

**EXPLORING CHALLENGES OF KNOWLEDGE MANAGEMENT
AT ETHEKWINI WATER AND SANITATION UNIT IN THE
ENGINEERING DEPARTMENT**

BY

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**SUBMITTED IN ACCORDANCE WITH THE REQUIREMENT
FOR THE DEGREE OF MASTER OF COMMERCE IN
LEADERSHIP STUDIES, UNIVERSITY
OF KWAZULU-NATAL**

2016

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DECLARATION

I Bridget Ngenzeni Ntusi, do hereby declare that **exploring challenges of knowledge management at eThekweni Water and Sanitation Unit in the engineering department**, is a result of my investigation and research and that it has not been submitted and in part or in full for any other degree or qualification to any University.

Bridget Ntusi

Date: 4 December 2016

ACKNOWLEDGEMENTS

I thank God the Almighty for his abundant blessings.

I thank my family, especially my two daughters, Nokwazi and Anele, my mother, and my husband for moral support and their understanding during the busy times. If it was not their support this project would not be a success.

I would like to thank my supervisor, Dr E Mutambara for his professional support and guidance during the research process .The experience and incredible professionalism to the success of this study.

I would also like to thank Head of (EWS) EThekwini Water and Sanitation Unit, Mr E Msweli and the Head of (EMA) EThekwini Municipality Academy Dr Ngubane, for granting a permission to do this research. My gratitude also goes to the Deputy Head of EThekwini Water and Sanitation, Mrs B Soni in the engineering department for identifying and providing her team to participate in this research project.

I also would like to extend my gratitude to the team of engineers who participated and gave undivided support throughout the research project My words of gratitude also goes to some individuals who provided an exorbitant information in order for this study to be a success.

ACRONYMS

ECSA	Engineering Council of South Africa
EMA	EThekweni Municipality Academy
EWS	EThekweni Water and Sanitation
IMESA	Institute of Municipal Engineers of South Africa
JDE	Jack and Dan Edwards
KM	Knowledge Management
KT	Knowledge Transfer
MBI	Municipal Benchmarking Initiatives
SABS	South African Bureau of Standards
SALGA	South African Local Government Association
SOP	Standard Operating Procedures
WRC	Water Research Commission

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ABSTRACT

The study seeks to explore challenges of knowledge management in engineering department within EThekwini Water and Sanitation. Reviewed literature and the study through interviews revealed an understanding of knowledge management, knowledge sharing and transfer. In addition to that there has been a need to re-hire retirees as consultants. Collection of data was done via interviews where twelve participants were involved. Thematic data analysis used to articulate results aligned with four objectives Results of study discussed based on both themes and objectives. This study concluded by confirming ways knowledge sharing and transferring hereto recommended. Both literature and study findings discussed, and thereafter recommendations made to the management of engineering department within EThekwini Water and Sanitation. In dealing with mentoring, coaching, or shadowing, management should invest more to capacitate all the employees within the department to minimise the loss of expertise. Emphases to EWS management for proper controls in terms of protecting the knowledge embedded within the minds of knowers or experts. Uriarte (2008:10) wrote, the willingness to share tacit knowledge is influenced to a large extent by the managerial approaches to identify, capture and integrate that knowledge. So that service delivery is not impacted negatively when the engineers leave the department .The study also recommended proper imparting controls in knowledge sharing and transferred by the re-hired consultants for clear intentions and performance management system be implemented and outcome monitored and measured. Final, EWS to consider an establishment of a department to handle knowledge management system within the Unit.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The Water and Sanitation Unit is responsible for providing water and sewerage services in the Municipal area. Engineering forms one of the important roles in providing essential services. The engineers are regarded as the engine of the engineering department by virtue of the possession of skills, knowledge and expertise that they acquired over the years. The eThekweni Water and Sanitation (EWS) Unit relies on ageing engineers who have gained experience over the years. Due to factors like old age sometimes death, the majority of engineers retire without imparting their experience and knowledge to young engineers at the EWS Unit for daily operations.

If the engineering unit should have put in place knowledge management systems and practices for ensuring that retiring engineers gradually transfer their skills and experiences to young engineers within EWS Unit to provide for a smooth transition and avoid any problems. This study, therefore, tries to answer by exploring knowledge management challenges, in the engineering department within the eThekweni Water and Sanitation Unit.

1.2 Background

EWS is a Unit that provides water and sanitation services to communities within the eThekweni Municipal area. The eThekweni Water and Sanitation unit provides services to an average of 800 000 customers, both domestic and commercial, in rural and urban areas. The Water and Sanitation unit is made up of the following organizational structures; Customer Services, Scientific services, Operations services water, Operations services sanitation, engineering and auxiliary services.

The engineering department consists of the majority of the scarce skills employees, including civil, chemical and technical engineers. Engineers are ageing every year and the Water and Sanitation unit loses a wealth of engineering expertise and skills due to retirement or death. Due to this shortage, the unit finds itself having to rehire the retired engineers as consultants for at least two to three years.

This shortage exerts a challenge on the training of the young engineers as they have to depend on retired engineers for the transfer of skills. This does not always happen which, in turn, results in the skills gap. Therefore, the study seeks to investigate the impact of knowledge management challenges within the engineering department. According to Davenport and Prusak,(2000: 5): Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knowers. In organizations, it often

becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms”.

This study is based on the interviews of twelve engineers from engineering department within the EWS.

1.3 Statement of problem

Engineers are ageing every year and the Water and Sanitation Unit loses a wealth of engineering expertise and skills due to retirements, deaths and resignations. Emanating from the scarcity of engineers, the Unit finds itself faced with the challenges of having to rehire the retired engineers as consultants for at least two to three years, sometimes at exorbitant costs.

This shortage exerts a challenge on the training of the young engineers as they have to depend on the retired engineers for the transfer of skills. The retired engineers do not always do justice in transferring skills as expected. Consequently, there is a skills gap. Therefore, the study seeks to explore the challenges of knowledge management within the Engineering Department of the eThekweni Water and Sanitation Unit with a view to proposing some strategic interventions for gaps identified. The purpose of this study is to explore knowledge management challenges in the engineering department within the Water and Sanitation Unit.

1.4 Objectives of study

The following objectives were developed for this study:

- To explore the existing ways of knowledge sharing within the engineering department;
- To assess the importance of knowledge sharing within the engineering department;
- To explore innovative ways of transferring knowledge to younger engineers; and
- To assess if the re-hiring of retired engineers does add value to the Water and Sanitation Unit.

1.5 Research Questions

The study intended to answer the following questions:

- What are existing ways of knowledge management within the engineering department?
- Is knowledge sharing important in the engineering department?
- What are innovative ways of transferring knowledge to young engineers used by the department?
- What value do retired engineers add to Water and Sanitation Unit in the engineering department?

1.6 Aim of study

The main aim of the study was to determine and exploring challenges of knowledge management in the engineering department. The study focuses on the engineering department within the eThekweni Water and Sanitation Unit.

1.7 Significance of study

Although the literature revealed the importance of sharing and transferring knowledge, currently, there is no proper knowledge management system in place. This absence has an impact on scarce skills and creates a skills gap between the senior and junior engineers. As a result, leaders and managers are not paying full attention to knowledge management with the engineering department. Yet, management is responsible for knowledge management systems within the department. The significance of the study is divided into two dimensions.

The first dimension is that the study contributes to the management of the engineering department with particular emphasis on knowledge management.

It is believed that the study brings hope for further academic research in challenges of knowledge management. Secondly, in terms of professional engineering, the study makes recommendations on how to develop and implement knowledge management to avoid challenges of the skills gap resulting from the re-hiring of retired engineers and consultants.

1.8 Chapter organization

This research project covers five chapters. The study is organised as follows:

Chapter one – Introduction: The framework of the research has been clearly distinguished in this chapter. Other salient aspects included in this chapter are the problem statement, objectives, research questions, aim and the significance of the study.

Chapter two – Literature review: This chapter presents the reviewed literature in accordance with the objectives of the study. This chapter focuses on the definition of knowledge management and other concepts, sharing and transferring ways, benefits of the knowledge transfer (KT) programme as well as the model of knowledge transferring and the conclusion.

Chapter three – Research design and methodology: This chapter covers the study's research design research approach, sampling and sample strategy, data collection instruments, data analysis, validity and reliability, informed consent, delimitations and ethical considerations.

