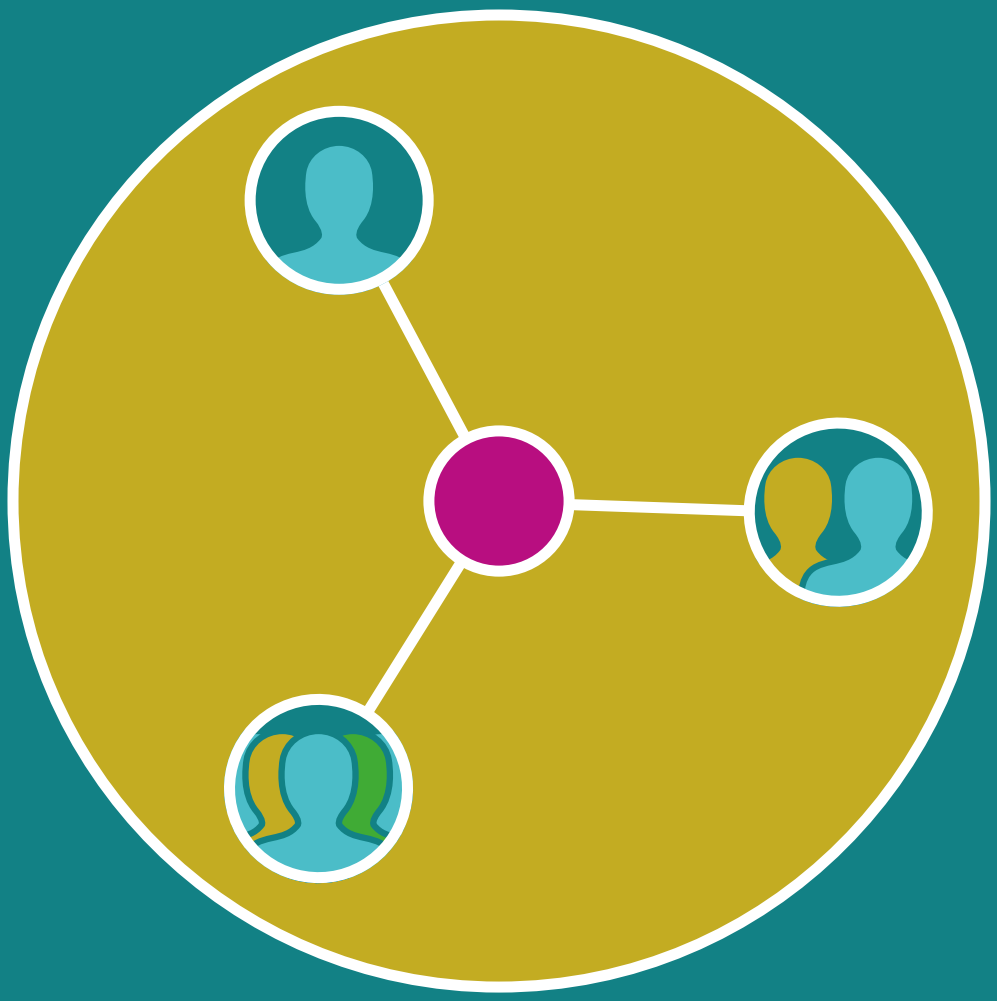
Knowledge Management of WOPping Water Operators



BEWOP

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Abbreviations

AfWA: African Water Association

BEWOP: Boosting Effectiveness in Water Operators' Partnerships

CAESB: Environmental Sanitation Company of Federal District

CD: Country Director (term used for Country Director at VEI)

DI: Dunea International

FGDs: Focus Group Discussions

GPEC: Gestion Prévisionnelle des Emplois et des Compétences

GWOPA: Global Water Operators' Partnerships Alliance

ICTs: Information and Communication Technologies

IEA: Institut International de l'Eau et de l'Assainissement

IWA: International Water Association

KIWASCO: Kisumu Water and Sewerage Corporation

KM: Knowledge Management

KVC: Knowledge Value Chain

LCDEA: La Cité de l'Eau et de l'Assainissement (training center and library of the SIAAP)

LVSWSB: Lake Victoria South Water Services Board

NRW: Non-Revenue Water

NWSC: National Water and Sewerage Corporation

ONEE: National Office for Drinking Water and Electricity

ONEP: Office National de l'Eau Potable (National Office of Drinking Water)

PL: Project Leader

PPPs: Public Private Partnerships

R&D: Research and Development

RD: Regional Director

RPM: Resident Project Manager

SDGs: Sustainable Development Goals

SIAAP: Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne

STE: Short-Term Expert

TANGA-UWASA: Tanga Urban Water Supply and Sanitation Authority

VEI: Vitens Evides International

WOPs: Water Operator Partnerships

WWn: World Waternet

Executive summary

Many water operators in developing countries face serious knowledge and capacity-related challenges that lead to poor service delivery. Water Operator Partnerships (WOPs) are used as a mechanism to strengthen the capacity of water operators for improved performance, by transferring new knowledge from mentoring water operators to mentee water operators. Since knowledge transfer is a joint learning process for the WOP partners, its success relies on the careful management of knowledge at either end. Thus, knowledge management (KM) within water operators requires urgent attention in order to ensure that the knowledge transferred to and/or generated within water operators in the context of WOPs is integrated, applied and managed well to help improve performance. The main objective of this study is to investigate KM processes of water operators and the factors influencing these processes. A secondary objective is to explore the extent to which water operators implement KM processes depending on their role in WOPs (i.e., mentor, mentee or both) and their degree of readiness to do so.

The study uses a qualitative case study approach, analysing nine water operators involved in WOPs. These include *three in Sub-Saharan Africa*: National Water and Sewerage Corporation (Uganda), Tanga Urban Water Supply and Sanitation Authority (Tanzania) and Kisumu Water and Sanitation Company (Kenya); *one in North Africa*: National Office for Potable Water and Electricity (Morocco); *four in Europe*, namely the Dutch Vitens Evides International, World Waternet and Dunea International, and the French Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne; and *one in Latin America*: the Environmental Sanitation Company of Federal District (Brazil). In addition to being located in different geographical places, the nine cases comprise public and private water utilities and vary in size and age. Furthermore, the selected operators play and have played different roles in WOPs (i.e., as mentor, mentee, or both). This variety of characteristics provided the opportunity to examine the reality of KM in water operators in different contexts.

The analytical framework used to analyse the KM processes of water operators is the *Knowledge Value Chain* by Weggeman (1997). The advantage of this model is twofold: first, it describes, in a very clear and simple way, the minimum set of processes that an organisation carries out to implement KM; second, it links KM processes to a variety of organisational variables (organisational structure, systems, culture, etc.) which capture the many factors influencing KM in organisations. Data was collected using a variety of instruments, notably interviews, focus group discussions (FGDs), non-participant observation and desk research. The analysis focused on individual cases first; then a cross-case analysis was conducted.

The study found that the water operators investigated are increasingly aware of KM and its potential to improve individual and organisational performance. However, in many companies, the concept of KM is still unknown to many employees, with top management staff generally understanding KM relatively well as compared to low level employees. KM is also still narrowly perceived by many, referring to it as consisting of staff training and development. This view reduces KM to the management of individual knowledge while that of collective knowledge is not acknowledged.

The study identified many activities relating to different KM processes across the nine water operators, but their level of professionalism varies from case to case. With regard to knowledge development/acquisition, it was observed that in most utilities the identification of needed and available knowledge tends to be conducted as a by-product of other organisational processes such as performance assessment or through routine meetings. Typical tools that are appropriate for these sub-processes of KM (notably knowledge audits and knowledge maps) seem to be unknown in the utilities. Training appeared to be the most common strategy used to acquire new knowledge; all utilities have a training structure and/or facility (and training plans) in place, although the nature and magnitude of the structures vary from utility to utility. In general, WOPs were reported to be an important channel for utilities to get exposed to (and acquire) new knowledge from external sources. Other knowledge acquisition strategies identified in the cases include research and development, hiring of competent people based on specified criteria, implementation of retiree programme, involvement in regional and global knowledge networks and collaborations with high learning institutions.

As a KM process, knowledge sharing is implemented to different extents in the nine cases. Across the investigated utilities, organisational meetings appeared to be the most common knowledge sharing mechanism. The utilities have

also embraced Information and Communication Technologies (ICTs) to foster information and knowledge sharing (among other things), although the level of complexity (and extent of use) of ICT systems vary from case to case. The ICT applications identified in the cases include, but are not limited to, websites, internal mailing, phones, web pages, the q-drive, Dropbox, livelink, and SharePoint. Other knowledge sharing practices that were identified in the cases include the following: knowledge sharing with colleagues following training participation, virtual and physical libraries, job rotations, staff induction programmes, training of trainers, coaching and mentoring, training on the job, repositories of staff's CVs that facilitate the identification and access to in-house experts, learning from peer utilities (e.g., through WOPs and other mechanisms), corporate newspapers, newsletter and water magazines, and internal and external benchmarking of team/department/utility performance.

A variety of practices were observed in the cases pertaining to fostering the application of knowledge. Particularly, most utilities have adopted (or are in the process of adopting) modern organisational management principles that aim at mobilising individual and collective knowledge for action. These include the development of high level goals (such as corporate visions and missions) and professionalization of utility businesses (e.g., by standardizing work management procedures). The utilities also implement a variety of human resources-oriented mechanisms that foster knowledge use; for example, efforts to place newly recruited staff in appropriate functions, repositioning and promotion of staff, development of teams (and a team spirit), result-oriented management and associated use of performance improvement plans.

Knowledge evaluation appeared to be the least known and practiced KM process. It was observed across utilities that knowledge evaluation is usually confused with concepts such as knowledge gap analysis and performance evaluation. Yet, these are different, although related, organisational management processes. Besides, knowledge evaluation is generally done as a by-product of other organisational processes such as performance evaluation and staff appraisal. In the context of WOPs, evaluating the value of knowledge was reported to be done by means of proxy measures and limited to the assessments conducted during project meetings and final project evaluations.

The results from the cases confirm that organisational features do influence KM processes to a significant extent. First, in many utilities the alignment between KM and organisational goals is still weak (or non-existent). Although water operators implement a variety of KM activities, these are not necessarily directly connected to the vision and mission of the utilities, and the relationship between KM and performance is not always clearly outlined. This has negative consequences on effective implementation of KM: particularly, it becomes difficult for many staff members to understand why they should support the proposed KM initiatives.

Second, KM appeared to be influenced by the utilities' personnel (and related policies). The studied mentee operators generally have an increasingly growing pool of capable staff; while mentor utilities already have sufficient numbers of competent people. When sensitized and motivated, these capable workforces can easily understand the value of (and give full support to) KM initiatives. The staff of water operators from industrialized countries seem to be more sensitized about the importance for KM (arguably because they belong to companies that are relatively knowledge oriented – appreciating the value of knowledge) than their counterparts in developing countries. Since KM is not yet an established practice in these countries, water operators must make efforts to motivate their people so that they can positively engage in knowledge activities. It was indeed observed in this study that where utilities create conditions (e.g., incentives and rewards) for staff to learn, KM initiatives run smoothly with positive impacts on performance. Unfortunately, the public nature of many of the studied water utilities in developing countries (e.g., they are less competitive and autonomous) seems to impede the establishment of sound and equitable KM incentive structures.

Third, the organisation structures of water utilities appear to be important factors influencing KM. In utilities that have adopted decentralised and/ or flat organisational structures, KM initiatives seem to work more appropriately than in utilities with centralized and bureaucratic structures. This study has identified many other structural initiatives across the cases which enhance KM. These include the following: knowledge and training structures and/facilities, monitoring and evaluation departments, introduction of open space offices and the so called "Ba" spaces, and creation of KM units. The study results seem to suggest that KM works better when it is assigned to a specialised department or unit which assists the utility management to shape its KM vision and strategy and to oversee their implementation at corporate level.

Fourth, the study found that organisational systems significantly influence a water utility's KM efforts. In particular, ICTs proved to play an important role in support of KM processes in the studied utilities. As indicated earlier, all nine cases have embraced ICT systems as a KM enabler. In some cases, these systems appeared to be better integrated and well-coordinated than in others, thus boosting KM. Evidence from interviews suggests, however, that ICTs do not necessarily ensure effective knowledge sharing and knowledge application in the utilities. This phenomenon is observed in other sectors as well, confirming that ICTs are not the whole solution to KM challenges. Specifically, the results suggest that ICTs ought to be implemented along with other non-technological KM initiatives (e.g., team development, incentive structures, decentralized structure, etc.) if they are to serve KM purposes effectively. Other important systems implemented in the cases that foster KM processes include benchmarking systems (internal and external), performance improvement systems, and monitoring and evaluation systems.

Fifth, the study shows that corporate culture is an important factor influencing KM in water utilities. Notably, reluctance to (versus acceptance of) change was identified as an important aspect of corporate culture affecting KM in some of the investigated cases. Notwithstanding, change and innovation are seen as positive and unavoidable in other utilities. Some utilities were found to be characterized by a lack of a 'systems thinking culture' and low levels of trust among employees; these features obstruct knowledge sharing and application in several regards. However, where managers and their staff members trust each other, KM activities generally proved to run smoothly.

Finally, the management style practiced by leaders proved to be one of the key drivers of KM in the cases. Where knowledge and people-oriented management (putting people at the center, thus effectively involving them in all processes, notably by giving them autonomy) was adopted, KM processes seem to run well, which positively affects performance. In such environments, management (at all levels) is open to employees and keen on empowering them, notably by supporting them to obtain the knowledge they need to perform their responsibilities. In contrast, where management systems are still centralized and non-democratic, KM initiatives face difficulties. In such systems, the majority of employees are less involved in decision making processes; their knowledge is therefore not used, let alone valued. The study results also suggest that where utility managers tolerate critical reflection and allow people to make mistakes for the sake of trying out new ideas, it is very easy to learn and apply knowledge. A variety of governance issues (such as transparency, patronage relationships and corruption) were also found to negatively affect KM processes in some water operators.

The analysis of the relationship between KM and WOPs showed that mentor operators tend to perform better in a number of KM processes and to have higher 'readiness' to implement KM than mentees. This can be explained by the high level of organizational maturity achieved by mentor utilities and their increased financial resources. Nevertheless, for some KM processes (e.g., knowledge gap analysis, knowledge evaluation) both mentors and mentees perform poorly and/or fairly. Similarly, they still present characteristics that are not favorable for KM (e.g., lack of well-articulated KM strategy, weak incentive structures), although to different extents.

The study concludes that the successful implementation of KM in water utilities is a complex task, requiring a multi-dimensional approach. Notably, KM efforts need to focus simultaneously on individual and organisational aspects of knowledge and consider the use of both technological and non-technological mechanisms. Effective implementation of KM also necessitates coordinating mechanisms at organisational level and sufficient time for KM initiatives to be appreciated (and supported) by beneficiaries and to affect performance. Thus, as a first step in their efforts to implement KM, water operators are recommended to establish (in their organisational strategic plans) clear knowledge visions and strategies and link these to performance. Only then can KM attract the attention of managers and staff at all levels, and be implemented, monitored and evaluated in a consistent manner, notably by giving equal emphasis to all KM processes. Given the established role of organisational variables in making KM work, water operators should make efforts to increase their readiness to accommodate KM interventions. Notably, they should strive to implement structural, cultural and attitudinal changes that are deemed necessary for staff to engage in knowledge/learning activities. In addition, since water operators that play the role of mentor in WOPs are also still struggling with KM to some extent, efforts that aim at promoting KM in the drinking water industry should target them too.

1. Introduction

1.1. Background

Many water operators in developing countries face serious performance challenges which lead to poor service delivery. These challenges are not just technical but have other important soft dimensions (Mvulirwenande, 2015). The biggest challenge appears to be low levels of service coverage, as in 2015 more than 663 million people across the world still lack access to safe drinking water (WHO and UNICEF, 2015). Other challenges facing water supply utilities include limited funding, high rates of Non-Revenue Water (NRW), intermittent supplies, poor water quality, governance problems (such as political interference and patronage, corruption, and lack of autonomy) etc. (Marin, 2009; Baietti et al., 2006; Transparency international, 2008; Mugisha and Brown, 2010). On top of that, in many cases, the above challenges are associated with a lack of appropriate knowledge and capacities. That is, inadequate competences of staff, inappropriate organisational processes, structures and policies, and institutional environments that are not enabling enough (Mvulirwenande, 2015).

Over the past three decades, efforts have been made globally to help water utilities in developing countries improve their performance. Since the late 1980s, many governments conducted performance-oriented reforms of their urban water supply sectors, by separating, among other things, water service provision from other water responsibilities (such as water resources management, water policy making and regulation). The reforms also very often involved Public-Private Partnerships (PPPs). Under PPPs, water supply responsibilities were delegated to private operators, through a variety of contractual arrangements, in the hope that the new operators would bring in new expertise and financial resources from the private sector (Harris, 2003; Marin, 2009). The above strategies have had different levels of impacts on the performance of water utilities, but in many cases expectations were not met.

