledge (Chow, Deng & Ho 2000). In most cases, organisational members are not willing to share knowledge in order to achieve the organisational goals. These factors are actually mutually reinforcing and the resultant effect is a cultural resistance to knowledge sharing.

Knowledge management approaches, as discussed by different authors, are being approached from a variety of perspectives and with a variety of methodologies. Each, in its own way, contributes to an understanding of knowledge management phenomena. The comparison of these frameworks yields several notable observations. First, there is not a common or standard way of characterising knowledge management activities. Second, there is not a way of characterising influences on the conduct of knowledge management. Lastly, no individual knowledge management framework subsumes the others. In order to promote a common understanding of knowledge management, it is essential to organise and consolidate knowledge management activities in a way that not only describes each activity but also identifies their interrelationships. Ideally, all of this can be accomplished in the creation of a new knowledge management framework that achieves unification within and across each of the content dimension. Having an integrated knowledge management approach is the key to successful knowledge management activities.

The key limitations of existing methodologies include their lack of detail, lack of an overseeing framework and failure to address the entire knowledge management process. However, each methodology does address important parts of the knowledge management process that incorporates strategy, culture and learning. Rubenstein-Montano *et al.,* (2001:306) pointed out that in an effort to address the entire knowledge management process the methodology should be consistent with the notion of systems thinking. Systems thinking is important for knowledge management because it encourages consideration of the entire knowledge process and facilitates the linkage between knowledge management initiatives and the strategic goals and objectives of an organisation.

2.5 The knowledge audit

Knowing how to do things better and being fit to respond to situations ensures the survival of the organisation. Considering that knowledge is becoming such an important asset, the future success of organisations will be directly related to its ability to create, capture, store and disseminate its knowledge. Developing procedures that facilitate the identification, flow, learning and sharing of knowledge will become essential. One of the critical first steps in the knowledge management area is to conduct a knowledge audit in order to successfully implement knowledge management (Abell & Oxbrow 2001; Cuthbertson & Farrington 2002; Hylton 2002; Kelleher & Levene 2001; Liebowitz *et al.*, 2001; Probst, Raub & Romhardt 2000; Sallis & Jones 2002; Wiig 1995). The following sections will focus on the role of a knowledge audit and the processes involved in carrying it out.

2.5.1 Defining the knowledge audit

Hylton (2002:1) defines the knowledge audit as "the all important first major phase or step of a knowledge management initiative, and is used to provide a sound investigation into the company or organisation's knowledge". In other words, it is a review or an analysis of the organisation's current knowledge status. Wiig (1995) defines the knowledge audit as a

> survey and characterisation of the status of knowledge in an organisation. Knowledge audit may refer to identifying specific knowledge assets such as patents and the degree to which these assets are used, enforced and safeguarded.

The above definition implies that organisational knowledge should be reviewed and typified. Wiig's (1995) definition of knowledge audit seems to put emphasis on explicit knowledge, without mentioning tacit knowledge. The knowledge audit should identify an organisation's knowledge assets, how they are produced and by whom (Henczel 2000:215). Cuthbertson and Farrington (2002:146) felt that "the knowledge audit should look at current levels of corporate knowledge management, identification and clarification of knowledge management opportunities, and the perceived value of

knowledge within the organisation". The knowledge audit helps to determine and identify areas for improvement and opportunities to leverage knowledge.

It can be stated that the knowledge audit is a process of identifying and analysing the way knowledge is used and how it flows within the organisation, with verification by reference to both people and existing documents, in order to establish the extent to which they are contributing to an organisation's objectives. In other words, the knowledge audit identifies those areas of the organisation that are producing knowledge.

2.5.2 The role of the knowledge audit

Why is it critical to conduct a knowledge audit prior to commencing a knowledge management initiative? Sallis and Jones (2002:54) stressed that "a knowledge audit can identify key issues within the organization relating to the way knowledge is used and the factors that encourage and inhibit it". A complete or detailed knowledge audit offers a wide comprehensive examination, review, assessment and evaluation of an organisation's knowledge abilities, its existing knowledge assets and resources and of its knowledge management activities. Keller and Levene (2001) stated that "conducting a so-called 'knowledge audit' would show how employees currently store, access, use and share knowledge that they need to do their jobs". Abell and Oxbrow (2001:267) were of the opinion that a knowledge audit is a review of the knowledge required by an organisation, department or group in order to carry out its objectives effectively. It will include a needs analysis, information, competencies and communication audits and a review of interactions and knowledge flow. The knowledge audit is aimed at analysing gaps and sinks in order to determine the knowledge needed within the specified field.

Probst, Raub and Romhardt (2000) stressed that when identifying the knowledge that an organisation has, it is important to understand the knowledge environment. That implies examining systematically how knowledge is created and how it flows within the organisation. The reason for this is that organisations often see only that which they have previously learned to see and miss important details. As a result, they lose opportunities to import knowledge, to co-operate with external experts, or to use important networks outside the boundaries of the organisation (Probst, Raub & Romhardt 2000). This means that a knowledge audit can measure the strengths and

weaknesses of the institution (Sallis & Jones 2002:54). In fact the purpose of the knowledge audit is to uncover or unravel the knowledge that adds value to the organisation.

Gianetto and Wheeler (2000:37) pointed out that the role of the knowledge audit is to define the broad 'knowledge landscape' of the organisation as a prelude to creating more precise 'knowledge maps'. It could be extended to cover all information and knowledge, from whatever source is held, used or required by the organisation. Gianetto and Wheeler (2000:38) and Stevens (2000) stated that a knowledge audit allows the organisation to determine the knowledge needs and gaps; how knowledge is created, acquired and used; how knowledge flows through the organisation; and to determine the organisation's intellectual assets and their value. Thus the information gained will help the organisation plan the next step in the knowledge management process. A key part of the knowledge audit should be to assess factors that potentially inhibit or promote knowledge sharing (Keller & Levene 2001:31).

Therefore a knowledge audit assesses potential stores of knowledge. It is the first part of any knowledge management strategy. By discovering what knowledge is possessed, it is possible to find the most effective method of storage and dissemination (Liebowitz *et al.,* 2001). The knowledge audit serves the purpose of providing evidence-based information and knowledge of the audited units' current knowledge status or 'knowledge health'. The main purpose of the knowledge audit is to help the audited unit or organisation to determine what it knows, who knows what, what it does not know, what it needs to know and how it should go about improving the management of its existing knowledge (Hylton 2002).

A proper knowledge audit evaluates how knowledge moves through the organisation, who has what knowledge and what they do with it. It examines and evaluates the organisation's knowledge environment, its knowledge ecology, its knowledge use and sharing. In essence, it examines or evaluates the knowledge enhancing the social and behavioural culture of the people within the company. Most importantly, as pointed by Hylton (2002), the knowledge audit investigates the perceptions of knowledge management effectiveness by the knowledge people. Thus the knowledge audit will

seek to give qualified insight into whether the company or organisation is ready, especially socially, to become knowledge-based or knowledge-centred.

It can be argued that the knowledge audit is a fact-finding analysis, interpretation and reporting activity, which includes a study of the organisation's information and knowledge policies, its knowledge structure and knowledge flow. The knowledge audit therefore brings high visibility to the organisation's knowledge assets. The enlightenment that results from the knowledge audit sets the agenda for the knowledge management initiative, programme and implementation, so that the organisation can better leverage knowledge for the achievement of its goals.

The central focus, indeed subject matter, of a knowledge audit is knowledge. Knowledge is not information. It is much more than information, as it is not just about documents in information systems or knowledge bases. It is first, and foremost, the skills and experiences that every person in the organisation carries around with them. Knowledge cannot be transferred, used or shared without the co-operation of people. It therefore stands to reason that a knowledge audit must be highly people focused, embracing all the organisation's people, or as far as it is practically possible (Hylton 2002). The National Electronic Library of Health (2001) stressed that the knowledge audit should focus on people. In other words, it should determine people with knowledge, where they are located in departments and teams, and what they do and what they know, that is their core knowledge and experience.

According to Debenham and Clark (1994), cited in Liebowitz *et al.*, (2001), "a knowledge audit is a planning document which provides a structural overview of a designated section of an organization's knowledge". Their view of a knowledge audit tends to be narrow. The reason for this is, as has been pointed out by Keller and Levene (2001), that the knowledge audit may be more effective if it covers the whole organisation, because once the audit involves everyone, it becomes much easier to find points of view which might be frequently overlooked, but which are critical success factors.

According to Dataware Technologies, Inc. (1998), "the audit begins by breaking that information into two categories: what knowledge currently exists and what knowledge is missing", in order to solve the targeted business problem, that is what knowledge does a company have, what knowledge is missing and how will the company use the knowledge? Dataware Technologies, Inc. (1998) suggested the following knowledge audit steps:

- To identify what knowledge currently exists in the targeted area, by determining existing and potential sinks, sources, flows and constraints in the targeted area.
- To identify what knowledge is missing in the targeted area, by performing a gap analysis to determine what knowledge is missing to achieve business goals and to determine who needs the missing knowledge.

Similarly, Rubenstein-Montano *et al.,* (2001:308) suggested that, when conducting a knowledge audit, it is important to identify types and sources of knowledge, determine competencies and weaknesses, perform knowledge mapping to identify the organisation and flow of knowledge, and perform gap analysis. Stevens (2000) explained that a knowledge audit identifies the intellectual assets which are of value to the company. The knowledge audit also points out improvements to existing processes and identifies people who have been barriers to knowledge proliferation. In addition, it can clarify what information various people really need and locate the best sources for this information. Stevens (2000) explained that a knowledge audit consists of two major tasks, namely knowledge mapping and knowledge flow auditing. In other words, the role of the knowledge audit locates and shows how knowledge flows within an organisation.

There is no universally accepted model for the knowledge audit process, due to the dramatically varying structures and circumstances of the organisations in which they are conducted. In other words, the process of conducting the knowledge audit should be context-specific. The knowledge audit is best conducted internally and co-ordinated by the project team. Gianetto and Wheeler (2000:84) stipulated that the audit should be planned and executed using normal project management principles that is planning who

will be involved; what the timescales are; what information will be gathered; how the objectives and context of the audit be communicated; and budget implications.

Critically analysing the knowledge audit process, the literature does not indicate step-by-step how to go about planning and conducting the knowledge audit. Emphasis is placed on what the audit does and what it aims to achieve. Further research is needed in the area of the knowledge audit methodology. The processes involved are not detailed. However, the National Electronic Library of Health (2001) outlined the steps or processes to follow in conducting the knowledge audit:

- Identifying knowledge needs. In brief, it is concerned precisely with getting a clear picture of what knowledge the organisation and people within it need to meet their goals and objectives. Common approaches taken to gleaning this information include questionnaire-based surveys, interviews and facilitated group discussions.
- Drawing up a knowledge inventory. Emphasis is placed on identifying and locating knowledge assets or resources of the organisation. The process involves counting and categorising the organisation's explicit and tacit knowledge.
- Analysing knowledge flows. The focus is on how knowledge moves in the organisation. In other words, it looks at how people find the knowledge they need and how they share the knowledge they have. The main focus in this step is people, processes and systems.
- Creating a knowledge map. This is concerned with mapping knowledge resources and assets, showing what knowledge exists in the organisation and where it can be found. It is also concerned with mapping how knowledge flows around the organisation from where it is to where it is needed.

The knowledge audit process outlined by the National Electronic Library of Health (2001) provides details concerning conducting the knowledge audit and ways of gaining information. Therefore the knowledge audit is a comprehensive process of identifying knowledge areas and sinks in an organisation, which requires appropriate methodologies. Its processes are critical and need to be context-specific. As a result, short-circuiting them may result in a less than optimum outcome of the knowledge audit.

2.6 Knowledge mapping

According to Wexler (2001:250) knowledge mapping is a consciously designed communication medium, which uses graphical representation of text stories, models, numbers or abstract symbols between map-makers and map users. Knowledge maps are excellent ways of capturing and sharing explicit knowledge in organisational contexts. Grey (1999) emphasises the fact that knowledge mapping is an ongoing quest to discover the constraints, assumptions, location, ownership, value and use of knowledge, people and their expertise, blocks of knowledge creation and opportunities to leverage existing knowledge. It aims to track the loss and acquisition of information and knowledge, personal and group competencies and proficiencies and show knowledge flows. The knowledge map portrays the sources, flows, constraints and sinks of knowledge within an organisation. It is a navigation aid to both explicit information and tacit knowledge, showing the importance and the relationships between knowledge stores and dynamics.

Stevens (2000) stated that, "knowledge mapping involves locating repositories of knowledge throughout the organization. This effort is primarily technological and usually prepares the way for creating a knowledge database". The knowledge mapping process takes an inventory of what people in the organisation have written down or entered into information systems and identifies sources of information from outside, such as subscription services, Websites and libraries. Steven's (2000) view of knowledge mapping places emphasis on locating codified knowledge. He does not mention the mapping of experts in the organisation.

