# An Analysis of Knowledge Management Lifecycle Frameworks: Towards a Unified Framework

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**Abstract:** Knowledge management (KM) has gained popularity in recent times because knowledge is regarded as a vital resource in today's economy. The popularity of KM has led to the creation of the KM field. Organisations have adopted KM because of its association with competitive advantage. Over the years, theories, models and frameworks have been developed to inform KM research and practice. KM lifecycle frameworks seem to dominate the KM literature. Too many of them have been created over the years, thus causing confusion about which one to choose for research and practice. The study analyses 20 prominent KM lifecycle frameworks, and proposes a unified framework. The unified framework aims to eliminate the confusion created by having too many frameworks with many different processes. Quantitative and qualitative content analysis was used to analyse the 20 frameworks. Processes appearing in all frameworks were listed and counted to determine the most prominent. After eliminating synonyms used to describe the processes, qualitative content analysis was used to group them into themes. Five prominent KM processes were discovered: knowledge transfer, storage, application, creation, and acquisition (K-TSACA). The conclusion of the study is that organisations and researchers seem to focus mostly on five KM processes, hence their popularity/dominance over others.

**Keywords:** knowledge management, knowledge management frameworks, knowledge management strategies, knowledge management lifecycle, unified framework, knowledge management lifecycle framework

## 1. Introduction

Knowledge has become a vital resource in today's economy. Organisations regard knowledge as a vital asset for competitive advantage (Grant, 2015). The importance of knowledge has made organisations manage their knowledge assets. Grant (2015) states that the KM field has been around for about two decades, and it has retained the interest of both academics and practitioners. As the KM field grows, like any other field, researchers and practitioners have developed theories, models and frameworks that explain KM phenomena. Among the most influential pioneers of the field who have developed such theories, models and frameworks are Wiig (1993), Nonaka and Takeuchi (1995), Grant (1996b), Earl (2001), and Hansen, Nohria and Tierney (1999), to name but a few. Their theories, models and frameworks have provided guidelines on how organisations can better harness knowledge into their routines and processes; explained how vital knowledge is in organisations; investigated how organisations can manage knowledge better; and provided strategies and solutions to KM challenges in business organisations and society in general.

This paper extends the current body of KM literature by proposing a new KM lifecycle framework built from existing KM lifecycle frameworks. There are many KM lifecycle frameworks that have been built over the past two decades. Prominent ones are Wiig's (1993) three pillars framework; Meyer and Zack's (1996) information processing framework; and recently, Evans, Dalkirs and Bidian's (2015) holistic KM framework. A KM framework is defined by The European Committee for Standardization (CEN) (2003, p. 11) as "the most essential components of KM and their relationship with each other. CEN further states that it provides a schematic picture and description of these various aspects and helps users to position and guide KM projects." Weber *et al.* (2002, n.p.) define it as explaining "the world of KM by naming the major KM elements, their relationships, and the principles of how these elements interact". They further state that "it provides the reference for decisions about the implementation and application of KM." According to Wiig (1993, p. 419), a framework allows us to understand the current state of affairs in the field, helps us envisage what is possible, places in context our methods and approaches, and determines how effective available methodologies and approaches are.

This study differentiates frameworks from theories and models. A model can be defined as a representation of reality that is too difficult to display directly. It could be a pictorial representation of key concepts, or a way of schematising a process so that it can be generalised to solve similar problems in other fields (Bountless.com Website, n.d.; Taylor, 2015; Khan, 2015). According to *The Oxford Online Dictionary*, a theory is a "supposition of ideas intended to explain something based on general principles independent of the thing to be explained". It is "a set of principles on which the practice of an activity is based. Therefore, theories and models such as Nonaka and Takeuchi's SECI model, Choo's sense-making theory, Boisot's I-space theory and many others are omitted in this study.

This creation of the unified framework is partly influenced by Wiig's reasons for doing so. It is also influenced by the fact that, over the years, many frameworks have been created. Having too many frameworks has caused confusion in research and practice. The confusion is caused by the fact that each framework has its own processes. For example, Alavi and Leidner's (2001) framework has four processes, but Rollett's (2003) framework has seven. The terminology used in these frameworks is confusing too. Synonyms are used to define some processes. This makes it difficult to understand the processes. Dalkir (2011, p. 32) concurs with this notion, and states that "the terms used differ, but there does appear to be some overlap with regard to different types of steps [processes] involved in a KM cycle"; hence the need of a unified framework that is going to eliminate such confusion.

With so many options, researchers (especially academics and students) and practitioners are liable to find it difficult to choose a framework to inform their research, and organisations may find it difficult to choose a framework to implement. This paper therefore proposes a unified KM lifecycle framework that combines the most prominent processes and terminology in the frameworks identified in literature into a single framework. A unified framework aims to eliminate the confusion in research and practice that emanates from having to choose from the many frameworks with different processes and terminology.

Recently, Heisig (2009), Dalkir (2011), and Evans *et al.* (2015) have attempted to develop such a unified/integrated framework. This paper differs from recent attempts in two respects. Previous attempts to create integrated frameworks analysed very few frameworks; this study analyses 20, making it more comprehensive. Others (e.g., Heisig, 2009) analysed frameworks from different fields; this study focuses only on KM frameworks.