Water Operator Partnerships (WOPs) emerged at the time when PPPs became less popular in many developing countries (Coppel and Schwartz, 2011). WOPs were recommended by the United Nation Secretary-General Advisory Board on Water and Sanitation (UNSGAB) in its 2006 Hashimoto Action Plan as an alternative mechanism to strengthen the capacity of water operators for improved performance (UN-HABITAT and IWA, 2009). The key idea behind Water Operator Partnerships (WOPs) is that water supply and sanitation operators around the world stand to help one another to improve services. WOPs are partnerships between peers, i.e. water operator partnerships carried out on a not-for-profit basis with the aim of improving water operator capacity, by sharing knowledge and experiences. Performance improvements of the mentee (recipient) water operator are aimed for by support from the mentor (external) water operators in this operational improvement process through a strong emphasis on inter-organisational knowledge transfer, learning and capacity development. Since knowledge and capacity (and their management) are nowadays widely acknowledged as potential sources of value for organizations (Penrose, 1959; Grant, 1996; Denisi et al., 2003), it is crucial to understand how water operators manage their knowledge assets. This helps to identify better ways to develop more effective partnerships for knowledge sharing.

The present study was conducted within the framework of BEWOP project, a collaboration between UNESCO-IHE Institute for Water Education and UN-Habitat's GWOPA for Boosting Effectiveness in Water Operators' Partnerships. While GWOPA, as the global mechanism for promoting and supporting the use of WOPs, had made advances in mobilizing involvement in and support to the WOPs practice globally, the ongoing need expressed by operators and funders alike to have more guidance on effective WOPs practice was yet unmet. The BEWOP project came in at a time when GWOPA had been operational for about 4 years and provided a welcome opportunity to jointly build on the work that has so far been done by GWOPA (especially in advocacy and expanding the volume of WOPs practice), and to address some of the challenges that stand in the way of the further expansion and effective use of the WOPs approach.

1.2. Rationale for knowledge management within water operators

As argued by Drucker (1995) *"Knowledge has become the key economic resource (…) and the dominant source of comparative advantage"*. In fact, as argued in the literature, knowledge (and knowledge management) help organisations to achieve improved performance, among other strategic objectives (Lee and Yu, 2004; Ahn and Chang, 2004; Choi et al., 2008; Rašula

et al., 2012; Ghisi, 2012). Bennet and Bennet (2011) posit that the real source of overall organisational performance lies in the employees and the knowledge they possess. In other words, the extent of available knowledge (and its application) determines the quality of the decisions and actions that are undertaken in specific situations by staff members at all levels and, thus, performance (Bennet and Bennet, 2011). The concept of performance can mean different things for different people, but in the context of organisations, such as water utilities, it is usually measured by standards such as efficiency (extent to which goals are achieved), effectiveness (extent to which an organisation does its work in an optimal way, e.g., low costs), and sustainability (extent to which an organisation's activities remain relevant to its stakeholders such as consumers, or the extent to which it can sustain itself financially) (Lusthaus et al., 1995). In the water industry, efforts have been made to define performance indicators for water utilities (Alegre et al., 2006).

Similar to organisations in other sectors, water operators rely on a sound knowledge base to sustain and improve their performance through change and innovation. It is clear that water operators are increasingly recognising knowledge as a valuable resource that needs to be carefully managed (e.g., Baker et al., 2004). A large scale survey among US water supply utilities (Bennet and Bennet, 2011) showed that more than 50% of the 207 participating utilities are already implementing knowledge management (KM) strategies, with additional utilities already planning knowledge management strategies or showing an interest in them. According to this survey, water utilities acknowledge many benefits of implementing knowledge management. These include having well prepared employees, improved performance (individual and organizational), a better work environment, improved customer service (awareness and satisfaction), ability to retain talented staff members, and so on. Similarly, indicative input from 15 water operators from the Global South (12), Europe (3) and US (1) received during the first BEWOP Water Operator Consultative Group meeting (November 2013, hosted by GWOPA, UN-Habitat, in Barcelona), summarized in Table 1.1, suggests that the same is true elsewhere (Wehn, 2014).

Table 1.1. Drivers of knowledge management: views of water operators

Internal drivers	'We realised that **knowledge is being drained from our organization** when senior staff left the organization without transferring their knowledge to junior staff.' 'We had to move from ad hoc to formalized KM because **we were losing information** with the growth of our company.' 'It would help us **remove 'cultural' barriers** that hinder knowledge sharing.' 'We created a dedicated training institution within our utility **to capitalize on our knowledge**.'
External drivers	'We initiated a KM platform following reforms of the sector that required **increased accountability and transparency**.' 'Keeping knowledge and promoting innovation was **key to our sustainability**.'

Source: *Wehn (2014)*

As indicated previously, Water Operator Partnerships aim at transferring new knowledge from mentors to mentee operators. However, it is not simply a matter of 'shipping readily packaged knowledge' from one operator to another. Instead, knowledge transfer is a joint learning process for the WOP partners the success of which relies on the careful management of knowledge at either end. Thus, knowledge management within water operators requires urgent attention in order to ensure that the knowledge that is transferred to and/or generated within water operators in the context of WOPs is 'anchored', applied and managed well.

BEWOP research therefore focuses on current knowledge management practices of water operators and tries to support them through action research (participating in organisational change while guiding it and reflecting on it).

1.3. Research objective

The main objective of this study is to investigate knowledge management processes of water operators participating in Water Operator Partnerships (also referred to as *"WOPping operators"* in this report) and the factors influencing these processes. A secondary objective is to explore the extent to which water operators implement KM processes depending on their role in WOPs (i.e., mentor, mentee or both) and their degree of readiness to do so. All of this allows the BEWOP project to identify the most salient knowledge management-related challenges faced by participating water utilities and to provide them with a structured approach for addressing these challenges.

1.4. Structure of the report

The remainder of this synthesis report is structured as follows. Chapter 2 describes the key concepts used in this study and the selected analytical framework. Chapter 3 presents the methodology. Chapter 4 presents the results and cross case analysis. Chapter 5 concludes the report and presents recommendations for WOPping water utilities.

2. Conceptual approach

2.1. Distilling the key concepts

2.1.1. Knowledge

Knowledge is a much debated topic and there are different ways of viewing it. Knowledge is often classified into two major categories, *explicit* and *tacit* (Polanyi, 1959; 1966; Nonaka and Takeuchi, 1995). On the one hand, explicit knowledge can be captured using words and images and written down in documents or stored in databases; it can easily be communicated and shared with others (e.g., written work procedures, best practices, formula, etc.). On the other hand, tacit knowledge cannot be easily articulated; people carry it in their heads (e.g., knowing how to ride a bicycle) and is, thus, difficult to transfer from one individual to another. In the context of organisations, tacit knowledge is viewed as more valuable than explicit knowledge because it provides context for people and can hardly be imitated by competitors (Von Krogh et al., 2000). As argued by Davenport and Prusak (2005) organisational management should create appropriate conditions (such as encouraging informal networks between colleagues, trust, etc.) for tacit knowledge sharing to occur.

Another important view on knowledge is the distinction between three concepts that are interrelated, namely *data, information and knowledge* (Davenport, 1997; Weggeman, 1997). Data is often described as raw observations or facts (expressed in terms of numbers, images, and words) about events. Information is created by adding some intellectual input to data to generate meaningful patterns out of it (e.g., putting data into context by clarifying when a particular event took place). Knowledge is generated from information through reasoning and interpretation processes and is always associated with action (Nonaka and Takeuchi, 1995; Sveiby, 2001). In that respect, Weggeman (1997) argues that knowledge (which he describes as the personal capability that enables an individual to execute a certain task) is the product of information and the capacity to act on this information through experience, skills and attitude.

Finally, important to highlight in this discussion is the distinction made between individual and collective knowledge (Argyris & Schön, 1978; Kim, 1993). Individual knowledge refers to the personal knowledge possessed by individuals (e.g., knowledge of professionals in a water utility), whereas collective knowledge refers, for example, to the knowledge that is embedded in any entity's routines, customs and procedures (Mvulirwenande, 2015). Under collective knowledge, a further distinction is made between group knowledge (such as the knowledge possessed by a community of practice) and organisational knowledge (such as collective understandings that are embedded in an organisation and allow it to use its resources in a particular way) (Penrose, 1959).

2.1.2. Knowledge management

The concept of knowledge management is usually used to describe a dynamic cycle of knowledge (individual and organisational) -related activities performed by an organisation in order to achieve its strategic aims (e.g., improved productivity, continuous adaptation to rapidly changing business environments) (Davenport and Prusak, 2000; Lehaney et al., 2004). These activities include the acquisition, application and dissemination of existing and newly created knowledge; the creation of conditions that enable learning and the means to share both explicit and tacit (difficult to express) knowledge; and the use of appropriate systems such as information and communication technologies (ICTs). Managing these learning processes to ensure that they result in the (improved) application of knowledge by individuals, and in collective changes such as improved organisational routines and procedures, as well as innovation, is crucial (Wehn, 2014). Simply put, one could argue that knowledge management is all about ensuring that individuals and groups in a particular entity (organisation, sector, and society) have the right knowledge they need to perform their tasks and are able to use it.

The literature makes a distinction between technological approaches to knowledge management (ICT-based) and non-technological approaches (people-based) (Davenport and Prusak, 2000; Alavi and Leidner, 2001). However, it is increasingly acknowledged that knowledge management becomes more effective when focused simultaneously on people, processes and technology (Davenport and Prusak, 2000, Collison and Parcell, 2002; Knight and Howes, 2003). This approach stresses the need to focus knowledge management initiatives on

organisational elements such as people's culture (including their behaviours, values and attitudes) (e.g., promoting the culture of openness and trust, rewarding innovative ideas, etc.), internal processes (e.g., re/structuring communication and decision making processes, changing the organisational structure, … so that they can foster instead of constraining knowledge activities), and technological systems (e.g., introducing information technologies that fit people and processes).

Thus, the knowledge management toolbox comprises a variety of tools and techniques many of which are not new, but have precedents in other organisational management practices such as education, training and artificial intelligence (McGraw and Harrison-Briggs, 1989; Gery, 1991). Examples of common tools and techniques currently used in knowledge management programmes include after Action Reviews, Communities of Practice, conducting knowledge audits, developing a knowledge management strategy, exit interviews, identifying and sharing best practices, training, establishment of knowledge centres, knowledge harvesting, peer assists, social network analysis, storytelling, white pages, etc. For a broader and more elaborated overview of knowledge management tools, see Bennet and Bennet (2011) or Servin (2005).

2.1.3. Learning and learning organisations

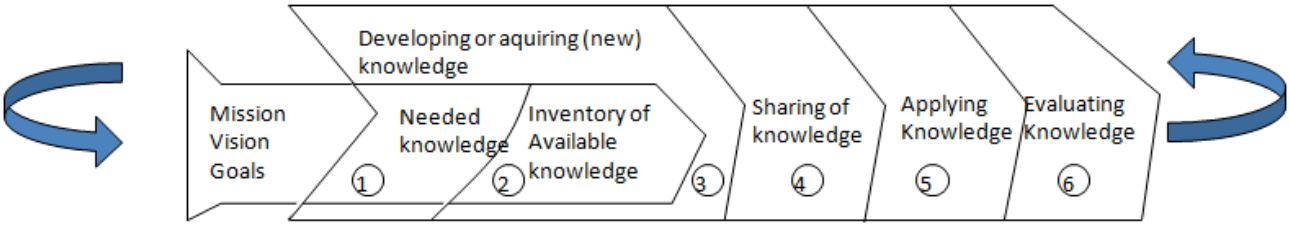
Learning is a very complex process and there is no generally accepted definition of the concept. However, most definitions associate learning with the idea of increase in capacity (operational and conceptual) to handle situations (Argyris and Schön, 1978; Kim, 1993; Illeris, 2007). For example, in broad terms, Illeris (2007, p. 3) describes learning as "*any process that in living organisms leads to permanent capacity change and which is not solely due to biological maturation or ageing*". Learning is indeed the process through which new knowledge (or capacity to act) is acquired. Three ways of learning are distinguished in organisation literature. First, *individual learning* takes place in various situations such as through discussions with colleagues at work place or in class. Worth noting is that most learning is informal and action-related, i.e. often outside the formal education and training system (Tough, 1971; Eichinger and Lombardo, 1996). Second, *group learning* occurs as when a particular group (say, a community of practice) adopts a new way of thinking or attitude *vis-à vis* a problem. Third, *organisational learning* takes place as when different units or sub-groups inside an organisation adhere to the same new rules and procedures which then start guiding their action. Similar to group learning, organisational learning is more complex and dynamic than just the sum of individual learning. In fact, although organisations rely on individuals inside them to learn, they do not necessarily rely on all individuals to learn (Kim, 1993; Liao et al., 2008).

Organisations that value learning at individual, group and organisational levels are often referred to as *learning organisations* (Senge, 1990; Kim, 1993). They create material and immaterial conditions to ensure that individuals, groups and the organisation as whole can continuously question their ways of thinking and doing and learn new knowledge for action. Senge (1990) has identified five areas of focus while creating learning organisations, the so called five disciplines. These are personal mastery (the commitment of an individual to learn), mental models (creating the values of an open culture that promotes inquiry and trust), building shared vision (motivating the staff to learn and so to create a common identity that provides focus and energy for learning), team learning (accumulation of individual learning through open communication, collaborative work and shared understanding.), systems thinking (understanding how things influence one another within a whole: natural (ecosystems) and organizational systems (people, structures and processes). In a similar way, Marsick and Watkins (2003) argue that the following features are key characteristics of learning organisations: continuous learning opportunities, improved culture of inquiry and dialogue, collaboration, systems to capture and share knowledge, empowered people towards a collective vision, connection of the organisation to the environment, and strategic leadership for learning.

2.2. Analytical framework

The literature on knowledge management provides a variety of models that could help to understand and / or investigate knowledge related processes in water operators. Examples of such models include the Knowledge Value Chain (KVC) by Weggeman (1997) and the knowledge conversion model by Nonaka and Takeuchi (1995). In this study, we use the KVC model to analyze the knowledge management processes of WOPping water utilities. The advantage of this model is that it describes, in a very clear and simple way, the minimum set of processes that an organisation carries out to implement knowledge management. These processes are pictured as a chain of linked phases and are, in addition, linked to organisational variables that influence them.

Figure 2.1. Knowledge Value Chain (Weggeman, 1997)



On the one hand, the KVC model links knowledge management processes closely with the mission, vision and goals of the organisation. On the other hand, the distinct phases are the acquisition and generation of knowledge, its distribution and sharing, and – most importantly – the application and use of knowledge, followed by the evaluation and subsequent restart of the chain. These phases all need to be aligned and one by one feed into one another. The value of knowledge increases with each subsequent phase: for example, sharing knowledge is more valuable than generating it – but applying knowledge is even more valuable. Furthermore, the model shows that the smooth flow of the knowledge value chain depends on a variety of organisational features, notably a supportive organisational structure, strategy, and systems (e.g. ICTs) as well as the management style, human resource management and organisational culture. These variables capture, to a great extent, the many factors influencing KM in organisations as described in the literature (Skyrme and Amidon, 1997; Liebowitz, 1999; Hasanali, 2002)

The analysis of the water operators' KVC is operationalised using the matrix displayed below (Figure 2.2), enabling a detailed examination of the extent to which the KVC is supported by the key organizational elements. Note that in the subsequent analysis, the KM activities and/ or practices relating to the first three processes (i.e., identifying needed and available knowledge and acquiring knowledge) are discussed jointly. The determination of what knowledge needs to be developed and or acquired relies on a thorough assessment of what is needed and what is available.

Figure 2.2. The KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy						
Structure / organisation						
Systems (e.g., ICT)						
Management Style						
Personnel (HRM)						
Organisational culture						

3. Methodology

3.1. Research Method: Case study approach

This study uses a qualitative case study approach. The approach has been selected due to its potential to allow a deep investigation and understanding of complex phenomena in their natural real-life context (Yin, 2005). In order to obtain deep insights into the knowledge management processes of water utilities involved in WOPs, we analyse specific cases of operators. Since WOPs are being used in different parts of the world and involve a wide range of water utilities, cases were selected carefully in order to examine the reality of KM in water operators in different contexts. We used the following criteria to select a representative set of cases: (1) geographical representation (cases were selected from Africa, Europe and Latin America); (2) roles played by water operators in WOPs (cases include mentor and mentee utilities, as well as utilities that play both roles); (3) ownership (cases include publicly and privately owned utilities); and (4) size and age (cases included old and young operators, large and small sized utilities). In total, the following nine water utilities were investigated: National Water and Sewerage Corporation (NWSC), Tanga Urban Water Supply and Sanitation Authority (TANGA-UWASA), Kisumu Water and Sanitation Company (KIWASCO), National Office for Potable Water and Electricity (ONEE), Vitens Evides International (VEI), World Waternet (WWn), Dunea International (DI), Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne (SIAAP), and Environmental Sanitation Company of Federal District (CAESB). Details of the key characteristics of the cases are summarized in Table 3.1. These cases are further described in section 3.2 below.