Fisher, Wandersee and Wideman (2000) pointed out that all forms of knowledge mapping have an emphasis on mean making, achieved by explicit connections among ideas. Knowledge mapping gives meaning to the identified knowledge. To promote creativity, the connections may remain unlabeled. To promote learning and communication, the connections are clearly labelled, preferably without ambiguity. It appears that knowledge mapping has originated independently, many different times and in many different contexts. Emphasis here is placed on making meaningful knowledge maps that can be comprehended.

Knowledge maps provide skeletal representations of information. They strip away the minor connecting words and get at the essence of meaning (Fisher, Wandersee & Wideman 2000). A knowledge map typically includes the most important concepts in a topic, usually expressed as noun-centred relations. The knowledge map provides insights not only into what ideas the individual knows but also on how the individual organises and links them. Creating directories or visual representations, that is charts or maps of knowledge repositories, can be an early, tremendously useful exercise in knowledge management. Knowledge maps serve as blueprints to pinpoint knowledge sources and facilitate finding relevant information and knowledge pockets in the organisation. Creating a knowledge map for all organisational knowledge is best done using a building block approach (Probst, Raub & Romhardt 2000). For the construction of a comprehensive map, one of the fundamental building blocks is a map of the experts in the organisation. As noted above, it can be seen that there are several ways of creating a knowledge map.

According to Jones and Brennan (2000), the map of experts should be backed by a database detailing skills, experience, expertise and location or contact information, such as electronic mail and phone numbers, at least. An individual is regarded as a key source of knowledge in an organisation and it is important, when mapping knowledge, to start with the individual. Cecez-Kecmanovic and Dalmaris (2002) pointed out that the development of individual representations enables, first, an individual to make the picture of what he or she knows is explicit and accessible by others; second, by connecting the elements of this picture to other sources of knowledge an individual can expand, enrich and critically assess his or her knowing; third, by engaging in interaction with others, including the sharing of individual representations about a particular situation or problem domain, a group of people can develop shared, collective representations. According to Eppler (1997), cited in Probst, Raub and Romhardt (2000:75),

> knowledge maps are graphic representations of experts, knowledge assets, knowledge sources, knowledge structures or knowledge applications. They increase transparency and support identification of experts or sources of

knowledge, thus enabling the user to classify new knowledge in relation to existing knowledge, and to link tasks with experts or knowledge assets.

Knowledge mapping is essential for the information age. The Internet demands it and the knowledge explosion requires it. The reason is that most of the information and knowledge sources are scattered and their location not identified. After the knowledge audit, it is important that all the knowledge sources, in whatever format, be mapped. It is important to have representations that people can relate to and make immediate sense of, and that offer options of different styles of representation.

2.7 Knowledge management case studies

There is a widespread understanding of the value of knowledge management in many organisations. Organisations are starting to leverage knowledge to achieve organisational goals. Knowledge management systems are evolving as organisations test and refine the knowledge management paradigm. DBBasics (n.d.) defines a knowledge management system as a "systematic and automated process for developing, assessing, tracking and utilizing the intellectual assets of an organization or groups within that organization". Organisations engage with knowledge management due to various reasons outlined in sections 2.3.1 and 2.3.2.

The following sections will review how the World Bank and International Land Coalition engaged with knowledge management to give examples of different contexts in which knowledge may be managed. There is no best way to manage knowledge work, as what is effective depends very much on the history and type of organisation, the employees involved, the form of employed, and so on (Newell *et al.*, 2002).

2.7.1 World Bank

The World Bank is the largest provider of development assistance. It offers advice and an array of customised resources to more than 100 developing countries and countries in transition. Its mission is to reduce poverty and increase the quality of life in developing countries. At the 1996 Annual Meeting, President James Wolfensohn said that one of the Bank's goals is 'making the Bank's know-how accessible both to staff and to external clients, partners and stakeholders around the world' (Abell & Oxbrow 2001:

184). Launching a broad knowledge management programme, the World Bank, as a global organisation, defined its knowledge strategy; made a decision to share knowledge and also decided on what to share; it identified mechanisms to share knowledge; and decided to build a knowledge repository and nurture communities of practice.

2.7.1.1 Defining a knowledge strategy

Denning (2000b) pointed out that "the most difficult part of launching a knowledge management programme is to put in place a strategy for knowledge sharing". A knowledge strategy in an organisation tries to articulate why an organisation should share its know-how, what the organisation will share, with whom the organisation will share and how the organisation will share (Pommier 2000). One of the critical elements in the World Bank knowledge sharing strategy was the public commitment made by its president, James Wolfensohn, to build a 'knowledge bank'. The idea was to organise and preserve the wealth of knowledge created by various stakeholders working on similar issues. King and McGrath (2000) argued that, given its size and influence, the Bank's progress towards being a knowledge bank and the implications this has for the partnership and development are of prime importance in understanding the current trends in development co-operation. The decision taken by the chief executive to share knowledge at the World Bank sheltered the organisation from lengthy discussions that typically surround the development of strategies in large organisations.

2.7.1.2 Decisions to share knowledge

Knowledge sharing may aim at making available various types of content. However, the approaches will be different, depending on whether the intent is to share know-how, best or good practices, or knowledge of clients or customers (Denning 2000b). Organisations have reasons for their decision to share knowledge. The same applies in the case of the World Bank. The World Bank Group (2001) emphasised that knowledge sharing at the World Bank was about capturing and organising systematically the wealth of knowledge and experience gained from staff, clients and development partners, making this knowledge readily accessible and creating linkages between groups and communities working on similar topics. Given the characteristics of the global economy, and the plummeting costs of communication and computing, the World Bank realised that sharing knowledge would enhance its organisational performance and therefore its global impact on poverty. Knowledge management at the World Bank was

motivated by a decision to increase the speed and quality of service delivery, lower the cost of operations by avoiding rework, accelerate innovation and widen the Bank's partnerships to fight poverty.

2.7.1.3 Deciding what to share

At the launch of the knowledge management, the World Bank decided to share country and sector know-how and global best practices and research in the field of development. However, the Bank shifted its knowledge sharing strategy to an integrated strategy. The World Bank's knowledge efforts aimed at providing a sharper strategic focus on various efforts and promoting better co-ordination of various global knowledge initiatives. The World Bank has thus introduced a 'knowledge for all' strategy (Ramphele 2001).

2.7.1.4 Mechanisms to share knowledge

It is important for organisations to carefully consider mechanisms for sharing knowledge. Mäki and Järvenpää (n.d.) mentioned that information and communication technologies (ICTs) have made it technically easier to transfer both explicit and tacit knowledge. Technology is the enabler of knowledge management and therefore the use of ICTs cannot not be overemphasized. The goal of knowledge management technology is to create a connected environment for knowledge exchange (Mentzas *et al.*, 2001).

Denning (2000b) stressed that there needs to be consensus within the organisation concerning the principal channels by which knowledge would be shared, whether face-to-face or by way of help-desks, email, collaborative tools or Web. The World Bank used a multitude of different channels to share various forms of knowledge. Knowledge sharing takes place virtually on the Web and face-to-face with clients and partners, video-conferencing, help-desks to obtain packets of information and referral services. In setting up the system to enable knowledge sharing, the World Bank considered the fact that most of the individual knowledge is tacit. It also considered that the information technology tool should be quick to access and user-friendly and easy to operate to ensure that the users' requirements are met.

2.7.1.5 Building a knowledge repository

At the beginning of the knowledge management programme, the central knowledge management unit at the World Bank was attached to the information technology group, because attention was primarily focused on building a knowledge management system, that is a repository of knowledge collections. When thematic groups gained importance, attention shifted to connecting people for accelerating learning and bringing the benefits of knowledge sharing to operations. The central knowledge management unit was moved to the vice-presidency Operation Core Services (Pommier 2000). Building a knowledge repository was easier, but the challenge for the World Bank was how to build a knowledge sharing culture.

2.7.1.6 Communities of practice

Communities of practice can be seen as a vital ingredient in the acquisition and sharing of learning, making knowledge a collective resource for the organisation, rather than the property of a particular individual (Newell *et al.*, 2002:121). At the programme's inception, the World Bank had various professional groups who gathered informally over 15 years (Pommier 2002). Some of the groups had established an email distribution list, where technical questions were debated, help was requested and success stories shared. The World Bank saw the importance of nurturing the development of such communities. In 2001 the World Bank had more than 120 thematic groups and various instruments have been developed to nurture them (World Bank Group 2001). These groups are meant to facilitate knowledge sharing and learning across regions and themes. However, they did not fit well into the World Bank's conventional organisational structures and budgetary processes. The reason for this was that their membership was voluntary and based on self-selection. An attempt was made to put in place a Directory of Expertise to identify each sector family, the expert profile of its members and their professional affiliation. This was for budgetary purposes and for the Bank to support the groups in terms of addressing areas of immediate action.

The World Bank case study is a lesson to other organisations intending to implement a knowledge management programme. Organisations embark on knowledge management for various reasons. The World Bank launched its knowledge management programme to integrate the global sharing of knowledge with different stakeholders, partners, clients

and staff. Creating a knowledge sharing culture in an organisation is important in order to achieve desired goals.

2.7.2 International Land Coalition

The International Land Coalition, formerly known as the Popular Coalition to Eradicate Hunger and Poverty, was convened by the International Fund for Agricultural Development (IFAD). The International Land Coalition is a global alliance of intergovernmental, governmental and civil society organisations. The Coalition works together with the rural poor to increase their secure access to natural resources, especially land, and to enable them to participate directly in policy and decision-making processes that affect their livelihoods at local, national, regional and international levels (Moore 2003). The International Land Coalition's emphasis is placed on empowering rural people to be effective agents of their own development. The focus of the International Land Coalition is based on the following belief:

> The right to land and water is basic to durable solutions to poverty and hunger. Without secure land tenure, poor rural people are denied access to produce resources, credit, improved technology and the support services needed to improve their productivity and income (IFAD [n.d.]).

This implies that rural people should have access to natural resources to survive hunger and poverty.

It is further pointed out that civil society organisations throughout the world are actively and successfully undertaking activities that are helping to increase the rural poor's access to natural resources. However, it was indicated that in most cases information on these activities is not documented and is lost. The International Land Coalition articulated that the civil society's direct experience generates knowledge that can validate or challenge traditional assumptions about land issues (IFAD 1999).

With regard to the above facts, the International Land Coalition saw that it was important to facilitate knowledge sharing activities. The Knowledge Programme was established and created in order to help civil society organisations, governments and intergovernmental organisations to learn from each other, by providing a mechanism for

the identification, documentation and sharing of the knowledge drawn from the practical experiences of similar organisations around the world. The idea was to produce practical guides, case studies, step-by-step presentations of the lessons learned and other reports, on the results achieved.

The Knowledge Programme covered a broad range of knowledge areas and themes, for example community-level actions and approaches, advocacy and policy engagement strategies and national and regional network development. The emphasis was placed on the provision of practical knowledge that would help other civil society organisations engaged in similar activities in the communities they serve, so that intergovernmental organisations and governments can realise how these initiatives may serve the public good.

Some of the work by the civil society organisations includes the protection of the knowledge systems of indigenous and nomadic peoples, while strengthening the access of these peoples to complementary resource management technologies (IFAD [n.d.]). Most importantly, the Knowledge Programme represents a concrete instrument to provide information to civil society organisations on practical approaches, methods and tools. In addition, the emerging areas of knowledge which led to the establishment of the Knowledge Programme at the International Land Coalition was based on (IFAD [n.d.]):

- Reinforcing the legal rights of marginal communities in Bangladesh, Bolivia and Ecuador;
- Establishing a national association to defend the land rights of small farmers in Cameroon;
- Raising land literacy at the community level by educating marginalized groups about their land rights in India and Mozambique;
- Developing databases and Internet-based resources to strengthen community land claims in Indonesia and Peru;
- Developing methods to assess the sustainability to community-based institutions in Nepal;
- Using media to draw attention effectively to community land claims in the Philippines;

- Organising audits of the skills of civil-society members and developing related capacity-building programmes in South Africa.

The main aim for the International Land Coalition in establishing the Knowledge Programme was to enable civil society organisations, governments and intergovernmental organisations to learn from each other and transfer best practices. Their knowledge management initiative was largely based on sharing of documented knowledge in the form of reports, practical guides and manuals of lessons learned. The programme did not emphasise the sharing of tacit knowledge. In the long run it would thus lose valuable knowledge created by individuals. Furthermore, as a global dispersed organisation, it did not have a strategy on integrating all information and knowledge sources to avoid duplication. However, it can be seen that the International Land Coalition's knowledge programme is based on knowledge networking.