Chapter four – Data analysis and results discussion: In this chapter, research results are analysed and discussed. Tables are presented on participants' profiles, distribution of participants in hierarchical levels and participants by gender and race groups.

Chapter five – Conclusions and Recommendations: This is the last chapter of the research, which focuses on the conclusions and recommendations of the study as well as the scope of further research.

1.9 Conclusion

The engineering department has been utilizing retired engineers as a solution to the knowledge management challenges. It is, therefore, important that management is aware of the impact of not developing knowledge management system in order to deal with succession plan, mentoring and coaching issues. The EWS Unit in the engineering department has the ability to attend to those challenges. This chapter provided the background, objectives, aim and the significance of the study. The research questions and the organisation of the chapters of this study are also addressed in this chapter. The next chapter reviews the relevant literature for this study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature related to the research objectives. The literature review focuses on exploring the existing ways of knowledge sharing, assessing the importance of knowledge, and exploring innovative ways of transferring knowledge. This chapter also weighs the benefits and cost of re-hiring retired engineers as consultants.

The chapter provides different authors' definitions of knowledge management. The different dimensions of the research are also reviewed, namely; sharing knowledge in relation to the study, ways of sharing knowledge, and the importance of knowledge transfer. Literature is also provided on why knowledge management is important, and the benefits of knowledge management transfer. The chapter covers the way in which the knowledge management plan is developed and implemented. The knowledge transfer model provides the last part of the theoretical review in this chapter.

2.2 Defining Knowledge Management

“ Knowledge management as the constant challenge to identify, rescue, create, access, develop, preserve, disseminate, promote, use and reuse knowledge in order to answer audiences on delivering an excellent service” (Kraft and Donors 2012). Knowledge management is also defined as a systematic process, “knowledge management as a systematic process of

finding, selecting, organizing, distilling and presenting information which involves the design, review and implementation of both social and technological processes to improve the application of knowledge” (Knowledge Management Glossary of Terms 2012: p. 5).

Young observed, “Knowledge management as a set of organizational practices, deals with any intentional set of practices and processes designed to optimize the use of knowledge, in other words, to increase allocative efficiency in the area of knowledge production, distribution and use” (2013:5). According to Rouse (2013) knowledge management is the name of a concept in which an enterprise consciously and comprehensively gathers, organizes, shares, and analyses its knowledge in terms of resources, documents, and people skills.

“The process of systematically capturing, describing, organizing, and sharing knowledge making it useful, usable, adaptable, and re-useable” (Clobridge 2013). On the other hand, Koenig (2012) write, “knowledge management is a process of capturing, distributing and effectively using knowledge”.

Any organization whose objective is to deliver excellent services to its community can look at knowledge management as the constant challenge to identify, rescue, create, access, develop, preserve, disseminate, promote, use and reuse knowledge in order to answer to our audiences on delivering an excellent service. Therefore, this study adopts the definition of Kraft and Donoso (2012), as EWS provides services to the community.

2.3 Knowledge Sharing

Van Den Hooff and De Ridder (2004) define knowledge sharing as a process where individuals mutually exchange their implicit (tacit) and explicit knowledge to create new knowledge.

Knowledge management is mainly about making the right knowledge available to the right people at the right time. Knowledge sharing is the important part in the process of knowledge management. Knowledge sources are libraries, seeking out an expert, and receiving knowledge via an experienced co-worker.

Knowledge sharing depends on people's willingness to seek out these knowledge sources. Organizational culture, incentives, etc., form part of knowledge sharing. David James (2013) wrote; the purpose of education is to share our knowledge with others. Luis Suarez (2010), states that sharing knowledge needs to happen on a defined context, a context that one can suggest by promoting a number of different activities knowledge workers can engage with.

As discussed in Mark Easter-Smith, M. A., 2012. Organisational Learning & Knowledge Mngement. Second ed. United, while an agents of knowledge sharing, for example, management might enforce knowledge sharing in the organization, it might have limited concern for details of knowledge shared, and so its control might focus more on the structure of sharing, effectiveness, fairness and distributive justice and punishing free-riders.

Knowledge has become the most important asset in an organization as it transits into the knowledge economy of the 21st century where knowledge is not only critical, but essential, for every knowledge-based organization.

2.4 Different ways of knowledge Sharing

Tacit knowledge is mainly within the person's mind and can be only seen in action, with commitment and involvement in a specific concept. It is characterized by paradigms, viewpoints, beliefs and can create the know-how such as crafts and skill. Since it is embedded in people's minds, it becomes difficult to access. For most of the time, people are not aware of the knowledge they possess or how it can be valuable to others people and their organization.

Collins (2011) defines the salient characteristic of the tacit knowledge approach as the basic belief that knowledge is essentially embedded in a person's mind. Therefore, it is difficult to access, therefore transferring tacit knowledge should be done willingly.

Explicit knowledge is formal and systematically stored in records such as libraries, archives, and databases. Explicit knowledge can be kept in documents and computer systems. Explicit knowledge can be used as guides for rules and regulations. Collins (2011) describes explicit knowledge in terms of longer and shorter strings where people who know the same things can often convey what they want to convey with short strings, but people who do not know the same things can often be given a longer string which enables the same effect, meaning that it allows the

recipients to do something they could not do because of lack of knowledge. Explicit knowledge can be changed to suit the requirement of the situation. There are two factors which affect knowledge sharing, that is, individual and organizational factors. Mainly, lack of social network, lack of trust, and fear of loss of power are seen as individual factors. Other organizational factors include the lack of training, leadership, inappropriate information system, lack of sharing opportunities, and lack of appropriate reward system, which can benefit the organisation and contribute to its growth. Knowledge sharing is regarded as the most important function of the knowledge management system within the organization.

According to Bulchandani (2015), knowledge sharing is important to the organization, as it: creates Awareness, knowledge sharing plays an important role in creating awareness amongst the people in an organization. If knowledge is properly shared, employees become aware about what is expected out of them and they can thus create a road map keeping in mind the availability of resources, and try to achieve better results for the company as well as clients and themselves

Bulchandani (2015) also sees knowledge sharing as providing a quick solution, thus, improving the response time. Knowledge sharing is also seen as an element that increases co-ordination as it creates comfort and efficiency in the work environment.

Suarez (2010) states that sharing knowledge needs to happen on a defined context, to promote a number of different activities with which knowledge workers can engage.

Knowledge sharing should have a clear and effective purpose within the organization so that it can become a success. The study discusses the following ways of knowledge sharing, sometimes known as building blocks.

2.4.1 Information audit

Information audit is a systemic process which allows an organization to understand its knowledge needs, abilities and capabilities, information flow and gaps. Information audit is also known as information review or mapping. According to the International Journal of Managing Information Technology (IJMIT) Vol.3, No.4, (November 2011) creation and dissemination of knowledge requires both cultural social and technological dimension. The process of information audit is to gather the information currently used, arrange interviews, and advise or inform people of the nature of discussion.

2.4.2 Knowledge mapping

This is where skills are identified within the organization. The aim is to know what employees are capable doing, by ensuring that they do work on what they know better.

The human resources department is responsible for identifying competencies in order to advise the knowledge management team

accordingly. The following process is followed in identifying qualifications, experiences and competencies.

A questionnaire is designed and interviews are conducted. From the outcome of the interviews, roadmaps are compiled. All employees with skills and expertise are placed and better utilized where their expertise is needed.

2.4.3 Experts' locator

Experts are employees who understand a particular job or have a vast knowledge compared to their colleagues in the same field. Experts can be located via the telephone directory or internet. Expert locators can be identified through knowledge exercises, identifying an expert's data base, and training employees who participate in sharing and imparting knowledge. Like all other building blocks, experts' locators do have success stories as well as challenges.

2.4.4 Retired experts

There are skills that require people to leave a legacy, for example, by retirees. In most cases, it becomes difficult as one do not know exactly where to start. Knowledge management practitioners take their part by liaising with human resources department in connection with employees who are due to retire in the next 5 years.

2.4.5 Knowledge fairs

Knowledge fairs are an important benefit to the organization in order to expose the experts to working communities so that they are known by their expertise.

Experts showcase their excellent work during knowledge fairs, especially when there are developments within an organization which needs to be learned.

Knowledge fairs requires knowledgeable recommended speakers from that particular company. An important requirement is to arrange venues, get equipment, organize capturers, and bring digital videos.

2.4.6 Digital video

Collins (2011), spoke of communication as a string of referred digital tones that can be chopped into discrete entities, such as electronics. This is done to capture tacit knowledge which has become accessible via digital video that sometimes cost more.