Table 3.1. Summary of major characteristics of the 9 cases

Utility	Status	Year of creation	Services provided	People served	Size/in terms of employees	Country	Role played in WOPs
Environmental Sanitation Company of Federal District (CAESB)	Public	1969	Water supply and sewerage services in Federal District of Brazil. WOPs	2.59 million people (water supply) and 2.45 million people (sanitation)	2,745 staff (in 2013)	Brazil	Mentor and mentee
Kisumu Water and Sewerage Company (KIWASCO)	Public	2003	Water supply and sewerage services	More than 35,000 connections	Permanent staff of 134 and 161 temporary staff (as of December 31, 2014)	Kenya	Mentee
National Water and Sewerage Corporation (NWSC)	Public	1972	Water supply and sewerage services	Over 450,000 Water and Sewerage customers rely on NWSC services	2,816 staff (by end of December 2015)	Uganda	Mentor

Utility	Status	Year of creation	Services provided	People served	Size/in terms of employees	Country	Role played in WOPs
Vitens Evides International	Private	2006	Water knowledge sharing through WOPs, Delegated Management Contracts, and Technical Assistance.	Has 12 projects in Asia, 37 projects in Africa, and 3 special projects (as of November 2014)	40 FTE employees + around 300 STEs	The Netherlands	Mentor
World WaterNet (WWn)	Private	2007	Water knowledge sharing through WOP and economic partnerships	Operate in 10 countries	8 full time employees + several STEs	The Netherlands	Mentor
Dunea International	Private		Water Knowledge sharing through WOPs	Has 4 projects in 2 countries (Indonesia and Tanzania) as of 2015		The Netherlands	Mentor
National Office for Potable Water and Electricity (ONEE)	Public	1972	Water services	13.4 million	17000 employees	Morocco	Mentor and Mentee
Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne (SIAAP)	Public	1970	Sanitation services	9 million	1700 employees	France	Mentor
Tanga Urban Water Supply and Sanitation Authority (TANGA-UWASA)	Public	1998	Water and sanitation	282,728	154 employees	Tanzania	Mentee

Note: *These characteristics are based on data available in individual case study reports: van Griethuijsen and Kremer (2015), Lerebours (2015a and b), Metzker Netto (2015), Johnson (2015), Uwamariya (2015), and Kiluwasha (2016)*

3.2. Brief description of the cases

3.2.1. Environmental Sanitation Company of Federal District

CAESB is one of the ten biggest water companies in Brazil and a mixed capital company under the private law. The company provides water supply and sewerage services to 2.59 million people and 2.45 million people respectively in the Federal District of Brazil. This is equivalent to 98% coverage in terms of water supply and 82% coverage in terms of sewerage services (CAESB, 2013). The population of the Federal District is around one percent of the population of Brazil. In comparison, in Brazil, 78.6% of the houses are supplied with piped water and 39.5% of the houses have access to sewerage services. CAESB has been engaged in several national and international partnerships, including WOPs where it plays the roles of mentor and mentee utility. The company also offers engineering and management solutions in the field of environmental sanitation. Its mission is to develop and implement solutions related to environmental sanitation; and to contribute to public health, environmental protection and socio-economic development. CAESB comprises four functional departments (engineering and environment, operations and maintenance, commercial, and management) and is headed by a president who assisted by many advisors (communications, ICTs, fundraising, etc.) among others.

3.2.2. Kisumu Water and Sewerage Company

KIWASCO was established in July 2003, under the Water Act 2002. It is one of the leading water utilities in Kenya, providing water and sewerage services to the growing population in the City of Kisumu and its surroundings. Situated on the shores of Lake Victoria, the company serves approximately more than half a million population (KIWASCO, 2014, 2015). This company is led by a Board of Directors of the Lake Victoria South Water Services Board (LVSWSB). KIWASCO consists of six functional departments: Commercial Services, Financial, Human Resources and Administration, Technical Services, Supply Chain/ Procurement and Internal Risk and Audit. Each department is headed by a senior manager while the entire management team (all departments) is headed by the Managing Director who provides leadership and guidance. In order to ensure good service levels, KIWASCO has subdivided the city of Kisumu into five commercial zones as follows: Central Business District (CBD), Kenya Kajulu, Manyatta, Middle East and Milimani. While some of the customers are directly connected to the water distribution network of the company, others are serviced through water kiosks and private water operators contracted via the so-called Delegated Management Model. KIWASCO has a total permanent staff of 134 and 161 temporary staff, as of December 31, 2014. In order to strengthen its capacity (and boost performance), KIWASCO has been involved in a number of WOPs as a mentee utility. For example, at the time of interviews a WOP with Vitens Evides International was ongoing.

3.2.3. National Water and Sewerage Corporation

Uganda's National Water and Sewerage Corporation (NWSC) is a government-owned company, established in 1972 by decree no 34. The company is in charge of water and sanitation services delivery in Uganda, mostly in large towns. Since its creation, NWSC's operations have expanded from 3 to 134 towns across Uganda in 2015 (NWSC, 2015). NWSC consists of a headquarter in Kampala which is responsible for strategic activities (e.g., setting policies and strategies, monitoring and evaluation, capacity development, etc.) and several service areas that are in charge of day-to-day delivery of water supply and sewerage services to its customers. The service areas enjoy autonomy in many decision making areas. In order to cope with the recent increase in terms of coverage, NWSC has clustered its operations into the following 4 regions: Kampala Metropolitan, Central, North and East, and Western and South Western. The corporation is headed by a Managing Director and 2 deputy Managing Directors, one for technical services and the other for finance and business stream. The utility is further subdivided into six directorates: Engineering services, Business and scientific services, Finance and Account, Commercial and Customer services, Internal Audit and Planning and Capital Development. Over more than a decade, NWSC has implemented a series of change management programmes that have resulted in a relatively capable organisation and turned around its performance (Muhairwe, 2008; Mugisha, 2009; Mvulirwenande, 2015). Through its External Services Unit, NWSC is involved in many WOPs as a mentor utility.

3.2.4. Vitens Evides International

Vitens Evides International (VEI) was created in 2006 as a joint venture between the two largest Dutch water utilities, namely Vitens and Evides. Three more water companies, Waterleiding Maatschappij Limburg, Waterbedrijf Groningen and PWN joined the venture (as partners, not shareholders), respectively in 2008, 2010 and 2015. Through VEI, all five companies aim to implement their Corporate Social Responsibility policy and to contribute to Sustainable Development Goals, by improving water supply and wastewater services in developing and transitioning countries. VEI works with local water companies through three types of mechanisms: WOPs, Delegated Management Contracts, and Technical Assistance. From 2006 until 2014, VEI has been active in 22 countries and has reached 65 million people. However, in order to increase its impact, the company has resolved to focus on nine countries in sub-Saharan Africa, and four countries in Asia. Thus, in November 2014 VEI had 12 projects in Asia, 37 projects in Africa, and 3 special projects. In 2014, the organisation had a total of 40 FTE employees and around 300 short term experts (STEs).

3.2.5. World Waternet

World Waternet (WWn) was officially established in 2007. The company aims to share knowledge with partners (such as water utilities, the private sector, governments and knowledge institutes) on technical, organizational, and institutional matters, and to give advice on all aspects of the water cycle using an integrated approach. WWn has a project based staffing agreement with Waternet through which 1% of Waternet's staff capacity can contribute to WWn's projects. WWn operates through two types of partnerships, namely WOPs and economic partnerships (i.e. partnerships on an economic basis). The company's activities focus predominantly on the African continent: in 2013, it was active in 10 countries with a total of 15 WOPs in Egypt, Indonesia, Morocco, Mauritania, Mozambique, Suriname, Turkey, South-Africa, Uganda and Tanzania. Within the framework of its 'Africa Concept', the utility has three strategic locations in Africa (Egypt, Morocco and South Africa) where it supports training centres. These, in turn, train water utilities in neighbouring countries. WWn has 8 full time employees; the remaining staff consists of project leaders (PLs), heads of projects and short term experts (STEs).

3.2.6. Dunea International

Dunea International (DI) was established by the Dutch water utility Dunea as its international department. The utility aimed to implement its Corporate Social Responsibility, by sharing knowledge and expertise with mentee water utilities in developing countries. DI has three goals: (1) contribute to realizing Sustainable Development Goals (SDGs) with (inter) national partners through WOPs, (2) personal development of Dunea staff members by working in developing countries, and (3) improvement of DI's image in the Netherlands and the international development sector. In 2015, DI was actively working on four projects in Indonesia and Tanzania. DI was also looking for new opportunities in Moldovia or Romania to further diversify its geographic reach.

3.2.7. National Office for Potable Water and Electricity

The National Office for Potable Water and Electricity (ONEE) is a public utility, established in April 2012 as a merger of the National Office for Potable Water (ONEP) and of the National Office for Electricity (ONE). The water division of ONEE kept the same responsibilities as ONEP (water production, supply, distribution and sanitation). At the time of research, the two utilities were still working separately (and the new organization chart had not been released). Thus, the analysis in this study focused on the previous ONEP. The ONEP was created in 1972, with the mission to provide potable water and sanitation services on behalf of local governments. Institutionally, ONEP has always been a fully public utility under the highest authority of the King. Today, it is supervised by the Minister of Energy, Mining, Water and Environment. In 2012, the utility had more than 1.5 million clients and served 13.4 million people. Before the merger, ONEP employed about 7600 people, of which 1500 worked in the national headquarter in Rabat. After the merger, the company has more than 17000 employees and is structured into four main departments: Finances, Resources, Industry and Development. Through its International Institute of Water and Sanitation: the IEA (Institut International de l'Eau et de l'Assainissement), ONEE is involved in several WOPs, both as mentor and mentee. As a mentor, the utility provides capacity development services mainly to water operators in sub-Saharan Africa.

3.2.8. Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne

The Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne (SIAAP, the sanitation utility of Greater Paris) is a public utility providing sanitation services for Paris and its surroundings on behalf of the communes[1]. It was formed in 1970 as an association of four departments (administrative division) and groups now 286 communes in the region of Paris. All of them delegated their sanitation responsibility to SIAAP through a contract. SIAAP has the same status as local government bodies. This particular status comes with specific regulations that impact the utility's way of working: employees are local public servants, public procurements are well regulated, and the board is composed of local elected people. SIAAP cleans 2.54 million cubic meters of wastewater (household, industrial and pluvial water) per day that is then released into the Seine and Marne rivers. The utility serves around 9 million people in its 1800km^2 area of collection; it has 6 plants, 440 km of networks and a total of 1700 employees. SIAAP has three directorates: Resources, Operations, and Forward Planning. Through its international relations team, the utility is involved in WOP projects as a mentor, where it partners and shares its knowledge and expertise with local governments and sanitation operators in other countries.

3.2.9. Tanga Urban Water Supply and Sanitation Authority

Tanga Urban Water Supply and Sanitation Authority (TANGA-UWASA) is a government owned utility that provides clean water and sewerage services in the city of Tanga in Tanzania. The Authority commenced its activities officially in July 1998 under the Water Supply and Sanitation Act No. 12 Cap 272 of 2009. TANGA-UWASA is led by a Board of Directors appointed by the Ministry of Water. The authority is headed by a Managing Director and has four departments: Customer Service, Finance, Technical and Human Resources. The utility supplies about 29,000 m3/day serving 96.9% to the city population, estimated to be 282,728 people (NBS, 2013). TANGA-UWASA has 29,132 water connections and 2,673 sewerage connections, with a total of 154 employees.

3.3. Data collection and analysis

The data collection instruments used in this study are qualitative. By nature, the case study approach requires the use of multiple sources of evidence in order to collect a comprehensive and varied set of data and information. Thus, the present study triangulated data that was collected with a variety of data collection instruments. Notably, primary empirical data was obtained using interviews, focus group discussions (FGDs) and non-participant observation. The study also relied on secondary data and information collected through desk research. Interviews (individual and collective) were held with selected staff members representing different departments and other levels of management in the utilities (Table 3.2 shows the number of interviews and FGDs conducted per case). The collected data was categorized and analysed using the key variables as outlined in the Knowledge Value Chain (see Figure 2.1). The analysis focused on individual cases first; then a cross-case analysis was conducted. The following chapter presents the results of this second level of analysis. It is worth indicating that the degree of details of the research material collected and reported on KM in water operators varied across the cases. This was mainly due to the fact that in some instances, the key focus was on KM vis-à-vis a particular aspect of the utility's business (e.g., NRW, WOP), while in others the analysis considered the whole utility. Under these conditions, we included a lot of case specificities in the cross-case analysis in order to avoid comparisons and generalizations on KM issues for which no sufficient material was reported. Notwithstanding this limitation, the material collected and synthesized in this report gives a good overview of KM reality in WOPping operators.

1 In France, the communes are in charge of water and sanitation and they can keep or delegate this competence to a group of communes. The commune or the group of communes can operate the services themselves or delegate them to a company.

Table 3.2. Number of interviews and Focus Group Discussions per case

Utility	Number of interviews	Number of Focus Group Discussions
Environmental Sanitation Company of Federal District (CAESB)	20 interviews	No FGDs were conducted – due to a workforce crisis at the time of interviews
Kisumu Water and Sewerage Company (KIWASCO)	25 interviews	6 FGDs (56 participants in total)
National Water and Sewerage Corporation (NWSC)	32 interviews	3 FGDs (16 participants in total)
Vitens Evides International	8 interviews	1 FGD (6 participants in total)
World WaterNet (WWn)	10 interviews	1 FGD (5 participants in total)
Dunea International	9 interviews	No FGDs were conducted – due to a small number of staff
National Office for Potable Water and Electricity (ONEE)	16 interviews	No FGDs were conducted
Syndicat Interdépartemental pour l'Assainissement de l'Agglomération Parisienne (SIAAP)	13 interviews	2 FGDs (8 participants in total)
Tanga Urban Water Supply and Sanitation Authority (TANGA-UWASA)	30 interviews	2 FGDs (20 participants in total)

4. Results and cross-case analysis

This chapter provides a detailed cross-case analysis of knowledge management practices in the cases and the factors influencing these practices. The results show that the utilities investigated are implementing KM initiatives and practices (e.g., research strategies and training plans, coaching and mentoring, introduction of open offices, introduction of ICT systems, etc.), although to different degrees. At the same time, the results of the nine cases confirm that organisational features (e.g., culture, management style, organisational structure, communication systems) influence KM processes to a significant extent. Annex 1 provides a summary of the key results obtained from each of the nine cases, using the KVC matrices introduced above.

4.1. Analysis of knowledge management in the cases

4.1.1. Awareness of KM as a concept and its value for the utilities

The water operators investigated in this study *are increasingly becoming aware of knowledge management* and its potential to improve individual and organisational performance, although to different levels. For example, at VEI the management is convinced that KM must be actively and properly addressed to ensure the quality of its "knowledge transfer" services. This is mostly evidenced by the fact that the utility has appointed a knowledge manager and implemented many knowledge activities as described later in this report. At NWSC, KM is nowadays acknowledged as one of the key strategic areas, and the management envisions the transformation of NWSC into a learning organisation. In utilities such as ONEE and SIAAP, the managers interviewed in this study appeared to feel the need for professional KM as one of their business processes, but at the same time they seemed not to know how to start its implementation.

However, the results from interviews in many of the companies show that the concept of KM is still unknown to many employees. Top management staff generally seem to understand KM relatively well, while low level employees are less informed about it and how it can help to boost the performance of their utilities. In utilities such as TANGA-UWASA and KIWASCO, KM appeared to be a new word for many employees, and most interviewees argued that they had hardly heard of the concept before. The gap is assumedly due to different levels of exposure: top management staff generally attend different types of learning events and have many opportunities that allow them to learn about (and appreciate) the value of KM for their utilities; many staff in middle and lower levels of management have less such opportunities. The situation is somewhat different in some water utilities that operate as mentors through WOPs and other knowledge transfer mechanisms. Staff members of utilities such as VEI, WWn, NWSC and DI seemed to get increasingly familiar with some KM processes and to understand the need for KM. This is arguably due to the fact that, by working abroad, many employees (e.g., PLs, STEs) get exposed to the real challenges of knowledge transfer and get convinced of doing this in a professional way. One could also argue that the fact that some of these utilities are by definition knowledge brokers (such as VEI) triggers the curiosity of their managers and staff to know about KM and its importance in today's organisations.