2.8 Summary

It can be argued that knowledge management plays an important role in most organisations, as it enables the transfer of best practices and know-how. Knowledge management is viewed as a survival technique for most organisations. This chapter discussed attempts made by a host of researchers to define knowledge management. It can be seen from the literature that knowledge management as a concept is broadly defined and that there is no consensus regarding the term. However, it can be argued that knowledge management is aimed at identifying, capturing, creating, sharing and distributing knowledge, to achieve organisational objectives. Knowledge management requires turning personal knowledge into organisational knowledge, so that it can be widely shared in the organisation.

This chapter discussed the driving forces behind knowledge management. It becomes clear from the literature that knowledge management emerged from various disciplines. Knowledge management will continue to evolve and draw upon support from many theoretical and methodological areas. A myriad of researchers have presented methodologies and frameworks for implementing knowledge management (Bhatt 2001; Dataware Technologies, Inc. 1998; Probst, Raub & Romhardt 2000). However, frameworks do not provide sufficient detail for executing knowledge management

initiatives and existing methodologies do not adequately address all the requirements for effective knowledge management. This chapter discussed the role of the knowledge audit and knowledge mapping in implementing a knowledge management initiative. It becomes clear that the knowledge audit process lacks a methodology in terms of planning and conducting the audit. The chapter concluded by examining the application of knowledge management at the World Bank and International Land Coalition.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

> No particular method has a clear superiority over the others…what one's method reveals about the problem and how well one executes whatever method is chosen seems significantly more important" (McCall & Bobko 1990).

3.1 Introduction

This chapter details the research design and methodology underpinning the study. The purpose of the study was to develop a model for knowledge auditing in the Eastern Cape estuaries, with special reference to the Tyolomnqa Estuary. The nature of this study is applied research, that is it tended to be more pragmatic and emphasis was placed on providing information that can be used in resolving actual problems (Powell 1997: 44). To answer the research questions posed in the study and attain the objectives stated in Chapter One, section 1.4.2, the descriptive research method, utilizing the case study method, was employed to gather data. The chapter contains detailed information about the population of the study, data collection methods and data analysis procedures.

3.2 Descriptive research design

The research design is the logical plan of how the study is conducted (Yin 1989). The role of a research design is to connect the questions to data. As mentioned earlier, a descriptive research design was used to collect data in this study. According to Adams and Schvaneveldt (1985:107), "descriptive research seeks to acquire evidence concerning a situation or population; it identifies baseline information which can be used for comparative purposes". Furthermore, Allison *et al.,* (1996:15) pointed out that descriptive research "sets out to seek accurate descriptions of activities, objects, processes and persons". The outcome of this study is potentially important, as descriptive research was used to gain an in-depth insight into the phenomenon (Bless & Higson-Smith 1995: 42), in this case the knowledge that was available, missing and needed in the Tyolomnqa Estuary community. The descriptive research method was chosen for this study because of the nature of the problem and the data collected. There are many different forms of descriptive research, namely surveys, case studies, causal-comparative studies, correlational studies and development studies (Allison *et al.,* 1996:15). For the purpose of the present research, the case study approach was used.

3.2.1 Case study approach

Case studies are in-depth studies of particular events, circumstances or situations which offer the prospect of revealing understandings of a kind which might escape broader surveys (Allison *et al.*, 1996:15). The case study is a research strategy which focuses on understanding the dynamics present within single settings. Case studies can involve either single or multiple cases, and numerous levels of analysis (Yin 1989). Case studies can be used to provide descriptions (Huberman & Miles 2002) or test hypotheses (Gomm, Hammersley & Foster 2000). Feagin, Orum and Sjoberg (1991), cited in Tellis (1997), pointed out that case studies provide an ideal methodology when a holistic, in-depth investigation is needed.

For the purpose of this study, the case study approach was used to provide a description and an in-depth investigation of the knowledge status of the Tyolomnqa Estuary communities. The Tyolomnqa Estuary was used as a case study to develop the model for knowledge auditing in a non-constrained environment. The case study approach was used to gain an in-depth insight into the knowledge status of the Tyolomnqa Estuary communities. It involved identifying the knowledge generators and carriers, identifying where knowledge was created and stored, identifying the knowledge domains or categories in estuaries and identifying the knowledge gaps and needs.

Although the case study approach has a number of drawbacks, it also has a number of distinctive advantages. Among the drawbacks is that the case study approach offers no ground for establishing generality of findings (Soy 1996). Tellis (1997) stated that the problem in case studies is to establish meaning rather than location. However, the case study method has its strength in its ability to deal with a full variety of evidence such as documents, artefacts, interviews and observations (Yin 1989).

3.3 Research population

The research population is considered a critical part of any survey, especially a descriptive one. A target population consists of all elements or units about whom survey information is collected. These elements are usually individual persons. To draw a sample it is necessary to select a specific population and identify population parameters to obtain a benchmark population. The sample for the study was purposively drawn

from the target population. The population included estuary users from the east and west bank villages of the Tyolomnqa Estuary. As stated in Chapter One, the east bank villages consisted of riparian owners from the Chalumna Estates and Chalumna Conservancy and the west bank consisted of villagers from the Phozi, Xhama, Sandile and Ncera villages. In addition, representatives from the Tyolomnqa Forum and Buffalo City Council were included, as they play a role in the management and policing of estuaries. Estuary users carry and generate information and knowledge on the management of estuaries. The sample was deemed to be representative of the population and appropriate for this study.

3.4 Instrumentation

The protocol (see Appendix 1) was developed using the literature focusing on estuarine management and knowledge management. The protocol targeted different aspects of the knowledge audit process and it included the following:

- Knowledge sources: aimed at determining what and where knowledge sources existed in the Tyolomnqa Estuary area.
- Knowledge identification: focused on identifying the knowledge that existed, that is the know-how that estuary users had in terms of managing the Tyolomnqa Estuary and also identifying estuary management issues and problems surrounding the area.
- Knowledge needs: focused on what knowledge the estuary users needed in order to manage the Tyolomnqa Estuary effectively.
- Knowledge gaps: what gaps existed in terms of the management of the estuary, for example dealing with sediment degradation problems.

The protocol was used as a guide to conduct focus groups and unstructured interviews in order to obtain reliable information in an unstructured way. The titles and questions included in the protocol were not shown to the participants. Most of the questions were qualitative in nature that is open-ended, which allowed the participants in both focus groups and unstructured interviews to express their views on the available and missing knowledge, as well as their knowledge needs on the management of the Tyolomnqa Estuary and the estuarine issues and problems arising in that area. Follow-up questions and probing were used to get an in-depth response to a particular question.

The protocol was broken into four sections that captured various aspects of the knowledge audit process. The use of themes helped to obtain in-depth information about the knowledge situation of the Tyolomnqa Estuary area.

3.5 Data collection methods

In achieving the objectives of this study, data was collected using focus groups and unstructured interviews. Interviews were considered the most appropriate method of data collection because Webb (1998:22) recommended them as the most useful tool for conducting knowledge audits. In the context of this study, questionnaires would not have been appropriate because the literacy levels of the target population were relatively low. Although triangulation of methods is useful in achieving reliability in data collection, it was not used in the true sense of the word. The fact that the study used two types of interviews, namely face-to-face interviews and focus groups, one would safely conclude that the data that was gathered was relatively reliable.

3.5.1 Unstructured interviews

Unstructured interviews, also called in-depth interviews, are usually designed to collect qualitative information from a small-sized sample. According to the World Bank Group (2000), "in-depth interviewing entails asking questions, listening to and recording the answers, and then posing additional questions to clarify or expand on a particular issue". Unstructured interviews were conducted with sixteen estuary users who were representatives from the Buffalo City Council, Chalumna Conservancy, Chalumna Estates, Tyolomnqa Forum, Phozi, Ncera, Sandile and Xhama communities. These representatives were key informants, with management positions and community leadership roles. This assisted in identifying the knowledge sources, gaps and needs of the estuary users in the Tyolomnqa Estuary area. The interviews were tape-recorded, because most questions were open-ended. This meant that most answers were extensive and writing them down would have taken too much time and reduced the participants' time quality in the interview session.

The unstructured interviews conducted tended not to use prepared questionnaires; rather they were more focused on a number of themes and issues that were explored. The

questioning followed no order, but took a sequence that depended on the responses to early questions. The unstructured interviews were based on the knowledge or assumption that the participants possessed the particular information and knowledge about estuary management issues surrounding the Tyolomnqa Estuary area, on which they elaborated.

The advantages of using unstructured interviews are the flexibility they offer and the detailed data they can provide (Doyle 2001). In addition, the interviewer can build rapport with respondents and the nature of the response is not limited. Hakim (2000:35) stated that unstructured interviews provide enough freedom for respondents to steer the conversation, for example bringing in all sorts of tangential matters that have a bearing on estuarine management. However, using unstructured interviews has disadvantages. Turban (1997) pointed out that unstructured interviews are more like a conversation, dominated by the participant but initiated by a question. The information from the participant may be vast and too unrelated for the interviewer to unravel. Furthermore, the unstructured interviews tend to be time-consuming and difficult to analyse. This makes it very difficult to claim that the findings of a study can be generalised to other groups of people that did not participate.

3.5.2 Focus groups

Several authors (Bloor *et al.*, 2001; Krueger 1994; Morgan 1998) provide guidelines for utilising effective focus groups. The guidelines address the characteristics based on the research topic or theme, the number of sessions, the number of participants per session and the moderator's level of involvement. Focus groups involve in-depth qualitative interviews with a small number of carefully selected people, based on a set of criteria brought together to discuss a host of topics (American Statistical Association 1997).

Focus groups typically emphasise a specific theme or topic that is explored in-depth (Bryman 2001:336). Focus groups represent a *qualitative* rather than a *quantitative* methodology. Krueger (1994:19) pointed out that "focus groups produce qualitative data that provide insights, perceptions, and opinions of participants". Focus group interviewing was deemed appropriate for this study, in the sense that the participants shared issues related to the management of estuaries and the challenges they faced in

managing and using the Tyolomnqa Estuary. While the results are not statistically representative, that is they may or may not reflect the views or opinions of all estuary users in the Tyolomnqa Estuary, they provide useful information for planning and evaluating the processes involved in the management of estuaries.

3.5.2.1 Advantages and disadvantages of using focus groups

Doyle (2001) asserted that the primary advantages of focus groups are that they tend to be more convenient and less time-consuming, for both the researcher and participants, and they are less likely than individual interviews to be subject to bias introduced by the researcher, since the researcher takes a less active role in guiding the discussion. In addition to that, Krueger (1994:34) provides several advantages of using focus groups are:

- The format allows the moderator to probe. For instance, the flexibility to explore unanticipated issues is not possible within the more structured questioning.
- Focus groups have high face validity. The technique is easily understood and the results seem believable to those using the information.
- Focus groups can provide speedy results.

The use of the focus group method may be appropriate and even advantageous, since it allows participants' perspectives to be revealed in ways that are different from individual interviews. However, Bryman (2001:349) mentioned that focus groups have limitations, in that:

- The researcher probably has less control over proceedings than with individual interviews.
- The data are difficult to analyse and organise. The reason is that group interaction provides a social environment and comments must be interpreted within that context.
- The recordings are probably more time-consuming to transcribe than equivalent recordings of individual interviews, because of variations of voice pitch.

Doyle (2001) pointed out that focus groups do not allow for findings to be generalised to larger populations. Despite these limitations, focus groups were used to gain an in-depth insight into the information and knowledge that the Tyolomnqa Estuary communities use to manage estuaries.

3.5.2.2 Selection of people in focus groups

Unlike interviews, questionnaires or telephone surveys, in which a representative sample of the population is selected for a study, a planned sample is chosen for focus groups. Focus group participants are not randomly or blindly chosen. The composition of a focus group is usually based on the similarity of the group members. Bringing people with common interests or experiences together makes it easier for them to carry on a productive discussion. Greenbaum (1997) pointed out that the selection of people in focus groups is based on their common characteristics relative to the issue being discussed. The selection of estuary users in the focus group was based on the role they play in the issues that impact on the utilisation and management of the Tyolomnqa Estuary.

Focus groups typically consist of five to 12 people (Bloor *et al.*, 2001). Such a size in a focus group encourages participants to effectively contribute their ideas. It is desirable to select participants who are as representative as possible of the population (Powell 1997:114). Participants were drawn from the Tyolomnqa Estuary community, though the majority was composed of community leaders. The Tyolomnqa Forum focus group was made up of 12 respondents. Phozi consisted of six respondents, Ncera had 10 respondents, Sandile had eight and Xhama had 12.