Digital video is mainly used if it is required by someone who is in need of knowledge, but is unavailable to attend. This video shoot is easily done when knowledge sharing is in a talk format.

The video can then be shared with a group of workers within the company as well as used as and when a need arises. The process involved in making a good quality video requires an expert in taking films as well as funding of all costs, writes Collins (2011).

2.4.7 Stories /Legends

Sharing stories is regarded as more than just information, as knowledge comes from far via stories. Telling stories is regarded as a part of conveying sharing knowledge and making a difference to those who need it.

Change management goes hand in hand with storytelling as employees behaviour needs to change in preparation for the storytelling.

Stories are collected from within the organization, via interviewing and analysing the told stories to determine whether to get permission to use names. Stories are to be told by leaders repeatedly, and behaviour, character and values are analysed. They should be encouraged to be re-told. Unwanted, boring, and making up may results from or are a product of not analysed stories.

2.4.8 Innovation and technology

Innovation and technology have improved the way how employees can easily do their jobs. This requires the involvement of the leadership, as well as benchmarking the company in order to understand its internal processes.

As part of encouraging knowledge sharing via innovative initiatives, a rewarding system needs to be developed. The process in getting ideas from employees is via the mapping of the process, building a workflow tool, creating topics, recruiting experts, and implementing a rewarding system and ideas.

2.4.9 Documents and data management system

A company's documents management system is made of presentations, workshops with users, coding and designing. This system encourages the need to share within the company's employees in order to access documents.

The effectiveness of business processes indicates how the company flow of documents is encouraged, while allowing the history of documents to accumulate overtime.

2.5 Knowledge Transfer

Knowledge transfer forms part of knowledge management that has been in existence in simple ways via on-the-job discussions with colleagues, agents in libraries, and attending training and mentorship programmes. Technology has been part and parcel of knowledge transfer (KT) as it has created knowledge which include systems of expertise.

2.5.1 Why is knowledge transfer important?

Companies are faced with a huge number of employees who have retired or due to retire in a few years' time. Some of the employees have gained massive experience within an organization which can be used for daily operations of the business.

Companies are losing employees with such expertise and experience which contributes to the reduction of efficiency, resulting in mistakes that cost the

company fruitless expenditure, dropping of quality, significant disconnections in services and drop of the employees' performance.

According De Long (2006), knowledge is richer and more meaningful than information. So, if knowledge is lost, it might not be easy to replace. When others share knowledge, one is able to grow and share with others. Sometimes, new knowledge is created if it is shared together.

2.5.2 What are the benefits of a knowledge transfer programme?

According to De Long (2006), the goal of transferring knowledge to others (known as knowledge transfer) is to identify key positions and people where important knowledge loss is possible. Assessing an amount of loss could be difficult, but coming up with a plan of action ensures the capture of vital knowledge.

De Long (2006) further highlighted benefits of knowledge transfer (KT) programmes to avoid the loss of the important knowledge loss by sticking to key areas such as useable, and reusable documentation of the knowledge which is required in certain positions.

KT can be done by some of the employees via learning, or via employing, training, mentoring and coaching. This improves employees' retention, integrates employees, and improves other processes.

2.5.3 Developing and implementing knowledge transfer plan

Knowledge Transfer plan is an important part of knowledge management, as it assists management, including their personnel, to prioritise types of knowledge and expertise that should be shared with the existing staff. The task is to evaluate how knowledge was aligned into the mission statement of the company. The knowledge transfer tool is provided and completed by each employee within the company.

Knowledge transfer discussed as a process in GNB Knowledge Transfer Guide for Managers, (2010), consists of the following steps:

Identify essential knowledge at risk, identify who has the knowledge (the giver), identify "whom" the knowledge should be transferred (the receiver), select knowledge transfer tools to capture and transfer knowledge and lastly monitor and evaluate. De Long (2006) also included the process of developing a knowledge management transfer plan which includes three steps:

2.5.3.1 Identify critical tasks and activities

Personnel list the types of tasks and activities they only know, by following questions like what do you know? For what do you know? What to do? When you leave your position now what wouldn't get done? As you are the only one who knows, when you return from vacation, what work will be waiting for you because there is no one who knows how to do it? What does your office rely on you for, (De Long 2006)

2.5.3.2 Define tasks and activities

It is important to define knowledge and experience required for each task and activity. Tasks or activities are defined in more detail. Include information needed to carry out a particular task or responsibility. The focus should be on things one knows and that others should learn, according to De Long (2006)

2.5.3.3 Develop knowledge transfer plan

This is the final step of the process. Each question about tasks and activities get answered in detail. According to De Long (2006), the importance of the task has to be indicated by prioritizing as well as completing a matrix where all the steps

2.6. Knowledge Transfer Model

Elements of this framework for Organizational Knowledge Retention are Interdependent

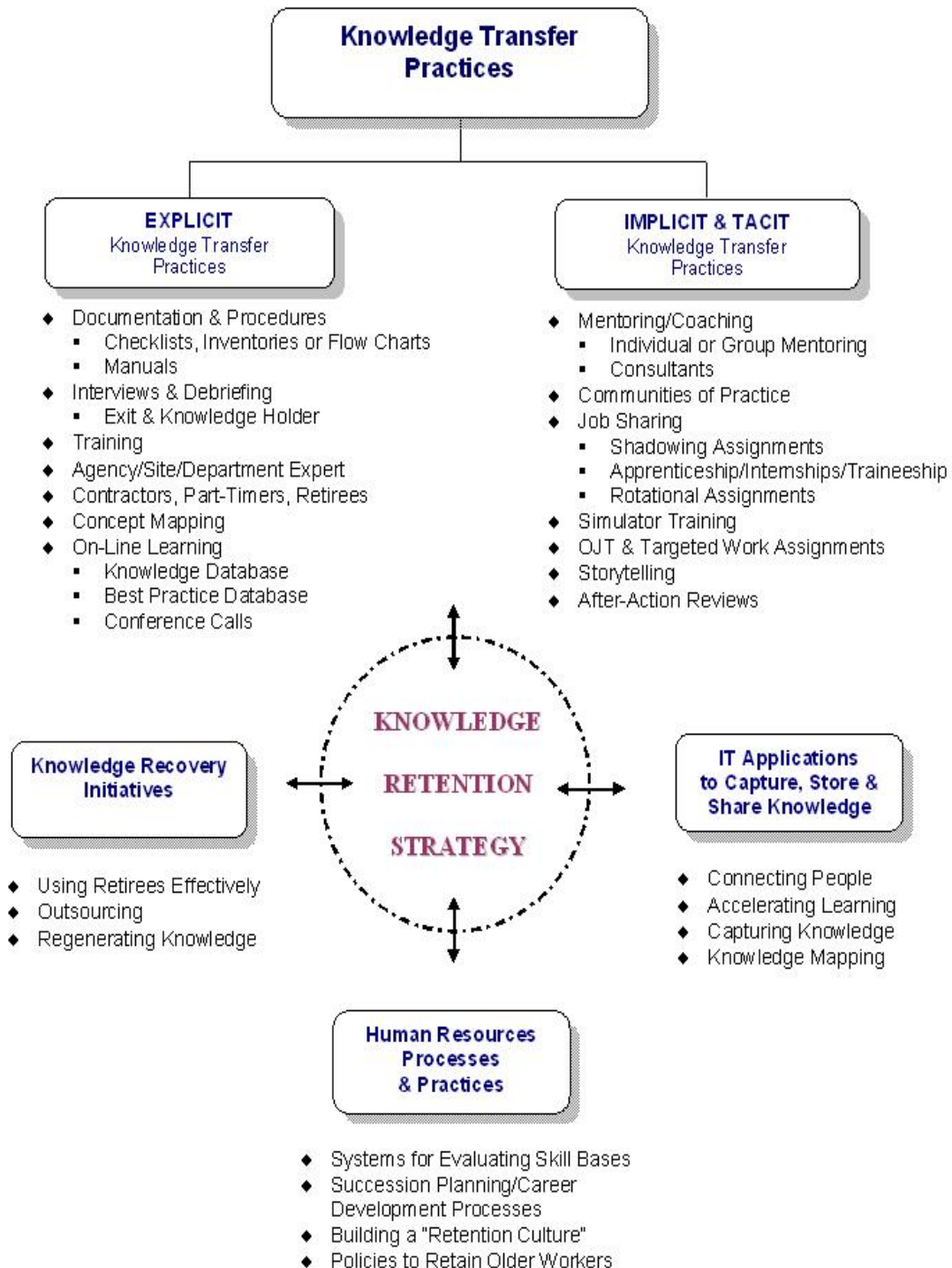


Figure 1. Source: Adapted from DeLong, Lost Knowledge: *Confronting the Threat of an Aging Workforce*

De Long (2006:7) elaborated on the importance of knowledge retention, as presented in figure 1.