The rest of the paper is structured as follows: section two briefly discusses KM and KM strategies; section three briefly describes the KM frameworks used to build the proposed framework; section four explains the methodology, which is followed by a description of the concepts of the proposed framework; and the last section comprises discussions, implications and suggestions for future research.

## 2. Knowledge management and knowledge management strategies

No accepted definition of KM has been adopted yet by the KM community. Handzic (2001) says that literature shows that the definitions of KM vary in scope and focus. Wiig (1993) defines KM as a special set of approaches and processes that are aimed at identifying positive and negative uses of knowledge in different organisational operations. A synthesis of definitions given by Dalkir (2011) indicates that KM is a series of activities such as knowledge capture, transfer and application. The goal of KM is to provide the right knowledge at the right time to the right people in the right presentation (Holsapple & Joshi, 2002). KM has been popularised by its association with innovation and competitive advantage (Grant, 2015). Different strategies have been developed and adopted by organisations to manage knowledge. They include creating communities of practice to generate and share knowledge (Lave & Wenger, 1991), promoting organisational learning and learning organisations (Argyris & Schon, 1978, 1996; Senge, 1990), the personalisation and codification strategy (Hansen, *et al.*, 1999), KM schools of thought (Earl, 2001), and the KM lifecycle (Wiig, 1993, and many others). According to Hansen *et al.* (1999), the personalisation and codification strategy seeks to promote the management of knowledge by encouraging organisations to codify the knowledge that individuals possess, and store it in databases so that it can be available to everyone in the organisation. This strategy also encourages the retention and management of knowledge holders. Earl (2001) defines the KM strategy in terms of three broad schools of thought: the technocratic, behavioural and economic schools. The technocratic school explains the role played by technology in managing knowledge; the behavioural school describes the role played by people in managing knowledge; and the economic school explains the business value of knowledge assets.

A KM strategy is also defined in terms of the KM lifecycle: a series of processes that are assumed to be taking place in organisations involved in KM. This paper focuses on the KM lifecycle. A review of literature revealed many frameworks, but 20 were selected for analysis, and for building a new KM framework. The 20 were selected because of their prominence. By "prominence", we mean that they are widely cited in the literature. Table 1 shows the frameworks.

**Table 1**: KM lifecycle frameworks

| | |
|---|---|
| 1 | **Huber (1991)**<br>Acquisition, distribution, interpretation, organisational memory |
| 2 | **Wiig (1993)**<br>Creation, sourcing, compilation, transformation, dissemination, application, value realisation |
| 3 | **Meyer and Zack (1996)**<br>Acquisition, refinement, store/retrieve, storage/retrieval distribution, presentation |
| 4 | **Nickols (1996)**<br>Acquisition, organisation, specialisation, store storage/access, retrieve distribution, conservation, disposal |
| 5 | **Skyrme (1998)**<br>Identify, create, collect/codify, knowledge database, diffuse/use |
| 6 | **Bukowitz and Williams (200)**<br>Get, use, learn, contribute, assess, build/sustain, divest |
| 7 | **Alavi and Leidner (2001)**<br>Creation, storage/retrieval, transfer, application |
| 8 | **Holsapple and Joshi (2002)**<br>Acquiring, selecting, internalizing, using |
| 9 | **Birkinshaw and Sheehan (2002)**<br>Creation, mobilisation, diffusion and commoditisation |
| 10 | **Lee and Hong (2002)**<br>Capture, development, sharing, utilisation |
| 11 | **McElroy (2003)**<br>Individual and group learning, knowledge claim validation, information acquisition, |
| 12 | **O'Dell, Grayson and Essaides (2003)**<br>Organizsng, sharing, adapting, using, creating, defining, collecting |
| 13 | **Rollet (2003)**<br>Planning, creating, integrating, organising, transferring, maintaining, assessing |
| 14 | **Awad and Ghaziri (2004)**<br>Capturing, organising, refining, transferring |
| 15 | **Becerra-Fernandez, Gonzalez and Sabherwal (2004)**<br>discovery, capture, sharing, application |
| 16 | **Heisig (2009)**<br>Sharing, creating, using, storing, identifying |
| 17 | **Dalkir (2005, 2011)**<br>Knowledge capture and/or creation, knowledge acquisition and application, knowledge sharing and dissemination |
| 18 | **Sağsan (2006, 2009)**<br>Knowledge creation, knowledge sharing, knowledge structuring, knowledge using, knowledge auditing |
| 19 | **Evans and Ali (2013)**<br>Identify, organise and store, share, apply, evaluate and learn, create |
| 20 | **Evans, Dalkir, Bidian (2015)**<br>Identify/create, store, share, use, learn, improve |

Huber's (1991) organisational learning framework was created to show how learning occurs through KM initiatives in organisations. The framework has four KM processes that support learning. They are knowledge acquisition, information distribution, information interpretation, and organisational memory. Huber (1991) states that these main processes are made of sub-processes. This framework represents the various processes and sub-processes that enable an organisation to learn from KM initiatives.