3.5.2.3 Procedure of conducting focus groups

Bryman (2001:342) suggested that, in qualitative research, "the aim is to get the perspectives of those being studied. Consequently, the approach should not be intrusive and structured". Participants should therefore have the opportunity to share their insights and to provide a diversity of perceptions. The protocol (See Appendix 1) was used as a guide to conduct focus group discussions in the Tyolomnqa Estuary area. The focus group discussions were moderated. The moderator was primarily concerned with

directing the discussion, keeping the conversation flowing and taking a few notes, as suggested by Krueger (1994:103). Moderating the focus group discussions is important, as participants may introduce irrelevant topics and it is the moderator's role to carefully and subtly guides the discussion back on track.

According to Powell (1997:114), "focus groups are usually scheduled for one session of one to two hours, but it may be necessary to hold more than one session in some cases". The focus group discussions in the Tyolomnqa Estuary area took place on 1 to 5 July 2002. The first few moments in focus group discussions are critical (Krueger 1994:113). Each group discussion in the Tyolomnqa Forum, Phozi, Ncera, Sandile and Xhama communities consisted of an introduction and purpose of holding the discussions and procedures and guidelines for participation. Focus group discussions were held in Xhosa language, particularly in the Phozi, Ncera, Sandile and Xhama communities to allow participants to express their views clearly. The researchers had a working knowledge of the Xhosa language so there was no need for the services of a language translator.

The first session was scheduled for 30 minutes and participants were asked to introduce themselves and explain their involvement in estuaries. The second session was scheduled for one hour and participants were asked to elaborate on what they used the estuary for and how they learned about estuaries. The third session was scheduled for one hour and participants were asked to express their main concerns and problems which they experience regarding the Tyolomnqa Estuary; the approach they have taken to address the problems in terms of knowledge sources and skills they have. The fourth session was scheduled for one hour and participants were asked about their knowledge needs in terms of addressing the problems they had and how they could enhance knowledge sharing amongst themselves.

Tape-recorders were used because they facilitated the acquisition of participants' explanations and opinions quickly and therefore helped obtain most of the information from participants in a shorter period of time. According to Bryman (2001:336) when interviewing for qualitative research, "the focus group session will work best if it is recorded and subsequently transcribed". In that light, each session of the focus group

discussions were audio recorded and the permission of the participants was first sought before recording the discussions. Written notes are also essential and therefore in all the discussions two assistant moderators took notes.

3.5.2.4 Transcription of focus group data

All tapes used in the focus group discussions were transcribed. The tapes were reviewed several times and different comments of different participants within the groups were compared, until the themes emerged. In a transcription of focus groups it is important to indicate the point at which the current speaker is overlapped by another's speech and to make suggestions regarding uncertain transcription (Bloor *et al.*, 2001). The transcript aims at reproducing as near as possible the group as it happened, so that it is possible to see how the group discussions went. The transcripts were used for the analysis of data. However, transcribing focus group discussions was more complicated and hence more time-consuming than transcribing interview recordings. The reason was that one needs to take into account who would be talking in the session, as well as what is said. This is sometimes difficult, since people's voices are not always easy to tell apart.

3.6 Data analysis procedures

Data from focus groups and unstructured interviews tend to be qualitative in nature. After transcribing the tapes, data were organised by themes. The use of focus groups and unstructured interviews aimed at obtaining in-depth information on the knowledge issues surrounding the communities of the Tyolomnqa Estuary. As a result, the nature of the study did not allow generalisation of issues. Content analysis was used to analyse the data collected from focus groups. Content analysis is collecting and organizing information systematically in a standard format that allows analysts to draw a conclusion about the characteristics and meaning of recorded material (Alreck & Settle 1995:271). According to Babbie and Mouton (2001:383) and Neuman (2000:292) the technique can be applied to any form of communication. The first step in content analysis entailed the construction of categories that have been described by Sarantakos (1998:281) as "a set of criteria which are integrated around a theme". In that light, data was analysed according to themes such as knowledge sources, knowledge identification, knowledge needs and gaps. The categories were examined using one of content

analysis' basic methods, namely, conceptual analysis or thematic analysis. The analysis involved quantifying and tallying the presence of a concept. Categories were coded and dominant themes and trends were identified. In order to satisfy criteria of reliability, the field data, that is the tape recordings, were listened to and the knowledge management team members read written field notes, in order to agree on the themes or patterns emerging from the data.

3.7 Evaluation of research methodology

The study employed the descriptive research, utilising the case study approach. This research design was found applicable for conducting the knowledge audit in the Tyolomnqa Estuary. However, in developing the model the researcher felt that the explorative research design could have been applied. The data collection method, such as the focus groups and unstructured interviews, were very effective methods of identifying the knowledge sources, gaps and needs in the Tyolomnqa Estuary community. These techniques were found to be time-consuming because of the transcription of the data. However, they enabled the researcher to collect data within a specified period of time. Although the methodologies used do not allow results to be generalised, they do give an in-depth analysis into the phenomenon under investigation.

3.8 Summary

This chapter presented a methodology that was used to develop a model for knowledge auditing in the Eastern Cape estuaries, with special reference to the Tyolomnqa Estuary. A descriptive research design was deemed appropriate for this study. The Tyolomnqa Forum, Buffalo City Council, Chalumna Estates, Chalumna Conservancy and Phozi, Xhama, Sandile and Ncera communities are involved in estuarine issues and therefore constituted the population of the study. Focus groups and unstructured interviews were used to collect data and a protocol was developed to guide the discussions. This chapter discussed the procedures followed to conduct both focus groups and unstructured interviews. Finally, due to the qualitative nature of the data collected, themes were used to analyse data. The themes applied in the study helped determine the knowledge status of the communities of the Tyolomnqa Estuary.

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF RESULTS

4.1 Introduction

The purpose of this chapter is to present the research results and to explore the ideas that emerged during the conduct of unstructured interviews and focus groups interviews. The nature of this study is qualitative and although the results may not be generalised statistically, they do raise the understanding of the knowledge status of the Tyolomnqa Estuary communities. The output of the knowledge audit will deliver the following results: identification of core estuarine knowledge in terms of who creates it and who uses it; identification of knowledge needs and gaps in the Tyolomnqa Estuary area; and lastly, an understanding of the problems arising in the utilization and management of the Tyolomnqa Estuary.

This chapter is organised into two sections. The first section presents research results according to the interview guide (See Appendix 1) followed during the conducting of both unstructured interviews and focus group interviews. The second section discusses the research results according to the following themes: knowledge sources; knowledge identification, knowledge needs and gaps.

4.2 Presentation of results

In this section, unstructured interview results will be presented and, following that, focus group interview results will be presented.

4.2.1 Unstructured interview results

Unstructured interviews were conducted with 16 estuary users who were representatives from the Buffalo City Council, Chalumna Conservancy, Chalumna Estates, Tyolomnqa Forum, Phozi, Ncera, Sandile and Xhama communities. The purpose of conducting these interviews was based on the assumption that the participants played a key role in estuarine management issues and therefore they had in-depth information and knowledge on issues surrounding the Tyolomnqa Estuary.

4.2.1.1 Participation in estuarine management issues

In the first and second session of the interviews, participants were asked to explain their involvement in estuarine management issues in the Tyolomnqa Estuary area, as well as to explain how they learned about estuaries. The purpose of asking these questions was to predetermine the participants' know-how on issues surrounding the Tyolomnqa Estuary and their role in estuarine management issues. The questions were trying to elicit the ways in which participants obtain information and knowledge on estuaries.

Some participants indicated that they obtained tacit knowledge on estuaries through interaction with their colleagues at work and personal involvement in the management of estuaries. Participants pointed out that they obtained explicit knowledge on estuarine management in books and research documents. It was found that most participants acquired knowledge about estuaries through their interaction in meetings, workshops and with their colleagues. Only a few learned about estuaries at higher educational institutions.

Participants were asked whether they used the estuary and what they used it for. "Use" in this case, refers to the utilization of the estuary and its resources. It was found that most participants used the estuary for various purposes. Participants indicated that they used the estuary for fishing, grazing their cattle and enjoying the wilderness environment. However, participants indicated that in the past they had no interest in the estuary as they used it only for fishing. Their involvement in estuarine issues by way of workshops and meetings had increased their interest in estuaries.

4.2.1.2 Problems impacting on the Tyolomnqa Estuary

In the third session of the interviews, participants were asked whether they had major concerns and problems regarding the Tyolomnqa Estuary. The question was tried to determine whether the problems exist due to lack of integrated information and knowledge in sustaining the Tyolomnqa Estuary in terms of its status and resources. Problems identified were summarised as follows:

- Restricted public access to the Tyolomnqa Estuary.
- Lack of consensus among various government departments, local authorities and estuarine researchers regarding the state of management in terms of laws

governing the estuaries, for example whether to allow limited access, free access or to regard the Tyolomnqa Estuary as a wilderness or protected area.

- Lack of delegation of the Sea Shore Act to local authorities in controlling illegal jetties.
- Lack of infrastructure to enable the estuarine management structure to run properly.
- Over-utilisation and exploitation of Tyolomnqa Estuary resources, that is subsistence fishing and bait collecting, intermittent poaching and commercial fishing from outsiders targeting the estuary.
- Lack of policing in the Tyolomnqa Estuary.

4.2.1.3 Strategies to address estuarine management issues

Participants were asked to elaborate on the strategies they had taken to address the issues that impact on the Tyolomnqa Estuary. The reason for asking this question was to determine whether participants knew who to see for expert advice and where to find information and knowledge related to estuaries. The question was trying to elicit whether the participants have the necessary skills and expertise in addressing issues impacting on the Tyolomnqa Estuary.

Participants mentioned that in addressing issues that impact on the Tyolomnqa Estuary, they have in most cases consulted internal and external sources of information and knowledge from the Marine Working Group, Marine and Coastal Management and estuarine researchers.

In addressing the issue of access to the Tyolomnqa Estuary, participants indicated that the estuary was a national and public asset and that the resources found on the estuary were State resources. Participants indicated that they had invited different stakeholders who represented the Phozi, Ncera, Xhama, and Sandile villages, the Buffalo City Council, Chalumna Conservancy and Chalumna Estates to address the issue of access to the Tyolomnqa Estuary. Participants pointed out that the aim of including the different stakeholders was to reach consensus on how access could be enhanced and how controlled access to the estuary could be established.

The lack of consensus among various government departments with regard to laws governing the estuaries was creating a problem for the Tyolomnqa Estuary communities in terms of managing the estuary. Participants indicated that it was important that the Department of Environmental Affairs and Tourism (DEAT) delegate the functions of the Sea Shore Act. Participants indicated that proper integrated estuary management structure should be in place. Education and awareness among communities was seen as important in terms of conserving the Tyolomnqa Estuary and its natural resources.

4.2.2 Focus group interview results

Five focus groups were conducted with a total of 48 participants who were purposively selected from the local communities living along the Tyolomnqa Estuary. The number per focus group ranged from six to 12. Figure Four depicts the distribution of participants by group.

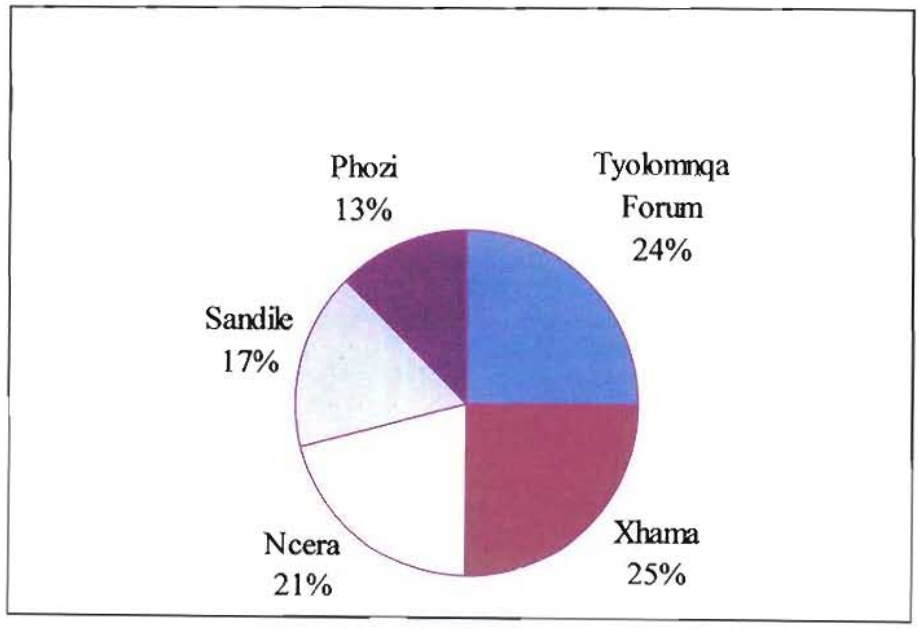


Figure 4: Distribution of respondents by group

4.2.2.1 Reasons for taking part in estuarine issues

The first and second sessions of the discussions were combined, as they were regarded as overlapping issues. The reason for this was that the discussions aimed at asking participants about how long and why they were involved in estuarine issues. Participants gave various reasons for their involvement and participation in estuarine issues, particularly the Tyolomnqa Estuary. Participants indicated that they are involved

in estuarine issues because they need to gain knowledge and obtain skills that would help them in the optimum utilisation of the Tyolomnqa Estuary and its natural resources. Participation in estuarine issues for some had been the result of being invited by other estuary users to meetings. Participants pointed out that they had had no interest in the activities of the estuary in the past until their regular attendance at Tyolomnqa Estuary meetings. Some participants stated that they were keen to observe the Tyolomnqa Estuary and its natural beauty, because they think the estuary may attract tourists in the future.