Knowledge transfer practices indicate both implicit (tacit) and explicit practices. Examples of implicit transfer practices are mentoring, coaching, and communities of practice, job sharing, like shadowing assignments, apprenticeships, internships and traineeships. Simulator training, on-job training and work target assignments. Storytelling and after action reviews form part of implicit knowledge transfer practice.

Secondly, explicit knowledge transfer practices are provided as documentation including checklists, inventory or flow charts and manuals. Interviews and debriefing, training, agency expert, contractors, part time retirees, concept mapping, on-line learning also form part of explicit knowledge transfer practices according to De Long (2006).

The second part of figure 1 forms part of the knowledge retention strategy. This includes knowledge recovery initiatives like using retirees effectively, outsources and re-generating knowledge. The second strategy is IT applications to capture, store and share knowledge by connecting people, accelerating learning, capturing knowledge and knowledge mapping. The last strategy is human resources processes and practices. These include systems for evaluating skills bases, developing processes, building a retention culture and policies to retain older workers.

2.7 Conclusion

Chapter two outlined the different definitions of knowledge management by different authors. The study is based on a service-oriented organization. Knowledge sharing, as the main part of the study, has been defined as well as its importance. Innovative ways of knowledge sharing were also discussed as they also form part of the objectives for the study. The chapter also focuses on the importance of knowledge transfer where reasons for knowledge transfer are covered, benefits of knowledge transfer and a plan to transfer knowledge has been developed and implemented.

A model of knowledge transfer practices was detailed in figure 1, which illustrates that knowledge transfer practices, was split ,i.e., explicit and implicit. Knowledge retention strategies also form part of knowledge transfer practices. These strategies are divided into three, namely; knowledge recovery initiatives, IT applications to capture, store and share knowledge and human resources processes and practices.

The next chapter will discuss the research design and methodology used in this study.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter presents the study's research design, which includes the research approach, methods of constructing the instrument (questionnaire), target population, and sampling strategy. Other salient aspects discussed in this chapter include the validity and reliability of data, data collection, informed consent, data analysis, limitations and ethical considerations.

Plooy- Cillier (2015), define research as a process determined and re-determined by choices one makes on a continuous basis. The qualitative research approach was used. Whereas Kenton (2001:2) defined research as the process of asking questions and finding answers. "Research is asking questions and finding answers as continuous activities within the research process" (Davis 2015:2)

3.2 Research Design

The research design outlines the entire plan of what to do flowing from constructing questions, data collection and how data get analysed. "Research design is a procedural plan that is adopted by the researcher to answer questions validly, objectively, accurately and economically," (Kumar 2011:396). Getting answers to questions depend on the kinds of decisions made during the research Process. Understanding the meaning of

events of each case. In this paradigm, a researcher uses different methods with small samples analysed deeply.

3.3. Research approach

3.3.1 Research paradigm

A paradigm refers to a cluster of beliefs and dictates what should be studied, how research should be done, and how results should be interpreted Bryman, (2012).

3.3.2 Positivism paradigm

According to Easterby-Smith (2004), a positivism paradigm belongs to epistemology which means the philosophy of knowing. In this paradigm, the world is perceived as an external objective, not depending on the value of an observer. Mainly, the researcher focuses on facts of law, reduced to small elements. The research concept has to be operational and consist of a large sample.

The principles of positivism have an atomistic, ontological view of the world as comprising discrete, observable elements and events that interact in an observable, determined and regular manner (Collins, 2010:38).

3.3.3 Phenomenology paradigm

De Long (2006) stated that phenomenological paradigm is seen as being subjective as the observer forms part of the observation. The focus of the researcher is on causalities, and in understanding the meaning of events of

each case. In this paradigm, a researcher uses different methods with small samples analysed deeply. The study adopt the phenomenology paradigm as it consist of small sample of engineers.

3.4. Research methods

The quantitative method is used to measure data that can be put into numerical form or statistics. Quantitative methods are easily done using statistical analysis. A qualitative measurement focuses on collecting information that is not numerical but deals with opinions, and personal behaviour that reflects qualities of subjective experiences. Researchers provide a thick descriptive of subjective experience and meaning based on qualitative data (Neumann, 2011). Quality is the major element of qualitative research. According to Wild and Diggins (2010), qualitative research has its roots anchored in depth description by respondents so as to gain insight into a particular problem.

Kenton (2011:58) writes, in opposition to quantitative research, that qualitative researchers do not convert their observations or participants' observations to numerical form nor do they separate or isolate part of interaction from the whole.

Some of the important characteristics of qualitative research of a non-numerical nature, describes opinions, beliefs and views, in a form of words. Its main purpose is getting the meaning, feeling and the situation described. Qualitative data cannot be graphed as it is exploratory in nature

and investigates the why and how of decision making. the qualitative method consist of ethnography research which consists of six types; audience, street, auto ethnography, virtual and institutional ethnography The research has adopted the qualitative research approach as exploring challenges of knowledge management at the eThekwini Water and Sanitation Unit within the engineering department.

3.5. Target Population

According to Pascoe, we have to review our question and problem and identify our population parameters. This is between the target population and the accessible population.

Population is define by Wiid and Diggins (2013:186) as a total group of people or entities from whom information is required. In considering the sampling process, population parameters are to be set, population target identified.

Kenton (2011:2) writes, population consist of all units, or the universe, people or things possessing the attributes or characteristics in which the researcher is interested

According to Pascoe (2013) we have to review our questions and problem and identify our population parameters. This is between the target population and the accessible population. This study targeted twelve engineers from the engineering department within EWS.

3.6. Sampling and sample strategy

Sometimes, a sample strategy is also called a sample population.

Once the population has been identified, a sampling method is determined. Sampling is divided into two methods, namely, probability and non-probability as per Plooy-Cillier (2015:136).

According to Plooy-Cillier (2015:136) probability sampling is characterised by the fact that each unit in the population has an equal opportunity to be part of the sample. There are different types of probability sampling methods. Cluster sampling looks at the geographic location of participants. In systematic sampling, participants are chosen at regular intervals from the starting point. In simple random sampling, the selection of population is randomly done.

In stratified sampling, also called proportionate sampling, the sample is chosen from the proportion of the population or from strata units. Samples are drawn using either simple random sampling or systematic sampling (Neuman, 2011).

The second example of types of population sample is non-probability sampling which is used when getting the entire population is impossible or when parts of the population are not accessible. The first type of non-probability is accidental sampling method, which uses elements who happened to be at the right place in the right time. Secondly, convenience

sampling relates to the use of pre-test questionnaires. Thirdly, in purposive sampling, elements are chosen purposefully to participate in the sample.

Quota sampling is a fourth type and it is similar to purposive sampling. The only difference is the way in which the sample is drawn to match the ratio of different elements, as stipulated by parameters. The final non-probability sampling is snowball, which is used for the qualitative research method where the results obtained cannot be generated from a larger population.

Neuman (2011) refers to the sampling frame as the list of people or objects in a particular population. Things like a directory, a list of customers, tax records, telephone, driver's licence and a mailing list are examples of sampling frames.

This research sample consists of twelve engineers, comprising of the deputy head of engineering services, two senior engineer managers, two chief professional engineers (civil), two senior professional engineers, one project technician engineer, one engineer and three retired and rehired engineers.

The sampling method adopted for this study is purposive sampling as the research will focus in a specialised department with engineering skills and knowledge.

3.7. Validity and reliability

According to Plooy-Cillier (2015:152). Reliability and validity in research refer to the way human being develop feelings of trust in certain people. If

the study is to be repeated by different researchers same results are received.

Reliability is linked to the findings of the research, this is about the credibility of the research. Leitz & Zayas (2010) writes, credibility refers to the to which a study reflects the views of the research participants.

According to Welman, Kruger and Mitchell (2006:145), a study is reliable if someone is able to retest your data and obtain the same results.

There are five types of reliability, namely; inter-rate or inter-code, test-retest, parallel forms, split forms and according to Plooy-Cillier (2015:254).