Worth indicating is also that, in many companies, KM is still often referred to by many employees as consisting of staff training and development. This is a narrow perception, as it reduces the concept of KM to the management of individual knowledge while that of collective knowledge is not acknowledged. Yet, these two dimensions of knowledge are equally important and must, as such, be managed simultaneously. It was indeed observed that this narrow view characterizes many of the KM initiatives identified in the cases. For example, the Capacity Matrix used at CAESB to determine needed knowledge focuses mainly on staff knowledge and capacity, while leaving the organisational knowledge component out. In the same vein, all the utilities have put more emphasis on establishing training facilities than on other KM aspects. Finally, in many cases KM initiatives are undertaken "unconsciously" (such as coaching, knowledge sharing on the job), i.e., not through well-structured projects. Such practices can be categorized under the rubric of KM, but they usually have limited impact since they are not systematic and well-thought out interventions.

4.1.2. Knowledge management activities implemented in the cases

The growing recognition that knowledge management can add value to what organisations do (and can achieve) has generally triggered a variety of initiatives aimed to make good use of it in different sectors (Alavi, 1999; Lehaney et al., 2004). Across the nine water operators, the study identified many KM related activities (e.g., human capacity development, development of teams, employee incentives, fostering knowledge moments). Nevertheless, the extent to which utilities practice KM in a professional manner varies from case to case. With regard to this, the NWSC in Uganda and the Dutch Vitens Evides International, for instance, appear to have relatively advanced KM systems, with comprehensive and integrated sets of KM initiatives. While utilities such as KIWASCO, ONEE and TANGA-UWASA, on the other hand, hardly have KM visions and strategies and their initiatives are, therefore, piece meal and scattered – with little or no coordination at all. However, some of the typical KM tools such as expert locator, knowledge audits, communities of practice, knowledge vision and strategy, exit interviews, workforce succession plans, and social network analysis seem to be not known (and used) in the cases.

4.1.2.1. Activities related to knowledge development/ acquisition

To start with, this study found that in most of the investigated utilities *the identification of needed and available knowledge tends to be conducted as a by-product of other organisational processes such as performance assessment* (e.g., Open Performance Review and Appraisal System (OPRAS) used in TANGA-UWASA, use of Balance Score Card in KIWASCO; performance evaluation workshops and employee appraisal in NWSC and SIAAP) or through routine meetings. Overall, typical KM tools that are appropriate for these sub-processes of KM (notably knowledge audits and knowledge maps) appear to be unknown in the utilities. However, in some utilities, efforts are underway to professionalise knowledge assessment processes, at least from the workforce development perspective. This is notably the case in SIAAP where a new tool has been introduced by the human resources department, the so-called GPEC – "Gestion prévisionnelle des emplois et des compétences" (forward management of jobs and skills in English). The tool assesses all categories of jobs/positions and identifies the knowledge and skills that will be needed by the utility in the future. At Dunea International, the interviewees indicated that there is a resonance group which usually conducts a yearly knowledge assessment. In this group, several managers and employees meet to discuss what knowledge is needed (including why and by whom), and, based on this evaluation, a yearly plan to acquire new knowledge is formulated.

In the context of WOPs, *mentor utilities generally undertake assessments of knowledge and capacity gaps in mentee operators prior to designing their interventions.* Depending on the scope of a partnership, the assessment can be so comprehensive as to cover both the individual and organisational capacity aspects of the partner utility. With regard to this, VEI's WOP projects usually include an inception phase during which a baseline survey is conducted to determine, among other things, the knowledge (individual and organisational) needed in the mentee partner. The External Services department at NWSC generally undertakes a similar exercise, the so-called "situational analysis" the results of which inform the interventions needed at individual and organisational levels. Based on such analyses, mentor operators also get an idea of what knowledge their staff (to be sent abroad) should possess. For example, at VEI, once the inception phase is completed new resident project managers (RPMs) undergo a competency assessment which determines what additional knowledge they may need before starting their job. However, in utilities such as WWn and ONEE, the interviews revealed that little is done to further assess the knowledge of their external services' staff members. These utilities wrongly assume that their employees already possess all the knowledge necessary to ensure a WOP project deliverables. Or, they simply rely on contracting external experts to do the job if they do not have the required expertise in-house.

Therefore, it appears that in most cases, knowledge (and capacity) needs assessments are generally conducted (e.g., at CAESB, by analysing the information collected via the capacity matrix that is filled annually; in the cases of utilities such as NWSC and ONEE, by analysing the information provided in staff appraisal forms; or, through the baseline survey at VEI), on the basis of which knowledge acquisition strategies are developed.

Across the studied utilities, *training appeared to be the most common strategy used to develop/acquire new knowledge*; this reflects the narrow view of KM as essentially a workforce competency development issue as described before. It was

observed that all utilities usually have a training structure and/or facility (and training plans) in place, although the nature and magnitude of these structures vary from utility to utility. In this regard, KIWASCO has simply established a committee that oversees training issues across the utility. CAESB has created its own corporate school where staff members attend short and medium term trainings. This initiative is comparable to NWSC's vocational training school, aiming at serving not only the corporation's skills development needs but also the whole of Uganda and other countries in the region. Similarly, NWSC has opened an international training centre (the International Resource Centre – IREC) which aims to keep the know-how and expertise of its employees up-to-date, among other key targets. The centre serves not only the utility but also sister companies inside and outside Uganda. However, many interviewees in this study felt that the directorate in charge of this centre for putting too much emphasis on the centre's external services. The situation is very different in the case of ONEE's training centre where around 80% of the trainings are dedicated to ONEE personnel, 10% to national partners and 10% to international partners. ONEE has also created the "Institut de l'Eau et Assainissement" (IEA) to foster knowledge development and/or acquisition efforts. The Dunea College (Dunea International) and the Wn Academy (WWn) are other similar initiatives aimed to professionalise training services within water operators.

Water operators with strong financial capacity, mostly those in rich countries, usually get their workforce development plans implemented easily. For example, VEI's training programme (for back-office staff, RPMs and STEs) is accredited (in terms of financing) by the mother companies. Similarly, in the context of WOPs, knowledge development interventions that are planned for mentee utilities generally get implemented since they are properly budgeted in the partnerships. However, in utilities that are weak financially, the implementation of training plans was reported to be problematic due to a variety of reasons including, *inter alia*, favouritism and lack of sufficient funds. For example, at NWSC and KIWASCO, interviews with middle and low level staff members revealed that the decision making process around the selection of trainees is not always participatory, i.e., dominated by top management staff who often choose training candidates among their best friends and not necessarily among those who actually need training. Under such circumstances, training as a knowledge management initiative is actually misused and becomes less effective for boosting the utility's performance. In spite of financial difficulties, utilities generally allocate a budget to training activities, which shows the importance given to new knowledge acquisition and /or development. In that regard, in 2013, CAESB invested 0.26 of its net revenue in training i.e., R$3,206,647. 44 (around 1 million Euros) and 60% of the utility's employees were trained (CAESB, 2013). Similarly, a budget estimated between 300-500 millions of Ugandan shillings (83,600-140,000 Euros) is spent on research and training activities annually at NWSC (Mvulirwenande, 2015).

Some *utilities do also rely on research and development to acquire new knowledge*. For instance, the Uganda's NWSC has a Research and Development department, with a clear research policy, strategy and dedicated R&D staff in place. Research and development at SIAAP is led by the Forward Planning department and focuses on the anticipated needs of the utility, while ONEE has a Research and Development Division, with a Technological Watch Service. This service aims to provide an up-to-date assessment of new technological knowledge, and to make it available to each entity of the utility. As such, the utility is able to identify its strategic directions and to make informed/wise technological choices. These results indicate the extent to which these water companies are committed to developing new knowledge internally, regarding their products, processes and systems.

Other knowledge acquisition strategies implemented by utilities include the *hiring of competent people* based on specified criteria. However, in some utilities the recruitment processes were reported to be problematic, involving malpractices such as favouritism in KIWASCO. At ONEE, the human resources department is introducing a *retiree programme*, whereby an association of retired employees was created, with the aim of being able to call them back for specific issues (trainings or conferences). CAESB has introduced a KM project aimed to *systematically collect novel ideas from employees*, the so-called Bank of Ideas CAESB (BICA), although not all employees seem to be aware of the project. At NWSC, the utility has introduced a so-called "stand-by staff" strategy, especially in the engineering department intended to be used in emergency situations (e.g., in case of serious leakages when the utility does not have sufficient staff to intervene, to replace permanent staff who are sick or unavailable due to other circumstances). Furthermore, some utilities have instituted *innovative mechanisms aiming to generate insights about their external stakeholders,* notably water consumers and other partners. At NWSC, such mechanisms include the local water committees (bringing

together representatives of NWSC, NGOs, customers, local government, etc.) and the call centre unit through which information is collected and insights are generated about customers' concerns and needs (Mvulirwenande, 2015).

With regard to acquiring new knowledge from external partners, *all of the studied mentor and mentee operators acknowledged that they usually acquire valuable new knowledge from their partners*. WOPs were indeed reported to be an important channel for utilities to get exposed to (and acquire) new knowledge from external sources. The learning-by-doing and trial and error approaches generally used in these partnerships allow participating utilities (and their staff) to learn from each other and to co-create new knowledge together. The new knowledge developed/acquired in WOP processes can be "procedural knowledge" (e.g., how to guide STEs, how to design effective partnerships, how to effectively transfer knowledge) or "content knowledge" (relating to water and sanitation technical subjects *per se*). Basically, all the employees going on missions in WOP projects abroad (RPMs, STEs, PLs, etc.) are confronted with new problems that challenge their knowledge. Thus, when they come back, they are full of new experience and insights, even if these may not be necessarily and immediately incorporated in their organisation's day-to-day processes.

Creating organisational knowledge from insights acquired individually by staff members is quite challenging for water utilities, mentors and mentees alike. However, in a utility like VEI the management appears to be aware of the importance of this important step in the knowledge creation spiral (Nonaka and Takeuchi, 1995) and efforts are underway to turn staff's (individual) knowledge into organizational knowledge. For example, the knowledge and insights gained by individual STEs and RPMs are usually discussed at organisational level during a variety of knowledge moments (such as trainings, the annual "'VEI Come Back Days'" and Regional Meetings), with the aim to produce best practices on how to implement WOPs. In this regard, VEI has used its experienced staff members to produce the so called "fact sheets"[2] which specify VEI's services and enables the organization to actively focus on the quality of the services it delivers. Fact sheets remain general to ensure a decent understanding of knowledge/skills that are needed for VEI's RPMs and STEs, but simultaneously sufficient room is left to apply the knowledge/skills in different (cultural and technical) context of the local mentee water operator. Similarly, VEI's knowledge manager makes use of experienced STEs, RPMs and RDs to develop training materials.

Finally, as a means to acquire new knowledge, *the utilities analysed in this study are involved in regional and global knowledge networks* (such as International Water Association – IWA and African Water Association – AfWA) and cooperation with high learning institutions and universities. These networking and collaborative efforts allow water utilities to be aware of (and possibly acquire) updated knowledge which they can use to improve their performance. For example, in their partnerships with UNESCO-IHE Institute for Water Education, VEI and NWSC are able to benefit from the research done by the Institute in developing countries and countries in transition, and they provide real-life case studies to UNESCO-IHE. Likewise, through its Water Academy, WWn cooperates with VEI to develop a teaching method for NRW to be applied in their projects. In a similar vein, SIAAP collaborates a lot with universities and scientific research groups, and is part of many international working groups.

4.1.2.2. Activities related to knowledge sharing

Knowledge sharing *as a KM process is implemented to different extents in the nine cases*. Whereas in utilities such as KIWASO and TANGA-UWASA there is no formal policy or strategy aimed at fostering knowledge sharing, this is done in a relatively systematic way in water companies such as VEI and NWSC (e.g., through regular lunch seminars and expert meetings). At Dunea International, there are policies and strategies that specifically emphasize the need for effective knowledge sharing within the utility and abroad. These include, on the one hand, the so called 'Knowledge Flows' policy which aims at facilitating the transfer of knowledge and unstructured information within Dunea. On the other hand, the so called "Koers 2015" promotes the transfer of knowledge from employee to employee within the organization, while "Koers 2020" describes the importance of KM and role of the employees in fostering it, as well as Dunea's strategy to share knowledge with partner organizations in other countries.

2 A fact sheet describes the relevance of the theme/service: from the analysis of the situation, to the steps taken to tackle the problems, as well as several possible solutions. Graphs are included to visualize the impact the services have.

Organisational meetings appeared to be the most common knowledge sharing mechanism that is used across the investigated utilities. Regular and ad-hoc meetings are, indeed, useful knowledge moments; they allow staff and their managers to exchange information and knowledge relating to the utility's business. Meetings were reported to be organised on departmental, inter-departmental, daily, weekly, monthly, quarterly or yearly basis, depending on the nature of the knowledge and information to be shared. At SIAAP, for example, organisational meetings include the so called "technical mornings" which are open to everyone, the "managers' conference" – open to all managers and executives, "conferences on security" and so on. At VEI, regular meetings are organised between all (senior) managers and staff working abroad (RDs, CDs, RPMs and STEs) and include the yearly 'VEI Come Back Days' (organized in January) and the "Regional Days" for RPMs on their respective continents. Similar meetings were reported in Dunea International as well as in WWn. During the implementation of WOP projects, knowledge is equally shared through informal ad formal meetings between the staff members of mentor and mentee utilities, particularly through learning by doing encounters.

Another important strategy embraced in all nine utilities that obviously fosters knowledge sharing is the use of ICTs. The ICT applications identified in the cases include, but are not limited to, websites, internal mailing, phones, web pages, the q-drive, Dropbox, livelink, and SharePoint. However, the level of complexity (and extent of use) of ICT systems vary from case to case. For instance, the Uganda's NWSC is one of the utilities that have an ICT-based system that is relatively more integrated and comprehensive (with a lot of applications). Thus, the utility has a centralized knowledge data base that can be accessed by anyone across the utility due to its wide area network. At VEI, the knowledge produced in WOPs is generally stored in (and shared through) an integrated ICT based system. Notably, the q-drive and Dropboxes contain documents on various sub-results (NRW, for example) of different WOP projects. The q-drive, which was introduced for the internal use among VEI staff, can be accessed through a citrix account. The STEs from other mother companies can also in theory access the intranet and the q-drive; but it came out of this study that the majority of the non-Vitens STEs either do not know how to use these knowledge bases or do not have a citrix account. Overall, it appeared that water operators that work globally or have large operating areas rely more on (and appreciate the role of) ICTs to manage organisational knowledge than others. Notably, since the staff of these utilities are scattered, ICT becomes the only mechanism through which they can easily get connected and timely share knowledge.

The study found that *some utilities have introduced ICT systems, but these are not well-developed, let alone integrated and/or coordinated, which limits their impact on knowledge activities*. For example, ONEE relies on a variety of ICT systems to ensure effective communication and knowledge sharing processes within the utility. However, the lack of integration among these systems was reported to hinder these processes, especially given that each direction/department has its own way of sharing knowledge. Thus, many reports (such as WOP reports) may be available but not accessible to everyone inside the utility. This problem is compounded by the fact that users/staff always have to justify why they need access to particular information and to make huge efforts to find out who holds that information. In SIAAP, KIWASCO and TANGA-UWASA, the issue of ICT literacy proved to be an important barrier to effective use of ICT applications for knowledge management purposes. It was observed that not all employees, particularly those from operations, have full access to computers or know how to use them.

Other *organisational factors still constraint knowledge activities in the utilities despite the introduction of ICTs*. For example, because of a secrecy and confidentiality culture, managers at CAESB and ONEE were reported to not always share news and important decisions with lower level staff. Particularly in ONEE, the interviewees argued that the knowledge relating to WOP projects tends to be kept in the hands of only a few people: senior experts hardly share knowledge with their junior colleagues. At CAESB, interviewees argued that formal communication is very badly managed and most knowledge sharing actually occurs through informal channels. Resistance to knowledge sharing was also reported as a problem in other cases, especially in CAESB and KIWASCO where some staff members are afraid of sharing knowledge with their colleagues, for fear of having their positions taken over. For such staff, keeping knowledge and skills to themselves is considered as a means to remain powerful (and keep their jobs). Arguably, these results confirm that ICTs are not the whole answer to knowledge sharing.

Another issue reported in utilities such as SIAAP and ONEE concerns *the lack of appropriate mechanisms to ensure*

inter-generational knowledge sharing. In SIAAP, the baby-boom generation is now retiring, and the utility is losing strategic knowledge because there is no sound strategy in place to retain it (by transferring it to younger employees). The study found that attempts were made in some departments to address this issue: e.g., by organising events that bring together new and older (leaving) employees to share knowledge. Also, a few years ago, a project of oral records was set up to capture the knowledge of retirees. However, due to lack of time and resources, only 8 people were interviewed and the project was stopped before the records could be used. By the same token, an important group of ONEE's managers and staff are retiring, but there is no knowledge "handover" mechanism between those who leave the utility and their replacements. For the past two decades or so, ONEE has not recruited new employees so frequently because of an austerity plan at national level. As a result, most heads of divisions and directions belong to the generation 91, while most heads of service belong to later generations. Under these circumstances, the utility has introduced the strategy of voluntary departure and employees have been leaving the utility, but no mechanisms were devised to ensure that their knowledge is kept within the organisation. There is, therefore, a gap in the utility knowledge memory. The human resources direction appeared to be aware of this issue and is trying to address it, notably by attempting to "engage Golden Expertise"[3]. An association of retired employees was created, with the aim of inviting them from time to time to do some work while ensuring that they transfer their knowledge to younger employees.