Wiig's (1993) framework is based on three pillars which are supported by a conceptual KM base. The base has four processes: knowledge creation, manifestation, use and transfer. The three pillars consist of different functional areas. The first pillar has three functional areas: survey and categorise knowledge; analyse knowledge and related activities; and elicit, codify and organise knowledge. The second pillar has two: appraise and evaluate the value of knowledge and related actions. The third pillar has three: synthesise knowledge and related activities; handle, use and control knowledge; and leverage, distribute and automate knowledge (Wiig, 1993, p. 20). According to Wiig (1993), the framework is based on the understanding of how knowledge is created, used, and manifested in people's minds and culture.

Meyer and Zack (1996) proposed an information processing platform for the manufacture of information products. The information processing platform acts both as an information repository and an information refinery for

information processing. The refinery process is based on six information processing stages: information acquisition, refinement, storage/retrieval, distribution, and presentation/use. According to Mayer and Zack (1996), these processes are not executed sequentially as there may be feedback loops between them.

Skyrmer's (1998) framework describes technological tools that could be used to support different KM functions. These tools can support knowledge identification (e.g., knowledge discovery, and data-and text-mining tools), creation (thinking aids and conceptual mapping tools), collection/codification (intelligent agents), storage (knowledge databases), and diffusion/use (video conferencing, groupware, and decision support tools).

Bukowitz and Williams' (2000) KM processes framework follows two streams of activity that occur simultaneously in organisations: the day-to-day use of knowledge to respond to demands or opportunities from the marketplace; and the process of matching intellectual capital to strategic requirements (p. 8). They state that the framework presents a simplified way of thinking how organisations create, maintain and deploy knowledge to create value. It is divided into two broad processes: the tactical and the strategic. The tactical process is triggered by market-driven opportunity or demand, and the strategic process is triggered by shifts in the macro-environment. The tactical side spans four basic steps: get information, use it, learn from it, and contribute it. The strategic process spans three: assess information, build and sustain an information database, and divest the information. According to Bukowitz and Williams (2000), these processes ensure that organisations use their knowledge to respond to demands and opportunities from the market place.

Alavi and Leidner's (2001) framework views the KM lifecycle from an information systems perspective. It explains the roles that are played by information systems in KM. It posits that information systems play four KM roles: knowledge creation, storage and retrieval, transfer, and application. They mention systems such as data warehousing to support knowledge creation; multimedia databases and query languages to store knowledge; lotus notes to support knowledge transfer; and decision support systems to support knowledge use.

Holsapple and Joshi (2002) created a knowledge episodes framework that identified a set of interrelated knowledge manipulation activities believed to be common in most organisations. They state that these episodes make us understand how knowledge is processed in organisations, and how it can change over time. The episodes highlight the major areas on which the chief knowledge officer must concentrate. The episodes are knowledge acquisition, selection, internalisation and use. The acquisition episode has its sub-processes, which are identification, capturing, organising, and transferring knowledge. The selecting episode has the same sub-processes as the acquiring episode. The only difference is that the acquisition happens externally, and selecting happens internally. The internalising episode has four sub-processes: assessing, targeting, structuring and delivering.

Birkinshaw and Sheehan (2002) created the four stage KM lifecycle framework after a five-year study with major multinational companies. The model aims to explain the lifecycle of an idea in a commercial setting. It shows that knowledge is born as something in a person's head, and that it takes shape once it is tested, matures as it is applied in real life settings, is diffused into a growing audience, and finally becomes accepted as common practice. There are four KM stages in the framework: knowledge creation, mobilisation, diffusion and commoditisation.

Lee and Hong (2002) categorised KM processes into four activities: knowledge capture, development, sharing and utilisation. Their framework explains information technologies that could be used to support such KM activities. They state that database systems, data warehouses and document management systems can be used for knowledge capture; data-mining and competitive intelligent systems are used for knowledge development; and networked technologies, such as the Internet (email, groupware, video conferencing, blogs, etc.), are used for knowledge transfer purposes. Multimedia technologies are assumed to play a vital role in the application of knowledge.

McElroy's (2003) framework posits that the KM lifecycle begins with the detection of a knowledge gap, and ends with knowledge claims. In other words, people start with a knowledge gap realisation, and end up with solid (desired) knowledge. The lifecycle has two activities: knowledge production and knowledge integration. Knowledge production has the following processes: individual and group learning, knowledge claim formulation, and information acquisition – which leads to a codified knowledge claim, which in turn leads to a knowledge claim evaluation. Knowledge integration processes are knowledge broadcasting, searching, teaching, and sharing. McElroy's framework assumes that KM seeks to produce knowledge and integrate it into the organisation.

Rollett (2003) adopted the process view of KM, and created a framework with seven processes: knowledge planning, creation, integration, organisation, transfer, maintenance, and assessment. These processes are applicable when knowledge is used in organisations. According to Rollettt (2003, p. 10), the KM processes optimise the way knowledge is used, and prove that knowledge is indeed used in these processes.