Plooy-Cillier (2015:256) also referred validity as determines whether the research measured what it was supposed to measure. Types of validity are divided into four, namely, content, face, construct and criterion-related validity.

3.8. Data collection

According to Neuman (2011:424), a researcher attempts to capture all details of a social setting in an extremely detailed description and convey an intimate feeling for the setting and inner lives of the people in it.

Qualitative data collection methods include field research which is suitable for observation. Ethnography is a field approach that describes of culture to explore. Ethnographic research is made up of five types: audience, street, auto ethnography, virtual and institutional ethnography Plooy-Cillier (2015:176).

Focus groups are types of interviews done with a group of people in determining their attitude, behaviour, preferences and dislikes. These interviews are conducted by a facilitator at the same time writes Plooy-Cillier (2015:183).

An in-depth interview is an example of a qualitative data collection method where questions are posed to participants in order to determine their beliefs, opinions and views according to Plooy-Cillier (2015:188)

There are different types of interviews. In an informal conversation interview, a researcher is able to ask questions as the interview proceeds. Standardised, open ended interviews, are made up of the same set of open-ended questions asked to all respondents. The general interview is a conversation type.

This study adopted the open-ended interviews as they can be analysed by comparing notes on the views and opinions of participants in a more organised manner. Data were collected from the sample population of twelve engineers within the eThekweni Water and Sanitation Unit conducted in October 2016.

3.9. Informed Consent

Hofstede (2006) refers to informed consent as a responsibility of the researcher to ensure that all research subjects have a clear understanding of implication of participating in the study. It is the responsibility of a researcher to explain the following to all participants.

- **Understanding:** This includes the ability of participants to understand the research. The chosen respondents to participate in face-to-face interview are of high academic level. The researcher ensured that all participants understand the nature of the research.
- **Information:** Participants must be informed of the nature of the study, the purpose, the research institution, data collection process and the duration of an interview.
- **Voluntary:** The researcher needs to explain to each participant that the participation is voluntary. Therefore, each participants' approval is required. The participants may refuse to participate or withdraw from the project at any time with no negative consequences.
- **Confidentiality:** The confidentiality and anonymity of records will be maintained by the academic institution.

3.10. Data analysis

Data analysis is a process of bringing order or structure to the collected data (DE Vos, Strydom, Fouche' and Delport, 2011:397).

Among the number of data analyses available, this study adopted qualitative content analysis which is referred to as a textual analysis as it is used to explore and identify themes contained in a particular text.

According to Zhang and Wildemuth (2009:319), qualitative content analysis pays attention to unique themes that illustrate the range of meanings of the phenomenon rather than the statistical significance of the occurrence of particular text or concepts. The study used thematic analysis,

sometimes known as thematic coding, this is process of reducing data by using a list of themes known or anticipated to be found in the data or derived from the literature review.

3.11. Delimitation of study

The study was delimited to the eThekweni Water and Sanitation Unit in the engineering department. The researcher understood and acknowledged the complexity of the department as it forms the core function of the unit.

The eThekweni Municipality consists of engineers in almost all the technical oriented departments and units, but only twelve engineers from the EWS Unit participated in the stud.

3.12. Ethical consideration of study

The researcher ensured adherence to the ethical research standards by providing the relevant information to the Water and Sanitation engineers who participated in the study. The researcher also obtained consent from respondents to participate in the project. The level of confidentiality and anonymity was maintained by the researcher on the data collected.

3.13. Conclusion

Research design and methodology were outlined in this chapter. The qualitative research method was chosen for this study because of the sample which was twelve engineers. The target population was identified. Sampling strategies were discussed.

The study sample consisted of twelve engineers including the retired and rehired engineers as consultants. The research process was unpacked and included a discussion of validity and reliability.

The data collection was discussed and the qualitative method explained. In-depth interviews were conducted because of the small number of participants. Informed consent formed part of the research process. The researcher adherence to the ethical research standards by providing the relevant information to the participants of the study. The consent from respondents to participate in the project were also given, including the level of confidentiality assured during the process of data collection.

The chapter also focused on the limitation of the study in terms of the engineering department within the Water and Sanitation Unit. Ethical considerations of study were considered to ensure that all respondents were provided with the relevant information and that the informed consents were signed.

The next chapter will provide the data analysis and discussion of results.

CHAPTER FOUR: DATA ANALYSES AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the data analysis and discussion of results from interviewed participants in relation to the research questions established for the study. Firstly, tables below present the targeted participants' profiles, distribution by hierarchical levels, gender and race groups existing within the engineering department of the target population.

Secondly, the study objectives are also included in this chapter to match the identified themes.

Thirdly, the study discusses the manner in which the reduction of data took place after several times of reading the transcribed data. An open coding process was used in the study in order to identify and establish the following themes: a concept of understanding knowledge management; ways of sharing knowledge management; methods of transferring knowledge and, lastly, benefits and costs of hiring retirees. These themes are also discussed together with findings under each of the objectives aligned to the study.

4.2 Presenting results of the study

4.2.1 RESPONDENTS PROFILES

Codes	Designation	Number
KM01	Chief engineer (civil)	1
KM02	Chief engineer (civil)	1
KM03	Project technician	1
KM04	Senior engineer (civil)	1
KM05	Senior engineer	1
KM06	Retired engineer	1
KM07	Retired engineer	1
KM08	Retired engineer	1
KM09	Senior Manager	1
KM10	Senior Manager	1
KM11	Chief engineer (civil)	1
KM12	Deputy Head Engineering	1
Total		12

Table.1: Respondents' profiles

4.2.2 DISTRIBUTION OF PARTICIPANTS BY HIERARCHICAL LEVELS

Designation	Number
Deputy Head Engineering	1
Senior Managers	2
Chief Professional engineers (civil)	2
Senior Professional engineers	2
Engineer (civil)	1
Project technician engineer	1
Retired engineers	3

Table.2: Respondents by hierarchical levels

4.2.3 PARTICIPANTS BY GENDER AND RACE GROUPS

Gender	Male				Female			
Race	Coloured	Indian	Black	White	Coloured	Indian	Black	White
Number		3		5	1	1	2	

Table 3: Respondents by gender and race groups

The respondents' profiles is a good indicator of the target population interviewed. Table 1 outlines the participants in terms of codes from KM01 to KM12.

The study covered almost all the hierarchical levels of engineering from the head of the department to the re-hired retirees (consultants). Tables 2 and 3 indicate gender in the engineering profession within the EWS Unit as a male-dominated profession. In terms of race, it is evident that the engineering department has a history of being a white male-dominated skill.

4.3 Objectives of study

Data analysis is presented against each of the research objectives below:

- To explore the existing ways of knowledge sharing within the engineering department;
- To assess the importance of knowledge sharing within the engineering department;
- To explore innovative ways of transferring knowledge to younger engineers;
- To assess if the re-hiring of retired engineers does add value to the Water and Sanitation Unit.

4.4 Thematic data analysis

Thematic analysis, sometimes known as thematic coding, is a process of reducing data by using a list of themes known or anticipated to be found in

the data or derived from the literature review. Zhang and Wildemuth (2009:313) refer to this stage to make inferences and present reconstructions of meanings derived from the data.

4.4.1 Findings under objective one and data analyses

Objective one explores the existing ways of knowledge sharing within the engineering department.

This objective was covered by the following themes; understanding knowledge management, and existing ways of sharing knowledge.

4.4.1.1 Understanding knowledge management

Firstly, all participants demonstrated an understanding of knowledge management in different perspectives.

One participant explained knowledge management as passing the information down as the acquiring of knowledge developed and transferred. Another respondent sees knowledge management as the use of knowledge gained over the years and transferred to others.

A few of the respondents also felt that knowledge management is a knowledge pass on to the younger engineers within the company.

One respondent indicated knowledge management as a broad human knowledge stored in books, files and library, and business and was related to theoretical aspects. One participant looked at knowledge management as part of managing staff knowledge for a business succession plan.

A few respondents explained KM as individual knowledge and indicated that management has to ensure that such experience and skills were retained.

The literature reviewed KM as follows:

Young, (2013: 3) sees knowledge management as a set of organizational practices. The emphasis is in the use of knowledge as contribution toward efficiency in the area where it's needed most and there has to be a set of practices together with designed processes.

There is inconsistency in Young's definition of KM which indicates the intention of a set of practices and processes designed to optimize the use of knowledge. The study revealed no set of practices and procedures.