Participants said that their interest is focused on conservation issues and maintaining the ecology of the Tyolomnqa Estuary. Some representative statements from the focus group transcripts in this regard are as follows:

Participant 1

I live in the banks of the Tyolomnqa Estuary; hence I am interested and affected person in the future of the Estuary. I love the high quality of the natural environment and I am very interested in all aspects of maintaining and improving the greater environment, that is the environment of the birds and of the fish and the social environment as well.

Participant 2

I became involved with the Tyolomnqa Estuary through my fishing activities...I am keen to see the river remain in its natural state and not be polluted or over-fished.

Participant 3

I have a key interest in ecology and I think this led to my involvement in the Tyolomnqa River, in order to be part of those who could help maintain the quality of the river in all its aspects; make sure the river is there for as much enjoyment by the public under controlled circumstances; and using this natural resource to create wealth, particularly in terms of job creation.

Participants mentioned that their interest lies in studying the living resources in the Tyolomnqa Estuary and conserving these resources. In general, participants indicated that the estuary draws their attention because it is good for fishing, it brings tourism and it could be used to create wealth and job opportunities.

Probing was used to get in-depth information from the responses made by participants. Participants were asked to elaborate on what they used the estuary for. Most participants indicated that they used the estuary for fishing, grazing their cattle and for recreational purposes such as swimming, boating and skiing. Some participants indicated that they have no idea what an estuary is used for in terms of activities and creating wealth. Participants pointed out problems they experienced in the Tyolomnqa Estuary, which led to the third session of the focus group discussions.

4.2.2.2 Problems and issues affecting the Tyolomnqa Estuary

The third session of the discussions focused on asking participants to explain the problems they experienced in the Tyolomnqa Estuary. The discussions were trying to elicit whether participants had information and knowledge on managing the estuary. The problems include a complex and diverse range of environmental, socio-economic, management and scientific issues. The following were considered to be the major issues affecting the Tyolomnqa Estuary and its community:

- Restricted access to the estuary by the Tyolomnqa Estuary community and the wider public. Most participants indicated that they had no free access to the estuary and they indicated that there are few people who had access to the estuary. There is no equal access to the Tyolomnqa Estuary and its resources.
- Lack of road paths and access roads.
- Sedimentation, both marine deposits at the mouth region and runoff from ploughed lands and erosion from grazing.
- Fish poaching at night by individuals with cast nets; and excessive crabbing.
- Lack of monitoring and law enforcement in the Tyolomnqa Estuary.
- Lack of knowledge of how the community can create wealth for themselves from the Estuary, that is, the knowledge of how to do something and make things happen.
- Lack of basic information and knowledge of how to address estuarine problems and conserve the natural resources.
- Lack of communication infrastructures in terms of arranging estuarine meetings.
- Lack of knowledge in terms of the laws and regulations governing the estuary.
- Lack of consensus among the community on the management of the estuary.

- Lack of information and communication technologies (ICTs) infrastructure.

4.2.2.3 Strategies and approaches taken to address issues affecting the estuary

Participants were asked about the approaches or strategies that they used to address the problems. The purpose of this question was to find out the ways in which the Tyolomnqa Estuary community addresses the problems they face, in terms of source of information and knowledge, that is who they contact. In addressing the above problems, participants indicated that they have consultations with various government departments and various stakeholders, such as the Buffalo City Council, the Marine Working Group and community leaders, estuarine managers and representatives from all the communities in the Tyolomnqa Estuary.

Participants pointed out that the issue of access is a major problem. Their concern regarding the monitoring of the Tyolomnqa Estuary is that it must be done for the right reasons and not purely for restricting access so that a few affluent individuals can benefit from its beauty and resources. Participants stressed that members of the community must be subject to the same restrictions placed upon outsiders. However, participants suggested that there should be access points established so that the community and wider public can have access to the estuary, but nonetheless access to the estuary should be controlled. Some participants disagreed with the suggestion that the estuary should be opened to the wider public. The reason for their disagreement was that they felt that, if the estuary was over-utilised, it would lose its natural state. Other participants suggested that both the community and the local government should address the issue of access.

With regard to the issue of sedimentation, participants indicated that they had approached various experts on estuaries and that the problem was still being addressed. Participants suggested that there was a need for the community to be educated regarding the estuary in terms of law enforcement, conservation and sustainable use. They indicated that it would be important if children in primary schools were taught about estuaries and how they can be conserved for sustainable use. They stressed that the community should be educated continuously through meetings and workshops about the importance of estuaries.

The Tyolomnqa Estuary communities approached the Institute of Natural Resources to seek expert advice on the management of the Estuary. Participants urged that a workshop to initiate a co-operative estuary management process should be established and that they wanted to form a forum to address the issues affecting their Estuary.

4.3 Interpretation of results

This section discusses what the collected data shows and determines the significance of results to the communities of the Tyolomnqa Estuary. This study was based on the assumption that the Tyolomnqa Estuary communities have an in-depth knowledge of estuarine management issues and therefore their knowledge could add value for the effective management of estuaries in the Eastern Cape.

4.3.1 Knowledge sources

A very practical knowledge management activity is that of discovering knowledge sources within the organisation and mapping them (Fisher, Wandersee & Wideman 2000; Probst, Raub & Romhardt 2000). The focus was on identifying the sources that estuary users consult in enhancing the utilization and management of the estuary. It includes both explicit and tacit knowledge generated in the Eastern Cape estuaries area. The unstructured interviews revealed that some respondents used libraries as their source of information and knowledge. It was found that the manuals and books concerning the management of estuaries were the main sources of knowledge in the Tyolomnqa Estuary area. However, most respondents in the areas of Phozi, Xhama, Ncera and Sandile do not know where to find information pertaining to the preservation and conservation of the Tyolomnqa Estuary. They do not know where the information and knowledge is located. Some respondents indicated that they do not know who had what knowledge in their area. Some respondents obtained information through attending workshops run by researchers in the Tyolomnqa Estuary area.

4.3.2 Knowledge identification

The process identifies the knowledge that has been created, as well as knowledge that already exists but is not yet identified. Based on the results of the study, it is evident that the Tyolomnqa Estuary communities have little knowledge about the nature of

estuaries and how they should be protected, utilised and sustained. The Tyolomnqa Estuary communities are aware of issues impacting on the estuary and they have taken particular actions to address problems at hand. Thus, knowledge is about knowing how to do things better and being fit to respond to situations to ensure the survival of the organisation. The knowledge identified in the Tyolomnqa Estuary communities is not sufficient to sustain the use of the estuary and its natural resources. The purpose of identifying the knowledge existing in the organisation is to determine how knowledge flows and to assess what the organisation knows and how that knowledge adds value to the organisation (Stevens 2000; Sallis & Jones 2002).

The results also show that the Tyolomnqa Estuary communities have little idea of who to contact for expert advice. Liebowitz *et al.,* (2001) pointed out that the knowledge audit is aimed at capturing tacit knowledge and making it accessible. In that regard, it is important to identify and locate knowledge in a wide variety of forms, tacit and explicit, internal and external knowledge in a targeted area. The identified knowledge should be harnessed and stored in a repository that would enable the Tyolomnqa Estuary communities to access it to effectively manage the estuary.

4.3.3 Knowledge gaps and knowledge needs

One of the objectives of the knowledge audit is to identify what knowledge is missing in the targeted area and determine who needs the missing knowledge (Dataware Technologies, Inc. 1998; Kelleher & Levene 2001). Major findings of the present research show that, regardless of the fact that the Tyolomnqa Estuary communities were aware of the management of estuaries and how they function, they had a huge knowledge gap.

Due to lack of knowledge, the community was unable to address the problems or issues pertaining to estuarine management. For example, the participants indicated that they did not have relevant information and knowledge of how to deal with sedimentation problems. Furthermore, participants pointed out that there is over-exploitation of the Tyolomnqa Estuary and its natural resources. The community lacked knowledge on laws governing estuaries and procedures in terms of monitoring of estuaries. This kind of knowledge gap can have a negative impact on the achievement of local estuarine

management goals, which is the conservation and sustainability of estuarine resources. The Tyolomnqa Estuary communities have established a forum to address estuarine management issues. However, the community needs to be motivated in the right way through the dissemination of information and transfer of best practices from researchers.

4.4 Summary

This chapter presented the results of the study and discussed the results according to knowledge themes. At the inception of this study, the assumption was that the Tyolomnqa Estuary communities possess and generate knowledge on the management of estuaries and that their knowledge could add value to the management of estuaries in the Eastern Cape. The results of the study showed that the communities of the Tyolomnqa Estuary had little information and they consult knowledge sources to enable them to address estuarine problems. Lack of knowledge and skills in addressing estuarine problems could have a negative impact on protecting the estuarine environment. Furthermore, the study established that the community lacked information and knowledge in terms of finding expert advice as well as information on laws governing estuaries. However, the results also showed that the community had awareness of the conservation of estuaries. There is a huge knowledge gap and the community needs information and knowledge for them to sustain the natural resources.

CHAPTER FIVE: THE KNOWLEDGE AUDIT MODEL

5.1 Introduction

This chapter presents the development of the context-specific knowledge audit model for the Tyolomnqa Estuary communities and for non-traditional and non-formalised organisations. The main benefit of the knowledge audit in this study is the development of a much better understanding of the know-how and how it can be used effectively to sustain the use of the Tyolomnqa Estuary. The development of this model was based on the background information on estuaries, knowledge management literature, unstructured interviews and focus group findings. The model provides processes or steps that could be applied to determine the knowledge status or health of a non-traditional organisation. The lessons learned from focus groups and unstructured interviews were used intensively to develop the model, which has been designed in such a way that it could be taken from the body of the thesis and employed as a stand-alone document. The model could assist non-traditional organisations in evaluating their knowledge health or status, particularly in managing estuaries, targeting their areas of improvement, setting up an action plan for improvements and tailoring a special part of their knowledge needs in estuarine management.

The knowledge audit model presented in this chapter is like a 'cookbook'. The model shows that the knowledge audit could lead to improving or successfully implementing knowledge management strategies in non-traditional organisations such as the Tyolomnqa Estuary. However, there is no single or best way to conduct this model. The reason for this is that non-traditional organisations are different in terms of their people, culture, history, goals, structure and focus. Therefore the model should be combined with uniqueness of non-traditional organisations, such as in the case of the Tyolomnqa Estuary communities, so as to consequently develop ways of excellence.

5.2 Structure of the knowledge audit process model

This chapter introduces the knowledge audit model by outlining its main processes, sub-processes and the relationship among the processes. The knowledge audit model has four main processes, namely community profiling, identification of knowledge, generation of knowledge maps and identification of knowledge gaps and knowledge

needs. Before elaborating on the processes and their sub-processes in the following sections, an overview of the model is provided below: Figure Five shows the main processes of the model and their dependencies.

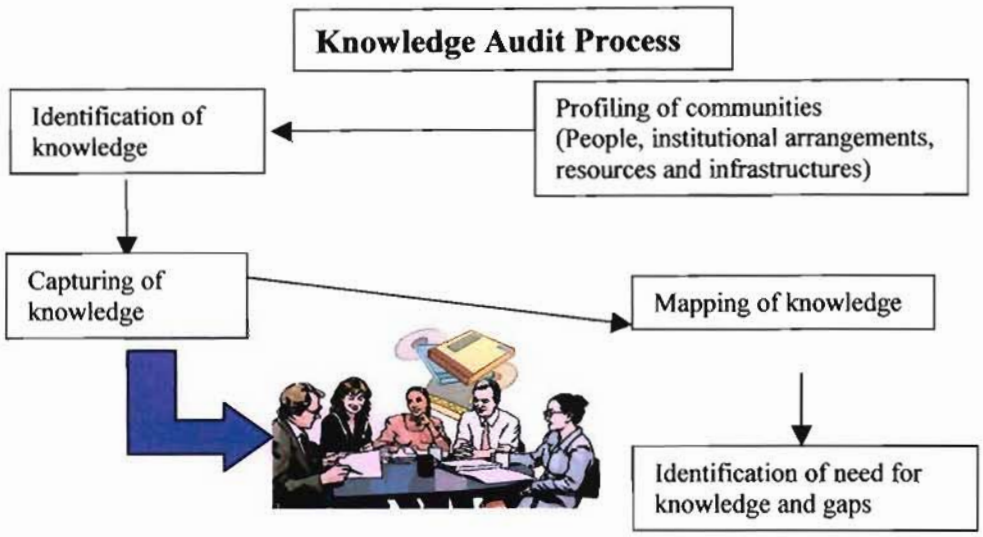
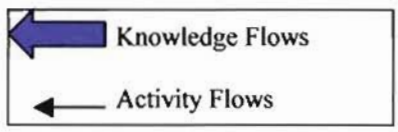


Figure 5: ***Overview of the main processes***

Legend to the arrows in Figure 5



The arrows connecting the processes provide an overview of the interaction and knowledge flows. The pictures in the middle represent the place where the knowledge is generated and stored. The purpose of the pictures, showing people and various storage media, is to express the variety of possible ways of capturing and tapping knowledge, including both explicit (databases, documents, videos) and tacit knowledge (minds of people).