Beccerra-Fernandez *et al.* (2004) state that KM relies on four main processes and seven sub-processes. The processes and sub-processes are based on Nonaka's (1994), Grant's (1996a, 1996b), and Nahapiet and Ghoshal's (1998) theories. The four main processes are: knowledge discovery, which consists of two sub-processes, socialisation and combination; knowledge capture, which consists of externalisation and internalisation; knowledge sharing, which consists of socialisation and exchange; and knowledge application, which consists of direction and routines.

Dalkir (2005, 2011) created the integrated KM lifecycle framework based on Meyer and Zack's (1996), Bukowitz and Williams' (2000), McElroy's (2003) and Wiig's (1993) frameworks. According to Dalkir (2005, p. 26), the KM processes identified in the framework aim to identify and locate knowledge resources within organisations. The integrated framework has three major stages: knowledge capture and/or creation, sharing and dissemination, and acquisition and application. The framework shows that the transition of knowledge across these three stages happens through assessment, conceptualisation and updating. Dalkir (2005, 2011) asserts that organisations need such frameworks to help classify different activities and functions needed to deal with all knowledge-related work.

Sağsan (2006, 2009) also created a framework with five processes: knowledge creation, sharing, structuring, use and auditing. According to Sağsan and Zorlu (2010, p. 405), knowledge can be created through the conversion of tacit and explicit knowledge, and can be shared through social and technological communications infrastructure. Knowledge can be structured via mapping techniques and retrieval systems, and can be used in organisational processes and routines. Knowledge auditing allows organisations to control their intellectual capital.

Heising (2009) analysed 160 frameworks from research and practice to create an integrated KM framework. Heisig (2009) focused on their processes to discover their differences and similarities. After a thorough synthesis of the frameworks, six frequently cited KM activities were then used to create a new framework. The activities are knowledge sharing, creation, use, storage, identification, and acquisition. According to Heisig (2009, p. 9), the classification of such processes helps to "overcome conceptual differences between different KM frameworks and serves as a basic common understanding".

Evans and Ali (2013) created the "identify, organise, store, apply, evaluate, and create" (IOSAEC) KM lifecycle framework. Just like many others, it was built from existing frameworks by synthesis and integrating KM processes. According to Evans and Ali (2013, p.160), the framework includes "second generation KM principles and a potential for double loop learning".

Building on the work of Evans and Ali (2013), Evans *et al.* (2015) proposed an integrated KM lifecycle framework. Just like Dalkir"s (2005, 2011) frameworks, theirs was distilled through the synthesis of other popular frameworks. The framework aimed to help improve how organisations conceptualise, strategise and manage their knowledge and knowledge assets. It has seven phases: identify, store, share, use, learn, improve, and create knowledge. They indicated that technology can be used at the different phases of the processes.

Awad and Ghaziri's (2004), O'Dell, Grayson and Essaides' (2003), and Nickols' (1996) frameworks have also been cited by Sagsan and Zorlu (2010) as popular frameworks. They were used in the creation of the proposed framework. They have not been briefly described like the rest because of the non-availability of full text documents.

A synthesis of the 20 frameworks reveals that: 1) the number of processes (major and minor) varies significantly among the frameworks. For example, some have three, others have more. 2) Synonymous words/terms have been used in some processes to mean the same processes in different frameworks. For example, one framework mentions knowledge sharing, another knowledge transfer, and others dissemination. 3) In some frameworks, the processes follow a certain sequence, yet in others there is no sequence. For example, in one framework, knowledge creation is regarded as the first KM process, yet others indicate that there is no sequence because of feedback loops. The KM process can start anywhere.

With the above issues in mind, this paper proposes a unified KM lifecycle framework. The unified framework will integrate all prominent processes listed in the 20 frameworks into one, with the sole intention of creating a single

framework with all major processes. It also aims to integrate all synonymous terms into themes, and lastly determine if there is a sequence to be followed in implementing these processes in organisations.

The following section explains the methodology used to create the proposed framework.

## 3. Methodology

Heisig's (2009), Dalkir's (2011), and Fteimi and Lehner's (2016) methodologies were adopted in this study. Quantitative and qualitative content analysis of existing frameworks published in the KM literature was used to develop the proposed framework. Quantitative methods were applied by counting the number of times each process appeared in all frameworks. This was done without considering synonyms (see Table 3 in appendix A). Terminology was then considered just like in Heisig (2009) and Dalkir (2011). It was noted that synonyms were used to define similar processes in different frameworks. For example, concepts such as knowledge transfer, distribution, dissemination or sharing are synonymous. Using qualitative content analysis, in such cases the processes were counted and grouped together into themes; for example, "knowledge transfer". Following this method, concepts such as knowledge acquisition, discovery, identification, sourcing, getting and collection were grouped under "knowledge acquisition", while knowledge transfer, distribution, dissemination, sharing, and contribution were categorised as "knowledge transfer". Knowledge application and use were grouped under "knowledge application", and knowledge storage, conservation, organisational memory and databases were grouped under "knowledge storage". Concepts such as knowledge acquisition, acquiring, get, retrieve, and sourcing were classified under "knowledge acquisition". Concepts that did not have synonyms were used as is. For example knowledge creation, get, etc. After the themes were created, processes were counted again to fit into the new themes or used as standalone. If a process appeared in nine or more frameworks, it was accepted as a prominent process, and therefore included in the new framework (see Table 4 in Appendix B). Nine was chosen because mathematically it is 45% (9/20), a figure which is statistically significant. Therefore five major KM processes: knowledge transfer, storage, application, creation and acquisition were identified to form the proposed framework. The processes are shown in Table 2. They are arranged according to their prominence (the number of times they appear in frameworks; see Table 4 in Appendix B).

