A FRAMEWORK AND METHODOLOGY FOR KNOWLEDGE MANAGEMENT SYSTEM IMPLEMENTATION

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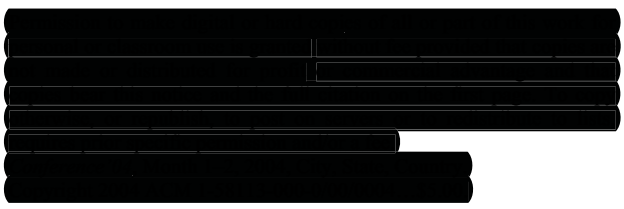
ABSTRACT
Knowledge assets are of far greater value than any tangible asset and provide organisations with the basis for creating a sustainable competitive advantage. The nature of knowledge and knowledge management have given rise to a range of different definitions of knowledge management systems that enable organisations to convert their knowledge into actionable information that provides them with a competitive edge and innovative capability. Such an implementation process is a comprehensive course of action that requires focus and commitment through-out the organisation in order to achieve results, yet no universally accepted framework or methodology for such a process exists.

This paper analyses and describes enhancements to a 12-step process derived by Calabrese and Orlando [6] to implement a knowledge management system aimed at providing a more comprehensive framework and methodology for knowledge management system implementation. These enhancements are based on findings relating to a knowledge management proof of concept implementation conducted at one of the major mobile telecommunication operators in South Africa.

Categories and Subject Descriptors
H.1.1 [**Information Systems**]: Models and Principles; *Systems and Information Theory; Value of Information*

General Terms
Management, Documentation.



Keywords
Knowledge management system implementation process; knowledge management system implementation; knowledge management system implementation methodology.

1. INTRODUCTION
Knowledge assets are of much greater value than any tangible asset that provided organisations with a competitive edge in the past [8]. Furthermore, as new technologies, innovation, organisational flexibility and new and better forms of leadership propel the growth and earnings of knowledge-intensive organisations, so the need to extract wealth from brainpower and knowledge (individual and organisational) becomes increasingly pressing. The shift to knowledge as the primary source of value results in the new economy being led by those who manage knowledge effectively.

Today's organisations are creating and leveraging knowledge, data and information at an unprecedented pace and the extraordinary growth in on-line information, makes the use of technology not an option, but a necessity [1, 20]. The specific nature of knowledge and knowledge management (KM) lead to different definitions of KM systems that in general refer to a class of information systems (IS) applied to managing organisational knowledge [3]. Technology adds value by reducing time, effort and cost in enabling people to share knowledge and information. This is particularly true when technology is closely aligned with organisational requirements and the way people work and is integrated with relevant processes [15, 23]. Although KM comprises much more than software tools, these play a significant role in facilitating KM in organisations [11, 29, 39].

The implementation of KM software tools that are integrated with organisational processes assists an organisation to convert knowledge into actionable information that provides it with a competitive edge and innovative capability. However, the process of implementation is a comprehensive procedure that requires focus and commitment through-out the organisation in order to achieve results. Numerous approaches to KM have been

developed, yet no universally accepted framework or methodology for the implementation of KM solutions exists [23, 30].

Calabrese and Orlando [6] suggested a 12-step approach for the implementation of a KM system. In order to derive the 12-step approach, Calabrese and Orland analysed 5 KM approaches – 2 derived from academic sources and 3 from practitioner organisations – and derived the 12-step hybrid KM approach, that combined the best features of the KM approaches analysed. We took the 12-step approach and used it in a telecommunication environment. However, in implementing the approach in practice, we found it not to be comprehensive enough and lacking especially in implementation detail. We therefore address this gap in this paper and identified a number of possible enhancements that would improve the suggested 12 step approach.

The goal of this paper is to report on the suggested enhancements to the 12-step process derived by Calabrese and Orlando [6] and to propose an adapted framework and methodology for KM system implementation. These enhancements are based on findings relating to an implementation of the suggested 12-step approach at one of the major mobile telecommunication operators in South Africa. Section 2 provides the theoretical background to the paper. In section 3 the enhanced method is described as a proposed KM implementation framework and methodology based on the outcome of the implementation of the 12-step approach. Section 4 comprises a summary and conclusion.