According to Kraft and Donoso (2012), knowledge management is defined as any organization whose objective is to deliver excellent services to its community. Knowledge management is seen as the constant challenge to identify, rescue, create, access, develop, preserve, disseminate, promote, use and reuse knowledge in order to answer audiences in the delivery of excellent service.

According to the literature above, the study does not reveal KM as a constant challenge but rather a part of assisting candidate engineers to qualify for their profession.

According to Stuhlman (2012), knowledge management is a hopeful constant plan. In other words, it is strategy which the company can implement with a hope of keeping knowledge for future use. Although some

of the respondents indicated that knowledge is stored in books, libraries and other theoretical aspects, some mentioned that knowledge is contained by individuals but it lacks the strategy to implement as well as the retrieval procedure.

4.4.1.2 Existing ways of sharing knowledge

Secondly, respondents provided existing ways of sharing knowledge as follows: Few respondents indicated that there is nothing formal but mentioned a documented management system as a EWS library where important books, reports, SOP, business processes, and historical information are kept. Electronic information systems form part of response as i-manage, e-works, and fault man, JDE, and e-mails assist to track and stored work that has been done. I-manage is a system used within the Water and Sanitation Unit to keep all correspondence sent to customers. E-works is a computer system used to track work-in- progress. Fault man is a system used by customers to log water and sanitation faults. JDE is a system used to place and track orders of eThekweni Municipality.

One of the consultants (retiree) explained ways of sharing knowledge as courses for professional development as well as a Workplace Skills Programme that will assist in passing standard knowledge from seniors and to the young engineers via projects.

One of the respondents mentioned that every individual kept information of projects on files, and contract files in an archive system. Computer

system accommodated information files which could be accessed later, e.g., M drive and data base.

One respondent indicated some ways of sharing knowledge between the young as well as the experienced engineers by meeting at least three to four times a week, by discussing reviews and making changes to site works.

One consultant indicated ways of sharing technical knowledge.

Some respondents perceived sharing knowledge as a process “where one get people to know how to take off and let the make mistakes, allow them to came and ask. Allow them to work around, put people in the teams where there is a diverse strength do not spoon-feed them.” One respondent mentioned sharing knowledge as a method used during interviews where a wrong answer is provided and the candidate has to tell the panel tell why it’s wrong.

Some respondents mentioned that knowledge should be shared on-the – job training, complicated contracts and non-contracts projects and that engineers need to self-educate and ask for the solutions.

Some ways of sharing knowledge listed by respondents were “to attend workshops, seminars, and courses as engineers which fall under ECSA strive to achieve qualifications that range from design to planning, that allow them to get to the profession registration”. The respondent concluded by saying that engineers are given more time to get the best standards that have been drawn up.

According to Mark Esterby –Smith Agency and Marjorie, A Lyles (2012:409), it is management’s responsibility to enforce knowledge sharing in a controllable manner.

Management should focus on details for the successful sharing of knowledge (Mark Esterby –Smith Agency & Marjorie, A Lyles, and 2012:409).

Very few respondents from the study provided knowledge willingly. Collins (2011) revealed that literature does confirm that embedded knowledge is personal in nature and not easily accessible to extract from minds of individuals.

Collin’s (2011) argument is in agreement with the study’s findings in that the extraction of such knowledge becomes very difficult as an individual has to be in a state of providing knowledge without any pressure. So, whoever is expected to transfer knowledge should do so willingly.

Bulchandani (2015) revealed that, if knowledge is properly shared, employees become aware about what is expected out of them and they create a roadmap. The study did not reveal the appropriateness of the concept of sharing.

Bulchandani (2015) states that knowledge sharing is important to the organization, as it creates awareness amongst the people in an organization. Proper knowledge sharing assists employees to understand

what is expected of them and encourages a clear direction in what they are doing to achieve the best.

The study revealed no clear habit and routines for knowledge sharing as reviewed in the literature below.

Suarez (2010) states that one reason why knowledge sharing is important is that it create habits and routines for sharing. In other words, a clear context of sharing knowledge, for the right purpose and awareness, takes priority and becomes a habit in the working environment.

Common ways of knowledge sharing were generally mentioned in the study. However, the literature refers specifically to knowledge sharing as information audit, knowledge mapping, expert locator, retired experts, and knowledge fair, digital video, stories or legends, innovation and technology, documentation and data management.

4.4.2 Findings under objective two and data analyses

This objective relates to assessing the importance of knowledge sharing within the engineering Department. This study's objective relates to two themes; involvement in sharing knowledge within the engineering department and understanding sharing knowledge.

4.4.2.1 Involvement in sharing knowledge

Firstly, one respondent stated that he was flexible in sharing and referred to seniors when he did not have some specific knowledge. The respondent

mentioned basic levels like reports, M drive as well i-managed as common information areas where the department is involved in sharing knowledge. One respondent indicated that he has always been available for mentoring candidate engineers for the past three to four years as well as to the department's seniors if there was a need for a second opinion and confirmation of contractual or design issues.

Another respondent mentioned that his involvement in sharing knowledge has been part of his career, mostly in training graduates. The same respondent emphasised individuals' empowerment and success, and assisted in checking simple things like mistakes, designs, drawings and calculation of tender documents qualities.

The study revealed some respondents' willingness to empower but did not reveal the involvement in KM as a constant challenge where knowledge is taken through a process or a system used to achieve excellent service.

The willingness to share tacit knowledge is influenced to a large extent by the managerial approaches to identify, capture and integrate that knowledge, wrote Uriarte (2008:10).

According to Kraft and Donoso, (2012), knowledge management is the constant challenge to identify, rescue, create, access, develop, preserve, disseminate, promote, use and reuse knowledge in order to answer audiences in delivering an excellent service. Koenig (2012) states that knowledge management is a process of capturing, distributing and effectively using knowledge.

4.4.2.2 Understanding knowledge sharing in the engineering department

Few of the senior and retired respondents indicated SOP, workflows, seminars are part of sharing knowledge within engineering department.

Secondly, respondents highlighted involvement in sharing as follows; being able to seek knowledge and share with the team, as some possessed the experience gained from the private sector to share in the public sector. Some respondents mentioned that the filing system is accessible to every staff member whose part of the team is. One respondent further advised that there is a gap of at least fifteen years of experience between them, so this makes it difficult to involve everyone in knowledge sharing within the department.

Seven respondent indicated their understanding in sharing knowledge within the department was to give a project to the candidate engineer, monitor and correct a mistake.

The study indicated an understanding of KM with the engineering department but lacks the definitions revealed by literature. Stuhlman (2012) regards knowledge sharing as conscious and constant, whereas Chlobridge (2013) believes that knowledge sharing is useful and usable and should be distributed to those who need it.

4.4.3 Findings under objective three and data analyses

Objective number three of the study explores innovative ways of transferring knowledge to younger engineers. Two themes are discussed that are aligned to this objective, namely, special ways of transferring the

knowledge within the engineering department and guiding new engineers in their daily work.

4.4.3.1 Special ways of transferring the knowledge within the engineering department

Firstly, respondents indicated the following as special ways of transferring knowledge within the department; communication via meetings, established steering committee, presentations, filing system for reports and documents where information is created, updated and stored.

Standard operating procedures, and practical experience, especially when the engineers are taken to the sites to work with contractors, were also mentioned during the study interviews. One of the respondents also mentioned mentoring of engineers as part of transferring knowledge which implies that it may take an experienced engineer less time to do work compared to the young engineer as engineering is judgemental, risky and involved problems.

Three of the respondents also gave their responses on transferring knowledge by engaging young engineers in a project and allowing them to gain the necessary experience.

One respondent referred to special ways of transferring knowledge such as the involvement of young engineers to the big and interesting projects from the beginning to the end.

One respondent, who occupies a senior position, explained special ways of transferring knowledge through dynamics by applying the same principles that were used differently by earlier engineers who were interviewed by their seniors for their profession registration.

One of the special ways in transferring knowledge mentioned during study interview was that Council should employ candidates and start teaching them on a one-on-one basis on how to read map scales, sewer reticulations and design sewer lines. This process involves the guidelines to design as per the SABS, teaching engineers on how to put together quantities for small contracts and later to larger contracts.

Some respondents also revealed that candidate engineers are taken through the Supply Chain Management process, codes of uniformity, and general conditions of a contract. They mentioned that young engineers are then taught more intricate tasks by involving them with the BID Specifications committees, tender process and adjudication and how to manage the awarded tenders, deal with claims and general conditions of contract issues.