**Table 2**: KM processes of the proposed framework

| KM processes | Frameworks in which processes appear |
|---|---|
| Knowledge transfer | Lee and Hong (2002), O'Dell, Grayson and Essaides (2003), Becerra-Fernandez, Gonzales and Sabherwal (2004), Heisig (2009), Dalkir (2005, 2011), Sağsan (2006, 2007, 2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015), Alavi and Leidner (2001), Rollett (2003), Awad and Ghaziri (2004), Huber (1991), Meyer and Zack (1996), Nikols (1996), Wiig (1993), Bukowitz and Williams (2000). |
| Knowledge storage | Huber (1991), Meyer and Zack (1996), Nickols (1996), Skyrme (1998), Alavi and Leidner (2001), Lee and Hong (2002), O'Dell, Grayson and Essaides (2003), Award and Ghaziri (2004), Becerra-Fernandez, Gonzales and Sabherwal (2004), Heisig (2009), Dalkir (2005, 2011), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Knowledge application | Wiig (1993), Skymer (1998), Bukowitz and Williams (2000), Alavi and Leidner (2001), Holsapple and Joshi (2002), Lee and Hong (2002), O'Dell, Grayson and Essaides (2003), Becerra-Fernandez, Gonzales and Sabherwal (2004), Heisig (2009), Sağsan (2006, 2007, 2009), Dalkir (2005, 2011), Evans and Ali (2013). Evans, Dalkir and Bidian (2015). |
| Knowledge creation | Wiig (1993), Skymer (1998), Alavi and Leidner (2001), Birkinshaw and Sheehan (2002), O'Dell, Grayson and Essaides (2003), Rollett (2003), Heisig (2009), Dalkir (2005, 2011), Sağsan (2006, 2007, 2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Acquisition | Huber (1991), Wiig (1993), Meyer and Zack (1996), Nickols (1996), Bukowitz and Williams (2000), Alavi and Leidner (2001), Holsapple and Joshi (2002), McElroy (2003), Dalkir (2005, 2011). |

## 4. Processes of the proposed unified framework

This section defines the processes of the proposed framework. The proposed lifecycle framework will be called the knowledge transfer, storage, application, creation and acquisition (K-TSACA) framework.

### 4.1 Knowledge transfer

"Knowledge transfer is the conveyance of knowledge from one place, person, ownership to another" (Major & Cordey–Hayes, 2000, p. 412). Li and Gao (2003) provide a business definition of knowledge transfer, associating it with the emulation of, and continuous learning from, competitors in the market. It is the process in which knowledge is communicated to other people (individuals and groups), across and within departments and organisations (Becerra-Fernandez, *et al.*, 2004, p. 34) through face-to-face interactions (conferences, seminars, workshops, classrooms and meetings), or the use of technology (conferencing software, emails) (Likalu, *et al.*, 2010).

### 4.2 Knowledge storage

Knowledge storage refers to the identification and codification of existing knowledge and know-how into organisational memory (Dalkir, 2005). Organisational memory is the means by which knowledge from the past influences present organisational activities (Stein & Zwass, 1995). Huber (1991) states that knowledge is stored for operational and reporting reasons. Knowledge can be captured and stored in organisational databases (Samoilenko & Nahar, 2013). Knowledge storage is important because knowledge can be lost, especially if it is still tacit and held by knowers. When they leave the organisation, they leave with it, hence the importance to store it for future use. Organisations can store knowledge manually and electronically. Manually, knowledge can be stored in manuals, minutes of meetings, reports, policies and many other physical organisational documents. Electronically, it can be stored in organisational databases, portals and emails.

### 4.3 Knowledge application

Knowledge application refers to the actual use of knowledge that has been captured and stored in organisational databases or the knowledge in people's heads. It is the act of applying available knowledge to create new knowledge and produce an externalisation of knowledge (Holsapple & Joshi, 2002, p. 57). Knowledge has to be applied in organisational routines and processes (Gottschalk, 2007, p. 37). The knowledge-based view of the firm indicates that the source of competitive advantage lies in the application of knowledge (Alavi & Leidner, 2001). These sentiments are shared by Gottschalk (2007), who emphasises the importance of applying knowledge in organisational processes and routines. As indicated by many writers, the available knowledge has to be applied to the processes of the organisation. It could be in innovation, production, consulting, executive decision making, and many other tasks that require knowledge.