2. BACKGROUND

In this section we provide the theoretical background to the paper. In it we discuss the nature of knowledge and the implication for KM solutions and barriers to successful KM implementation. In addition, we provide an overview of the 12-step process as proposed by Calabrese and Orlando [6], as well as of the method followed to enhance that process.

2.1 The Nature of Knowledge and the Implication for Technology Solutions

Explicit knowledge is defined as knowledge that has been articulated in the form of text, diagrams, product specifications and so on [7, 26]. Nonaka, Toyama and Byosiere [27] refer to explicit knowledge as being formal and systematic, as in the case of a computer program. Explicit knowledge is found in reports, documents and manuals and can easily be gathered and stored as a knowledge base [7, 9, 28]. Organisations use groupware applications to collect, store and share their explicit knowledge, and once this has reached a sufficient level of efficiency, collaborative technologies such as intranet, the internet, extranet, e-mail, video-conferencing and tele-conferencing are used to assist in the growth of implicit and tacit knowledge transfer [7, 28, 39].

Implicit knowledge is far less tangible than explicit knowledge and refers to knowledge deeply embedded in an organisation's operating practices [16, 18]. This is often the knowledge that is observed by a work-study consultant or task analyst and made explicit through being documented. Tacit knowledge, as a dimension of implicit knowledge, includes relationships, norms and values. This is knowledge that cannot be articulated and is much harder to detail, copy or distribute.

In order to enable organisations to retrieve captured knowledge, knowledge route maps and directories are developed to create an understanding of the location of knowledge [3, 7]. Knowledge networks are created using virtual business environments such as chat rooms, team web sites and learning communities [3, 7, 28] with the development of specific applications of technology such as databases, workflow systems, personal productivity applications and enterprise information portals [39, 40].

According to Lindval, Rus, Jammalamadaka and Thakker [20], software tools make it possible to capture knowledge by converting it from being unpredictable and tacit to predictable and explicit. Software tools support storage and organisation through distributed databases and document-management technology. It also enables reliable and secure access from various locations. Software tools support efficient search and retrieval by means of search engines and databases enhanced with artificial intelligence techniques and facilitate collaboration between people who are not geographically co-located.

Although KM tools are enhancements of existing technologies, true KM technologies differ in several important aspects from the traditional workflow, document management and intranet to groupware solutions [12, 14, 28, 37]. According to Tsai and Chen [37 : 258], KM systems are:

> ... more than just information systems or IT-enabled tools in support of knowledge management activities. Instead, a knowledge management system must be a socio-technical system as a whole which comprises the knowledge itself (the intellectual capital of the organisation), organisational attributes (intangibles such as trusting culture), policies and procedures, as well as some form of electronic storage and retrieval systems.

Although KM initiatives rely on IT as an important enabler [23], not all information technologies apply to KM [3, 28]. If it is considered that people (knowledge workers and managers), technologies (manual and computer-based technologies) and knowledge itself interact to comprise a KM system [37], then Alavi and Leidner's [3 : 114] definition is more appropriate as a generic definition:

> Knowledge management systems refer to a class of information systems applied to managing organisational knowledge.

These specific implications of knowledge and knowledge management for KM systems are important, as these different views lead to different perceptions and definitions of KM systems [4, 29].

2.2 Barriers to Successful Knowledge Management Solution Implementation

Given the dynamics of hyper-competition and globalisation , organisations in the new economy deal with two major management tasks: the resulting re-invention of businesses and pressure for innovation, as well as the related re-alignment of corporate activity [5, 17]. Further changes in this landscape that organisations need to deal with, include global integration [16, 17], geographic distribution associated with the globalisation of markets and growth in organisational scope. Organisations have to do more with less and at an accelerating pace of change [5, 13].