Other knowledge sharing practices and/ or initiatives that proved to be common in most utilities include the following: knowledge sharing with colleagues following training participation (e.g., in the case of NWSC, this is done at departmental level first, then through lunch seminars that bring together interested staff from different departments), virtual and physical libraries, job rotations, staff induction programmes, training of trainers, coaching and mentoring, training on the job, repositories of staff members with their CVs (showing competences) that facilitate the identification and access to in-house experts, and learning from peer utilities (through WOPs and other arrangements). Furthermore, utilities such as CAESB, NWSC and SIAAP have corporate newspapers, newsletters and water magazines. These types of media are used to share company news and information both internally and externally. At NWSC, they also implement initiatives such as learning-oriented staff transfers, and internal and external benchmarking (see also Mvulirwenande et al., 2014; Mvulirwenande, 2015). CAESB has also developed a knowledge base capturing staff expertise, practical abilities, subjects they are able to teach, etc. This mechanism is likely to facilitate knowledge sharing to a great extent since staff can find out in which part of the organisation (and in which "heads") the expertise they need to do their own job better is located.

4.1.2.3. Activities related to knowledge application

A *variety of common practices were observed in the studied cases with regard to fostering the application and use of knowledge*. On the one hand, it was found that utilities have adopted (or are adopting) *modern organisational management principles* that aim at mobilising individual and collective knowledge for action. Notably, the development of high level goals such as corporate visions and missions was observed to be a common practice across the cases. Basically, all the studied utilities have well-articulated vision and mission statements and, in many cases, these are accompanied by appropriate policies, strategies, and guidelines that aim to turn them into reality. Corporate visions and strategies can be expressed in different terms (e.g., VEI's Vision 2020; WWn's Africa Concept, NWSC' Five Year Strategic Direction) but they all have in common, when they are shared by the entire workforce, the power to provide a strong foundation for action by getting all employees on board.

Besides, it was observed during interviews that many utilities have (or are making efforts) to professionalize their business, particularly by standardizing their work management procedures. For example, utilities consistently reported that their processes and procedures (e.g., personnel practices, complaints procedures, case management procedures) were increasingly being ISO certified. The standardization of work processes usually makes evident an effective internal control system and compliance (e.g., to regulations and standards), thereby encouraging staff members to use their knowledge.

In addition, there are *a number of human resources- oriented mechanisms that are implemented in the cases to foster knowledge application*. First, utilities make efforts to place newly recruited

3 "Engaging Golden Expertise" is a KM practice that consists of engaging retired or external experts who are no longer fully engaged in the workplace.

staff in appropriate functions to ensure that they apply their expertise. Second, repositioning of staff is used as a mechanism to foster knowledge use as and when employees have completed their training programmes, such as a master's degree or an important short course, and are promoted to new positions that rely on the newly acquired knowledge and / or skills. In fact, promotion to higher positions generally implies better remuneration and, as such, increases staff motivation to put their competences to use. Third, most of the studied utilities reported that they rely on internal promotions when positions become vacant. Arguably this policy fosters knowledge application, because staff members and their managers are convinced that effective use of their competences can allow them to grow personally (in this case by bringing them promotion) if it results in improved performance.

Furthermore, the *development of teams (and a team spirit)* was identified as another KM tool used across the cases to encourage people to use their knowledge. For example, employees within SIAAP were reported to work in teams often, including teams with a cross-departmental dynamic. These include project working groups (such as the new IT master plan) that bring together people from across the organisation, and job networks grouping people from different sites who are in the same core job family (laboratories, accountants, archivists). Similarly, at TANGA UWASA, CAESB and NWSC, relying on multi-disciplinary teams appeared to be a widely accepted strategy to foster knowledge use among employees while working on particular assignments or complex challenges (such as fighting NRW). Within TANGA UWASA, the conviction that the technical and customer service departments are both responsible for NRW has triggered the creation of a joint NRW team in order to deal with this issue effectively. The team, whose members change every week and receive a weekly allowance, performs daily supervision of water networks to identify leakages and water theft situations, and takes appropriate measures. The creation of such permanent and ad-hoc teams not only promotes knowledge sharing and teamwork attitudes in the utility, but also allows people with different backgrounds to use their diverse knowledge more effectively (as opposed to struggling alone) to find solutions to a particularly complex problem.

Moreover, the *result-oriented management principle and associated use of performance improvement plans were found to be an important mechanism increasingly being implemented by the studied utilities.* Although these plans usually target improved performance, they intrinsically carry the potential to foster knowledge application. In NWSC, (soft) competition among departments and service areas is used as a means to foster knowledge application, and is grounded in the above principles. This practice is associated with rewards for best performers (and indirectly for best knowledge users) (Mvulirwenande, 2015). A similar practice was reported in CAESB where the utility used to have the so-called "Quality programme", an initiative aiming at rewarding best performing departments/units. But at the time of interviews this practice had stopped. At KIWASCO, competition was poorly introduced (and managed) and resulted in internal conflicts between departments (and their staff) and negatively affected both the application of knowledge and performance. The conflicts were due to a lack of objectivity in the process through which best performers were selected and rewarded. WOPs are also generally results oriented, i.e., partners always agree on a number of results that must be achieved at the end of the partnership. As such, staff members from mentor operators get motivated to apply knowledge in order to address the challenges faced by their mentee partners. The interviews revealed that experts from all mentor operators are eager to use their knowledge in an international context. It was also observed that going abroad is perceived as a strong recognition for these experts, and thus an extra-motivation for them to use knowledge in order to perform their duties.

Finally, *in some water operators applying new knowledge was reported to be a challenge for a number of reasons.* At SIAAP, the interviewees disclosed that many people report (during annual evaluations) that they are not able to use the knowledge and skills acquired during trainings. One of the explanations provided is that, in many cases, staff members request trainings, but these take time to be implemented. So, by the time new knowledge is acquired it is no longer necessary because knowledge needs have shifted. At ONEE, effective knowledge application was reported to be hampered by the big size of the organisation. Particularly, the upgrading of technologies in all plants and sites was reported to take a long time, making it very difficult to use these technologies. A common observation across utilities from less developed countries is that staff members do not always obtain appropriate and sufficient tools and equipment (e.g., old, with low frequency of maintenance, or simply non-existent) to apply what they know. Yet, these inputs remain an important prerequisite for individual and organisational knowledge to be translated into productivity. Applying new knowledge can also be difficult due to the lengthy

processes involved in knowledge acquisition and integration (into utility's business processes) (Mvulirwenande et al., 2013), and sometimes resistance to new knowledge can occur.

4.1.2.4. Activities related to knowledge evaluation

Across the nine case studies, *knowledge evaluation appeared to be the least known and practiced KM process*. To start with, the study found that *knowledge evaluation is usually confused with concepts such as knowledge gap analysis and performance evaluation*. Yet, these are different, although related, organisational management processes. The interviews also revealed that *knowledge evaluation is generally done as a by-product of other organisational processes* such as performance evaluation and staff appraisal. For instance, at TANGA UWASA, the management uses the Performance Review and Appraisal System to evaluate the knowledge possessed by employees on NRW. If the appraisal shows that the knowledge being assessed helps to reduce NRW rates, the utility encourages staff members to continue using it. On the contrary, if that knowledge proves to be less helpful, the utility abandons it and sends employees to trainings to acquire new and appropriate knowledge. Similarly, the annual staff appraisal at SIAAP looks at both the performance of employees and the trainings they have followed during the year in order to see whether they were useful or not.

At NWSC, there are monitoring and evaluation systems (e.g., checkers systems) which are used to evaluate performance but also the organisational processes that contribute to it. Outside the context of change management programmes, respondents in NWSC argued that organizational knowledge such as systems, procedure manuals and software are generally evaluated when staff start complaining about their efficiency. The results of such evaluations usually trigger changes in different aspects of the utility (e.g., structure) and inform the overall corporate strategy. On the contrary, the successive change management programmes implemented in NWSC since 1998 were evaluated on a regular basis, and the lessons learnt were used to improve them over the years (Muhairwe, 2009). In utilities such as KIWASCO and CAESB, there are few operational mechanism in place to evaluate the value of existing knowledge (both individual and collective) in relation to performance, let alone the knowledge management process itself.

However, *efforts are being undertaken in some utilities to evaluate knowledge per se*. At the time of interviews, the management of CAESB was still figuring out how to implement the so called "X-ray" project which will allow to check all procedures and knowledge activities at CAESB. Another interesting but recent mechanism used to evaluate knowledge, the so called "Rex" (Experience Feedback), was reported at SIAAP. The tool uses incidents as triggers for knowledge evaluation and change planning, and covers almost the whole KM cycle. When an incident occurs at a particular treatment plant, the relevant team compiles a short feedback report. Then, an assessment is made to understand why the incident happened, i.e., assessing the technologies used and the employees' knowledge to run machines. If new knowledge is needed, it is then made available. Afterwards, employees are accompanied (if needed) during the first applications of the newly acquired knowledge; after a few weeks or months, evaluators come back to check if the plant runs smoothly. The ultimate objective of this evaluation system is to help the utility and its staff to learn from mistakes and incidents, and not to punish those who are found guilty.

In the context of WOPs, *evaluating the value of knowledge was reported to be limited to the assessments conducted during project meetings and final project evaluations*. For instance, the interviewees at ONEE argued that there is no systematic way to evaluate the impact of WOPs on the competence of the mentee operator after the period of intervention. When a project is over, no official way exists to keep the relationship (and to follow up) between mentor and mentee utilities; yet arguably this would provide insights into the added value of the knowledge used in WOPs. At VEI, the knowledge used in WOP projects is generally evaluated through project meetings (e.g., Regional Days for RPMs). During these meetings, participants discuss the extent to which and how the knowledge used to implement WOP projects (e.g., methods and procedures, new technologies) is solving the mentee's performance problems. In a similar vein, at WWn, the value of knowledge in use is usually discussed and evaluated during board meetings on an annual basis. Once a year, a planning meeting is organized for all back-office staff during which the previous year's situation is analysed, and the requirements (including knowledge) for the coming year are discussed. In addition, WOP projects are discussed on a monthly basis by the entire WOP team to assess the extent to which knowledge has been effective or not and what can be improved in the following years.

The evaluation of knowledge is also conducted by means of proxy measures, notably WOP project performance evaluations. For instance, VEI's WOPs are continuously monitored

and evaluated by the RPMs who submit their progress into the 'Dashboards' in the online VEI portal. The so-called RWNO cycle is also used to evaluate how WOP knowledge is performing (e.g., processes and procedures to run a mentor organization). The cycle entails three meetings per year in which employees have (1) a planning meeting (results they plan to achieve in the coming year), (2) a progress meeting, half way through the year (are the results realistic, and is assistance required?), and (3) an evaluation meeting where results are discussed, and VEI staff are scored on a scale from A to E. VEI applies this system to almost all its employees (except STEs), including senior management. The knowledge of STEs is evaluated through informal discussions with RPMs, and through the evaluation format that is usually filled in by each STE (upon return from mission) in the VEI portal. The format captures the mission's goal and asks for feedback on what went well (and what did not) as well as suggestions for improvement. The STE, RPM and representatives of the mentee water utility also sit together to discuss the progress.

4.2. Analysis of the factors shaping knowledge management in the cases

4.2.1. Alignment between knowledge management and organisational goals

The study found that *although the nine water operators implement KM initiatives and strategies, these are not necessarily directly connected to the vision and mission of the utilities.* Besides, KM as a concept is hardly mentioned in the strategic documents of most of the studied companies; the relationship between KM and performance is also not always clearly outlined. Most importantly, while it is true that some of the utilities' corporate documents (e.g., strategic plans, human resource manuals) do mention closely related terms to KM such as innovation and learning, none of the nine water operators has a clearly articulated knowledge vision and a strategy to achieve it. Yet, these are prerequisites for any organisation that aims to harness the potential of KM (Von Krogh et al., 2000).

In this regard, KIWASCO's strategic plan contains a list of relevant statements about what the utility intends to do (e.g., build and enhance employee capacity, motivate staff, develop a structure for continuous learning, etc.) *to attract and retain the best talent/ employee of choice* (KIWASCO, 2012), but the document does not outline how these goals will be achieved and along which timelines. The corporate strategies of utilities such as TANGA UWASA, ONEE and SIAAP highlight the importance of employees' knowledge and KM mechanisms such as training and workshops; but these elements are hardly organised into a coherent strategy. Similarly, although CAESB has a KM unit and guidelines, the utility still suffers from the lack of a coherent and comprehensive knowledge vision and strategy, as the planning of knowledge assets does not seem to be a priority. According to the interviews, the existing guidelines are hardly applied, implying that there is a gap between KM intentions and practice (see also Silva, 2011). In addition, it was observed that the staff members in the KM unit at CAESB are not fully informed of what is going on inside the utility in terms of KM, implying that the established structure is not working properly. Under the conditions described above, it becomes difficult for many staff members of the water operators to understand why they should support the proposed KM initiatives. This may be why some of the employees in the cases were reported to resist practices such as knowledge sharing, perceiving them as threats instead of opportunities.

Nevertheless, *some utilities are increasingly moving ahead towards establishing KM visions and strategies*. For instance, in comparison to the other water companies, NWSC has a somewhat well-articulated KM strategy. The utility's strategic plan (2013-2018) highlights *"learning and people"* as key drivers of the corporation's performance. Thus, the plan contains a variety of KM-oriented interventions (e.g., review of NWSC structure, implementation of innovative staff welfare and incentive systems with a view to improve staff morale and retention, robust Research and Development framework, etc.) along with implementation timelines (NWSC, 2013). In a similar way, VEI's corporate vision and strategy (VEI's 2020 vision) acknowledge KM as an important performance driving factor. This is evidenced, among other things, by the fact that KM has been allocated a budget in VEI's 2015 year plan; so employees can administer their work activities under the KM category. In addition, as indicated earlier, VEI has appointed a new knowledge manager who deals with KM issues on a daily basis.

4.2.2. Knowledge management and personnel

As indicated previously, *managers of the utilities investigated in this study seem to understand what knowledge management means for the success of their businesses*. However, this is a necessary

but insufficient condition for effective KM, since successful implementation of KM requires awareness, full engagement and buy-in of the entire utility's workforce. Again, as highlighted before, in many utilities employees in lower levels of management do not always understand the importance of KM; and it is therefore hard for them to engage in KM activities. At TANGA, for instance, it was reported that some operational employees – with many years of experience in fighting against NRW – refuse to share their knowledge with junior employees. This is explained by the fact that the experienced staff still believe that knowledge is an asset that makes them powerful; so they fear losing their positions by sharing their knowledge. The key to overcome such behavioural problems in water utilities is education: management should strive to sensitize their workforce about the importance of KM, notably by highlighting the fact that the more knowledge is shared the more it grows, and the more efficient and effective the water utility is likely to be.

Nonetheless, awareness raising about KM alone is not enough. Success banks also on whether the utility has a learning potential in terms of quality of staff. In the nine cases, the results show that utilities make efforts to hire competent personnel and to continuously train them. The *studied mentee water utilities generally have an increasingly growing pool of capable staff.* As for mentor operators, they all already have sufficient numbers of competent people in all categories; that is why they generally recruit staff to send abroad among their own employees. For example, utilities such as VEI, WWn and DI recruit their staff members (e.g., STEs, RPMs, PLs) from mother companies that already have sufficient individual knowledge assets. The individual knowledge base existing in water operators is an important ingredient for generating new knowledge and fostering innovation. When sensitized and motivated, a capable workforce can easily understand the value of (and give full support to) knowledge management initiatives.

It appears that *employees of water operators from industrialized countries are more sensitized about the importance of KM in water utilities*. The fact that these employees come from companies that are relatively knowledge oriented (appreciating the value of knowledge) and the experience they gain abroad prepares and convinces them further of the need to engage in KM activities. On the contrary, in less industrialized countries where KM is not yet an established practice, water operators must make efforts to motivate their people so that they can positively engage. In utilities such as SIAAP and ONEE, where many formal and informal KM tools were introduced on voluntarism of some employees, it is evident that not everybody inside the utility is mobilized for KM. That is why the new KM practices tend to be resisted in these operators. In utilities facing such challenges, a first step to boost KM activities would be logically to recognize and reward those dedicated employees who have already understood the importance of KM for the utility and are doing something about it.