5.3 Community profiling

This stage of the process is very important in that it provides an overview of the nature of the community. Community profiling involves conducting a detailed description of the community's needs and resources. Hawtin, Hughes and Percy-Smith (1994:5) defined a community profile as:

> a comprehensive description of the needs of a population that is defined, or defines itself, as a community, and the resources that exist within that

community, carried out with the active involvement of the community itself, for the purpose of developing an action plan or other means of improving the quality of life in the community.

Community in this instance refers to a group of people who live in the same geographical location, who share common interests, for example the Tyolomnqa Estuary communities in Phosi, Ncera, Xhama, Sandile, Chalumna Conservancy, Chalumna Estates, as well as the Buffalo City Council. These community structures live near estuaries and share common interests, namely the conservation of the Tyolomnqa Estuary and its natural resources. Another element involved in the community profile is the identification of needs and resources. Resources could refer to the assets held in the area and put them to use for the benefit of the community. These could include information centres and estuary resources, as well as people's time and expertise made available to others or into a wealth distributing function.

In communities there are resources that are generally under-utilised. It is important to find out why they are under-utilised and how they can be utilised effectively. Resources could also mean those intangible resources that are a source of strength and potential within the community. This might include such things such as the know-how, skills, both informal and formal, of members of the community about the conservation and sustainability of the estuary resources.

A further element focuses on active community involvement and participation. Involving the community in the profiling process normally results in a more comprehensive and accurate description of the community. Hawtin, Hughes and Percy-Smith (1994:8) said that involving the community in the whole process of profiling "is an important way in which a community can be empowered through the development of skills, confidence and awareness of issues relating to the community". This implies that the involvement and participation of the community could result in the community realising what they do not know and what they do know.

Conducting a community profile leading to an action plan that could capacitate people in the right way is also important. This is because it serves no purpose to produce

information for its own sake without taking people into consideration. One way of doing this is the development of an action plan which identifies issues, priorities and action to be taken, based on the knowledge of the community, for example how controlled access by the public to the Tyolomnqa Estuary can be achieved. Relevant stakeholders should be involved in the whole process of developing an action plan.

The finished community profile may take different forms, that is a written report, an exhibition, a video or a combination of all of these. It is important that the medium selected to convey the information is appropriate to the community it is aimed at, for example issues of literacy skills and language should be taken into account.

The results of the community profile can be used to identify the knowledge of the community in terms of conserving estuaries, for example. Community profiling needs to be limited to the area of focus, for example estuarine management. However, there can be overlapping issues that need to be covered.

5.3.1 Methods for conducting the community profile

The purpose of a "baseline" community profile is to establish a basic picture of the structure and composition of local people and to analyse their resources, for the benefit of determining their knowledge status, in this case, at the Tyolomnqa Estuary. A baseline community profile is the first step in any more sophisticated analysis of non-traditional organisations. The necessary components of this first step are shown in Figure Six.

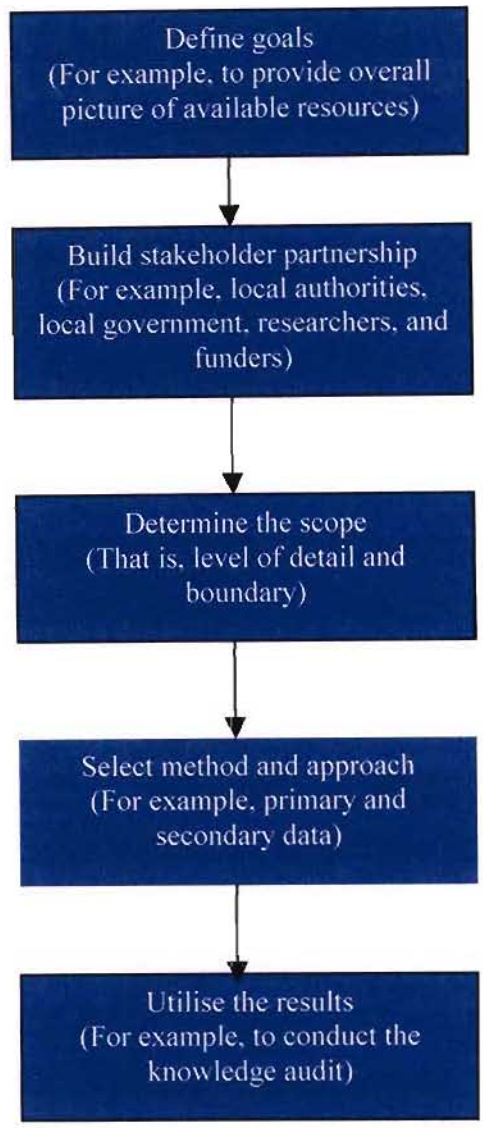


Figure 6: Community profiling components

The first component of the community profiling effort stresses that the goals need to be defined as specifically as possible, that is determining whether the profiling is generally aiming at providing an overall picture of the structure and composition of a local community involvement (for example, estuarine management) and detailing available resources (information and knowledge).

The second component deals with building a stakeholder partnership. In compiling a community profile it is important to initiate collaboration of key stakeholders. Stakeholders in this case might include community-based organisations, local authorities, estuarine institutions, estuarine researchers, local government, estuary users and estuary managers.

The third component determines the scope of the profile. At this stage, communities need to decide on the geographic reach and its level of detail. It is important to focus on institutional arrangements in a non-traditional organisation, that is, looking at their composition. For example, the institutional arrangement in the Tyolomnqa Estuary at a local level can be represented or structured as depicted in Figure Seven.

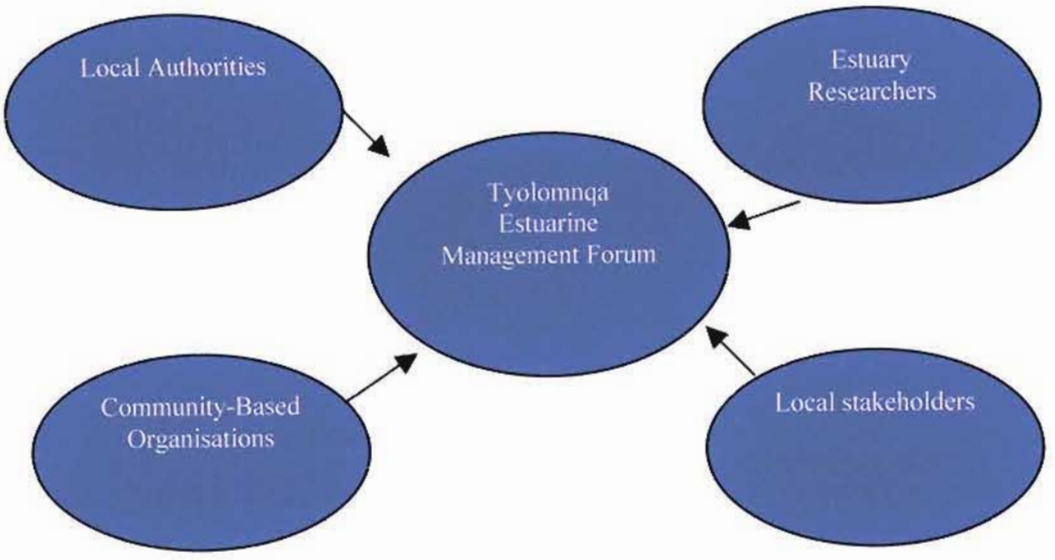


Figure 7: ***Institutional arrangements at Tyolomnqa Estuary***

It is envisaged that the people represented in Figure Seven would have a close link with the estuary at a very local level and would play an important role in the integrated management of the estuary. The local estuarine management would require the involvement of various stakeholders and therefore determining the level of detail and boundary is important. In other words, identifying key people in a particular estuary is essential.

The fourth stage of the community profiling involves the selection of an appropriate method or approach to collect data from the various stakeholders in the Tyolomnqa Estuary. This stage aims to gather together existing data and information about the Tyolomnqa Estuary and its communities. This kind of information might exist in the form of documents, manuals and research publications. It is important to conduct a careful search for, and use available data and information about a particular community, before collecting primary data. Using secondary data can often allow the examination

of past trends and the making of comparisons with other groups or places that would not be possible for a single researcher undertaking primary research (Hawtin, Hughes and Percy-Smith 1994:51). However, the challenge of gathering existing information and knowledge about the community, and the estuary in particular, is involved in finding out precisely what is available, identifying where it is located and then obtaining access to it. The existing information and knowledge can be both explicit and tacit. The results of the profile would, in general, show the structure and composition of the local communities living near estuaries, local authorities, various interest groups in estuaries or community-based organisations, the infrastructure available and the natural resources.

The fifth stage of the community profile involves the utilisation of results to identify the available information and knowledge and the identification of the knowledge gaps, particularly in the management of the local estuary.

5.4 Identification of knowledge

This process identifies knowledge that already exists but is not yet identified and knowledge that has been created. It is important to identify and locate knowledge in a wide variety of forms, tacit and explicit, internal and external, in the targeted area. The process identifies who knows what in a specified area, the location and form of knowledge (tacit or explicit) and how the knowledge adds value in the specified area.

To identify knowledge effectively within a specified or targeted area, it is important to perform the following activities or processes:

- Analyse existing profiles for potential knowledge generators and carriers, for example determining their key roles in estuaries (participatory development or research) and working fields (policing or monitoring, ecology, and biodiversity). Existing profiles of knowledge generators and carriers can be obtained from the *community profiling report*.
- Identify where knowledge is primarily created, for example, Marine Working Group, Tyolomnqa Forum, Marine and Coastal Management. This includes knowledge created within and around the specified or targeted area by different stakeholders.

- Identify categories of knowledge created by the knowledge generators and carriers, for example skills in creating wealth, know-how on impact assessments and estuarine habitats. Information can be obtained from research documents and by interviewing individuals.
- Find out where knowledge is stored, for example workshop proceedings, manuals, research documents and audio-visual recordings.
- Create a knowledge map to show knowledge generators and carriers, and categories of knowledge and storage places.

Figure Eight below represents the sub-processes involved in identifying knowledge.

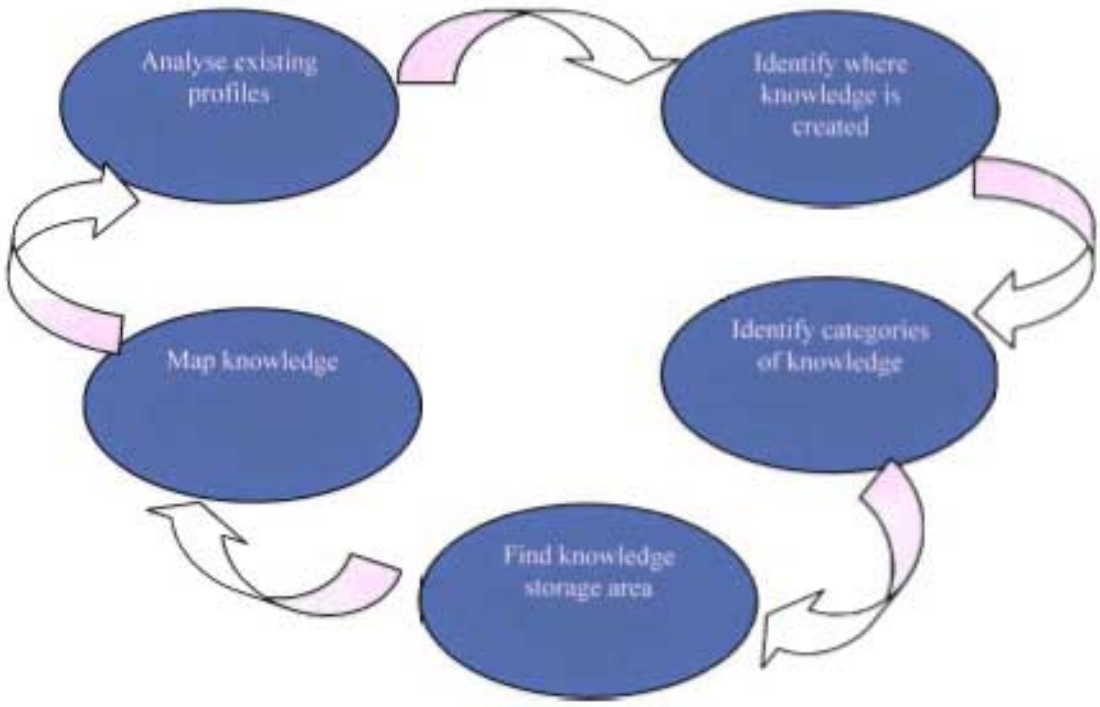


Figure 8: Process of identifying knowledge

5.5 Generation of knowledge maps

In order to recognise and locate knowledge in a wide variety of forms, that is tacit and explicit, mapping knowledge is important. This is typically part of the knowledge audit step that attempts to identify stores, sinks and constraints dealing with knowledge in a targeted area and then identifies what knowledge is missing and available knowledge, who has the knowledge and how the knowledge is used (Liebowitz 2001:7). Depending

on the scale of the defined scope, it might be necessary to create several knowledge maps:

- *Linking knowledge categories to knowledge generators and carriers.* This is important in order to determine who knows what in a specified or targeted area. Figure Nine shows an example of such a knowledge map.