When staff attrition due to downsizing and reengineering, growing knowledge intensity of products and services and the revolution in IT are considered, obstacles for KM reveal three

main groups of factors [5, 21]. The first group relates to flaws in the organisational KM process [25], the second to misconceptions of the role of technology in the process [22] and the third to a disregard for the importance of the human factor in realising a successful knowledge managing and knowledge sharing culture [21, 23].

In addition to having to contend with obstacles to KM system implementation, organisations also have to deal with barriers to sharing knowledge such as organisational hierarchy, geographical barriers, human nature and personality. Motivating users of a KM system to contribute their knowledge to the system is critical for the success of the overall KM initiative [11, 24]. Any KM initiative in an organisation must deal with and overcome these barriers to optimise knowledge sharing, as this forms the basis of value creation and leveraging of the intangible assets of the organisation.

2.3 Overview of the 12-Step Process

There is currently no universally accepted standard or best practice for the implementation of KM systems, although organisations today have developed multiple approaches to creating distinct steps to design, implement and measure KM systems that meet the goals and objectives of the organisation [6]. Calabrese and Orlando [6] analysed 5 KM approaches – 2 derived from academic sources and 3 from practitioner organisations – and derived a 12-step hybrid KM approach, that combined the best features of the KM approaches analysed. These 5 KM approaches include the 10-step roadmap proposed by Tiwana [As cited in 6], the George Washington University 8-step blueprint [As cited in 6], as well as approaches formulated by practitioner corporations IBM, SAIC [32] and CSC in order to provide a broader comparative population. A summary of the 5 approaches analysed is given in Table 1, which reflects the steps or phases of which each consists. Calabrese and Orlando [6] have identified correlations among the 5 approaches and derived the 12 steps summarized in Table 2.

These 12 steps were then logically distributed to the George Washington University Four Pillar Framework [6]. The Four Pillar Framework consists of leadership, organisation, technology and learning – four domains that have constantly shown the potential to encompass all aspects of effective knowledge sharing and collaborative cultures [34]. Leadership refers to the cultivation of business strategy through the driving of values for knowledge creation and sharing, while organisation refers to support for the values. Technology connects knowledge through a network to allow knowledge to span the whole enterprise and learning aims to cultivate and utilise virtual teams and exchange forums for shared results and innovation.

These four pillars or domains are interrelated in the process of creating a usable KM system as it encompasses all the aspects of effective collaboration and knowledge sharing.

Table 1: Summary of the five KM implementation approaches analysed by Calabrese and Orlando [6]

Steps	Tiwana's 10-step roadmap	George Washington University 8-step blueprint	IBM (9 event process)	SAIC (6 event process)	CSC (9 event process)
1	Identify knowledge critical to your business	Locate knowledge critical functions	Deal with a critical business problem that faces the organisation	Identify and select pilot projects	Assess current state of knowledge flow
2	Align business strategy and knowledge management	Develop process models for candidate functions / applications	Align knowledge effort with most pressing business issues	Customise pilot process and create stakeholder alignment	Assess state of sponsorship
3	Analyse existing knowledge in your organisation	Analyse knowledge critical gaps, opportunities and risks	Familiarise oneself with expertise and skills within the organisation	Capture key learning and good practices	Define / revise business drivers
4	Building on, not discarding existing IT investment	Prioritise and select goals	Implement repositories / technologies	Establish and leverage communities of practice	Define / revise principles, directions and gaps
5	Focus on processes and tacit, not just explicit, knowledge	Ensure alignment of KM with corporate strategy	Establish communities of practice and mentoring programs	Train and coach internal KM practitioners	Plan and document high level strategy
6	Design a future-proof, adaptable knowledge management platform	Develop KM requirements	Understand unique needs of various users groups	Monitor, review and optimise pilot learning and impact	Design the measurement program
7	Build and deploy a results-driven knowledge management system	Document requirements and describe KM cycle elements required	Create new products and services and provide better support for existing ones		Implement strategy / operate knowledge environment
8	Implement leadership and reward structures needed to make knowledge management work	Develop and "sell" KM resource(s) and manage reward and management commitment to plan	Measure contribution KM makes to bottom line		Monitor, measure and report
9	Evaluate initiatives using real options analyses		Share appropriate knowledge		Extract lessons learned and change requests
10	Learn from war stories				