One respondent stated that knowledge transfer is done when engineers are allowed to make a mistake and guided on how to correct the mistake, and are also encouraged to do research to resolve problems and write reports.

One respondent indicated that part of the responsibility is encouraging staff to buy more relevant text books and publications as part of transferring knowledge.

One respondent is part of Water Research Commission (WRC). Part of his job is to attend a conferences, where he could meet with different suppliers, graduates, and experienced engineers and be able to impart and gain knowledge. The respondent also contributed to study modules for the engineering department in one of the tertiary institutions where he is lecturing as part of imparting knowledge. This respondent contributed to other research as he is able to set trainings, provide access to industry of experts on the particular project, and set programmes for use of equipment.

The respondent also mentioned that knowledge transfer involves the writing of business processes, including why and how to avoid making mistakes in presentations. The respondent concluded by mentioning that it's not easy to document forty years of information due to lack of resources and time. He recommended that a dedicated person to is needed to do documentation. The study reveals that part of knowledge transfer is entrusting projects to young engineers, and taking them through systems and procedures, which seem to be partly consistent with the literature.

Collins (2011) describes knowledge transfer in terms of longer and shorter strings where people who know the same things can often convey what they want to convey with short strings, but people who do not know the same things can often be given a longer string which enables the same effect, meaning it allows the recipient to do something they could not do because of lacking knowledge.

“Core knowledge alone cannot fully support an organization and make it competitive. There is need for knowledge that can maintain the effectiveness of the organization. Such knowledge is known as “enabling knowledge”. When combined with the core knowledge, such enabling knowledge leads to the development of new products, processes and services.” observed Uriarte (2008:9)

The study does not reveal any clear developmental plan. A developmental knowledge management plan revealed in the literature by De long also included the process of developing a knowledge management transfer plan which includes three steps, namely, identify critical tasks and activities, define tasks and activities and develop a knowledge transfer plan.

The study revealed the involvement of one respondent to WCR as well as MBI. This finding is consistent with the literature as knowledge fairs are an important benefit to the organization. It is important to expose the experts to working communities so that they are known by their expertise. Experts showcase their excellent work during knowledge fairs, where knowledgeable and recommended speakers from that particular company are present.

The study revealed that, by sharing knowledge, respondents believed they were also transferring knowledge, which is inconsistent with the literature review. According to De Long (2006), the goal of transferring knowledge to others is to identify key positions and people where potential knowledge loss is most possible, and develop and implement a plan of action.

The study revealed that knowledge transfer to young engineers is done via training, developmental programmes, taking them to the sites and entrusting them with big projects. Literature reviewed by David De Long defines knowledge as richer as and more meaningful than information.

De Long (2006) further highlighted benefits of knowledge transfer programs to avoid the loss of the important knowledge by sticking to key areas such as useable, and reusable documentation of the knowledge which is required in certain positions.

4.4.3.2 Guiding new engineers in their daily work

Respondents viewed their opinions and understanding in terms of guiding young engineers in their day-to-day work. The first respondent indicated that, each year, they take over learner engineers and technicians to a developmental programme for five years. However, only a few make it through.

One respondent advised that the general approach is for young engineers to try to resolve problems as well as ask for the solution instead of looking for an answer. The respondent indicated that since he was groomed by senior engineers, he has used the same tactics with the young engineers, and this happens on a daily bases.

The retired respondent advised that he always gave guidance throughout the process on designs, and organised presentations to teach engineers communication skills by writing reports, organised trips to factories, did site visits with the water design contractors, and compiled reports every month

and evaluated alternatives. The respondent further eluded that he is always available anytime for any other staff having queries as well as for young and old engineers who ask for advice and opinions.

One of the retired engineers confirmed that he has been training young engineers, by finding out about the experience they have, and then pairing them with senior engineers so that they get practice by undertaking projects.

One respondent indicated that guiding young engineers' forms part of the supervisor's job, as he only attends to the escalated queries. He imparted information by engaging via communication and pointed young engineers in the right direction by not spoon feeding them, but providing them with literature to read and come back with roadmaps.

4.4.4 Findings under objective four and data analyses

Objective number four is covered by three themes as re-hired retired engineers, benefits to re-hired retirees and costs involved. Respondents shared their views in different ways.

4.4.4.1 Re-hiring of retired engineers

The first respondent indicated reasons to re-hire retired engineers as the shortage of skills, skills gap, experience and knowledge they possess. The respondent further mentioned that the presence of retirees made it easier for other engineers to get second opinions.

Respondent number two stated that retirees are able to help the department coach and mentor young engineers, as some have accumulated knowledge for over forty years.

Another respondent indicated the issue of demographics as a cause of the skills gap. He also mentioned that engineering used to be a male-dominated profession. Now females are able to get their qualifications but needed experience.

One respondent also mentioned that some of the engineers are brought back to production because of their speciality in certain functions while others are imparting their knowledge.

One respondent indicated that some engineers leave the department because of the demographics, which widens the skills gap. So, the department resolves this problem by re-hiring the retirees. The respondent further mentioned the employment equity policy that has been passed by the Council as causing the engineering profession to be unattractive and this has affected entry to tertiary institutions. This shortage creates a need to re-hire retirees.

The literature revealed that hiring retirees contribute positively to the organization, as they assist with mentoring, coaching and shadowing. Their presence emphasises the importance of experts who share knowledge before they disconnect from the working environment. Van Den Hoff and De Ridder's (2004) define knowledge sharing as a process where individuals

mutually exchange their knowledge, both implicit (tacit) and explicit, to create new knowledge.

4.4.4.2 Benefits of re-hiring retired engineers

Responses on the benefits of re-hiring the retirees were as follows; some respondents highlighted benefits of having retired engineers as they have worked in projects and are able to prepare young engineers as well as other engineers who are unable to cope. Scarce skills, and the age gap are mentioned as other important reasons for re-hiring of retirees.

One respondent indicated benefits of bringing retirees as the department is able to function easily without sourcing information outside. The respondent further indicated that retirees bring experience and professionalism that are required for ethical compliance.

Another respondent highlighted benefits of having retirees as they assist in training and development of young engineers. Retirees are able to take young engineers and technicians through the process of using some complicated machinery and plants. Retirees are able to impart information to seniors who struggle without being led by retirees.

One respondent indicated that retirees provide massive knowledge through transfer rather than production, thus, increasing the knowledge base.

Some respondents highlighted benefits of re-hiring retirees to undertake big projects which assist candidate engineers with their ECSA requirements. De Long (2006) further highlighted benefits of knowledge transfer (KT)

programs to avoid the loss of the important knowledge by sticking to key areas such as useable, and reusable documentation of the knowledge which are required in certain positions.

4.4.4.3 Cost of hiring retired engineer versus normal engineer

Thirdly, opinions and views about the cost of hiring retirees in comparison to the normal engineer are discussed below.

Four respondents shared the same views that retirees earn more than the normal engineers because of their experience gained over the years. They emphasised that people need to get paid for their skills and experience is no specific package used by Municipality to hire retirees. However, due to their scarce skills, managers are trained to work out attractive strategy packages.

A few of the respondents also had similar opinions that “because retirees possess more experience than a normal engineer, one cannot balance knowledge and cost as this comes back to why was no succession plan in place.” The respondents further indicated that no one can fill the void, except the retirees. They indicated that, when retirees are re-hired as consultants, they add more value because they have experience.

Another respondent was not sure about the rate received by consultants as some retirees are working for a few hours but he believed that the rate was very favourable.

One respondent mentioned that the retirees earn what they have been earning before they retire, but the rate was calculated hourly and they get an increase like all the Council employees. The retirees enjoy the stress-free environment by working less hours.

One respondent mentioned that "the cost depends on an individual package, check and compare it's cheaper to rehire a retiree, because of the area they coming from, the same institution not a problem compared to private sector". On the training perspective, they understand everything about the unit. They are involved with training and up skilling technicians and engineers who want to register for a profession.

The last respondent stated that "the cost of rehiring compared to employing normal engineers, is about the same but retired guys came back without benefits, whereas normal engineers are hired with all benefits". Retired engineers are expected to pay tax and declare their personal interests. If this is linked to productivity, a normal engineer can take up to six months to develop a tender whereas a retiree can do this within a month.

It is also mentioned in the study that one of the benefits of re-hiring retirees is because they possess a lot of experience.