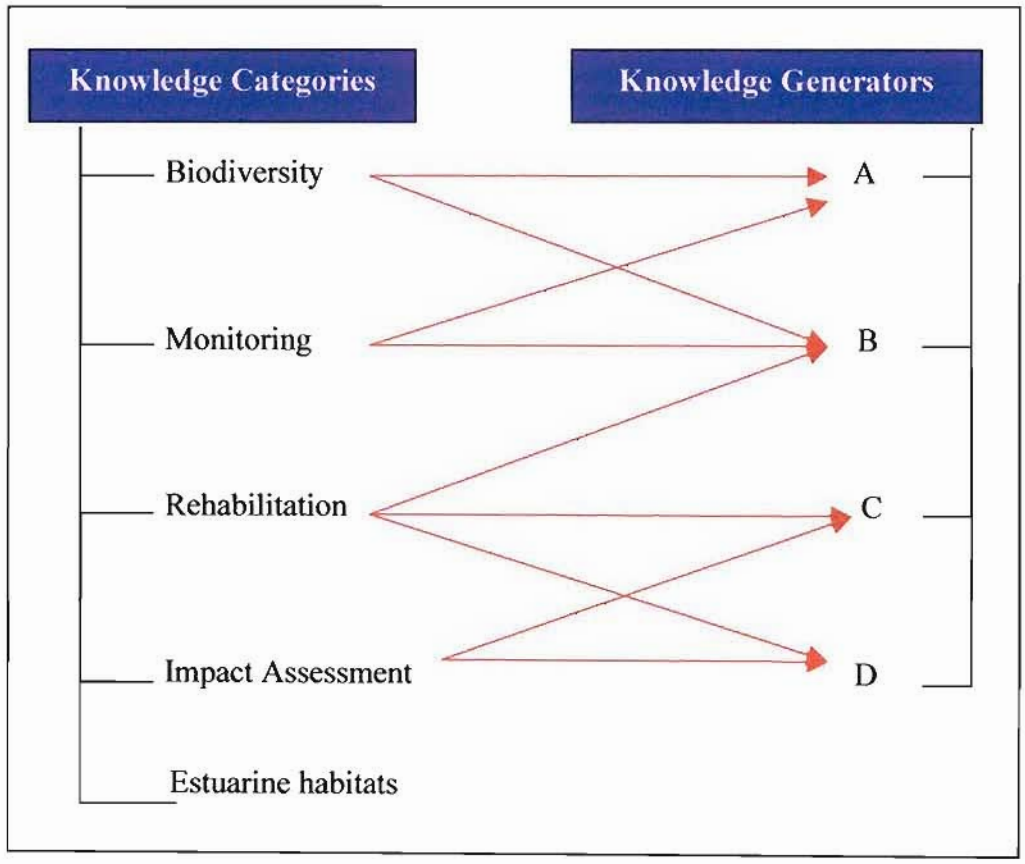


Figure 9: Linking knowledge categories to knowledge generators

- *Relating knowledge categories that are available and those that are needed or missing.* This determines knowledge that is available and gaps within a specified or targeted area. Table Two below shows the relationships:

Table 2: Relationships of knowledge categories available and missing

Critical knowledge category	Available knowledge	Missing knowledge	Who has the knowledge
Biodiversity	X		A
Monitoring	X		A, B
Rehabilitation	X		B, C D
Impact Assessment	X		C, D
Estuarine habitats		X	

5.5 Identification of knowledge gaps and knowledge needs

One of the objectives of the knowledge audit is to identify what knowledge is missing in the targeted area and to determine who needs the missing knowledge (Dataware Technologies, Inc. 1998; Kelleher & Levene 2001). In order for knowledge to be searched or created, it is important to determine what kind of knowledge is missing, as well as to determine the need for knowledge. Knowledge gaps focus on analysing sinks and potential constraints in a targeted area. The Tyolomnqa Estuary communities, for example, might be lacking information and knowledge about a particular knowledge domain or category, that is lack of knowledge on laws governing estuaries or lack of guidelines to assist the estuary managers in decisions about mouth opening, dredging and jetties in the estuary or how to deal with sedimentation problems. This kind of knowledge gap could impact on the achievement of local estuarine management goals, that is, the sustainability and conservation of the estuary.

There are various possibilities that may lead to the identification of knowledge gaps and knowledge needs in an institutional arrangement like the Tyolomnqa Estuary. These include:

- An analysis of current problematic issues in a particular area and how these issues are being addressed. This implies looking at the approach that the community is taking to address problems encountered in the management of

estuaries. It can identify shortcomings that lead to a need for additional knowledge.

- When addressing a new estuarine problem, the question whether existing knowledge can help in addressing the problem must be answered. For example, when addressing effects of human exploitation, especially subsistence fisheries, knowledge of estuarine ecosystem functioning in general, and specifically from the biotic and abiotic viewpoint, is needed. Consequently, it is possible to utilise knowledge embedded in already existing estuarine management guidelines or to use the experts in the field.
- An analysis of estuarine research projects (lessons learned), for example mouth management and sedimentation, monitoring, biodiversity and rehabilitation, can help to identify knowledge gaps and knowledge needs to solve specific problems that have occurred.

Having identified knowledge gaps and knowledge needs in a particular area, it is important to determine the knowledge requirements, that is to determine the kind of knowledge needed to accomplish a particular task, for example, method or approach and manuals or guidelines. Figure 10 below represents the process in determining the knowledge requirements:

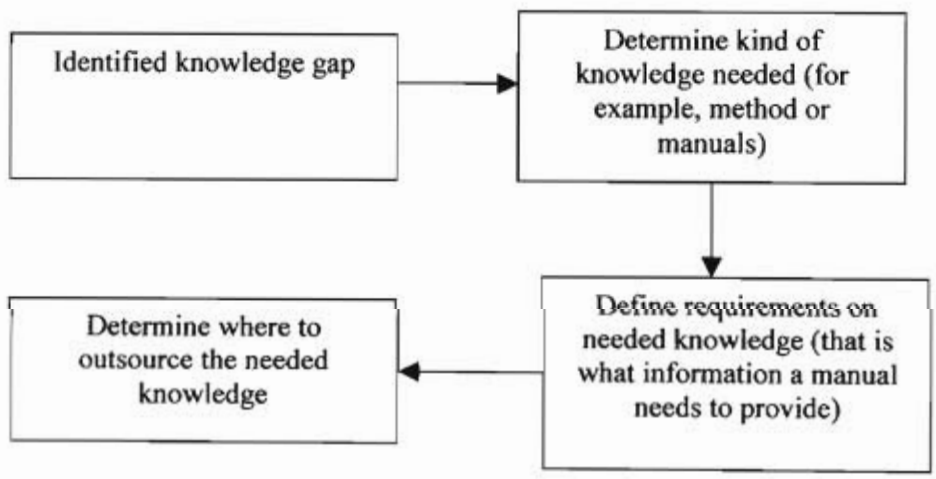


Figure 10: Determining knowledge requirements

The determination of knowledge requirements optimally includes the ways to outsource or create new knowledge, that is, for a case in which no existing knowledge matches the

knowledge needs. This provides a basis for the decision whether to reuse or to create the needed knowledge in a particular area.

5.6 Summary

In this chapter, a context-specific knowledge audit model, which could be applied to non-traditional organisations, was presented. The model was developed with the intention to suit non-traditional organisations, as opposed to business environments. In most cases, the knowledge audit models available are only applicable to business organisations. They emphasise business processes and focus on how knowledge flows from strategic, middle and operational management. Non-traditional organisations have complex structures and institutional arrangements and are unique in terms of people, culture, beliefs, history, goals and focus. The model has been developed in context, to identify and assess the available information and knowledge in communities and how the identified knowledge could be used for the effective management of local estuaries.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter provides a summary of research findings, conclusions and recommendations. The purpose of the study was to develop a context-specific model for knowledge auditing in the Eastern Cape estuaries, with special reference to the Tyolomnqa Estuary. The objectives of the study were to:

1. Identify the knowledge community in the Tyolomnqa Estuary area
2. Analyse existing knowledge sources in the Tyolomnqa Estuary area.
3. Analyse knowledge gaps and identify knowledge needs of the Tyolomnqa Estuary community.
4. Develop a knowledge audit model applicable for non-traditional organisations.

6.2 Conclusions

In the present information and knowledge era, the need to manage knowledge is ever-increasing (Martensson 2000; Radebe 2001; Schaefer, Cook & Barrett 2002). As a result, knowledge management has gained its popularity due to emerging needs to incorporate changes into an organisation (Yu 2002). The estuarine environment is a very complex environment, which poses threats and challenges to estuary managers and estuary users. This is because estuaries are irreplaceable natural resources that must be managed carefully for the mutual benefit of all who enjoy and depend on them. The complexity of the estuarine environment requires the use of practical knowledge and know-how to manage estuaries. Lack of knowledge and skills to manage estuaries will result in a loss of the natural resources.

Estuarine management is a very knowledge-intensive task, which poses a challenge for the communities of the Tyolomnqa Estuary to engage with knowledge management to ensure continued success and effective management of their estuary. For the community to know where to locate information and knowledge on monitoring, rehabilitation and governance of estuaries, it was essential to conduct the knowledge audit. The results of the audit, and the literature cited in Chapter Two, were used to develop the context-specific model presented in Chapter Five. The reason for this was to identify critical areas or elements to consider when conducting a knowledge audit in

non-traditional organisations. In achieving this, the literature related to conducting the knowledge audit was reviewed. It became evident that no large-scale empirical research dealing with conducting a knowledge audit in non-traditional organisations had been systematically conducted. In addition, very limited research had been conducted in developing a knowledge audit model that could be used to determine the knowledge health or status of such non-traditional organisations. This is due to the lack of focus and the lack of universally accepted knowledge management methodologies.

6.2.1 Knowledge sources and knowledge community

It is important for people to be able to locate information and knowledge that is needed to carry out their required tasks. Knowledge sources are aimed at determining what and where knowledge exists in the organisation. The study found that the communities of the Tyolomnqa Estuary do not know where to find information pertaining to the conservation and preservation of the estuary. In other words, they do not know where to ask for expert advice. The reason for this was that the communities did not have an expert list or directory to refer to when they encountered estuarine problems. They did not have manuals or step-by-step practical guides for the protection, biodiversity and rehabilitation of estuaries. The communities of the Tyolomnqa Estuary can thus not be regarded as a knowledge community.

A knowledge community consists of those people who generate and create knowledge that adds value to the management of an organisation. The present study established a few knowledge sources that are at the disposal of the Tyolomnqa Estuary communities. These are the Tyolomnqa Estuary Forum, the Buffalo City Council and the Marine Working Group. These structures address issues affecting the protection and management of estuaries. The knowledge created and generated in these structures, in terms of lessons learned and best practices, is not captured anywhere. Based on the findings, it becomes evident that there are insufficient knowledge sources available for the Tyolomnqa Estuary communities to protect, monitor and rehabilitate the Tyolomnqa Estuary.