However, our study found that *the public nature of many of the studied water utilities (e.g., they are less competitive and autonomous) seems to impede the establishment of sound incentive structures* for the aforementioned growing pool of staff. Yet, incentives are a prerequisite for staff to support and engage actively and positively in organisational programmes, including KM. In fact, it was observed in this study that where utilities create conditions (e.g., incentives and rewards) for staff to learn, KM initiatives run smoothly with positive impacts on performance. The staff members of NWSC appeared to be relatively more motivated than the workforce in TANGA UWASA, KIWASCO and CAESB, for example. The corporation has established a comprehensive set of individual and group incentives which maintains people's commitment to learn, share knowledge and excel in their work (Muhairwe, 2008; Mvulirwenande, 2015). This situation is partly due to the fact that NWSC enjoys sufficient autonomy, including in the areas of setting salaries for its employees and granting them promotions. In KIWASCO and CAESB, efforts are also made to motivate staff, but these do not seem to be properly developed and implemented, which constitutes a barrier for knowledge sharing and application activities. For example, in KIWASCO cases were reported where employees are still hired based on criteria other than merit, including ethnicity and friendship. This negatively affects the level of trust among staff members at all levels as well as the image of the utility as whole, thus hampering KM processes, notably knowledge sharing and application.

A common observation across the companies in less industrialised countries is that *there seems to be gaps and inequities in terms of incentives* (salaries, remuneration, fringe benefits, promotion, etc.) *between employees in higher and lower levels of management*. In this regard, the interviews revealed that the management of TANGA-UWASA provides incentives to employees who introduce and/or share new knowledge on NRW reduction. At the end of the year, such people get some amount of money as well as certificates, which arguably motivates them

to engage further in knowledge activities. However, the incentives provided were reported to be inequitable; in particular, it was argued that lower level employees hardly obtain these incentives no matter how interested they may be in KM. On a related note, while senior managers get good salaries and house allowances, operational staff members have no such arrangements. The inequities characterizing employee remuneration systems were also reported in NWSC, where major salary gaps still exist between top and lower categories of employees (Mvulirwenande, 2015).

The empirical research suggests that *such inequities negatively affect the motivation of staff members to learn, share and apply their expertise in the utilities*. For example, due to poor incentives, NWSC's middle and lower level employees generally tend to leave the company for greener pastures (Mvulirwenande, 2015). Similarly, some staff in KIWASCO – especially field workers – were reported to look for part time jobs elsewhere. For instance, instead of spending a whole day working for the company, they escape for a few hours to fix water and sanitation problems in people's homes to generate extra income. Such working environments do not allow potential knowledge champions to emerge within mentee water operators. Yet, such people are a sine qua non condition to make KM work in an organisation (Von Krogh et al, 2000).

4.2.3. Knowledge management and organisation structure

The organisation structures of water utilities appear to be important factors influencing knowledge management. To start with, *in cases where decentralised and/or flat organisational structures were adopted KM initiatives seem to work properly*. The Dutch utilities (VEI, WWn and DI) appeared to have relatively flat structures, and the working relationships between different layers of management are generally perceived to be flexible. Even where a utility's organogram shows clear hierarchies, these were reported to be supple. Such structural features imply that the flows of information and knowledge within utilities are smooth and effective. In the context of WOP interventions, the study also found that the structures of the Dutch utilities give sufficient autonomy to the individuals and teams working abroad, which allows them to think and act independently. For example, VEI's Resident Project Managers are permanently stationed in foreign countries and are fully responsible for the day-to-day management of the partnerships. They must ensure constant monitoring of the projects' progress and good relationships with the mentee water utility. RPMs are equally responsible for integrating, guiding and evaluating STEs through their missions.

However, the autonomy described here does not mean that RPMs (or other managers at back office level) are detached from the rest of VEI, far from it. They indeed do their job in collaboration with VEI's Regional Directors (RDs) and top management team. Overall, the organisational structure in DI, WWn and VEI is shaped in a way that the role of leaders (at all levels) consists more of providing advice and support to staff members and creating good environment for them to perform well. Put differently, leaders give up some degree of authority to their employees while retaining responsibility. Under these circumstances, staff and their teams are held accountable for what they do and are interested in knowledge management.

A decentralized structure, with positive influence on KM, was also observed in the Uganda's NWSC. As described in chapter three, NWSC consists of a head office which deals with strategic responsibilities (e.g., setting policies, asset management performance monitoring, learning, capacity development, and large-scale investments) and service areas dealing with day-to-day activities relating to the provision of water and sewerage services. Many powers to act autonomously were delegated to staff and units at lower levels, notably regions and service areas. According to the interviewees, this structure enables and motivates both employees and their managers to learn and apply their knowledge to solve problems in their respective areas of operation. The fact that the structure has less managerial layers reduces the time it would take for knowledge and information to move from one layer to another (see also Mvulirwenande, 2015). It was further observed that in some instances NWSC relies on a kind of matrix structure whereby employees are allowed to report directly to top managers rather than their direct supervisors, thus increasing the speed of information reporting and knowledge sharing. Similar to the service areas of NWSC, CAESB departments were reported to enjoy some autonomy in their operations, which allows them to easily apply what they know.

On the contrary, *KM activities face numerous challenges and can hardly run smoothly in utilities with centralized and bureaucratic structures*. This is the case in ONEE and SIAAP where organisational structures are characterized by important hierarchies, along with several sites and departments which tend to have

different working mechanisms. It is therefore difficult to establish official links among employees, and people have to rely mostly on their personal networks to access each other's knowledge. In particular, the many layers of management impede communication and knowledge sharing processes. Under these conditions, it is even more challenging to effectively introduce KM strategies that cover the entire utility, especially when there is no strong commitment and engagement from top leadership. By the same token, in KIWASCO and TANGA UWASA where there is a pyramidal way of organising the utility business, most responsibilities are held by top managers, whereas intermediate and low level managers have limited autonomy, including to think and act independently. It was reported that the processes of planning, selection and organizing trainings in these utilities are dominated by top management staff; and that low layers of management have little say in these processes. Besides, the study found that these two utilities have no strong mechanisms to hold staff and managers accountable, which makes them feel less concerned by (and committed to support and engage in) knowledge activities.

The study has identified many *other structural initiatives across the cases which enhance the processes of knowledge generation and / or acquisition, sharing, application and evaluation*. They include: (1) organisational meetings: all of the studied utilities rely on regular and structured meetings (e.g., VEI 'come back' days and Regional meetings), allowing individuals and teams within utilities as well as external stakeholders to exchange and share knowledge; (2) knowledge and training structures and facilities (e.g., training centers in ONEE and SIIAP, International Resources Center and vocational training school in NWSC, the Wn Academy in WWn, the "Institut de l'Eau et Assainissement" in ONEE, Research and Development departments or directorates such as in NWSC and SIAAP, the creation of a corporate school in CAESB); (3) monitoring and evaluation department and local water committees such as in NWSC; (4) hard library services, (5) open space offices such as in NWSC and VEI; (6) the so called "Ba"[4] spaces (e.g., the coffee areas common in Dutch water operators, spaces where staff can lunch together); (7) (multi-disciplinary) teams (e.g., NRW teams in TANGA-UWASA and CAESB; working groups for projects and job networks in SIAAP); and (8) KM units such as in CAESB and VEI.

Finally, *the study results seem to suggest that KM works better when – as a utility function – it is assigned to a specialised department or unity*. It appears that the human resource department which is traditionally understood as being the department responsible for knowledge activities is not necessarily effective when it comes to implementing KM (in addition to its traditional responsibilities). Arguably, knowledge management has become an established discipline and not all human resources management specialists are necessarily knowledge managers. At NWSC, VEI and CAESB where specialised KM units were created to deal with knowledge (and capacity) management related processes, these appear to work better than in other utilities (such as KIWASCO where a committee was created to deal with human resource development issues only). However, this does not mean that KM should be viewed as a "one-department-show". This study suggests that, for KM programmes to be successful, all organisational departments must be involved; while KM units and / or departments help utilities to shape their KM visions and strategies and to oversee the implementation at corporation level.

4.2.4. Knowledge management, ICTs and other Systems

To start with, *the results of this study suggest that ICTs play a very important role in support of knowledge management processes in the studied water utilities*. ICT applications provide easy ways to generate, store and access information and knowledge resources. They also allow the creation of networks

4 Simply put, the concept of "Ba" means in KM a physical or virtual collaborative space, where participants feel safe and exchange insights. According to Nonaka and Takeuchi (1995) the concept of "ba" refers to a shared space for emerging relationships. The space can be physical (e.g., office), virtual (e.g., e-mail, blog), mental (e.g., shared experiences, ideas, ideals). Ba provides a platform where a transcendental perspective integrates all information needed, thus advancing individual and collective knowledge. The authors argue that knowledge is embedded in Ba, i.e. in these shared spaces, where it is then acquired through one's own experience or reflections on the experiences of others.

of individuals or entities (such as departments) and foster communication inside and beyond utilities. In all nine cases, ICT systems seem to have been embraced as a KM enabler. A variety of ICT applications aimed to foster the management of data, information and knowledge (such as lotus notes, intranets, emails systems, corporate telephony, etc.) have been implemented by all the studied companies, although to different degrees.

The *ICT systems in some of the investigated utilities appeared to be relatively more integrated and well-coordinated.* This is notably the case in NWSC where, for more a decade, the management has viewed ICTs as a knowledge and performance driver and has implemented a comprehensive ICT programme. The utility keeps updating its ICT systems and some of the applications (e-procurement, e-payment) have been developed by the corporation's own staff. The use of ICTs at NWSC has allowed for the generation of a lot of explicit knowledge, namely the creation of centralized knowledge and data bases on the basis of which business related reports are produced, the conversion of paper-based manuals into digital documents, etc.

At VEI, ICT systems are equally developed and widely used as a KM instrument. The utility's main documentation system uses the q-drive, a database that contains information on various subjects (like NRW). Management staff at back-office level, RDs, RPMs and STEs use this system to retrieve the information they want. VEI has also introduced the so called Tangram Roos, a system used by back-office employees to match the skills and specialties of STEs (through their CVs) with the vacancies (i.e., short-term WOP missions) created. Indeed, the system provides a complete overview of the types of knowledge/skills and experience VEI's STEs have, and thus facilitates the management of the STE pool. On the other hand, Dropbox is used at the WOP level: STEs, the RPM and the local water company use this ICT tool to share documents. In a similar vein, WWn uses the t-drive and intranet as storage spaces for most of its explicit knowledge which is then shared throughout the utility. The t-drive contains documents on various WOP project related matters, while Dropbox is used for project specific information (shared with staff working in the same WOP). However, in comparison to the systems in VEI and NWSC, the level of integration of the ICT applications implemented in WWn is still low. For example, it was reported that there is no structured manner of saving information into these systems; making it more difficult to retrieve it. At the time of interviews, the utility was in the process of developing a knowledge database that will enable knowledge and information sharing with mentee water utilities. Similarly, a variety of ICT applications were introduced in ONEE, SIAAP and DI but their impact on KM is still limited due to, notably, a lack of integration. In the first two utilities, many of the introduced ICT tools are not well-known to all employees and consequently not widely used.

Despite the increasing use of ICTs by the water operators, evidence from interviews suggests that ICT based systems do not necessarily ensure effective knowledge sharing and knowledge application. For example, ICT systems are relatively well developed in CAESB (although not yet well integrated). However, the information that is stored in these systems (e.g., in SharePoint System) is not necessarily used or accessible to all, just because some staff are not willing and/or motivated to learn. Some of the interviewees and workshop participants in SIAAP complained about receiving many emails and phone calls, and not having enough time and incentive to meet their colleagues face-to-face; this implies that they are not very comfortable with some ICT applications. In the same vein, most information in DI is stored in ICT systems where it can be accessed easily; however it was reported that staff members still prefer to approach each other personally to acquire new information and knowledge, instead of looking in the database. One interviewee expressed the issue as follows: *"We know each other very well inside the organization, and the fact that we know where we can find new knowledge makes this system currently less relevant. However, when more people retire, the need for such a system will increase I think, but now I don't see the necessity that much yet"*. These phenomena are observed in other sectors as well, confirming that ICTs are not the whole solution to knowledge management challenges. The experience of NWSC shows that ICTs ought to be implemented along with other non-technological KM initiatives (e.g., team development, incentive structures, decentralized structure, etc.) if they are to effectively serve KM purposes. In addition, in KIWASCO and TANGA UWASA communication and knowledge exchange between office and field staff is still limited, assumedly because field employees generally do not have access to ICTs. A lot still needs to be done to increase IT literacy and spread the use of ICTs across these utilities.

There are *other important systems implemented in the cases that foster KM processes*. In the case of NWSC, these include, for example, benchmarking systems (internal and external). Internal benchmarking is usually conducted among service areas and allows them to learn from each other, while external

benchmarking takes place via NWSC's external services department. In the latter case, the utility's experts who are involved in different assignments abroad take the opportunity to compare NWSC's performance and processes to those of other utilities and get new insights that can be used in their own utility (Mvulirwenande, 2015). In addition, performance improvement and monitoring and evaluation systems were found in many of the investigated utilities. For example, over the last decade, NWSC has been implementing such systems and they have significantly fostered KM in this utility (Muhairwe, 2009; Mvulirwenande, 2015).

At VEI, the management uses a variety of systems to monitor performance as well. These include the system used to evaluate STEs and RPMs (evaluation forms accompanied with formal and informal face-to-face evaluations at the end of missions) and the system used to assess the performance of mentee utilities (the system consists of 28 indicators). Earlier, we also described the RWNO cycle used by VEI to evaluate, by proxy, how the knowledge used in WOPs is performing (see section 4.1.2.4). At KIWASCO, the Balance Score Card (BSC) – a tool that is usually used to assess performance on a monthly basis – gives also the opportunity to identify training needs per staff, for instance. The Open Performance Review and Appraisal System (OPRAS) used in TANGA-UWASA serves the same purposes. In the case of CAESB, the Capacity Matrix system discussed earlier helps the utility to identify what is needed in terms of knowledge and to devise knowledge acquisition strategies; while the so-called "X-Ray" system is a mechanism that aims at evaluating the added value of knowledge oriented initiatives (e.g., by checking all the utility's procedures and processes). Finally, the "Rex" (Experience Feedback) system described before (4.2.2.4) serves as a basis in SIAAP to assess the value of existing knowledge in case of incidents (e.g., at plant level).

4.2.5. Knowledge management and organisational culture

The study shows that corporate culture is an important factor influencing knowledge management in water utilities. To begin with, *reluctance to (versus acceptance of) change was identified as an important aspect of corporate culture affecting KM in some of the investigated cases*. In KIWASCO, people were reported to be generally reluctant to change (mostly in higher levels of management, apparently due to vested interests), which negatively impacts on KM and learning processes. Staff members of this water operator also reported that a lack of 'openness' and critical thinking obstructs the free movement of ideas. Similarly, the research interviews revealed that employees of SIAAP and ONEE are not always open to external knowledge and are generally afraid of change. The interviewees at SIAAP argued that new knowledge originating from a previous experience in another utility is hardly valued, particularly at operational level. On the contrary, if new knowledge originates within SIAAP (e.g., from a different operational site), employees are usually interested in it and willing to give it a try. One could indeed argue that this utility is characterized by the so called "not invented here syndrome" to some extent. In addition, ONEE and SIAAP operate in a public administration culture which, in the context of France and Morocco (these two countries have strong historic ties), usually implies reluctance to change and involves long processes while introducing novelty. Basically, this culture suggests that as long as things work, there is no need to change them. This perception drives employees into a more secretive attitude (and behaviour) whereby knowledge is seen as power, and sharing novel ideas means being exposed to criticism. In a similar vein, although individual staff members at CAESB were reported to be generally relatively open to new insights, the utility as an entity was reported to be still characterized by a weak change and innovation culture. All this has negative impacts on knowledge management.

However, in utilities such as VEI and NWSC, change and innovation are seen as positive and unavoidable. The management of NWSC has implemented a comprehensive change management strategy which resulted in changes in the corporate culture and staff behaviour, thus increasing the utility's readiness to learn and manage knowledge. Over the past decade, NWSC has also cultivated an innovation culture and fostered the values of creativity and inquisitiveness among its employees. The improvements made in terms of corporate culture have allowed the utility to embrace several innovations, both technological and non-technological, and to boost its performance. On the other hand, VEI is widely perceived among employees as a learning organization; the interviewees argued that there is, in this utility, sufficient room for change and innovation, and doing things differently is viewed as a positive aspect.