Gaining knowledge is mainly through experience and learning. At times, it is difficult to transfer what has been learnt throughout the years. We often speak of a "knowledgeable person," this is, a person who is full of knowledge or has an expertise in a certain area.

The literature also revealed that knowledge is expanded when shared to others. Therefore, new knowledge is created. The literature does not reveal much of the average salary rate for re-hired retirees but the study revealed that they are paid a higher rate compared to young engineers. De Long (2006) further highlighted benefits of knowledge transfer (KT) programmes to avoid the loss of important knowledge by sticking to key areas such as useable, and reusable documentation of the knowledge which are required in certain positions.

4.5 Conclusion

Chapter four presented data analysis and findings by firstly, presenting participants' profiles in table 1. Secondly, participant distribution by hierarchical levels was presented in table 2. In Table 3, the study presented participants by gender and race groups.

The chapter further presented four main objectives to align the study findings.

The final part of this chapter was the discussion of findings and thematic data analysis in terms of the four study objectives.

To explore the existing ways of knowledge sharing within the engineering department, the following interview questions were derived: In your understanding, what is knowledge management? What are the available ways of knowledge management which exist within the engineering department?

Objective two was to assess the importance of knowledge sharing within the engineering department. Questions posed were: Have you ever been involved in sharing knowledge within the department? As we acquire skills in different ways, what is your understanding in sharing what you know better?

Objective three was to explore innovative ways of transferring knowledge to younger engineers and the following questions were asked: Are there any special ways of transferring the knowledge within the engineering department? How do you deal with new engineers who are coming to you for guidance in their daily work?

The final objective was to assess if the re-hiring of retired engineers does add value to the unit and questions asked were: In your opinion why are the re-tired engineers re-hired in the department? Stipulate the benefits of having the retired engineers working within the department? Is there a difference in cost of hiring a retired engineer than a normal engineer?

Recommendations based on findings are discussed in the next chapter.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusion and recommendations of the study. The conclusions are based on the literature review and the research objectives. Secondly, recommendations are based on two wings, firstly, to management of the engineering department within EWS of how knowledge management challenges can be resolved. The second wing is based on the potential area for further research. Both conclusions and recommendations are discussed in line with the objectives and study questions.

5.2 Study summary

5.2.1 Findings from literature review

In the literature review of this study consists of three main focus areas:

- Reviewing the theory of knowledge management;
- Reviewing the theory of knowledge sharing; and
- Reviewing the theory of knowledge transfer.

The reviewed theory of knowledge management focused on defining the concept, and sharing knowledge. The study identified and analysed the understanding of knowledge management and special ways used with the EWS engineering department to share such knowledge. An understanding of knowledge management and ways of sharing knowledge were consistently reviewed throughout the literature. Literature also reviewed knowledge transfer, including benefits of knowledge transfer and the

transfer plan development programme, which were consistent with the study's findings.

It was found that there are ways of sharing knowledge in the EWS within the engineering department but they are not structured correctly.

The literature revealed the concept of knowledge management as considerably common in every organisation.

The literature also showed the concept of sharing knowledge as an important factor for excellent service delivery.

In the literature, knowledge sharing and transfer meanings were distinguished by different scholars whereas the study revealed concepts as synonymous and were used interchangeably.

The literature revealed knowledge transfer plan development programme whereas none was mentioned in the study.

5.2.2 Findings from the study

The study showed an understanding of knowledge management existing within the department, but was unable to provide the structure that goes with it. Ways of knowledge sharing are shown by the study but not in a structured manner. It revealed that knowledge transfers are done as part of job training. The study revealed the one side of mentorship as a requirement for young engineers to register for a profession.

The study suggested that retired engineers are the source of knowledge for the sustainability of service delivery with EWS because of the gap between the senior and young engineers. Scholars define knowledge as some information in the mind of a person. In order to benefit from such a person, one needs to get closer.

The results from the study also provide some confirmation where retirees are re-hired to impart knowledge but it lacks the “how” part.

The study revealed that retirees were rehired for different reasons for big projects, production and training young engineers but none of the respondents mentioned procedures for each function.

The study also presented evidence that re-hired retirees’ salary rate was equivalent to their last package before the retirement. Therefore, retirees were rehired at a higher cost compared to a normal engineer who comes from private sector or tertiary institution. Objectives of the study are therefore achieved.

5.3 Conclusions

This chapter presented both literature and study findings. It has established and analysed knowledge management challenges in the EWS within the engineering department. The study was conducted successfully in providing evidence theory, the analyses of results, and the summary of both the study and literature findings.

5.4 Recommendations

It is important that EWS management put controls in terms of protecting the knowledge embedded within experts so that service delivery is not impacted negatively when the department loses an experienced engineer.

EWS engineering management must pay attention to the proper ways of introducing knowledge management within the engineering department. Retention strategy needs to be clearly defined within the unit.

On transferring knowledge, management has to ensure that a clear succession plans are put in place to avoid the loss of expertise at least five years prior to the retirement date of each specialised functions.

On knowledge sharing the department has to ensure that retired engineers are brought back with clear objectives and in terms documented.

On mentoring, coaching or shadowing, management should invest more to capacitate all the employees within the department to minimise a risk of losing expertise.

In terms of the cost for re-hiring retirees as consultants, the unit has to implement the performance management system and service level agreement, so that the imparting knowledge process and the outcome are correctly monitored and measured. In other words, re-hiring of retirees should have a calculated value for money impacting the whole unit.

In order for knowledge management system to be successful, an addition department to the existing institutional structure is proposed to focus on

knowledge management system development, implementation as well as monitoring and evaluation.

5.5 Scope for further research

The study presented vital recommendations for EWS engineering department to use for their future strategic plan. A few areas of further research include; the impact of culture in imparting knowledge, how best can knowledge be protected, impacting performance by imparting knowledge, challenges of knowledge management raised by a demographics and does the lack of knowledge management due to demographics influence entry to tertiary institution?

5.6 Conclusion

The engineering department has the arrangement of utilizing re-tired engineers as a solution to the knowledge management challenges. It is, therefore, important that management is aware of the impact of not developing knowledge management system in order to deal with succession plan, mentoring and coaching issues.

Chapter two outlined different definitions of knowledge management by different authors. Knowledge sharing, as the main part of the study, has been defined as well as its importance including knowledge sharing , ways of knowledge sharing, importance of knowledge transfer where reasons for knowledge transfer are covered, benefits of knowledge transfer and a plan to transfer knowledge has been developed and implemented.

A knowledge transfer model illustrated the knowledge transfer practices. The research design and process were outlined in chapter three. In the research design, research approaches relating to positivism and the phenomenology paradigm were defined. The qualitative research method was adopted. The target population and the sampling strategy were identified. This research chose purposive sampling as this is where elements are chosen purposefully to participate in the sample. The study sample consisted of twelve engineers including the retired and rehired engineers.

Validity and reliability of a research were discussed. Six types of Reliability are provided as inter-rater or inter-code, test-retest, parallel forms, split forms and internal consistency. Validity is divided into five types; content, face, construct and criterion-related validity.

Data collection is covered and the qualitative method explained as ethnography research which consists of six types; audience, street, auto ethnography, virtual and institutional ethnography. The study conducted in-depth interviews because of the small number of participants. Informed consent formed part of the research process.

A qualitative content analysis was used as a process to bring order to the collected data. The study limitation was provided as the study was conducted only in the engineering department within Water and Sanitation Unit. Ethical considerations of study were adhered to as all respondents were provided the relevant information and informed consents were signed.

In chapter four, data analysis and findings were presented by means of, firstly, presenting participants profiles in table 1. Secondly, participants' distribution by hierarchical levels were presented in table 2, and participants by gender and race groups were presented in table 3. Thematic data analysis was also discussed.

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21 September 2016

Mrs Bridget Ngenzeni Ntusi (214585420)
Graduate School of Business & Leadership
Westville Campus

Dear Mrs Ntusi,

Protocol reference number: HSS/1419/016M

Project title: Exploring knowledge management challenges at eThekweni Municipality Water and Sanitation Unit in the Engineering Department

Full Approval – Expedited Application

In response to your application received on 01 September 2016, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Dr Shamila Naidoo (Deputy Chair)

/ms

Cc Supervisor: Dr Emmanuel Mutambara
Cc Academic Leader Research: Dr Muhammad Hoque
Cc School Administrator: Ms Zarina Bullyraj

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