Table 2: Derived 12-step process (Calabrese and Orlando)

Pillar	Steps	12-step process
Leadership	1	Identify knowledge critical to your business
	2	Conduct work-centred analysis
	3	Sell high-level plan of action to senior management
Organisation	4	Engage key stakeholders
	5	Develop process model
	6	Identify critical knowledge gaps, opportunities, and risks
	7	Establish and prioritise goals
	8	Develop requirements and measurement programme
Technology	9	Plan high-level strategy approach
	10	Implement strategy, build, and deploy
	11	Monitor, measure, and report metrics
Learning	12	Learn from results

2.4 Method Followed to Determine the Applicability of the Framework

The purpose of our research was to determine whether the 12 step process proposed by Calabrese and Orlando [6] was generally applicable to organisations, and specifically an organisation that has advance telecommunication technology as its niche market. In order to do so, we followed what we refer to as a *proof of concept* research approach in the remainder of this paper, to 'test' the applicability of the 12 step process in this environment.

2.4.1 Proof of Concept Environment

According to Lindval, Rus, Jammalamadaka and Thakker [20], it is better to evaluate how people share information naturally and then build a system to support those activities [8, 19, 38]. The means to successful KM therefore lies in leveraging existing infrastructure by including what already exists and then integrating it [35, 36].

We therefore chose an existing telecommunication company as *proof of concept* environment, namely the Mobile Telephone Networks (MTN) Group, a leading provider of communication services, offering cellular network access and business solutions globally. Launched in 1994, the MTN Group is a multinational telecommunications group, operating in 21 countries in Africa and the Middle East. As at the end of April 2009, MTN recorded more than 100 million subscribers across its operations.

Technological advancement of mobile phones is evident when one considers the change experienced over the past 15 years since the launch of mobile telecommunications in South Africa. The development of cost-effective and marketable growth products, the ability to recognise the best technology and the focus on retaining key employees and intellectual property are vital components in staying ahead in an extremely competitive market.

Enterprise architecture understanding, device and value proposition knowledge, knowledge to put together a mobile solution design and customer service are some of the key differentiators for ensuring a positive customer experience (and subsequently market share growth) in the mobile telecommunication sector today. These differentiators also foster innovation in an environment where all mobile operators have access to the same mobile networks, devices and similar products and services. Innovation is a key differentiator and KM processes play a key role in facilitating innovation cycles.

It is with these objectives in mind that doing a *proof of concept* using the 12 step framework was approved within the MTN South African (MTN SA) operation and a project team established.

2.4.2 Knowledge Focus for the Proof of Concept

The project team decided to focus on three key areas of the 12-step process proposed by Calabrese and Orlando [6] to guide the *proof of concept* implementation. These key areas were an implementation methodology, relevant content and a chosen technology solution.

Customer experience is one of the strategic themes and a key differentiator for the MTN SA operation and therefore the *proof of concept* focused on optimising the customer experience at the MTN SA Service Centre customer touch point with the aim to achieving the following objectives:

- Reduction in training time.
- Reduction in transaction completion time.
- Increase in on-sell and up-sell transactions.
- Increase in customer satisfaction.
- Retention of knowledge within the organisation.
- Identification of specialised training requirements for customer service agents.
- Dismantling of information silos residing in the organisation.

The *proof of concept* focused on a number of Service Centre business processes identified as per step 2 of the 12-step process. The most complex and time consuming business processes were selected, namely contract upgrades, insurance claims, new contracts, technical book-ins, billing queries and subscriber identity module (SIM) swaps. Each of these processes was assigned a process champion – someone with specific subject matter expertise (SME) – to assist and advise during the analysis phase.