### 4.4 Knowledge creation

Nonaka and Takeuchi (1995) state that knowledge is created through the conversion of tacit and explicit knowledge in four modes: socialisation, externalisation, combination and internalisation. Knowledge creation involves developing new knowledge or content from existing knowledge (Pentland, 1995; Taskin, Verville & Al-Omari, 2011). Mitchell and Boyle (2010) define it as a series of activities or processes, and as an output of those processes, or as a value-adding outcome such as a service or product. Knowledge is created in five steps: sharing tacit knowledge, creating concepts, justifying concepts, building a prototype, and cross levelling knowledge (Nonaka & Takeuchi, 1995; Wan, *et al.,* 2010). The development of a software product is an example of knowledge creation as a process and product (Wan, *et al.*, 2010; Shongwe, 2015). According to Frost (2010), Knowledge is created through education, interaction, practice and collaboration, as the different knowledge types are shared and converted. Evans *et al.* (2015) state that organisations create knowledge through prototyping, interviewing experts, competence and process mapping, and information workflow analysis.

### 4.5 Knowledge acquisition

Knowledge acquisition is the activity of accepting knowledge from the external environment and turning it into a commodity that can be used within the organisation (Holsapple & Joshi, 2002). The process includes locating, accessing, capturing and collecting knowledge from customers, competitors, suppliers and other knowledge sources. Huber (1991, p. 91) gives examples such as customer surveys, research and development activities, performance reviews and analysis of competitors' products as knowledge acquisition activities. Huber further states that organisations acquire knowledge through five processes: searching, grafting, congenial learning, vicarious learning, and experiential learning. Pacharapha and Ractham (2012, p. 725-726) likewise believe that knowledge acquisition is the process of accepting knowledge from external sources for the purpose of using it in the organisation. They state that this is achieved by "extracting, interpreting and transferring knowledge to improve existing organisational

knowledge". Dalkir (2005) defines knowledge acquisition as the stage at which knowledge is contextualised in order to be understood. Knowledge can be acquired from repositories, learning from others, and learning from experiences.

## 5. Discussions, implication and future research directions

This paper has discussed 20 prominent KM frameworks for the purpose of proposing a unified framework. A synthesis of the frameworks revealed that they differ according to the number of processes one has, and that often synonymous terminology is used to define the processes in different frameworks. It has also been noted that in some frameworks, the processes follow a certain sequence (Evans, *et al.,* 2015) and in others they do not follow any sequence (Meyer & Zack, 1996). A new KM lifecycle framework is proposed. The framework is built by counting prominent processes in all frameworks, and combining synonymous processes into broad themes. The proposed framework has five processes: knowledge transfer, storage, application, creation and acquisition (K-TSACA). These processes do not follow a specific sequence. They are arranged according to their prominence (see Table 4, Appendix B). This is interpreted to mean that organisations are mostly concerned with knowledge transfer, followed by knowledge storage, application, creation and lastly acquisition. Relying on Fteimi and Lehner's (2016, p. 12) analysis of knowledge management research topics presented at the European Conference on Knowledge Management over a period of eight years (2006-2013), we can confirm that knowledge transfer and knowledge creation are indeed prominent processes. In an analysis of 755 abstracts, they are ranked 42 and 52 respectively in the list of favourite processes. Serenko and Dumay (2015, p. 1345) confirm the importance of knowledge sharing [transfer] by stating that "a positive knowledge-sharing culture is required, which is a well-established fact in [KM] research". The importance of knowledge creation is emphasised by a number of authors. Nonaka and Takeuchi (1995) regard knowledge creation as the most valuable KM process. They state that the ability for organisations to create knowledge makes them competitive in the global economy. They are supported by von Krogh (1998), who states that companies' performance depends on the ability to mobilise knowledge resources held by the organisation, and turn them into value-creating activities. The importance of knowledge creation has also been emphasised by researchers such as Spender (1996), Grant (1996b) and many others. In Fteimi and Lehner's (2016) study, knowledge storage, application and acquisition are not listed as favourite research topics. Knowledge storage is not mentioned at all in the study, and knowledge application and acquisition are ranked 296 and 192 respectively. This is contrary to the findings of this study. This might be caused by lack of interest from researchers in these topics over the stated period. It is normal in research that certain areas are ignored over a certain period. This could be explained by future research. This does not mean, though, that these processes are not important. For example, the issue of knowledge storage (organisational memory) has been researched extensively. Alavi and Leidner (2001) state that the storage of knowledge constitutes an important aspect of organisational KM. They are supported by Argote and Ingram (2000), who highlight the importance of knowledge reservoirs in supporting competitive advantage. The importance of knowledge application and acquisition has also been highlighted in many studies. Perhaps there has not been interest recently in these two areas.

The main advantage of the K-TSACA framework is its comprehensiveness. It has been distilled from 20 existing frameworks. It has combined all the processes into one framework, and eliminated the terminology similarities.