Some *utilities were found to be characterized by a lack of a 'systems thinking culture'* (Senge, 1990) and *low levels of trust among employees, which obstructs knowledge sharing and application in several regards*. Notably, at KIWASCO, despite the

exiting efforts to foster teamwork culture, a case was reported whereby two departments (technical and commercial) engaged in a serious conflict, each of them claiming to be the best performer. This resulted in a situation whereby both departments and their staff members ceased to trust each other and share information altogether. The issue of low level of trust between senior managers and other employees is also rooted in unfair decision making processes at KIWASCO, whereby employee participation is reported to be "manipulated". According to the empirical research, top managers generally request inputs from employees prior to taking decisions, but these inputs are rarely used. Interviewees in KIWASCO argued that they prefer a non-participatory style over a fake and pretended participation. The problem of a lack of systems thinking culture was equally reported in CAESB where respondents referred to the utility as a fragmented entity, with many *"mini-CAESBs"* in the company, implying that the level of cohesion and integration among departments is very weak. This kind of environment is not favourable for KM initiatives. In SIAAP, internal politics was reported to constrain KM activities. Due to the tensions and conflicts (over power and responsibility) that very often characterize heads of departments and managers, trust gets eroded and employees are demotivated to fully engage in knowledge activities.

However, *where managers and their staff members trust each other, KM activities generally run smoothly.* This is notably the case of utilities such as VEI, WWn and DI in which trust was reported to be an integral part of organizational culture. Trust is clearly observed in the low threshold relationships inside the utilities, as employees can easily contact one another to discuss work related issues and to share knowledge. This goes for senior managers as well as lower ranking employees. Put simply, it is a culture in these utilities to listen to each other and to consult colleagues before acting, which implies a high level of trust. The flexible and flat hierarchies characterizing these utilities (see our discussion in 4.3.3) contribute to an open organization in which there is room and time for dialogue and discussion among people who trust each other. At VEI, staff members described the utility as a place where people and structures are flexible and everybody appreciates each other. Such a conviction is extremely favourable for knowledge management activities. Similarly, over the period of change management programmes at NWSC (Muhairwe, 2008), many efforts have been made to reduce fear in the utility while trying to increase the level of trust. Notably, the implementation of performance improvement programmes focused on departments and service areas have fostered the systems thinking perspective in NWSC thus fostering trust. The utility's departments, head office and areas (and their staff) have understood the importance of working together to achieve their collectively set performance targets. Thus, genuine employee participation (based on trust) has become accepted culture in NWSC, with positive impacts on knowledge management activities.

4.2.6. Knowledge management and management style

The management style practiced by leaders proved to be one of the key drivers of knowledge management in the water operators. *Where knowledge and people-oriented management* (putting people at the center, thus involving them in all processes) *was adopted*, KM processes seem to run properly, which positively affects performance. In such environments, the leadership (at all managerial levels) is open to employees and keen on empowering them and providing them with support to obtain the knowledge they need to perform their responsibilities. As argued by Mvulirwenande (2015), since 1998 the leadership of NWSC has been characterized by a strong focus on people's knowledge and its application. The board of directors usually supported the implementation of the change strategies proposed by the chief executive team. The utility leaders were also willing to allocate the necessary resources for employees and their teams across the organisation to implement their novel ideas. In addition, by adopting a participatory approach, leaders became open to all useful insights from staff, regardless of their positions in the company. Thus, NWSC leadership was able to mobilize in-house and external knowledge for action and created appropriate conditions for staff and their managers to continuously learn and apply their knowledge, which boosted the utility performance.

The study also found that leadership in the Dutch VEI is generally supportive of KM and committed to create a learning environment for staff. The interviewees argued that VEI management recognizes the importance of employees and their knowledge and has implemented a variety of initiatives aimed to continuously improve and manage this knowledge in a professional manner. As described in previous sections, these KM initiatives include – but are not limited to – the introduction of ICT systems, efforts to create organisational knowledge based on the expertise of individual staff members, creation of many knowledge moments (e.g., expert meetings), and the utility's decision to hire a specialized employee to deal with

KM. At TANGA UWASA, top leadership was also reported to be supportive of knowledge activities, notably by consistently encouraging staff members to upgrade their knowledge. Even when the utility is unable to secure financial support for learning activities, leaders allow employees who are capable of obtaining personal support to attend trainings or pursue an advanced degree (e.g., by granting them a study leave). The management style in this utility was described as open: in the sense that employees and managers (including the managing director) are free to discuss anything concerning work and professional development. According to the interviewees, this style helps people to learn from each other.

In contrast, *where management systems are still centralized and non-democratic, KM initiatives face difficulties.* In such systems, the majority of employees are less involved in decision making processes and their knowledge is therefore not used, let alone valued. In KIWASCO and ONEE, for example, managers were reported to lead by top-down approaches. That is, most decisions, including on KM undertakings, are merely taken by managers. Earlier, we discussed how trainees are selected in KIWASCO: although low level managers are involved in the assessment of knowledge gaps, their recommendations are hardly considered when it comes to the actual decision making regarding who should attend trainings. This is particularly true when trainings must take place outside the utility and attract, therefore, significant allowances. As a result, training opportunities are often misplaced, with poor outcomes.

As described before, knowledge management initiatives at ONEE still rely on voluntarism of some employees, and there are no significant efforts from the side of top leaders to support these initiatives. In situations where KM initiatives lack full backing of top management, it is usually difficult to get everybody inside the utility mobilized for KM. Managers in ONEE were equally reported to retain authority and responsibility over most aspects of the utility's business. They also tend to dictate employees what to do, leaving them little room to think and act autonomously. This leadership style does not foster knowledge management. The management style at CAESB was also reported to not be fully favourable for effective KM. Notably, the current board seems to be much entangled with politicians and has lost credibility and trust in the eyes of employees. In SIAAP, where a more or less laissez-faire management style was observed, KM efforts seem to be ineffective as well. The interviewees in this utility argued that there is no general rule within SIAAP on how relationships between leaders and employees should be managed: each manager acts how he/she estimates best. While some managers do share with employees what is being discussed at higher level and strive to give them information and knowledge they need to perform their duties, others hardly do so. Knowledge sharing also tends to happen mostly among employees of the same category (e.g., operational workers, engineers, and so on). All of these conditions constraint KM at organisational level.

Furthermore, the study results suggest that in water operators *where leaders and managers tolerate critical reflection on the organisation's processes and allow people to make mistakes for the sake of trying innovative ideas and approaches*, it is very easy to learn and apply knowledge. This is particularly the case in NWSC where the leadership has embraced a more or less democratic style of managing the business, and cultivated a team decision making approach, while focusing on change. Put differently, the utility is characterized by a less bureaucratic style, with an improved participatory way of managing its affairs. Hierarchical considerations are limited, implying that managers (including top management) can easily interact with lower level employees, thus fostering the emergence (and exchange) of novel ideas and increasing the level of trust. This style is further nurtured by the lay-out of the utility's buildings, particularly the "open office" set up. As seen previously, participation is also part of NWSC corporate culture, which allows staff to interact freely and to learn from each other. The interviews conducted in NWSC confirmed that leaders across the utility have understood the importance of this management style and are committed to it.

Finally, the study found that *governance issues such as transparency, patronage relationships and corruption* negatively affect KM processes in some water operators. Particularly, it was reported that most staff members of KIWASCO come from one ethnic group in the same region. The few employees who come from other regions feel isolated and hardly share knowledge with their colleagues. Despite the existence of some mechanisms to ensure transparent decision making around KM issues, these mechanisms are not always enforced and decisions continue to be based on favouritism. To give an example, KIWASCO has created the so-called Human Resource Development Committee to deal with all issues relating to human capacity enhancement (capacity gaps analysis, determination of needed knowledge, etc.) and provide advice to the Managing Director. However, in many cases the committee's recommendations are not considered.

4.3. Analysis of the relationship between knowledge management and Water Operator Partnerships

Water Operator Partnerships (WOPs) are used worldwide to develop the capacity of utilities to deliver sustainable water and sanitation services for all. As described previously, at the center of these partnerships lies a joint learning process through which new knowledge is transferred from mentors to mentee operators. For this process to lead to improved utility performance, the ultimate goal of WOPs, a careful management of knowledge at either end is essential. Put differently, water operators must have sound knowledge management mechanisms to ensure that the newly acquired knowledge is managed well, applied and translated into productivity. Because KM as an organisational management concept is still relatively new for many water utilities, an important expectation from the WOP approach is that it should, by its nature, help to raise awareness about (and boost the implementation of) KM in the drinking water utility industry. Therefore, a question that is worth reflecting upon in a study like this is whether and to what extent WOPs influence and foster KM practices in water operators. This section reflects on the extent to which WOPping operators implement KM processes depending on whether they are mentors, mentees or both, and their degree of readiness to do so.

4.3.1. Knowledge management processes and roles of utilities in WOPs

In light of the results discussed in section 4.1, it appears that water operators that play the role of mentor in WOPs tend to perform better in a number of KM processes than utilities that are involved as mentees. As illustrated in Figure 4.1, NWSC, VEI, WWn and DI surpass other operators in the following processes: knowledge development/acquisition, knowledge sharing and knowledge application. This is not surprising, though. In general, before engaging in WOPs, mentor utilities must have achieved a good level of organizational maturity. This implies that many of their processes are explicitly and consistently deployed, well-managed, and continually improved. The motivation to mentor sister utilities generally stems from the confidence that operators (and their partners) have in their strong capabilities and the conviction that they have a social responsibility to help others improve (Wehn and Montalvo, 2016). In that regard, the three Dutch water companies have been front runners in setting up WOPs in the water supply and sanitation sector across the world, while NWSC has been equally instrumental in popularizing the WOP approach (as a mentor) in Africa water supply industry (GWOPA and UN-HABITAT, 2015).

Therefore, it can be argued that utilities that take up the role of mentor in WOPs are likely to be implementing or have implemented some KM practices as part of their organisational development process. The exposure of mentor operators to, and their interest in, modern organisational management principles and concepts and their increased capabilities (and financial resources) foster the adoption of KM and learning-oriented practices. In addition, although some mentor operators (such as VEI) are already convinced of the importance of KM, one could argue that the experience gained in WOP projects generally reinforces the need for mentor utilities to manage their knowledge resources in a professional manner.

Figure 4.1. Performance of participating mentor and mentees utilities vis-à-vis KM processes

Utilities	Role in WOPs	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
SIAAP	Mentor only						
VEI							
WWn							
DI							
NWSC							
KIWASCO	Mentee only						
TANGA-UWASA							
ONEE	Both mentor and mentee						
CAESB							
Legend		Not working very well		Working fairly well		Working well	

Figure 4.1 also indicates that the utilities involved in WOPs as mentees only and as both mentors and mentees perform fairly in most KM processes. Again, this result is not surprising at all. Along the same line of thought as above, it can be argued that mentee utilities have by definition weaker capabilities than mentors – including in terms of managing their knowledge and learning processes. However, since all organisations implement some form of KM (the only difference being the degree of consciousness and formality with which KM is practiced as a strategic activity), it is clear that mentee utilities do also implement some initiatives that can be labelled as KM practices. Like mentors, mentee utilities are exposed to the importance of KM and learning principles. This occurs particularly through mechanisms such as WOPs and PPPs where utilities experience first-hand the fact that new knowledge leads to improved performance only if appropriate mechanisms exist to ensure that it is integrated and applied (Mvulirwenande et al., 2013; Mvulirwenande, 2015). However, due to their limited capabilities (and financial resources), mentee operators are arguably less prepared to commit resources to intangible aspects of their organisations such as KM. This is particularly true in the face of other competing priorities (e.g., extension of infrastructure). For instance, due to weak financial resources, utilities such as KIWASCO and TANGA UWASA can hardly invest in research and development activities or in comprehensive KM systems (such as ICTs).

Finally, it appears from Figure 4.1 that all of the studied utilities – mentors and mentees alike – do not perform well regarding knowledge evaluation. This does not mean that they do nothing in this area; rather, they do it inconsistently and haphazardly. As seen before, in most cases, knowledge evaluation is generally done as a by-product of other organisational processes such as performance evaluation and staff appraisal (see section 4.1.2.4). Similarly, all investigated utilities perform only fairly in the process of knowledge gap assessment (assessment of needed and available knowledge). In the absence of knowledge of tools appropriate for conducting this process, utilities also tend to do it as a by-product of other processes such as individual and team performance evaluations or through routine meetings (see section 4.1.2.1). This can be explained by the fact that most WOPping utilities still have a limited understanding of the concept of KM, the associated tools, and how these should be implemented successfully.

4.3.2. Knowledge management 'readiness' and roles of utilities in WOPs

KM 'readiness' of utilities refers here to the availability of certain characteristics and capabilities that foster knowledge management activities. These characteristics and capabilities are reflected by the status of the organisational variables described in Weggeman's (1997) Knowledge Value Chain. Figure 4.2 illustrates the readiness of the studied utilities to successfully implement KM initiatives and/or strategies. It appears again that mentor operators have higher 'readiness' to implement KM than mentees. This is particularly the case for VEI, WWn, DI and NWSC. They are characterized, among other things, by flexible/flat/decentralized structures, sound systems (such as ICTs, M&E systems), staff that are competent and more sensitized about KM, increased levels of trust, change and innovation mindsets, and democratic and people-oriented management styles. Altogether, these features are characteristics of knowledge and learning-oriented organisations.

Regarding NWSC, we saw how this utility implemented a series of change management programmes over a whole decade that resulted in improved systems, structures, management approaches, cultural changes and personnel policies. These changes have proven favorable for the adoption of technological and non-technological innovations in this utility, including in the areas of KM and learning. As explained earlier, the Dutch mentor utilities generally reflect their mother companies which have reached a high level of maturity in their organisational development process, notably because they are embedded in a knowledge society, The Netherlands. Like in other knowledge societies, many Dutch organisations in various sectors – including in the water sector – have been increasingly appreciating the importance of KM and implementing necessary organisational changes to accommodate it. Nevertheless, we see that WWn and DI are still performing only fairly well in terms of systems, as compared to VEI. This difference can be attributed to the fact that the first two operators are in a different stage of organizational development (maturity): they are indeed young and small operators.

Figure 4.2. KM readiness of participating mentor and mentees utilities

Utilities	Role in WOPs	Strategy	Structure / organisation	Systems (e.g., ICT)	Management Style	Personnel (HRM)	Organisational culture
SIAAP	Mentor only						
VEI							
WWn							
DI							
NWSC							
KIWASCO	Mentee only						
TANGA-UWASA							
ONEE	Both mentor and mentee						
CAESB							
Legend		**Not working very well**		**Working fairly well**		**Working well**	

Not all mentor operators perform well in all areas, though. Utilities such as SIAAP, CAESB and ONEE also play the role of mentors in WOPs, but they still present characteristics that are not favorable for KM. Again, this appears to be related to the level of maturity of these organisations. For example, in SIAAP and ONEE, resistance is still common when new practices are introduced. These two utilities are also characterized by strong hierarchies and their ICT applications fail to boost KM because of a lack of integration. Yet these are large and old utilities. However, since a utility's age and or size does not always correlate with its organizational maturity level (Logue and Yates, 2001), the two utilities still need to strengthen some of their organisational capabilities.

Most of the above characteristics are also found in small mentee utilities (KIWASCO and TANGA-UWASA) which also perform fairly well in terms of readiness for KM. These operators further present the following characteristics: people who refuse to share their knowledge, lack of comprehensive incentives, centralized and bureaucratic organisation structures, reluctance to change attitude, rejection of innovations and new ideas according to the "not invented here syndrome", lack of a 'systems thinking culture', lack of tolerance of critical reflection and mistakes, governance issues (such as transparency, patronage relationships and corruption) and so on. All of these features are incompatible with KM in organisations.

Finally, all of the studied utilities perform either poorly or fairly with regards to "strategy". This is explained by the fact that most operators do not yet consider KM a strategic activity. Earlier, we saw that none of the nine water operators has a clearly articulated knowledge vision and a strategy to achieve it; and that only a few have started efforts in that regard (e.g., NWSC, VEI). The lack of clear KM visions and strategies that are endorsed corporation-wide explains why, in many utilities, knowledge activities are implemented haphazardly and very often by "volunteers".

5. Conclusions and recommendations

5.1. Conclusions

This report has synthesized the results of nine case studies on knowledge management processes of water operators participating in Water Operator Partnerships (WOPs). The results were presented using the Knowledge Value Chain framework (Weggeman, 1997), highlighting KM initiatives and /or practices implemented in the water operators as well as the factors influencing them. The study further analysed the relationship between KM and the WOP approach. Below, we discuss the major conclusions emerging from this study.

First, the successful implementation of KM in water operators appears to be a complex undertaking. It requires a multi-dimensional approach: (1) focusing simultaneously on individual and organisational aspects of knowledge (management), (2) considering the use of both technological and non-technological tools and or initiatives, and (3) allocating sufficient time for the implemented initiatives to bear tangible results at field level, and for beneficiaries to appreciate the added value of KM and support it.