In addition to these six business processes, existing content that has already been deployed in the eGain KM software application [10] was made available and utilised. This was primarily information relating to old and new price plans being used by the call centre agents. The team agreed that one of the measures of success would be the transaction completion time per transaction type identified for the particular business processes, as well as a reduction in training time of the service centre agents.

The project plan for the implementation of the *proof of concept* was developed as per the 12-step process and the *proof of concept* process was formally initiated in accordance with the MTN SA project management methodology.

2.4.3 Outcomes of the 12-Step Process Proof of Concept

With step 1 of the 12-step process concluded, the next steps of the 12-step process were initiated. Key stakeholders were engaged, knowledge elicitation sessions were held and knowledge gaps

were identified. During the establishment and prioritisation of goals (step 7 of the 12-step process), did the project team experience problems that had a negative effect on the *proof of concept*. These problems delayed the project significantly as prior steps of the 12-step process that were concluded already, had to be revisited and re-scoped. The problems experienced included the following:

- The 12-step process is a general approach not specifically aligned for the telecommunications environment, and for that matter MTN SA. This resulted in misalignment between the 12-step process steps and the *proof of concept* implementation steps, as a result of which the latter had to be reconsidered.
- The order of the proposed steps had to be changed in order to accommodate project issues and risks raised. At the time, KM had not yet been established in MTN SA and additional clarification, buy-in and positioning were required.
- It became evident that a principle of 'design for the enterprise, implement for the *proof of concept*' had to be followed in order to achieve and align the objectives of the *proof of concept* to organisational goals, as well as other areas in the business where similar projects could be executed.
- A methodology is defined as a set of procedures that can be followed for achieving an objective and is more specific than a framework; it provides guidelines as to how to carry out the procedure in such a way that it is consistent with a particular framework [31]. The 12-step process did not provide enough detail on how to go about the KM implementation and therefore proved inadequate as a methodology. This also resulted in project delays as some of the steps had to be updated after significant issues in terms of approach had been amended.
- With regard to the nature of knowledge, some gaps in the 12-step process became evident as not all components of the KM process (for instance organisational design), were dealt with.

The project team conducted a special session on status and progress made with the *proof of concept*. It was concluded that the issues identified had to be addressed and that additional steps had to be included in the 12-step process in order to achieve the envisaged outcomes within the timeframes allocated.

3. PROPOSED ENHANCED FRAMEWORK AND COMPREHENSIVE METHODOLOGY

Rubenstein-Montano, Liebowitz et al. [30] make the following recommendations regarding a KM framework:

- A KM framework should be both prescriptive and descriptive.
- A KM framework should be consistent with systems thinking.
- The organisational goals and strategies must be linked to KM.
- Planning should take place before any KM activities are conducted.
- The cultural aspects of the organisation must be acknowledged and the KM practices must be compatible with that culture.
- KM must be directed by learning and feedback loops, both single and double.

Following a number of discussions with key stakeholders and subject matter experts, as well as consideration of what constitutes a KM framework [30], an enhanced framework and comprehensive methodology were defined and utilised for the continuation of the *proof of concept*. This proposed framework and methodology are depicted in Figure 1. The proposed framework consists of five phases namely *strategising*, *evaluation, development, validation* and *implementation*. Each phase of the framework consists of sub-phases describing the methodology applicable to each phase.

Strategising is the first phase and it entails the development of the overall KM strategy for the organisation including the desired outcome of the strategy and what the KM objectives are. It is essential that the KM strategy be aligned with the overall business strategy [2] and that the perceived outcomes support the desired key performance areas of the business strategy. The way KM will be monitored and measured must be defined and the critical success factors identified. Executive sponsorship and a strong organisational or governance structure of the KM programme are key requirements for success and constitute key components of the strategising step. This step deals with the KM principles at enterprise level and is referred to as the KM programme scope of work. The methodology procedures relevant to this step are KM principles and governance, organisational structure and sponsorship, requirements analysis and measurement.