The limitation of the K-TSACA framework is that it has eliminated many processes which could still be important and applicable in research and practice. For example, the learning, identification and organisation processes have been omitted. The importance of knowledge identification and organisation has been highlighted by many researchers. Many researchers and practitioners (Argyris & Schon, 1978, 1996; Senge, 1990) have indicated the importance of learning as a knowledge management process. Secondly, the framework is yet to be tested and validated. Research is needed to determine its applicability, suitability and usefulness in research and practice. Thirdly, the unified framework might not be distilled from all available KM lifecycle frameworks. Only those that were found by the author in journal articles and conference proceedings were analysed.

## 6. Contribution of the study

This study makes a theoretical contribution to the existing body of KM literature by proposing a framework that defines KM in terms of five important processes. The framework could be used in research and practice. In research, researchers will have a single comprehensive framework to inform KM research instead of choosing from many similar frameworks. KM practitioners can also use the framework to inform their KM initiatives in organisations. Just like in research, it will eliminate the confusion of choosing from many similar frameworks. It will also help KM practitioners to focus on the important/main processes.

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## Appendix A: Table 3: number of times each process appears in existing frameworks

| KM Process | Frequency(f) | Frameworks |
|---|---|---|
| Creation | 11 | Wiig (1993), Skymer (1998), Alavi and Leidner (2001), Birkinshaw and Sheehan (2002), O'Dell, Grayson and Essaides (2003), Rollett (2003), Heisig (2009), Dalkir (2005, 2011), Sağsan (2006, 2007, 2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Share/sharing | 8 | Lee and Hong (2002), O'Dell, Grayson and Essaides (2003), Becerra-Fernandez, Gonzales and Sabherwal (2004), Heisig (2009), Dalkir (2005, 2011), Sağsan (2006, 2007, 2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Use/using | 7 | Skymer (1998), Bukowitz and Williams (2000), Holsapple and Joshi (2002), O'Dell, Grayson and Essaides (2003), Heisig (2009), Sağsan (2006, 2007, 2009), Evans, Dlakir and Bidian (2015). |
| Acquisition/acquiring | 6 | Huber (1991), Meyer and Zack (1996), Nickols (1996), Holsapple and Joshi (2002), Dalkir (2005, 2011), McElroy (2003). |
| Store/storage/storing | 6 | Meyer and Zack (1996), Nickols (1996), Alavi and Leidner (2001), Heisig (2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Organisation/organising/organise | 5 | Nickols (1996), O'Dell, Grayson and Essaides (2003), Rollett (2003), Award and Ghaziri (2004), Evans and Ali (2013). |
| Application/apply | 5 | Wiig (1993), Alavi and Leidner (2001), Becerra-Fernandez, Gonzales and Sabherwal (2004), Dalkir (2005, 2009), Evans and Ali (2003). |
| Capture/capturing | 4 | Lee and Hong (2002), Award and Ghaziri (2004), Becerra-Fernandez, Gonzales and Sabherwal (2004), Dalkir (2005, 2009). |
| Identification/identify | 4 | Skymer (1998), Heisig (2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Learn | 4 | Bukowitz and Williams (2000), McElroy (2003), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Transfer/transferring | 4 | Alavi and Leidner (2001), Rollett (2003), Awad and Ghaziri (2004), Dalkir (2005, 2011). |
| Distribution | 3 | Huber (1991), Meyer and Zack (1996), Nikols (1996). |
| Retrieve/retrieval | 3 | Meyer and Zack (1996), Nickols (1996), Alavi and Leidner (2001). |
| Assess | 2 | Bukowitz and Williams (2000), Rollett (2003). |
| Collect/collecting | 2 | Skyrme (1998), O'Dell, Grayson and Essaides (2003). |
| Dissemination | 2 | Wiig (1993), Dalkir (2005, 2011). |
| Build | 1 | Bukowitz and Williams (2000). |
| Evaluate | 1 | Evans and Ali (2013) |
| Maintaining | 1 | Rollett (2003). |
| Planning | 1 | Rollett (2003). |
| Refinement | 1 | Meyer and Zack (1996). |
| Adapting | 1 | O'Dell, Grayson and Essaides (2003). |
| Auditing | 1 | Sağsan (2006, 2007, 2009). |
| Commoditisation | 1 | Birkinshaw and Sheehan (2002). |
| Compilation | 1 | Wiig (1993). |
| Conservation | 1 | Nickols (1996). |
| Contribute | 1 | Bukowitz and Williams (2000). |
| Defining | 1 | O'Dell, Grayson and Essaides (2003). |
| Development | 1 | Lee and Hong (2002). |
| Diffuse | 1 | Skyrme (1998). |
| Discovery | 1 | Becerra-Fernandez, Gonzalez and Sabherwal (2004). |
| Disposal | 1 | Nickols (1996). |
| Divest | 1 | Bukowitz and Williams (2000). |

| | | |
|---|---|---|
| Get | 1 | Bukowitz and Williams (2000). |
| Integrating | 1 | Rollett (2003). |
| Internalising | 1 | Holsapple and Joshi (2002). |
| Interpretation | 1 | Huber (1991). |
| Knowledge Database | 1 | Skyrme (1998). |
| Mobilisation | 1 | Birkinshaw and Tony Sheehan (2002). |
| Organisational memory | 1 | Huber (1991). |
| Presentation | 1 | Meyer and Zack (1996). |
| Selecting | 1 | Holsapple and Joshi (2002). |
| Sourcing | 1 | Wiig (1993). |
| Specialisation | 1 | Nickols (1996). |
| Structuring | 1 | Sağsan (2006, 2007, 2009). |
| Transformation | 1 | Wiig (1993). |
| Utilisation | 1 | Lee and Hong (2002). |
| Validation | 1 | McElroy (2003). |
| Value realisation | 1 | Wiig (1993). |