6.2.2 Knowledge identification

In identifying the knowledge that the organisation has, it is important to examine how knowledge is created and how it flows within the organisation (Probst, Raub & Romhardt 2000). This applies to how the Tyolomnqa Estuary communities know what they know. The study found that there was limited creation or generation of knowledge within the Tyolomnqa Estuary community. Knowledge about the management of estuaries is scattered and it does not reach the communities at grassroots level. Lack of knowledge dissemination did have a negative impact on the effective management of the estuary. The study established that the community had little awareness about issues pertaining to the estuary and activities that take place. The community gained awareness of activities taking place in the estuary through their engagement in the Tyolomnqa Forum meetings and workshops. The problem at hand was lack of skills and expertise to address issues impacting on the estuary. It can be agreed that lack of sufficient information and knowledge needed to protect the estuarine environment will result in poor management of estuaries. There is a need to acquire and create knowledge in the communities, to ensure survival of the Tyolomnqa Estuary.

6.2.3 Knowledge needs and gaps

It was established that the Tyolomnqa Estuary communities had a substantial knowledge gap. Their knowledge gaps lie in the following areas: practical management of estuaries, monitoring, laws governing estuaries, wealth creation and conservation issues. It becomes evident that, even though there might be information and knowledge created in the Tyolomnqa Estuary, it is not easily available for the community to access. This means that there could be a lot of 'wheel-reinventing' that is going on in estuarine management. If there were a knowledge repository, the Tyolomnqa Estuary communities would be aware of the potential of carrying out existing knowledge and put it to productive use for the effective management of estuaries. The study revealed that the Tyolomnqa Estuary communities needed knowledge in all aspects of estuarine management. The community needed to acquire estuarine knowledge through informal education, workshops and interacting with experts in the estuarine field.

6.2.4 The knowledge audit model

The study developed the knowledge audit model that could be used in non-traditional and non-formalised organisations, as opposed to business organisations. The knowledge audit model was developed based on the literature review in Chapter Two, background information on estuaries, presented in Chapter One, and the findings of the study. The reason for developing this model was that non-traditional and non-formalised organisations are different in terms of their people, culture, history, goals, structure and focus. Therefore, in understanding how knowledge is created and how it flows in a structure like the Tyolomnqa Estuary, it was seen as key to understanding the estuarine knowledge environment. Analysing the context in which knowledge is created and shared thus becomes extremely important.

The model provides processes and steps that could be applied, with further adjustments, to determine the knowledge that is needed to manage estuaries. The processes are presented on a specific level, to allow the model to match a specific context. At this level, the model is intended to suit non-traditional organisations or structures, especially the estuarine environment. There is no single or best way to conduct this model, as every situation or environment is unique and different. This means that the developed model can be seen as the 'context-specific knowledge audit model'. Summing it up, the model in its current state provides help in understanding the knowledge audit process in a particular context and way of conducting the audit.

6.3 Recommendations

The recommendations were made using the themes that emerged in the findings of the study. According to the literature knowledge has become to be regarded as the most important asset to all institutions and thus it needs to be managed properly (Henczel 2000; Martensson 2000; Radebe 2001; Schaefer, Cook & Barrett 2002). Indeed, knowledge can empower the communities of the Tyolomnqa Estuary to address issues impacting the estuary, as well as to take effective action. Conversely, lack of practical know-how, skills and expertise would result in irreplaceable natural resources like estuaries being threatened.

6.3.1 Knowledge acquisition

Huseman and Goodman (1999:204) pointed out that there are times when an organisation does not possess certain knowledge internally and does not have the skills to find it. This will require the organisation to look outside its own boundaries. In order for the Tyolomnqa Estuary communities to be in a position to address estuarine problems, they need to acquire knowledge from outside their boundaries. Knowledge can be outsourced through collaboration with estuarine experts, researchers and estuary managers. These sources provide opportunities to generate knowledge by encouraging people with different backgrounds and experiences to come together to share knowledge on the management of estuaries.

6.3.2 Establish a knowledge repository

A knowledge repository makes people aware of the potential of carrying out existing knowledge and put it to productive use. It is important for the Tyolomnqa Estuary communities to establish a repository of lessons learned and best practices. The knowledge repository should take into consideration the literacy skills and language of the community. The repository should incorporate anecdotes, videos, practical manuals and guidelines dealing with the protection, monitoring, governance and rehabilitation of estuaries.

6.3.3 Strengthen participation and links

It is recommended that communities of the Tyolomnqa Estuary participate actively in estuarine issues that affect their area. Participation in the Tyolomnqa Estuary Forum will foster the creation of knowledge and sharing of ideas. It is important that information and knowledge is captured on issues solved and be housed in a knowledge repository. Active participation will help the community to know what it knows, as well as to determine their knowledge needs. This will help the community to identify the knowledge within. Participation can take the form of meetings, workshops, seminars, topic groups and informal gatherings.

It is also recommended that the community should establish links with other estuary communities. This will enhance learning and the acquisition of new knowledge to address particular issues.

6.3.4 Need for continuous informal education

There is a need for continuous education for communities of the Tyolomnqa Estuary so that they can understand the nature of estuaries. Whitfield *et al.*, (2000) pointed out that South African estuaries are threatened by many anthropogenic influences, such as lack of education, particularly among the public, local authorities and regional planners, with respect to the sustainable use of estuaries. Successful estuarine management requires clearly articulated practices that have public support. It is a challenge that the local government, estuarine researchers and local conservation services are faced with. Much knowledge is created concerning addressing estuarine problems. The challenge is to disseminate the information and knowledge to the people at grassroots level. This study recommends that information and knowledge be disseminated through informal education, workshops and seminars. It recommends that a media programme be established that will continuously inform and educate communities on how to protect estuarine resources. Awareness programmes should be established in schools and community centres. In this way people will be capacitated appropriately.

6.4 Areas for further research

The major purpose of this study was to develop a context-specific knowledge audit model suitable for non-traditional and non-formalised organisations. The study has unravelled a number of areas that need further research. The model that was developed has not been tested. There is a need for verification and validation activities to determine the usability of the model for context-specific situations. This implies that with the identification of situations which the model is not suitable for, modifications might become necessary. The resulting extended version of the model could be implemented in context-specific situations.

In its current state the model is quite abstract, although pointing out what has to be done. Still, the model provides assistance in determining and assessing the knowledge status of non-traditional organisations. It is a starting point and needs to be further developed to maturity, including the provision of detailed methods and data collection tools or parameters on specific processes. This will allow the extension of the model towards a knowledge audit approach, providing not only the information about the operation to be

carried out but also guidance on how to perform the processes by including more examples and by the design of the knowledge audit questionnaires.

There are currently no projects underway to investigate the creation or development of universally accepted standards for the knowledge audit process. The use of this model might be a starting-point for the development of such knowledge schemas.

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APPENDICES

Appendix 1: Interview guide for the Knowledge Management Project

Focus Group Interview Questions for Tyolomnqa Estuary Users

Introduction

Good morning ladies and gentlemen. My name is Patrick Ngulube and these are my colleagues Pearl Maponya and Lucky Mosia (*This can vary depending on the person making the introductory remarks*). We are based at the University of Natal in Pietermaritzburg. Our project is on Knowledge management. Thank you for coming. A focus group is a relaxed discussion.

Purpose

We are here today to talk about issues you are experiencing in the management and utilisation of the Tyolomnqa Estuary. The purpose of this discussion is to get your views on how you manage the estuary and how you share your know how in terms of managing the estuary. Thus, we want to understand how you share the knowledge you have, teach others and or educate them on working with estuaries, and the role you play in the management of the estuary resources. In addition, we want to find out the know-how and skills that you don't readily have but that you require for protecting and conserving the estuary, and what knowledge sources you use to manage the estuary. We are not here to give you answers but rather hear from you. Your views are what matters. There are no right or wrong or desirable or undesirable answers. You can disagree with each other, and you can change your mind. We would like you to feel comfortable saying what you really think and how you really feel.

We hope that the information you will give us and the discussion today, will help all of us including yourselves put in place better means and way of using and managing the resources of the Tyolomnqa Estuaries. We also hope that your experiences and knowledge that you have may be shared with others in other estuaries so that we can manage the resources better.

We will be taking notes and tape recording the discussion so that we do not miss anything you have to say. Everything you say is confidential. Although we will ask you to tell us your names so that we can address one another by name, when we write up the report, we will not include your names and no one will know who said what and we would not write your names down. We want this to be a group discussion, so feel free to respond to me and to other members in the group without waiting to be called on. However, we would appreciate it if only one person talks at any given time and if you can give an opportunity to one speaker to complete what he/she wants to say. The discussion will last approximately 1 to 2 hours. There is a lot we want to discuss, so at times we may go beyond the time limit a bit.

SESSION 1: Participant Introduction (30 Minutes)

Now let us start by everyone sharing their name, where they come from, what they do (for a living), and how long they have been involved in estuaries.

SESSION 2: 1 Hour

Procedure: May each one of you write your responses on a card provided and after we will have an open discussion. ***(Procedure applicable to the Tyolomnqa Forum)***

(Since this will be more of a discussion, the lists that we have as possible choices can be used to prompt them to discuss the listed issues, if they are hesitant. Therefore, the given options will not be read to the respondents in the first instance, but will be used if and when they appear not to have an idea).

- How or where did you learn about estuaries? Did you learn through:
  - Meetings (Workshops, seminars)
  - On my own
  - My colleagues
- How many of you use the estuary?
- For those who indicate that they don't use the Estuary ask them why. They may well change their minds when they hear from other colleagues and obviously the variety of uses, which may not have been obvious to them.

- What do you use an estuary for? Do you use it for: (Don't give them the list to begin with)

- Fishing
- Harvesting of craftwork and house-building material
- Collect traditional herbs
- For grazing cattle
- Recreation like swimming
- Washing etc

- Is there anything that you do or rules that govern the use of the Estuary? For example are there time of the year when people are not allowed to fish? What kinds of activities are these? (After getting some indication on the rules or activities then you ask the specifics of Protection and Conservation. But you should start by using general words that describe protection and conservation) Are you currently involved in the protection and the conservation of the estuary and its resources?

- No
- Yes. If yes, what is your role?

<u>SESSION 3:</u> 1 Hour

Procedure: I would like each one of you to write down responses on a card provided and after we will have an open discussion (*Tyolomnqa Forum only*).

- Do you have any concerns and or problems about Estuaries?
- Can you explain what these are?
- Have you done or do you do anything about these problems? Why?
- What are your main concerns or problems regarding the Estuary? Do you have problems with:

- Sediment degradation
- Access (denied access for fishing, restricted, unlimited, vehicle access, no proper control, local people and cattle no access to paths or roads)
- Lack of fishing tools (e.g. boats, rods and reels)
- Lack of knowledge (skills or know-how) in protecting and managing the estuary
- Over-exploitation of the estuary resources

- ❑ Lack of quality water
- ❑ Lack of policing
- ❑ No tourism initiatives

- What approach or strategies have you taken to address the above issues or concerns? Where did you go to in addressing the above issues? Did you:

- ❑ Use your own skills and expertise
- ❑ Seek advice from estuary managers, government officials
- ❑ Talk to community members
- ❑ Discuss the issue in the Tyolomnqa Estuary Forum
- ❑ Read about it
- ❑ Did nothing about it

- Why have you taken this approach or strategy? You have taken this approach:

- ❑ I am more knowledgeable in the area
- ❑ Estuary managers have expert knowledge about the issue
- ❑ It is the best approach in addressing the issue

- How did you acquire or learn these skills and knowledge?

- ❑ Workshops and seminars
- ❑ Informal training
- ❑ Formal training
- ❑ Interaction with people knowledgeable in the field
- ❑ Reading manuals and guidelines

SESSION 4: 1 Hour

- What do you think should be done to address or solve these issues? Give reasons.

- ❑ Education and awareness
- ❑ Start or initiate volunteer monitoring programmes
- ❑ Elect field rangers to monitor the estuary
- ❑ Formalise and manage access

- What skills or knowledge do you need to address these issues? Do you need skills or knowledge on:

- ❑ Sedimentation

- ❑ Law enforcement
- ❑ Traditional fishing
- ❑ Environmental compliance
- ❑ Estuary resources management
- ❑ Estuarine conservation and protection
- ❑ Tourism

- Give reasons why you need these skills? Probes: *What would be the best avenue(s) for receiving these skills*?
- How many of you have shared their skills and knowledge about estuaries (also relate to the uses they have given above) with others? Probes: *Tell us about what you shared. Tell us about why you choose to share your skills and knowledge? How did this happen (through workshop and seminar presentations, informal conversations, estuary forum meetings, etc.)*
- Where do you get the knowledge on managing estuaries (its location)?
- How do you share the knowledge?

Closure and summary

Though there were many different opinions about (i.e. issues)_____,
it appears unanimous that_____.
Does anyone want to add or clarify the point?

Is there any other information regarding estuaries that you think would be useful for us to know?

Thank you very much for coming to this workshop. Your time is very much appreciated and your comments have been very helpful.