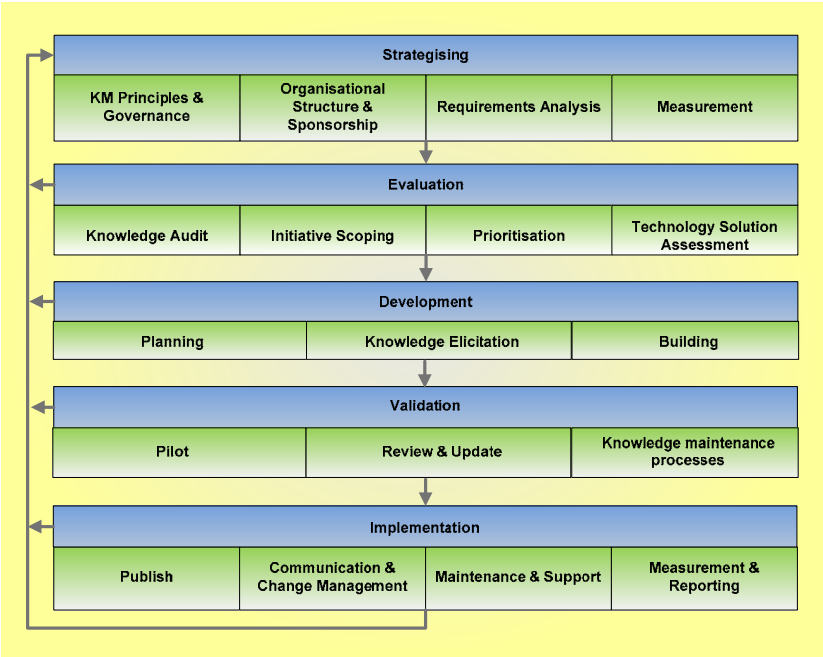


Figure 1. Proposed KM framework and methodology

The second phase in the proposed framework is *evaluation.* This phase focuses on the assessment of the current state of knowledge and KM in the organisation, as well as the scoping and prioritisation of specific initiatives in the organisation. These initiatives are aligned with the enterprise definition, but can be implemented as standalone initiatives. Technology as an enabler must be considered and the way in which existing technologies in the organisation support KM enablement or what gaps exist must be evaluated. The methodology procedure steps that form part of this phase are knowledge audit, initiative scoping, prioritisation and technology solution assessment.

The third phase is *development.* Here the emphasis is on the building blocks required for the implementation of the prioritised KM initiative. This phase entails the drafting of a project plan to manage the activities to implementation of the prioritised KM initiative and includes the collation, acquisition and harvesting of knowledge required for the initiative. Lastly, it includes the building of a pilot that can be tested and launched in subsequent steps of the proposed methodology. Planning, knowledge elicitation and building are the methodology procedures that are pertinent for this phase.

Validation is the fourth phase of the proposed framework; it deals specifically with the components required to launch the pilot such as the formalisation of the community of practice or user group for the specific KM initiative, the testing and update of the KM initiative pilot and the definition of all processes required to maintain the knowledge base once launched. Methodology processes applicable to this step include pilot launch, review and update of the pilot and knowledge maintenance processes.

The last phase in the proposed framework is *implementation*. This phase focuses on the publishing of the signed off KM base and all processes related to the communication and change management of the effort in order to facilitate user adoption. The maintenance and support processes defined are activated in order to build the knowledge base initiative launched and to facilitate continuous improvement and innovation cycles. Regular and active measurement and reporting of the KM effort is implemented and any key issues identified are addressed. The specific methodology procedures for this step are publishing, communication and change management, maintenance and support and measurement and reporting.

The proposed methodology describes the procedure and steps to be followed and is aligned with the proposed framework. This is reflected in Table 3. Table 3 also describes artefacts of each procedure within the methodology. The proposed framework is cyclic and iterative and a shorter or longer cycle can be utilised as required by the organisation once the overall strategy is completed (Step 1). It is essential - as experienced in the *proof of concept* - to design for the enterprise and to implement initiatives in a phased approach aligned with the overall strategy.