## Appendix B: Table 4: number of times each process appear in the frameworks after synonyms are eliminated

| KM Process | Frequency (f) | Frameworks |
|---|---|---|
| Share/sharing/ transfer/ transferring/distribution/ dissemination/contribute (knowledge transfer) | 16 | Lee and Hong (2002), O'Dell, Grayson and Essaides (2003), Becerra-Fernandez, Gonzales and Sabherwal (2004), Heisig (2009), Dalkir (2005, 2011), Sağsan (2006, 2007, 2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015), Alavi and Leidner (2001), Rollett (2003), Awad and Ghaziri (2004), Huber (1991), Meyer and Zack (1996), Nikols (1996), Wiig (1993), Bukowitz and Williams (2000). |
| Use/utilisation /application/apply (knowledge application) | 13 | Wiig (1993), Skymer (1998), Bukowitz and Williams (2000), Alavi and Leidner (2001), Holsapple and Joshi (2002), Lee and Hong (2002), O'Dell, Grayson and Essaides (2003), Becerra-Fernandez, Gonzales and Sabherwal (2004), Heisig (2009), Sağsan (2006, 2007, 2009), Dalkir (2005, 2011), Evans and Ali (2013). Evans, Dalkir and Bidian (2015). |
| Store/storage/storing/capture/capturing/conservation /collect/collecting/codify/ Knowledge databases/ Organisational memory (knowledge storage) | 13 | Huber (1991), Meyer and Zack (1996), Nickols (1996), Skyrme (1998), Alavi and Leidner (2001), Lee and Hong (2002), O'Dell, Grayson and Essaides (2003), Award and Ghaziri (2004), Becerra-Fernandez, Gonzales and Sabherwal (2004), Heisig (2009), Dalkir (2005, 2011), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Creation (Knowledge creation) | 11 | Wiig (1993), Skymer (1998), Alavi and Leidner(2001), Birkinshaw and Sheehan (2002), O'Dell, Grayson and Essaides (2003), Rollett (2003), Heisig (2009), Dalkir (2005, 2011), Sağsan (2006, 2007, 2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Acquisition/acquiring/get/ retrieve/ sourcing (Knowledge acquisition) | 9 | Huber (1991), Wiig (1993), Meyer and Zack (1996), Nickols (1996), Bukowitz and Williams (2000), Alavi and Leidner (2001), Holsapple and Joshi (2002), McElroy (2003), Dalkir (2005, 2011). |
| Organisation/organising/organise /structuring | 6 | Nickols (1996), O'Dell, Grayson and Essaides (2003), Rollett (2003), Award and Ghaziri (2004), Sağsan (2006, 2007, 2009), Evans and Ali (2013). |
| Identification/identify/discover | 5 | Skymer (1998), Becerra-Fernandez, Gonzalez and Sabherwal (2004), Heisig (2009), Evans and Ali (2013), Evans, Dalkir and Bidian (2015), |
| Learn | 4 | Bukowitz and Williams (2000), McElroy (2003), Evans and Ali (2013), Evans, Dalkir and Bidian (2015). |
| Assess/analyse | 2 | Bukowitz and Williams (2000), Rollett (2003) |
| Build | 1 | Bukowitz and Williams (2000) |
| Evaluate | 1 | Evans and Ali (2013) |
| Maintaining | 1 | Rollett (2003). |
| Planning | 1 | Rollett (2003) |
| Refinement | 1 | Meyer and Zack (1996). |
| Adapting | 1 | O'Dell, Grayson and Essaides (2003). |

| Auditing | 1 | Sağsan (2006, 2007, 2009). |
|---|---|---|
| Commoditisation | 1 | Birkinshaw and Sheehan (2002). |
| Compilation | 1 | Wiig (1993). |
| Defining | 1 | O'Dell, Grayson and Essaides (2003). |
| Development | 1 | Lee and Hong (2002). |
| Diffuse | 1 | Skyrme (1998). |
| Disposal | 1 | Nickols (1996). |
| Divest | 1 | Bukowitz and Williams (2000). |
| Integrating | 1 | Rollett (2003). |
| Internalising | 1 | Holsapple and Joshi (2002). |
| Interpretation | 1 | Huber (1991). |
| Mobilisation | 1 | Birkinshaw and Tony Sheehan (2002). |
| Presentation | 1 | Meyer and Zack (1996). |
| Selecting | 1 | Holsapple and Joshi (2002). |
| Specialisation | 1 | Nickols (1996). |
| Transformation | 1 | Wiig (1993). |
| Validation | 1 | McElroy (2003). |
| Value realisation | 1 | Wiig (1993). |