Second, the water operators investigated in this study are increasingly becoming aware of KM, and several KM initiatives and practices are being implemented to enhance performance. However, in terms of understanding the concept and its practice, there seems to be a big gap between managers and low level employees, particularly in water utilities from less industrialised countries. The former category appears to understand the essence of the concept, whereas the latter generally ignore what the concept really means and how it relates to improved performance. This situation has a negative effect on KM in water utilities, since its success banks on staff buy-in of the concept, among other factors. Thus, leaders of water utilities ought to devise robust strategies in order to popularise the concept and associated practice among their workforce.

Third, this study suggests that, in their efforts to implement KM, water operators still put more emphasis on some KM processes (e.g., knowledge acquisition through training, knowledge sharing) than others (e.g., knowledge evaluation). In part, this tendency results from the limited mastery of the concept of KM itself and of its implementation process. In that regard, evidence from the cases suggests that these water utilities tend to take the processes of knowledge evaluation and performance evaluation as synonymous. This is not surprising, though, since KM is relatively new in the world of water utilities as compared to that of performance. Notwithstanding this confusion, one could argue that the journey towards KM in water operators has started; it is up to leaders of these operators to keep the momentum and ensure that they reap the advantages of this important tool to the maximum.

Fourth, in line with the conceptual framework selected for this study, it appears that organisational features (such as structure, management style, culture, employee incentives) influence KM processes to a great extent. In that regard, the key success factors of KM identified in the cases include inclusive leadership and management, effective communication systems, flatter and less hierarchical structures, integrated ICT applications, participatory culture, availability of financial resources, a team-based approach, increased social capital, valuing employees (and their knowledge) and providing opportunities for personal growth and self-realisation. The factors constraining KM observed in the cases include a lack of systematic approaches to KM implementation, poor linkage between KM and the utility's goals, patronage and favouritism, a climate of fear, lack of an innovation culture, pyramidal and bureaucratic structures, resistance to change, culture of secrecy, and so on.

Fifth, it appears that the implementation of KM initiatives is sometimes done in a haphazard way. This is partly due to a lack of clearly articulated knowledge visions and strategies of implementation, monitoring and evaluation. In many cases, what departments (and water operators as entities) do in terms of KM is not necessarily harmonized. Thus, efforts to coordinate KM activities at organisational level are crucial. This study has also shown that poor implementation of KM initiatives (e.g., the implementation of training plans) is also due to insufficient budgets. Yet, implementing comprehensive KM programmes requires enough financial resources which, apparently, many water utilities are not yet ready to commit.

Sixth, in comparison to utilities in developed countries, water operators in developing countries are generally still characterized by traditional management and governance problems which have negative effects on knowledge management efforts. These problems include (but are not limited to) corruption,

nepotism and weak accountability mechanisms. In many cases, these problems are compounded by the inability of water operators to invest in soft aspects of utility management (notably the learning and KM dimensions) in the face of competing priorities to renovate and/or extend physical water supply infrastructures. However, experience has shown that well performing water utilities are usually those which give equal focus (including in terms of financial investment) to both engineering/technical and managerial/governance aspects.

Seventh, although mentor water operators tend to perform better in a number of KM processes and to have higher KM 'readiness' than mentee operators, it appears from this study that mentors are also still struggling with KM to some extent. Notably, they lack technical knowledge and capacity to effectively and consistently plan, implement and evaluate KM strategies and initiatives. Therefore, efforts that aim at promoting KM in the drinking water industry should target mentor utilities too.

Finally, the Knowledge Value Chain as a conceptual tool has served the purpose of this study well. It allowed us to analyse, in a comprehensive and systematic manner, the knowledge management processes of the targeted water operators. The processes outlined in the KVC model are clearly defined and allowed the authors to collect rich data and information on both KM processes and the factors influencing them. The limitation of the KVC framework proved to be its inability to accommodate the role of factors outside water operators that influence KM. In future studies, this framework should be complemented with other frameworks that take into account the role of external environment in fostering or constraining KM processes inside water utilities.

5.2. Recommendations

Based on the results of this research and the major conclusions discussed above, the following recommendations are formulated. They are meant to foster KM of water utilities and allow them to benefit from different types of knowledge oriented partnerships, such as WOPs and, thus, improve their performance.

In order to successfully implement KM and become true learning organisations, water utilities should – as a first step – strive to establish clear knowledge visions and strategies. These must be part and parcel of the overall organisational strategic plans and should be clearly linked to performance.

It appeared from the study that many of the tools commonly used to support implementation of KM in other sectors (notably the private sector) are still not well known in water utilities. Therefore, in order not to reinvent the wheel, efforts should be made to popularize these tools among members of water utilities' community. In particular, those in charge of change management, knowledge management, learning, workforce development and institutional strengthening issues in water utilities should be provided with practical and in-depth understanding of KM tools.

In essence, KM involves learning and change processes. Thus, water operators should acknowledge that KM implementation ought to follow a clear approach, with well-defined steps. Regardless of the size of KM initiatives, these must be well planned (based on objective information about the readiness of utilities to accommodate them), executed and evaluated. Finally, efforts must be made to sustain the gains from such initiatives.

Since people play an important role in the whole chain of KM (generation, sharing, application and evaluation), it is recommended that water operators adopt *"people centred"* management, along with the implementation of technological initiatives. Indeed, as argued by Ruggles (1998), organisations aiming at successful KM should get the approximately 50/25/25 people/process/technology balance right from the beginning. This statement shows how effective people management strategies lie at the heart of KM: they are likely to allow water operators to curb knowledge losses, by preventing their staff to leave for greener pastures and, thus, take with them the knowledge (mostly tacit) that is embedded in their minds.

In relation to the above, the management teams of water operators should acknowledge that one of the most difficult challenges in KM is getting employees to "buy-in" that KM benefits them. And, therefore, they should clearly explain to their staff how KM will improve organisational performance and the benefits they can get from engaging in knowledge activities as individuals. Put differently, leaders and change agents in water utilities should develop and defend the business case for KM in their organisations, which they should do by using a language that is easy-to-understand by all

categories of staff. Only then can people feel enthusiastic about KM and give it full support.

Given the demonstrated role of organisational variables in making KM work in water operators, it is recommended that leaders make efforts to increase their utilities' readiness to accommodate KM interventions. They can do this by committing to implement necessary structural, cultural and attitudinal changes (e.g., by introducing flat organisation structures, cultivating the culture of openness, etc.). In particular, employee incentives should be developed that are knowledge-oriented in order to encourage learning behaviour and attitude and foster the application of expertise and know-how.

Because KM crosses departmental boundaries, it is recommended that its management be assigned to a specialised unit and / or department, with a knowledge management staff (e.g., a knowledge management officer/manager or equivalent). This will allow water utilities to systematically implement, monitor and evaluate KM and, as such, increase efficiency and effectiveness of their business processes.

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7. Annex

KVC matrices summarising the key results on KM activities and factors influencing them in the cases

1. CAESB's KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	Strategic Plan highlighting the importance of knowledge, Training plans			Learning from partnerships		
Structure / organisation	Corporate School (to ensure training of staff); Knowledge management Unit				Multi-disciplinary teams for special programs (e.g., water loss); departments with autonomy	
Systems (e.g., ICT)	Capacity matrix system (knowledge map)			Emails, websites, intranet, printed paper, radio communication system	Technology is used to support many activities across the organisation	"X – Ray" of the company (to evaluate systems, processes and procedures)
Management Style	Top-down approach; staff weekly meetings (e.g., between president and directors)					
Personnel (HRM)			Training of employees		Knowledge based salaries; Team development	
Organisational culture	No innovation culture at organisational level; but staff generally willing to accept change;			No systems thinking culture (departments isolated from each other); strong culture of communicating informally	No culture to influence external environment	

2. KIWASCO's KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	Learning oriented partnerships (e.g., with VEI) Training plans			Learning from peer utilities, learning by doing		
Structure / organisation					Hierarchical and bureaucratic structure	
Systems (e.g., ICT)				ICT applications (internal mailing, phones, viber, web pages), ICT supported data base, radio communication system; Benchmarking with other utilities	Staff supervision system; Benchmarking with other utilities	Balance Score Cards (evaluation of performance, not knowledge per se)
Management Style	Top-down approach; Staff weekly meetings (e.g., Tsunami)					
Personnel (HRM)			Policy to recruit staff with appropriate qualifications; training of employees	Coaching and mentoring; training on the job; repository of people with their CVs (competences)	Rewards for exemplary knowledge users (but selective in many cases): trips, shopping vouchers	
Organisational culture			Resistance to change, conservatism	Climate of fear, low level of social capital (trust); fear to share knowledge	Teamwork encouraged	

3. NWSC's KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	Change management strategy, research strategy, training strategy; Strategic plan highlighting the role of learning and innovation			ICT strategy		Regular review of strategies
Structure / organisation	R&D department, capacity development unit, hard and virtual library services, vocational training school			Open space offices, Training Center IREC, External services department; Local water committees; membership to different learning platforms; staff meetings; lunch seminars; call center	Flat structure; areas=quasi business units; Local water committees; project-based teams	M&E department
Systems (e.g., ICT)	Comprehensive ICT applications (intranet, website, e-mails, various softwares, corporate telephony, etc.); benchmarking, documentation systems (work related manuals)				Benchmarking; performance improvement systems /plans	M&E systems (e.g., checkers system)
Management Style	People centered, democratic, focus on change, development of knowledge oriented leaders, team decision making					
Personnel (HRM)	Individual knowledge gap analysis		Hiring and training of staff	Training of trainers; staff induction; job rotation; coaching and mentoring; training on the job	Knowledge oriented incentives and rewards systems; merit-based promotions; development of teams	Regular job analysis, staff competences evaluation
Organisational culture	Participation		Innovation acquisition culture; fostering creativity and inquisitiveness culture	Reduced fear, increased level of trust	Tolerance of mistakes; soft competition; celebration of success	

4. VEI's KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	VEI 2020 acknowledges the importance of KM (with a budget), Training strategy for all employees, Cooperation with research institutions such as UNESCO-IHE, Baseline survey to generate knowledge needed in WOPs			ICT strategy, learning by doing strategy in WOPs		RWNO cycle
Structure / rganisation	Knowledge management Unit (with a dedicated staff and budget)			Structured meetings (e.g., STEs days and VEI 'come back' days), "Ba" spaces (coffee areas)	Flat and decentralized structure	
Systems (e.g., ICT)	ICT based knowledge databases (e.g., q-drive)			ICT applications: VEI-portal, Tangram Roos, q-drive, Intranet, E-mail, Dropbox		Evaluation system for the local utility performance (28 indicators); RWNO cycle (to evaluate knowledge by proxy); System to evaluate STEs
Management Style	Flexible, open and democratic management style (RPM and STEs work independently and have a lot of discretionary powers; knowledge oriented leadership (stimulating learning); participatory management (in WOPs)					
Personnel (HRM)	Assessment of the skills and knowledge needed by STEs		Hiring competent staff (e.g., STEs and PMs); Continuous training of staff	RPMs always train STE on the local working culture and how to work with mentee utilities	On the job-Learning (by working with the local organization)	
Organisational culture	Culture of self-learning (continuous learning) is highly developed			Culture of flexibility and consultation: employees and managers easily to talk to each other; informal relations are very developed	Results-orientation culture	

5. WWn's KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	Strategic cooperation with other organizations (VEI, for example) to develop new knowledge (e.g., on NRW); Training strategy			The African Concept: sharing knowledge with strategic mentees who then become mentors; learning by doing approach / strategy, MoU signed with mentees usually emphasize knowledge sharing and application		
Structure / organisation	Wn Academy			Open offices, "Ba" Space (coffee corners), structured meetings (e.g., Project Managers meetings: Management meetings), Flexible hierarchy: there is a hierarchy, but it is not rigid, Wn Academy		Regular evaluation meetings (e.g., between Project Leaders and Regional Managers; regular visits to local project partners; after mission evaluations
Systems (e.g., ICT)	ICT based databases (e.g., t-drive)			Intranet, Emails, Dropbox, t-drive containing knowledge on the projects; library		Project leader Evaluation system, Mission Debriefing system
Management Style	Flexible management style, hierarchies not exaggerated (no/ little distance between managers and other employees), Iindependent working relationships, knowledge oriented leadership (stimulating learning), participatory management					
Personnel (HRM)		Competent staff recruitment, internal and external trainings for PMs and RDs		Job descriptions (for both the back office personnel and STEs); Trust amongst employees (allowing to share successes and failures)		Annual evaluations of WWn employees
Organisational culture	Self-learning is a culture, continuous learning promoted			Culture of openness; Culture to communicate informally is well developed	Culture of adjusting to local conditions (while working abroad)	

6. DI's KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	Strategies to capture and share knowledge (Koers 2015, Koers 2020, Knowledge flows)			Strategies to capture and share knowledge (Koers 2015, Koers 2020, Knowledge flows)		Yearly review of strategies (by top management)
Structure / organisation	Dunea College , Knowledge resonance group			One physical working location (facilitating knowledge sharing); "Ba" spaces (e.g., open places in offices, coffee corners); Regular meetings (like Spettersessies, knowledge sandwich; Dunea College	Horizontal hierarchy / flat structure / decentralized structure	
Systems (e.g., ICT)	ICT based databases			ICT applications (Livelink – capitalizing knowledge between employees, Intranet, emails, SharePoint); Online magazine / newsletter; Flexible internal Communication system		
Management Style	Democratic and flexible style of management (e.g., all employees at Dunea decide for themselves what knowledge they need. It is not decided on by their managers)					
Personnel (HRM)			Acquisition of new STEs through Job interviews; continuous training of employees	Job descriptions for STEs and other staff members		Formal evaluation meetings (annual evaluation meetings between Dunea managers and their employees) Mission report (evaluation) for STEs;
Organisational culture				Everybody is accessible to everybody at DI; It is a culture at DI to help colleagues; Culture of informality developed	Culture of sharing failures, successes and work related questions amongst Duneans	

7. ONEE'S KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy				Participation in different WOPs, action learning strategy		
Structure / organisation	Training center; IEA (regrouping Research and Development, training and documentation management)				Lengthy and complex procedures to implement new knowledge	
Systems (e.g., ICT)	ICT based Knowledge database (but not well integrated)			ICT application (Emails, websites, intranet)		
Management Style	Top-down approach					
Personnel (HRM)			Recruitment of competent employees (also for experts to use in WOPs)			On the spot feedback for all trainings; WOPs' instant evaluation for all projects
Organisational culture				Knowledge perceived as power; Lack of openness to criticism; Confidentiality culture	Public administration culture – not favorable to change	

8. SIAAP's KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	Current corporate strategy acknowledges only the role of training (training plans); No clear KM strategy			Internal mobility of acknowledged in strategy		
Structure / organisation	La Cité de l'Eau et de l'Assainissement (LCDEA)			LCDEA– Training center; Informal structures well developed (favoring knowledge sharing); but too many and scattered organisation sites (sometimes with different organisation); "Ba" spaces (coffee machines)	Working groups and job networks (fostering teamwork); important but flexible hierarchy; different organisational structures in different sites and departments	
Systems (e.g., ICT)	Many ICT based knowledge systems (not integrated though and not well known by potential users); REX (Experience Feedback system)			ICT applications (emails, websites, intranet); Biblio and infothèque; newspaper, newsletter, share files; REX	Tableaux de bord	REX; Tableaux de bord (Scorecard)
Management Style	Generally top-down management (managers determine everything), but every department has its own management style (kind of laissez faire style)					
Personnel (HRM)	GPEC (Gestion prévisionnelle des emplois et des compétences – forward planning of jobs and skills); Annual assessments of knowledge gaps to develop training plans		Training of staff members; Hiring experts, interns, apprentices; Outsourcing activities	Attendance to conferences and trainings GPEC: new job descriptions;	Job rotations but not yet widely used	Annual evaluations (performance): include also discussions on trainings done; Social balance sheet
Organisational culture	Documentation culture (lessons learnt- many documents exist and are shared to some extent); culture of innovation			Freedom of speech culture; Culture of solidarity; culture of respecting hierarchy	Change aversive culture; not invented here syndrome still present (not easy to introduce new knowledge from outside); Working class culture and public administration culture reluctant to change; Belief that staff cannot change things	

9. TANGA-UWASA' KVC matrix

	Needed knowledge	Available knowledge	Developing/ acquiring knowledge	Sharing knowledge	Apply knowledge	Evaluate knowledge
Strategy	The strategy (to reduce NRW) emphasizes trainings and workshops to acquire NRW related knowledge					
Structure / organisation				Structured interactions through which employees share knowledge (seminars, workshops, in and out-door training)		
Systems (e.g., ICT)	ICT based knowledge bases			ICT applications (email, software program like Epanet, GIS and AutoCAD)		Open Performance Review and Appraisal System (OPRAS)
Management Style	Relatively democratic style (e.g., Employee are allowed to discuss new ideas on NRW with top management)					
Personnel (HRM)			Hiring of competent staff; Training of employees	Orientation training for new employees	Development of team work spirit among employees	Employee appraisal (which is done twice a year)
Organisational culture				Emerging culture to reward those who outperform in knowledge activities		

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