The timelines for the *proof of concept* implementation were re-planned in accordance with to the proposed framework and methodology and the phases and sub-phases were followed. *Proof of concept* target outputs were achieved successfully. This proposed framework and methodology will also be utilised for further implementations of KM initiatives in MTN SA.

The comparison of the proposed framework and methodology with the 12-step process is shown in Table 4.

Table 3: Detailed description of framework and methodology

Framework component	Methodology procedure	Methodology procedure description	Artefact
Strategising	KM principles & governance	Define the key objectives for the KM programme and identify what dimensions of knowledge i.e. explicit and implicit (tacit) must be addressed by the KM effort. Indicate how the programme will be managed and overseen and the strategy driven in order to achieve the defined objectives. Define knowledge framework or taxonomy. KM principles and objectives to be aligned to organisation strategy.	KM strategy and governance document.
	Organisational structure & sponsorship	Define the organisational structure and roles and responsibilities that are required to support the KM programme and maintain focus on implementation and adoption. Identify executive sponsorship to visibly support the KM objectives and motivate people to share knowledge.	KM strategy and governance document
	Requirements analysis	Analyse and identify specialist areas in the organisation that my require KM. Identify key areas of knowledge in line with the knowledge dimensions defined as part of the KM strategy.	KM business requirement analysis document
	Measurement	Define how the implementation and maintenance of the KM programme will be measured and tracked. Identify the key drivers [35] of the key performance measures and indicate what actions have to be taken to address negative key performance indicators on the KM dashboard.	KM strategy and governance document KM dashboard
Evaluation	Knowledge audit	Find and verify potential knowledge bases that may fulfil the requirements defined in the requirements analysis and produce an audit report. Identify the key employees who hold tacit knowledge that must be harvested as part of the KM programme.	KM audit report
	Initiative scoping	Scope initiatives aligned to and in support of the requirements analysis of the KM programme. Include the audit result to recognise where knowledge already exists in an explicit form that may be shared.	KM initiative scope document
	Prioritisation	Prioritise scoped KM initiatives in order to achieve best results first and / or quick wins.	KM initiative scope document
	Technology solution assessment	Utilise KM solution characteristic list to assess and select the best toolset of existing technology in the organisation and / or new technology to enable the KM programme [33]. Expand the initiative scoping with the technology requirement specification.	KM initiative and system requirement specification
Development	Planning	Draft a work plan with activities required, timeframe, resources and budget requirements to implement the prioritised KM initiatives. Define the way of working required to achieve the implementation of the identified KM initiatives.	KM initiative project plan
	Knowledge elicitation	Collate and / or elicit knowledge as per the KM initiatives planning through workshops, knowledge harvesting sessions, collection of explicit knowledge, etc. and document / collate / consolidate. Validate knowledge, classify knowledge according to framework (taxonomy) and encode knowledge.	KM workshop outputs KM content documents
	Building	Build the knowledge base and user interface as per the collated and elicited knowledge and technology enablement defined in the KM initiative and system requirement specification. Define storing, retrieval, sharing, maintenance and collaboration processes and workflow. Define and establish KM pilot community of practice to oversee and support KM pilot	KM prototype
Validation	Pilot & test	Pilot and test the prototype with identified community of practice / user group. Test storing, retrieval, sharing, maintenance and collaboration processes. Log enhancement and faults find.	KM pilot test results KM pilot fault / enhancement log
	Review & update	Update KM build with enhancements and faults as logged during the pilot phase. Obtain sign off on content.	KM updated / enhanced prototype
	Knowledge maintenance processes	Update storing, retrieval, sharing, maintenance and collaboration processes as per review and update and confirm maintenance process roles and responsibilities. Obtain sign off on processes.	KM final prototype (includes content and processes)
Implementation	Communication & change management	Draft communication plan to focus on information sharing and benefits regarding KM pilot. Change management plan to focus on user adoption and visibility, facilitating knowledge about the maintenance processes and optimal usage of the KM pilot base.	KM communication and change management plan
	Train & publish	Train community of practice / user group on using KM pilot and launch pilot with approved content and processes. Continuously assess adoption and usage rate and address areas of low adoption.	KM e-learning manual / user manual KM dashboard KM knowledge base
	Maintenance & support	Support KM users with queries logged, tips and techniques. Community of practice to actively facilitate maintenance of knowledge base and aid innovation cycles.	Updated KM knowledge base
	Measurement & reporting	Continuous assessment and monthly KM dashboard reporting tracking progress and alignment to objectives. Track and report on benefits defined in the KM strategy. Evaluate any updates to the KM strategy based on the implementation results and dashboard tracking.	KM dashboard

Table 4: Comparison of 12-step process vs. proposed framework and methodology

		Leadership			Organisation					Technology			Learning
		1	2	3	4	5	6	7	8	9	10	11	12
Framework component	**Methodology procedure**	Identify knowledge critical to your business	Conduct work-centred analysis	Sell high-level plan of action to senior management	Engage key stakeholders	Develop process model	Identify critical knowledge gaps, opportunities, and risks	Establish and prioritize goals	Develop requirements and measurement program	Plan high-level strategy approach	Implement strategy, build, and deploy	Monitor, measure, and report metrics	Learn from results
Strategising	KM principles & governance	✔						✔		✔			
	Organisational structure & sponsorship			✔									
	Requirements analysis		✔						✔				
	Measurement								✔				
Evaluation	Knowledge audit	✔					✔						
	Initiative scoping					✔			✔				
	Prioritisation							✔					
	Technology solution assessment												
Development	Planning									✔			
	Knowledge elicitation												
	Building										✔		
Validation	Pilot & test												
	Review & update												
	Knowledge maintenance processes					✔							
Implementation	Communication & change management			✔	✔								
	Train & publish										✔		
	Maintenance & support												✔
	Measurement & reporting											✔	

A comparison of the 12-step process with the proposed framework and methodology reveals that the proposed framework and methodology comply with the four pillars as indicated, namely leadership, organisation, technology and learning. However, the proposed framework and methodology provide more detail relating to the implementation process and approach and what specific outputs are required. A key step included in the proposed framework and methodology is technology assessment to establish optimal enablement of the KM programme. Other additional procedures are the pilot and testing of the KM initiative chosen prior to launching it. Sponsorship and user adoption are supported by a very comprehensive communication and change management plan and not just singular events as suggested by the 12-step process.

4. CONCLUSION

Sustainable competitive advantage in organisations is created through knowledge assets that are of far greater value than any tangible asset. A company with poor KM systems risks financial losses when losing its skills and knowledge encapsulated within its workforce. The successful implementation of KM is a key driver in mitigating these risks.

Organisations today are creating, storing, using, sharing and sending vast amounts of data and information and this makes the use of technology as enabler, an obligation. However, technology aimed at KM is not the only answer, as the way in which knowledge workers create, disseminate and manage information, is vital. The development of a comprehensive KM system that supports all phases of KM is both a technological and organisational solution, and is not necessarily available as a single technology.

The KM implementation process is a comprehensive course of action that requires focus and commitment through-out an organisation in order to achieve results, yet no universally accepted framework or methodology to guide such an implementation exists.

In this paper, we have proposed a framework and methodology for KM system implementation. This proposed framework and methodology evolved from the application of a 12-step implementation process derived by Calabrese and Orlando [6] and the implementation of a KM *proof of concept* for a particular department in an organisation. The study was conducted at a mobile telecommunication organisation in South Africa, in an environment characterised by an enormous demand for skills and an extremely competitive industry where innovation and value proposition are key differentiators to increasing market share. The proposed framework and methodology take account of the nature of knowledge and KM,

as well as barriers to KM system implementation that are evident in organisations today.

The KM system implementation framework and methodology were derived from a qualitative study and further research is needed to generalise them. However, according to informal discussions with key decision makers within different organisations in South Africa, there is strong evidence that they may also be appropriate for smaller companies. It was also possible to re-use the framework and methodology to guide the implementation of different sized initiatives in the telecommunication company in South Africa.

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